Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2010–2015

February 1, 2011

The Cisco® Visual Networking Index (VNI) Global Mobile Data Traffic Forecast Update is part of the comprehensive Cisco VNI Forecast, an ongoing initiative to track and forecast the impact of visual networking applications on global networks. This paper presents some of Cisco's major global mobile data traffic projections and growth trends.

Executive Summary

The Mobile Network in 2010 and 2011

Global mobile data traffic grew 2.6-fold in 2010, nearly tripling for the third year in a row. The 2010 mobile data traffic growth rate was higher than anticipated. Last year's forecast projected that the growth rate would be 149 percent. This year's estimate is that global mobile data traffic grew 159 percent in 2010.

Last year's mobile data traffic was three times the size of the entire global Internet in 2000. Global mobile data traffic in 2010 (237 petabytes per month) was over three times greater than the total global Internet traffic in 2000 (75 petabytes per month).

Mobile video traffic will exceed 50 percent for the first time in 2011. Mobile video traffic was 49.8 percent of total mobile data traffic at the end of 2010, and will account for 52.8 percent of traffic by the end of 2011.

Mobile network connection speeds doubled in 2010. Globally, the average mobile network downstream speed in 2010 was 215 kilobits per second (kbps), up from 101 kbps in 2009. The average mobile network connection speed for smartphones in 2010 was 1040 kbps, up from 625 kbps in 2009.

The top 1 percent of mobile data subscribers generate over 20 percent of mobile data traffic, down from 30 percent 1 year ago. According to a mobile data usage study conducted by Cisco, mobile data traffic has evened out over the last year and now matches the 1:20 ratio that has been true of fixed networks for several years. Similarly, the top 10 percent of mobile data subscribers now generate approximately 60 percent of mobile data traffic, down from 70 percent at the beginning of the year.

Average smartphone usage doubled in 2010. The average amount of traffic per smartphone in 2010 was 79 MB per month, up from 35 MB per month in 2009.

Smartphones represent only 13 percent of total global handsets in use today, but they represent over 78 percent of total global handset traffic. In 2010, the typical smartphone generated 24 times more mobile data traffic (79 MB per month) than the typical basic-feature cell phone (which generated only 3.3 MB per month of mobile data traffic).

Globally, 31 percent of smartphone traffic was offloaded onto the fixed network through dual-mode or femtocell in 2010. Last year, 14.3 petabytes of smartphone and tablet traffic were offloaded onto the fixed network each month. Without offload, traffic originating from smartphones and tablets would have been 51 petabytes per month rather than 37 petabytes per month in 2010.

Android approaches iPhone levels of data use. At the beginning of the year, iPhone consumption was at least 4 times higher than that of any other smartphone platform. Toward the end of the year, iPhone consumption was only 1.75 times higher than that of the second-highest platform, Android.

In 2010, 3 million tablets were connected to the mobile network, and each tablet generated 5 times more traffic than the average smartphone. In 2010, mobile data traffic per tablet was 405 MB per month, compared to 79 MB per month per smartphone.

There were 94 million laptops on the mobile network in 2010, and each laptop generated 22 times more traffic than the average smartphone. Mobile data traffic per laptop was 1.7 GB per month, up 49 percent from 1.1 GB per month in 2009.

Nonsmartphone usage increased 2.2-fold to 3.3 MB per month in 2010, compared to 1.5 MB per month in 2009. Basic handsets still make up the vast majority of devices on the network (87 percent).

There are 48 million people in the world who have mobile phones, even though they do not have electricity at home. The mobile network has extended beyond the boundaries of the power grid.

The Mobile Network in 2015

Global mobile data traffic will increase 26-fold between 2010 and 2015. Mobile data traffic will grow at a compound annual growth rate (CAGR) of 92 percent from 2010 to 2015, reaching 6.3 exabytes per month by 2015.

There will be nearly one mobile device *per capita* by 2015. There will be over 7.1 billion mobile-connected devices, including machine-to-machine (M2M) modules, in 2015—approximately equal to the world's population in 2015 (7.2 billion).

Mobile network connection speeds will increase 10-fold by 2015. The average mobile network connection speed (215 kbps in 2010) will grow at a compound annual growth rate of 60 percent, and will exceed 2.2 megabits per second (Mbps) in 2015.

Two-thirds of the world's mobile data traffic will be video by 2015. Mobile video will more than double every year between 2010 and 2015. Mobile video has the highest growth rate of any application category measured within the Cisco VNI forecast at this time.

Mobile-connected tablets will generate as much traffic in 2015 as the entire global mobile network in 2010. The amount of mobile data traffic generated by tablets in 2015 (248 petabytes per month) will be approximately equal to the total amount of global mobile data traffic in 2010 (242 petabytes per month). The same will be true of M2M traffic, which will reach 295 petabytes per month in 2015.

The average smartphone will generate 1.3 GB of traffic per month in 2015, a 16-fold increase over the 2010 average of 79 MB per month. Aggregate smartphone traffic in 2015 will be 47 times greater than it is today, with a CAGR of 116 percent.

By 2015, over 800 million terabytes of mobile data traffic will be offloaded to the fixed network by means of dual-mode devices and femtocells. Without dual-mode and femtocell offload of smartphone and tablet traffic, total mobile data traffic would reach 7.1 exabytes per month in 2015, growing at a CAGR of 95 percent.

The Middle East and Africa will have the strongest mobile data traffic growth of any region at 129 percent CAGR, followed by Latin America at 111 percent and Central and Eastern Europe at 102 percent.

There will be 788 million mobile-only Internet users by 2015. The mobile-only Internet population will grow 56-fold from 14 million at the end of 2010 to 788 million by the end of 2015.

The mobile network will break the electricity barrier in more than 4 major regions by 2015. By 2015, 4 major regions (Sub-Saharan Africa, Southeast Asia, South Asia, and the Middle East) and 40 countries (including India, Indonesia, and Nigeria) will have more people with mobile network access than with access to electricity at home. The off-grid, on-net population will reach 138 million by 2015.

Appendix A summarizes the details and methodology of the VNI forecast.

Year in Review: Mobile Data Traffic Nearly Tripled in 2010

Global mobile data traffic nearly tripled (2.6-fold growth) in 2010, for the third year in a row. It is a testament to the momentum of the mobile industry that this growth persisted despite the continued economic downturn, the introduction of tiered mobile data packages, and an increase in the amount of mobile traffic offloaded to the fixed network.

Although last year's Cisco VNI Global Mobile Data Traffic Forecast had projected strong growth in mobile data traffic in 2010 (149 percent), growth was even stronger than anticipated (159 percent). Even more surprising was the strong growth in markets that already had relatively high mobile data adoption and use. For example, last year's forecast projected 120 percent mobile data traffic growth in Japan in 2010, but we now estimate that the growth was 137 percent. As shown in Table 1, mobile operators and content providers in all regions have continued to report strong traffic growth.

Table 1. Examples of Mobile Data Traffic Growth in 2010

Region	Mobile Operator and Content Provider Examples
Korea	• From mid-2009 to mid-2010, KT recorded a 344% increase in 3G mobile data traffic, SK Telecom's traffic grew 232%, and LG's traffic grew 114%. • KT expects a 49-fold increase in mobile device traffic from 2009 to 2012, but plans to offload 40 percent of this traffic.
Japan	• Softbank's mobile traffic grew 260% from 1Q 2009 to 1Q 2010, according to estimates by HSBC. • KDDI expects mobile data traffic to grow 15-fold by 2015. • NTT DoCoMo's mobile data traffic grew 60% from year to year.
China	• China Unicom's 3G traffic increased 62% in a single quarter from Q1 to Q2 of 2010.
France	• SFR's mobile data traffic has tripled each year since 2008.
Italy	• Telecom Italia delivered 15 times more mobile data traffic in 2010 than in 2007.
Europe	• Vodafone's European mobile data traffic increased 115% from 1Q 2009 to 2Q 2009, and 88% from 2Q 2009 to 2Q 2010. • TeliaSonera expects mobile data traffic to double each year for the next 5 years.
United States	• AT&T reports that traffic grew 30-fold from 3Q 2009 to 3Q 2010.
Global	• Google reports that the number of YouTube videos delivered to mobile devices tripled in 2010, reaching 200 million video views per day.

Why Was Growth Higher than Expected in 2010?

One reason for the unexpectedly strong growth in 2010 was the accelerated adoption of smartphones by mobile phone subscribers, in combination with the much higher usage profile of smartphones relative to basic handsets. Last year we expected that the smartphone installed base would increase 22 percent in 2010, but Informa Telecoms and Media data indicates that the number of smartphones in use grew by 32 percent during the year.

In addition to the increase in smartphone adoption, there was a sharp increase in those smartphones that have the highest usage profile: iPhones and Android phones. The number of iPhones and Android devices in use grew 72 percent in 2010, bringing the combined iOS and Android share of smartphones to 23 percent, up from 11 percent in 2009.

Operators such as Vodafone have reiterated that smartphone users generate 10 to 20 times the traffic of their nonsmartphone counterparts. Operators have also reported that iPhones generate 5 to 10 times the traffic of the average smartphone, and according to a recent analysis of usage data conducted by Cisco, Android phones are catching up to iPhones in usage volume.

In addition to the evolving handset mix, other high-usage devices increased their presence on the mobile network. The number of mobile-connected laptops grew by 63 percent in 2010. A large percentage of mobile-connected laptop users consider mobile broadband their primary means of accessing the Internet, and in many regions there is a pronounced mobile broadband substitution effect. A recent survey by Ofcom indicates that the percentage of Internet users who have substituted mobile broadband for fixed broadband is 6 percent in the United Kingdom, 11 percent in Germany, and 13 percent in Italy. As expected, substitution users generate much more traffic than users who use mobile broadband as a complement to fixed networking.

Tablets also made their first appearance on the mobile network in 2010, bringing a data usage profile that is 5 times higher than that of a smartphone. Table 2 summarizes the number of each type of device and the traffic multipliers associated with them.

Table 2. Devices with High Usage Profiles Are Growing in Number on the Mobile Network

Device	Millions in Use 2009	Millions in Use 2010	Usage Multiplier Relative to Nonsmartphone	Usage Multiplier Relative to Smartphone
Smartphones	399	526	24 Nonsmartphones	1 Smartphone
iOS and Android phones	45	121	96 Nonsmartphones	4 Smartphones
Mobile-connected tablets	0.3	3.0	122 Nonsmartphones	5 Smartphones
Mobile-connected laptops	58	94	515 Nonsmartphones	22 Smartphones

Source: Informa Telecoms and Media, Strategy Analytics, Cisco VNI Mobile, 2011

What is the Outlook for 2011?

Cisco estimates that traffic in 2011 will grow 131 percent, reflecting a slight tapering in growth rates. The evolving device mix and the migration of traffic from the fixed network to the mobile network have the potential to bring the growth rate higher, while tiered pricing and traffic offload may reduce this effect. The current growth rates of mobile data traffic resemble those of the fixed network from 1997 through 2001, when the average yearly growth was 150 percent. In the case of the fixed network, the growth rate remained in the range of 150 percent for 5 years.

Table 3. Global Mobile Data Growth Today is Similar to Global Internet Growth (Fixed) in the Late 1990s

Global Internet Traffic Growth	
1997	178%
1998	124%
1999	128%
2000	195%
2001	133%

Global Mobile Data Traffic Growth	
2008	156%
2009	140%
2010	159%
2011 (estimate)	131%
2012 (estimate)	113%

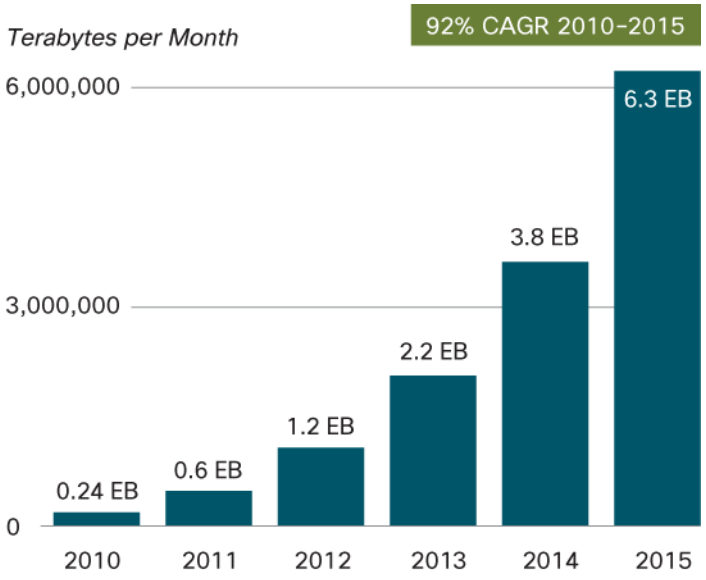
Source: Cisco VNI Mobile, 2011

In the long term, mobile data and fixed traffic should settle into the same growth rate, although the mobile data growth rate is likely to remain higher than the fixed growth rate for the next 7 to 10 years.

Global Mobile Data Traffic, 2010 to 2015

Overall mobile data traffic is expected to grow to 6.3 exabytes per month by 2015, a 26-fold increase over 2010. Mobile data traffic will grow at a CAGR of 92 percent from 2010 to 2015. Annual growth rates will taper over the forecast period from 131 percent in 2011 to 64 percent in 2015 (Figure 1).

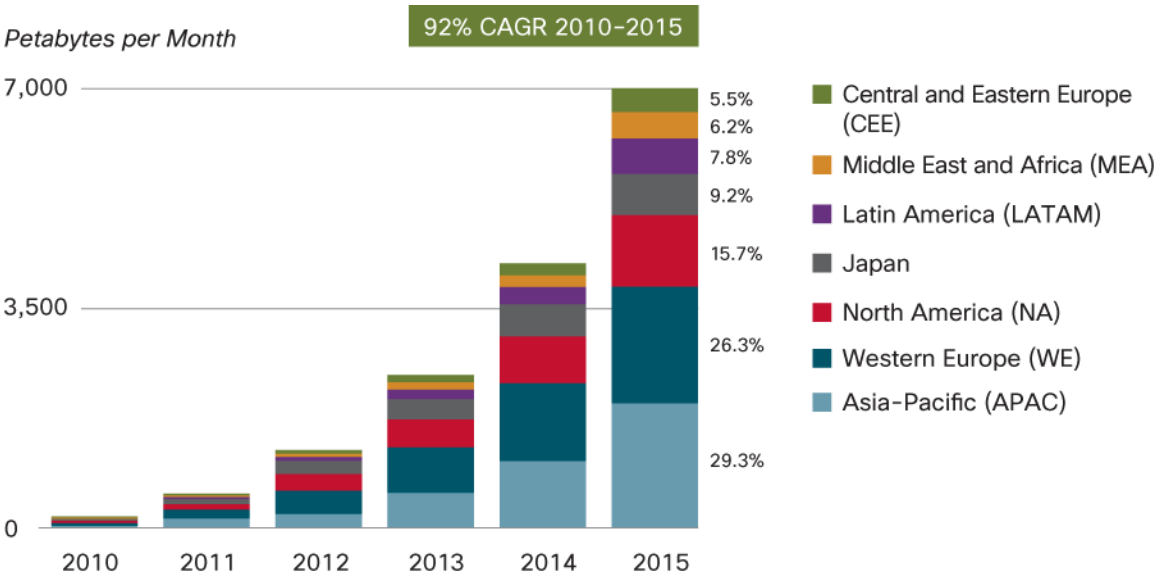
Figure 1. Cisco Forecasts 6.3 Exabytes per Month of Mobile Data Traffic by 2015



Source: Cisco VNI Mobile, 2011

Western Europe and Asia Pacific will account for over half of global mobile traffic by 2015, as shown in Figure 2. Middle East and Africa will experience the highest CAGR of 129 percent, increasing 63-fold over the forecast period. The emerging market regions (Central and Eastern Europe, Latin America, and Middle East and Africa) will have the highest growth and will represent an increasing share of total mobile data traffic, from 12 percent at the end of 2010 to 20 percent by 2015.

Figure 2. Global Mobile Data Traffic Forecast by Region



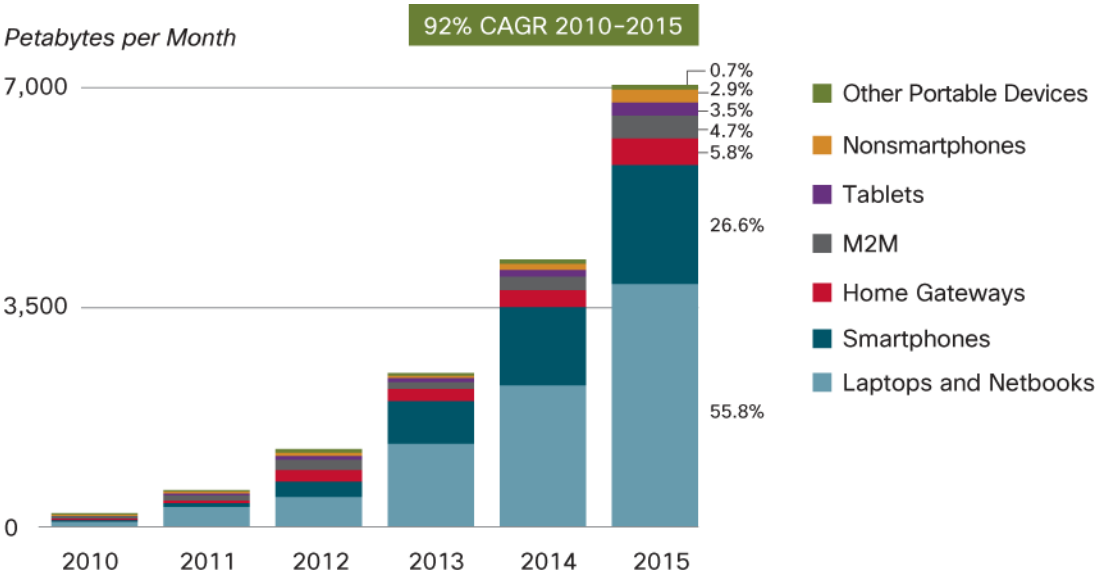
Source: Cisco VNI Mobile, 2011

In the sections that follow, we identify nine major trends behind the growth of mobile data traffic.

Trend 1: Device Diversification

Figure 3 shows the devices responsible for mobile data traffic growth. Laptops and netbooks will continue to generate a disproportionate amount of traffic, but new device categories such as M2M and tablets will begin to account for a significant portion of the traffic by 2015.

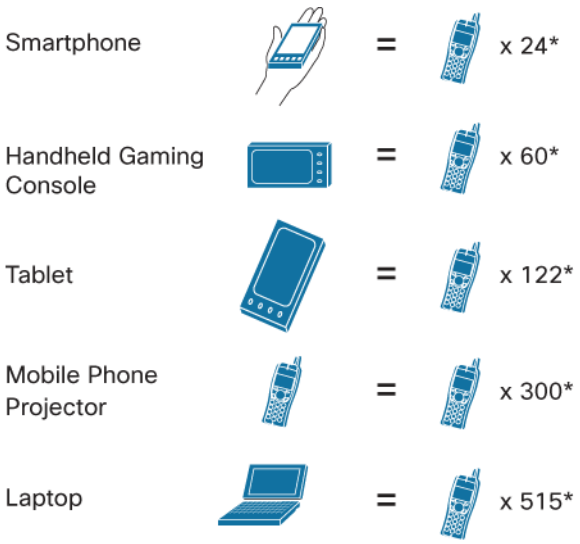
Figure 3. Laptops and Smartphones Lead Traffic Growth



Source: Cisco VNI Mobile, 2011

The introduction of laptops, tablets, and high-end handsets onto mobile networks is a major generator of traffic, because these devices offer the consumer content and applications not supported by the previous generation of mobile devices. As shown in Figure 4, a single laptop can generate as much traffic as 515 basic-feature phones, and a smartphone creates as much traffic as 24 basic-feature phones.

Figure 4. High-End Devices Can Multiply Traffic



* Monthly basic mobile phone data traffic

Source: Cisco VNI Mobile, 2011

Trend 2: Growth in Average Traffic per Device

Average traffic per device is expected to increase rapidly during the forecast period, as shown in Table 4.

Table 4. Summary of Per Device Usage Growth

Device Type	2009	2010	2015
Nonsmartphone	1.5	3.3	54
E-reader	5	11	245
Smartphone	35	79	1,272
Portable gaming console	Not available	250	879
Tablet	28	405	2,311
Laptop and netbook	1,145	1,708	6,522
M2M module	3	35	166

Source: Cisco VNI Mobile, 2011

The growth in usage per device outpaces the growth in the number of devices. As shown in Table 5, the growth rate of new-device mobile data traffic is 2 to 5 times greater than the growth rate of users.

Table 5. Comparison of Global Device Unit Growth and Global Mobile Data Traffic Growth

Device Type	Growth in Users, 2010-2015 CAGR	Growth in Mobile Data Traffic, 2010-2015 CAGR
Smartphone	24%	116%
Portable gaming console	79%	130%
Tablet	105%	190%
Laptop and netbook	42%	85%
M2M module	53%	109%

Source: Cisco VNI Mobile, 2011

The following are a few of the main promoters of growth in average usage:

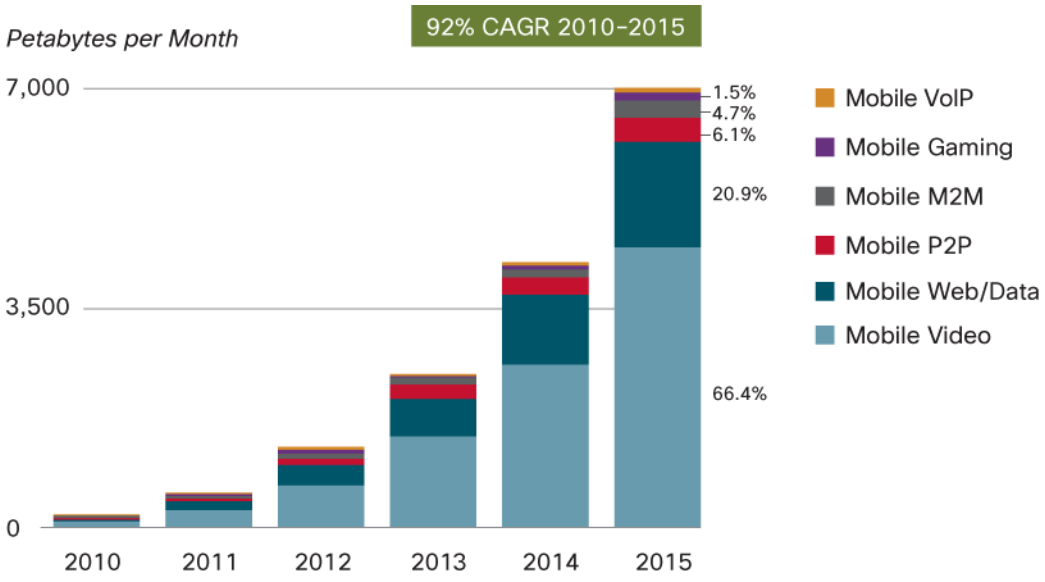
- As mobile network connection speeds increase, the average bit rate of content accessed through the mobile network will increase. High-definition video will be more prevalent, and the proportion of streamed content as compared to side-loaded content is also expected to increase with average mobile network connection speed.
- As the battery life of mobile devices improves, mobile minutes of use will increase. The amount of long-form video viewed on mobile devices will grow as battery life and processing power advances.
- As mobile network capacity improves, operators are more likely to offer mobile broadband packages comparable in price and speed to those of fixed broadband, thereby encouraging mobile broadband substitution. The usage profile of substitution users is substantially higher than average.
- The shift towards unicast from broadcast video will affect mobile networks as much as it will affect fixed networks. Internet radio and Internet video are unicast, meaning that there is one data stream per user, unlike broadcast, where one stream serves many users. The shift from broadcast to unicast means that traffic can increase dramatically even while the total amount of time spent watching video remains relatively constant.

Mobile devices increase an individual's contact time with the network, and it is likely that in the early stages of mobile Internet use, this increased contact time will lead to an increase in overall minutes of use per user. However, not all of the increase in mobile data traffic can be attributed to traffic migration to the mobile network from the fixed network. Many uniquely mobile applications have already emerged, such as location-based applications and services.

Trend 3: Mobile Video

Because mobile video content has much higher bit rates than other mobile content types, mobile video will generate much of the mobile traffic growth through 2015. Of the 6.3 exabytes per month crossing the mobile network by 2015, 4.2 exabytes will be due to video (Figure 5).

Figure 5. Mobile Video Will Generate 66 Percent of Mobile Data Traffic by 2015



VoIP traffic forecasted to be 0.4% of all mobile data traffic in 2015.
Source: Cisco VNI Mobile, 2011

Note that last year's forecast estimated that 66 percent of mobile network traffic would be video traffic by 2014. The mobile video percentage estimated for 2015 is not higher than 66 percent because of the inclusion of M2M traffic in this year's forecast.

Trend 4: Mobile Internet Substitution

In many countries in Europe and elsewhere, mobile operators are offering mobile broadband services at prices and speeds comparable to those of fixed broadband. Although there are often data caps on mobile broadband services that are lower than those of fixed broadband, some consumers are opting to forego their fixed lines in favor of mobile services.

Even where laptop-based mobile broadband services remain expensive, the number of handset-based mobile Internet users may exceed the number of fixed mobile Internet users in regions with low penetration of fixed telecommunications services.

In total, the number of mobile-only Internet users will grow 25-fold between 2010 and 2015, reaching 788 million mobile-only Internet users. Asia Pacific will account for over half of all mobile-only Internet users. Table 6 shows are Cisco's estimates for the number of mobile-only Internet users through 2015.

Table 6. Number of Mobile-Only Internet Users

	2010	2011	2012	2013	2014	2015
Global	13,976,859	31,860,295	78,855,662	188,375,368	487,426,725	788,324,804
Asia Pacific	2,448,932	6,768,196	20,543,294	67,012,433	240,350,642	420,277,951
Latin America	1,329,853	4,040,217	12,720,259	26,665,349	49,199,321	71,548,055
North America	2,615,787	4,218,310	6,550,322	14,257,565	38,783,886	55,646,710
Western Europe	5,237,113	10,348,319	21,163,143	33,524,429	58,670,609	83,364,841
Japan	441,060	1,021,441	3,322,664	10,780,236	21,462,108	31,876,998
Central and Eastern Europe	1,156,893	3,140,746	8,252,679	20,303,462	38,480,441	58,717,045
Middle East and Africa	747,221	2,323,065	6,303,302	15,831,895	40,479,719	66,893,204

Source: Cisco VNI Mobile, 2011

Trend 5: Traffic Offload from Mobile Networks to Fixed Networks

Much mobile data activity takes place within the user's home. A survey conducted by Cisco's Internet Business Solutions Group (IBSG) indicates that the percentage of time spent using mobile Internet at home is approximately 40 percent of total mobile data use, on average. The amount of mobile data use that is "on the move" is approximately 35 percent, while the remaining 25 percent of mobile Internet use occurs at work.

The relatively high percentage of home-based mobile data use suggests that operators may be able to offload traffic onto a fixed network, either by offering their subscribers dual-mode mobile phones or through deployment of femtocell technology.

Cisco has estimated the amount of smartphone traffic that can be offloaded through dual-mode devices or femtocells (see Table 7). The offload factor for each country is a combination of smartphone penetration, dual-mode share of smartphones, percentage of home-based mobile Internet use, and percentage of dual-mode smartphone owners with Wi-Fi fixed Internet access at home.

Table 7. Projected Dual-Mode and Femtocell Traffic Offload as a Percentage of Smartphone and Tablet Traffic

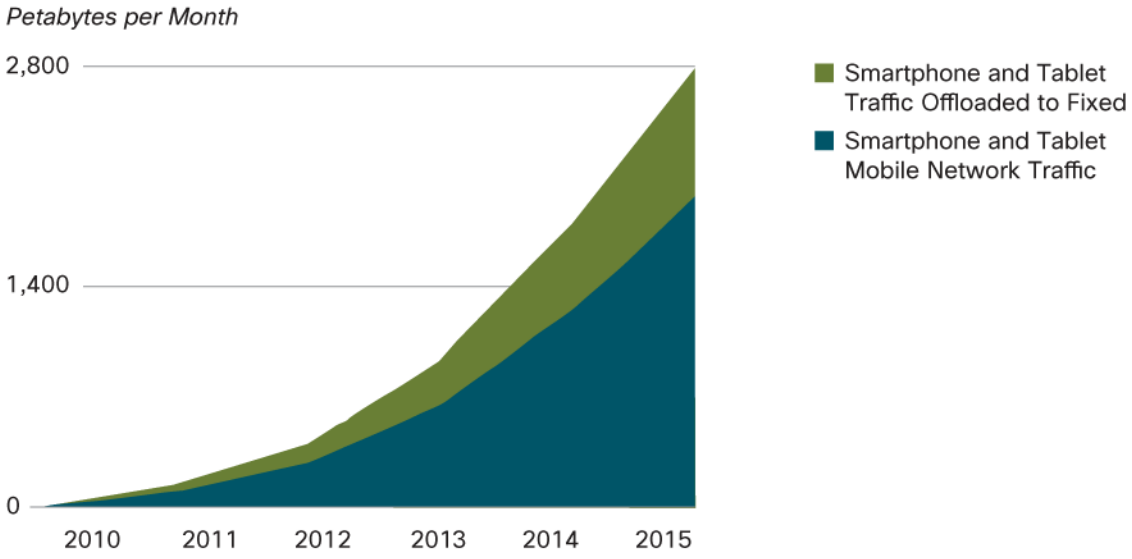
	2010	2011	2012	2013	2014	2015
China	20%	21%	21%	22%	22%	23%
India	28%	24%	19%	15%	10%	5%
Korea	28%	28%	30%	31%	32%	33%
Rest of Asia Pacific	30%	31%	33%	35%	37%	39%
Rest of Central and Eastern Europe	32%	32%	33%	33%	34%	35%
Russia	35%	36%	37%	39%	41%	42%
Japan	32%	31%	31%	30%	29%	28%
Brazil	23%	24%	24%	24%	23%	22%
Mexico	16%	14%	13%	12%	10%	9%
Rest of Latin America	21%	20%	19%	18%	17%	16%
Rest of Middle East and Africa	26%	24%	24%	23%	23%	23%
South Africa	29%	27%	27%	27%	26%	26%
Canada	21%	23%	26%	29%	31%	34%
U.S.	21%	23%	26%	28%	29%	30%
France	31%	32%	33%	35%	37%	38%
Germany	38%	40%	41%	40%	39%	37%
Italy	29%	28%	27%	27%	26%	25%
Rest of Western Europe	35%	37%	37%	36%	35%	34%
U.K.	40%	41%	43%	43%	43%	42%

Source: Cisco VNI Mobile, 2011

In many developing countries and regions, the offload percentage declines, while in developed regions, the offload factor steadily rises throughout the forecast period. The declining offload factor in developing markets is due to a decreasing number of mobile data users with Wi-Fi access at home.

Without offload, the combined amount of tablet and smartphone traffic would be 2.7 exabytes per month in 2015, up 54-fold from 2010. With offload, smartphone and tablet traffic will amount to 1.9 exabytes per month in 2015, up 52-fold from 2010. Over 800 million terabytes of mobile data traffic will be offloaded in 2015. The total offload for smartphones and tablets will be 39 percent in 2015, up from 31 percent in 2010 (Figure 6).

Figure 6. 39 Percent of Smartphone and Tablet Traffic will be Offloaded by 2015



Source: Cisco VNI Mobile, 2011

Because dual-mode devices are primarily smartphones and tablets, the overall offload amount in the current year is smaller than that shown above, as nonsmartphones still account for approximately one quarter of handset traffic.

Trend 6: Mobile Network Connection Speeds to Increase 10-fold by 2015

Globally, the average mobile network connection speed in 2010 was 215 kbps. The average speed will grow at a compound annual growth rate of 60 percent, and will exceed 2.2 Mbps in 2015. Smartphone speeds, generally 3G and higher, are currently nearly five times higher than the overall average. Smartphone speeds will quadruple by 2015, reaching 4.4 Mbps.

There is anecdotal evidence to support the idea that usage increases when speed increases, although there is often a delay between the increase in speed and the increased usage, which can range from a few months to several years. The Cisco VNI forecast relates application bit rates to the average speeds in each country. Many of the trends in the resulting traffic forecast can be seen in the speed forecast, such as the high growth rates for developing countries and regions relative to more developed areas (Table 8).

Table 8. Projected Average Mobile Network Connection Speeds (in kbps) by Region and Country

	2009	2010	2011	2012	2013	2014	2015	CAGR 2010-2015
Global								
Global speed: All handsets	101	215	359	584	934	1,465	2,220	60%
Global speed: Smartphones	614	1,038	1,443	1,953	2,608	3,424	4,404	34%
By Region								
Asia Pacific	37	74	115	188	328	584	984	68%
Latin America	13	50	103	206	402	744	1,260	91%
North America	376	707	1,071	1,556	2,198	2,996	3,994	41%
Western Europe	151	444	932	1,696	2,708	3,919	5,336	64%
Japan	769	1,394	2,009	2,631	3,353	4,282	5,509	32%
Central and Eastern Europe	43	117	246	499	955	1,704	2,786	89%
Middle East and Africa	13	59	141	309	620	1,142	1,948	101%
By Country								
Australia	413	953	1,397	1,967	2,674	3,556	4,649	37%
Brazil	26	74	145	275	508	895	1,458	82%
Canada	216	683	1,217	1,931	2,860	4,109	5,680	53%
China	13	50	99	208	428	816	1,384	94%
France	111	530	1,307	2,516	3,992	5,662	7,510	70%
Germany	61	306	730	1,462	2,486	3,668	4,929	74%
India	1	19	61	125	262	546	1,037	124%
Italy	158	465	1,073	2,092	3,475	5,142	7,037	72%
Japan	769	1,394	2,009	2,631	3,353	4,282	5,509	32%
Korea	868	1,447	1,950	2,521	3,193	3,981	4,984	28%
Mexico	6	36	80	175	384	822	1,557	112%
New Zealand	352	715	1,355	2,048	2,986	4,213	5,738	52%
Rest of Asia Pacific	24	85	168	321	608	1,103	1,860	85%
Rest of Central and Eastern Europe	56	140	292	577	1,070	1,854	2,966	84%
Rest of Latin America	6	38	79	165	326	598	997	93%
Rest of Middle East and Africa	10	43	105	238	503	977	1,738	110%
Rest of Western Europe	153	353	701	1,245	2,001	2,950	4,077	63%
Russia	20	75	163	356	741	1,422	2,448	101%
South Africa	51	268	655	1,386	2,474	3,842	5,454	83%
U.K.	306	820	1,466	2,338	3,398	4,668	6,155	50%
U.S.	389	709	1,059	1,526	2,143	2,902	3,848	40%

Source: Cisco VNI Mobile, 2011

Current and historical speeds are based on data from Cisco's GiST (Global Internet Speed Test) application and Ookla's Speedtest. Forward projections for mobile data speeds are based on third-party forecasts for the relative proportions of 2G, 3G, 3.5G, and 4G among mobile connections through 2015. For more information about Cisco GIST, please visit www.ciscovnipulse.com.

Trend 7: The Advent of Tiered Pricing

An increasing number of service providers worldwide are moving from unlimited data plans to tiered mobile data packages. To make an initial estimate of the impact of tiered pricing on traffic growth, we recently completed a case study based on the data of a Global Top 50 service provider, spanning the months immediately preceding and following the introduction of tiered pricing.

The impact of tiered pricing on traffic does not appear to be immediate. Three months after the service provider in this case study introduced tiered pricing, 20 percent of smartphone users were on tiered plans, but traffic growth continued at a rate of 5 percent per month. Although there may turn out to be longer-term effects, the overall measures in the 3 months following the pricing change reflect continued mobile data traffic growth.

Traffic volumes of mobile data users in the 3 months after the pricing change were 15 percent higher than volumes in the 3 months prior to the pricing change, growing from an average of 114 megabytes per month in the 3 months before tiered pricing to 131 megabytes per month in the 3 months after tiered pricing. The percentage of users generating over 200 megabytes per month increased from 20 percent to 30 percent over the course of 9 months.

The findings of the case study are reflected in the traffic forecast methodology in the following ways:

- The impact of tiered pricing is assumed to be a gradual rather than a sudden phenomenon
- Mobile broadband substitution is tempered according to common data caps in the country or region. For instance, mobile broadband packages in South Africa are comparatively expensive with relatively low data caps, so mobile broadband substitution usage is tempered by nearly 30 percent. A mobile broadband user who might otherwise generate 1.2 GB of traffic per month instead uses 0.9 GB per month.
- Growth rates per user slowed through 2012. After 2012 it is assumed that capacity upgrades will allow service providers to raise data caps.

More detail on the tiered pricing case study is available in Appendix B.

Trend 8: The (Mobile) Internet of Things

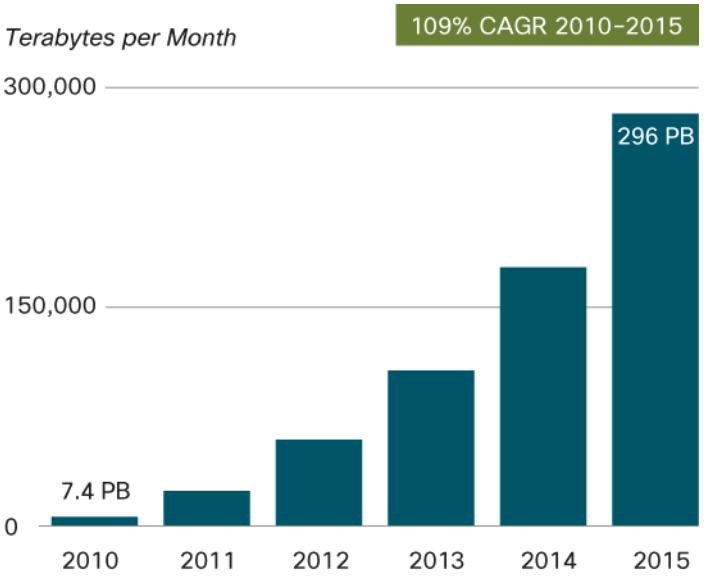
M2M mobile connections are expanding globally, along with other mobile connections, due to the growing hardware and software components for smart meters, business and consumer surveillance , inventory management, and fleet management, all of which are designed for operational excellence. As mobile data networks become ubiquitous in the enterprise, bandwidth-intensive M2M connections become more prevalent (Figure 7). Traditional appliances and devices, such as home appliances, vehicles, energy meters, and vending machines—which traditionally have not been connected directly to cellular networks—are now entering the network.

High-bandwidth scenarios for M2M are becoming real in many categories, including the following.

- **Business and consumer security and surveillance**: Video streams such as commercial security cameras, nannycams, petcams, etc. through mobile enabled residential or commercial gateways fall into this category. During the Shanghai World Expo 2010, 10,000 security cameras were installed on buses, trucks, and emergency vehicles. In normal circumstances, video is captured and uploaded when a Wi-Fi connection is available. When live monitoring is needed, video is transmitted over the mobile network at 2 frames per second. If each frame is 0.5 MB, then an hour of this video generates 3.6 GB. If half of these vehicles transmitted 1 hour of video over the course of a month, this would generate 18 petabytes of mobile data traffic, more that total global mobile data traffic in 2007.
- **Health care**: In the medical, well-being, and sports and fitness industries, devices and services used by medical personnel are being connected to reduce errors.

- **Inventory and fleet management**: Wi-Fi is being considered as an adjunct to cellular-based fleet management connectivity, to allow a vehicle to use cellular technology in the field, and support lower-cost, higher-speed Wi-Fi to download and upload data while in fleet headquarters and loading areas.
- **Telematics**: Trip assistance, navigation, and vehicle management are gaining greater consumer adoption, along with broadband-to-the-car offerings that use a cellular connection to the vehicle and then distribute the connection to notebook PCs and other devices within the vehicle through Wi-Fi.

Figure 7. Machine-to-Machine Traffic to Increase 40-Fold Between 2010 and 2015



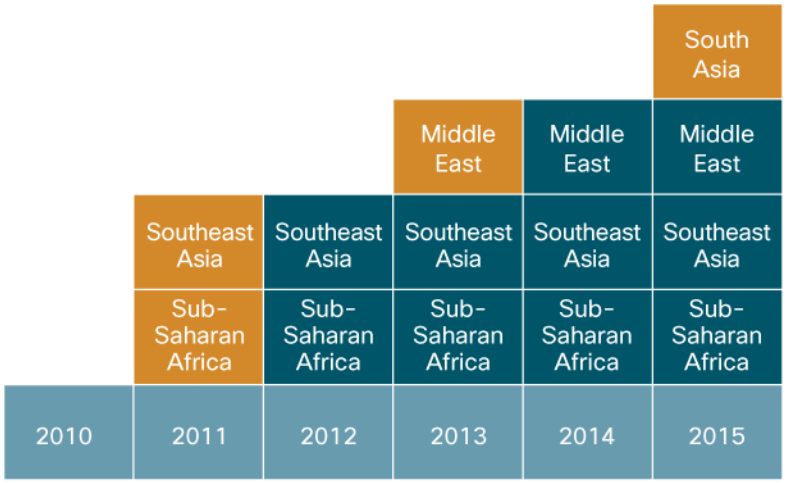
Source: Cisco VNI Mobile, 2011

Trend 9: Ubiquitous Mobility

One of the most astonishing developments of the past few years has been the extension of mobile services even beyond the boundaries of the power grid. Mobile phones are reaching every corner of the earth. There are already 32 countries where mobile data has broken the electricity barrier. By the end of 2011, this effect will be visible at the regional level, when the total number of mobile users in Sub-Saharan Africa and Southeast Asia exceeds the total on-grid population in those regions. By the end of 2013, the number of mobile users in the Middle East will exceed the Middle Eastern on-grid population, and by 2015 the number of mobile users in South Asia (India and surrounding countries) will exceed the South Asian on-grid population.

Figure 8 shows the regions in which the number of mobile subscribers exceeds the on-grid population, from 2009 through 2015. (Note: regions are highlighted in orange the first year that the on-net population exceeds the on-grid population.)

Figure 8. Mobile Access in 4 Major Regions Will Break the Electricity Barrier by 2015



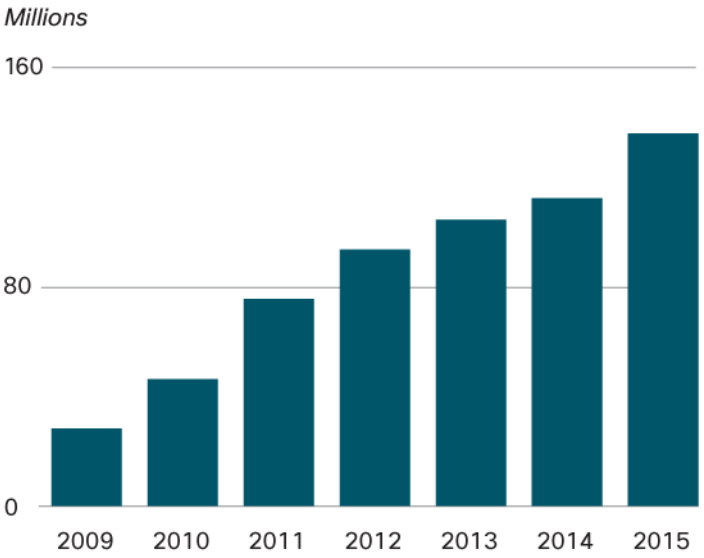
Source: Cisco VNI Mobile, 2010

Based on Cisco analysis of data from the International Energy Agency, the UN Statistics Division, and Informa Telecoms and Media, 2011

Selling a charge for a mobile phone–from a bank of wired outlets or even an adapted car battery–has become a cottage industry in many developing countries. Individuals, even those below the poverty line, are finding that mobile access increases their financial prospects, and are willing to go to great lengths to maintain access. Operators and governments also have incentives to encourage off-grid access to mobile services. Operators are developing new, highly profitable business models that are attractive and affordable to the base of the global economic pyramid. Governments and communities are finding that gross domestic product (GDP) and local economic growth appear to be correlated with mobile growth.

The end result is that the off-grid, on-net population will reach 138 million by 2015 (Figure 9). The mobile network will break the electricity barrier in 4 major regions and more than 40 countries (including India, Indonesia, and Nigeria) by 2015. “Breaking the electricity barrier” may be a short-lived phenomenon, since electricity access is likely to catch up to mobile access in the long term (perhaps even in response to the demand for mobile services), but it is nevertheless a testament to the socio-economic impact of network access that mobile has extended beyond the reach of the power grid.

Figure 9. The Off-Grid, On-Net Population Will Reach 138 Million by 2015



Source: Cisco VNI Mobile, 2011

Based on Cisco analysis of data from the International Energy Agency, the UN Statistics Division, and Informa Telecoms and Media, 2011

Further estimates and details are available in Appendix C.

Conclusion

Mobile data is well on its way to become a necessity. Mobile voice service is already considered a necessity by most, and mobile data, video, and TV services are fast becoming an essential part of consumers' lives. Used extensively by consumer as well the enterprise segments, and seeing impressive uptakes in both developed and emerging markets, mobility has proven to be transformational. Mobile subscribers are growing rapidly and bandwidth demand due to data and video is increasing. Mobile M2M connections continue to increase. The next 5 years are projected to provide unabated mobile video adoption despite the recessionary trends in macroeconomic conditions. Backhaul capacity must increase so mobile broadband, data access, and video services can effectively support consumer usage trends and keep mobile infrastructure costs in check.

Deploying next-generation mobile networks requires greater service portability and interoperability. With the proliferation of mobile and portable devices, there is an imminent need for networks to allow all these devices to be connected transparently, with the network providing high performance computing and delivering enhanced real time video and multimedia. This openness will broaden the range of applications and services that can be shared, creating a highly enhanced mobile broadband experience. The expansion of wireless presence will increase the number of consumers who access and rely on mobile networks, creating a need for greater economies of scale and lower cost per bit.

As many business models emerge with new forms of advertising, media and content partnerships, mobile services including M2M, live gaming and looking into the future, augmented reality, a mutually beneficial situation needs to be developed for service providers and over-the-top providers. New partnerships, ecosystems, and strategic consolidations are expected as mobile operators, content providers, application developers, and others seek to monetize the video traffic that traverses mobile networks. Operators must solve the challenge of effectively monetizing video traffic while investing and increasing infrastructure capital expenditures. They must become more agile and able to quickly change course and provide innovative services to engage the Web 3.0 consumer. As the net neutrality regulatory process and business models of the operators evolve, there is an unmet demand from consumers for the highest quality and speeds. As wireless technologies aim to provide experiences formerly only available through wired networks, the next few years will be critical for operators and service providers to plan future network deployments that will create a adaptable platform upon which will deploy the multitude of mobile enabled devices and applications of the future.

For More Information

Inquiries can be directed to traffic-inquiries@cisco.com.

Appendix A: The Cisco VNI Global Mobile Data Traffic Forecast

Table 9 shows detailed data from the Cisco VNI Global Mobile Data Traffic Forecast. The portable device category includes laptops with mobile data cards, USB modems, and other portable devices with embedded cellular connectivity.

Table 9. Global Mobile Data Traffic 2010–2015

	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
By Application Category (TB per Month)							
Data	73,741	160,101	321,036	561,242	893,330	1,407,000	**80%**
File sharing	33,510	64,186	113,821	176,657	258,727	378,559	**62%**
Video	117,943	288,405	655,442	1,334,333	2,452,898	4,149,610	**104%**
VoIP	4,021	6,120	9,067	11,797	14,386	23,282	**42%**
M2M	7,462	27,234	63,575	113,509	186,603	295,469	**109%**
By Device Type (TB per Month)							
Nonsmartphones	10,193	20,699	36,900	63,281	110,302	193,127	**80%**
Smartphones	35,451	97,490	250,877	566,772	1,081,368	1,661,689	**116%**
Laptops and netbooks	160,505	341,602	683,663	1,223,207	2,047,264	3,481,982	**85%**
Tablets	1,210	6,510	21,621	55,551	122,208	247,646	**190%**
Home gateways	21,686	51,994	105,038	171,898	250,741	362,584	**76%**
M2M	7,462	27,234	63,575	113,509	186,603	295,469	**109%**
Other portable devices	170	521	1,276	3,345	7,504	11,493	**132%**
By Region (TB per Month)							
North America	48,959	118,084	235,411	416,025	674,579	986,039	**82%**
Western Europe	64,407	145,685	325,518	634,869	1,072,665	1,631,953	**91%**
Asia Pacific	54,919	128,445	269,218	529,806	996,624	1,836,842	**102%**
Japan	40,245	86,478	172,112	289,322	425,161	577,998	**70%**
Latin America	11,687	25,997	60,486	127,206	257,463	487,784	**111%**
Central Eastern Europe	10,312	24,617	55,733	110,011	200,927	346,296	**102%**
Middle East and Africa	6,147	16,744	44,473	90,324	178,570	387,078	**129%**
Total (TB per Month)							
Total Mobile Data Traffic	236,676	546,050	1,162,950	2,197,563	3,805,989	6,253,991	**92%**

Source: Cisco VNI Mobile, 2011

The Cisco VNI Global Mobile Data Traffic Forecast relies in part upon data published by Informa Telecoms and Media, Strategy Analytics, Infonetics, Datamonitor, Gartner, IDC, Dell'Oro, Synergy, Nielsen, comScore, and the International Telecommunications Union (ITU).

The Cisco VNI methodology begins with the number and growth of connections and devices, applies adoption rates for applications, and then multiplies the application's user base by Cisco's estimated minutes of use and KB per minute for that application. The methodology has evolved to link assumptions more closely with fundamental drivers, to use data sources unique to Cisco, and to provide a high degree of application, segment, geographic, and device specificity.

- **Inclusion of fundamental drivers**. As with the fixed IP traffic forecast, each Cisco VNI Global Mobile Data Traffic Forecast update increases the linkages between the main assumptions and fundamental factors such as available connection speed, pricing of connections and devices, computational processing power, screen size and resolution, and even device battery life. This update focuses on the relationship of mobile connection speeds and the KB-per-minute assumptions in the forecast model. Proprietary data from the Cisco Global Internet Speed Test (GIST) application was used as a baseline for current-year smartphone connection speeds for each country.
- **Device-centric approach**. As the number and variety of devices on the mobile network continue to increase, it becomes essential to model traffic at the device level rather than the connection level. This Cisco VNI Global Mobile Data Traffic Forecast update details traffic to smartphones; nonsmartphones; laptops, tablets, and netbooks; e-readers; digital still cameras; digital video cameras; digital photo frames; in-car entertainment systems; and handheld gaming consoles.
- **Estimation of the impact of traffic offload**. The Cisco VNI Global Mobile Data Traffic Forecast model now quantifies the effect of dual-mode devices and femtocells on handset traffic. Proprietary data from Cisco's IBSG Connected Life Market Watch was used to model offload effects.
- **Increased application-level specificity**. The forecast now offers a deeper and wider range of application specificity.

Appendix B: A Case Study on the Initial Impact of Tiered Pricing on Mobile Data Usage

An increasing number of service providers worldwide are moving from unlimited data plans to tiered mobile data packages. Cisco is following this trend closely and recently completed a case study to determine the initial impact of tiered pricing on mobile data traffic. The case study is based on the data of a Global Top 50 service provider and spans the months immediately preceding and following the implementation of tiered pricing.

Study Findings

The impact of tiered pricing on traffic does not appear to be immediate. Three months after the service provider in this case study introduced tiered pricing, 20 percent of smartphone users were on tiered plans, but traffic growth continued at a rate of 5 percent per month. Though there may turn out to be longer-term effects, the revenue measures in the 3 months following the pricing change reflect continued mobile data traffic growth.

Traffic volumes did not decrease. Traffic volumes of mobile data users in the 3 months after the pricing change were 15 percent higher than volumes in the 3 months prior to the pricing change, growing from an average of 114 megabytes per month in the 3 months before tiered pricing to 131 megabytes per month in the 3 months after tiered pricing. Average monthly growth for all mobile users in the 9 months covered by the study was 5 percent.

Traffic growth has not slowed. There was no statistically significant slowing of monthly growth rates in the 3 months after the pricing change compared to growth rates in the 6 prior months.

The percentage of users generating over 200 megabytes per month increased from 20 percent to 30 percent, over the course of 9 months. The increased data usage is a short-term positive result for service providers because it will lead to a greater uptake of higher-tiered packages. Long-term, service providers in competitive markets may need tiers that keep pace with usage increases, or tiers that are defined in terms of services rather than data volumes.

The top 1 percent of subscribers generated 21 percent of traffic in the last 3 months of the study, down from 28 percent in the first 3 months. The most pronounced change found in the study was the shift in the amount of traffic from the top 1 percent of subscribers, which declined from 28 percent in the first 3 months to 21 percent in the last 3 months. In contrast, the lowest 80 percent of data users was responsible for 21 percent of the total data traffic in the last 3 months, an increase from 19 percent in the first 3 months. If this trend holds for other service providers, it may be a net positive effect for the industry, because traffic that is more evenly distributed across the subscriber base may increase profitability.

Android approaches "iPhone-like" levels of data use. At the beginning of the study, iPhone consumption was at least 4 times higher than that of any other smartphone platform supported by the service provider. In the final months of the study, iPhone consumption was only 1.75 times higher than that of the second-highest platform, Android.

About This Study

The findings in this study are based on Cisco's analysis of data provided by a third-party data analysis firm. This firm maintains a panel of volunteer participants who have given the company access to their mobile service bills, including KB of data usage. The data in this study reflects usage associated with over 15,000 devices and spans 9 months. Cisco's analysis of the data consists of categorizing the devices and users, incorporating additional third-party information on device characteristics, and performing exploratory and statistical data analysis.

Tiered Offerings and Mobile Data Traffic Growth

For most aggregate measures of data consumption, the effect of tiered pricing has yet to appear. The service provider did not require existing subscribers to immediately convert to the new system, yet almost 20 percent of mobile data subscribers migrated to one of the tiered plans within 3 months. It may take additional time before the full effects of tiered pricing on traffic are visible, but it is clear that the impact will be gradual. Mobile data traffic per user grew 5 percent per month, on average (Table 10).

Table 10. On Average, Mobile Data Traffic per User Grew 5 Percent per Month

	MB per User per Month									Average Monthly Growth
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	
All mobile users	91	99	94	108	114	121	124	133	137	5.4%
Mobile data users*	175	191	185	206	216	229	233	244	251	4.7%

* "Mobile Data Users" are defined as those who generate at least 10 KB of data traffic per month.

Source: Cisco, 2011

Traffic volumes in the final 3 months were significantly higher than the volumes in months 4 through 6 (with significance defined as a difference between measurements that exceeds 1 standard deviation). Although month-to-month growth rates did appear to be lower in months 7 through 9 compared to the earlier months, this was not a statistically significant decrease. It is possible that this is an early sign of slower growth rates for mobile data, should the growth rates continue to be lower than the growth rates prior to the introduction of tiered pricing at the end of month 6, but the data available at this time indicates no significant change (Table 11).

Table 11. Mobile Users Generated Significantly More Traffic after Pricing Change; Growth Rate Did Not Slow

	MB per User per Month in 3 Months Before Pricing Change	MB per User per Month in 3 Months After Pricing Change	Statistically Significant Increase in Volume?	Month-to-Month Growth in 3 Months After Pricing Change	Month-to-Month Growth in 3 Months After Pricing Change	Statistically Significant Decline in Growth Rate?
All mobile users	114	131	Yes	6.1%	4.3%	No
Mobile data users*	217	243	Yes	5.6%	3.1%	No

* "Mobile Data Users" are defined as those who generate at least 10 KB of data traffic per month.

Source: Cisco, 2011

The number of mobile data users generating more than 2 GB per month has more than doubled over the course of the study, and the percentage of users generating over 200 MB per month increased from 20 percent to 30 percent.

Table 12. Five Percent of Mobile Data Users Consume More Than 2 GB per Month

Data Usage	Percent of Data Users								
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
Greater than 5 GB	0.3%	0.3%	0.2%	0.3%	0.2%	0.3%	0.3%	0.3%	0.4%
Between 2 GB and 5 GB	2.0%	2.5%	2.7%	3.3%	3.6%	3.9%	3.9%	4.5%	4.6%
Between 200 MB and 2 GB	18%	19%	19%	22%	22%	24%	25%	25%	24%
Less Than 200 MB	79%	78%	78%	74%	74%	72%	71%	71%	71%

Source: Cisco, 2011

The rapid increase in data usage presents a challenge to service providers who have implemented tiers defined solely in terms of usage limits. Mobile data caps that fall too far behind usage volumes may create opportunities for competitors in the market. For this reason, many service providers are creating more nuanced tiers and data add-ons, such as a separate charge for tethering and hotspot functionality. Such offerings tend to require less vigilance on the part of subscribers than data caps, yet still monetize scenarios that tend to have high data usage.

Mobile Data Traffic Volume by Operating System

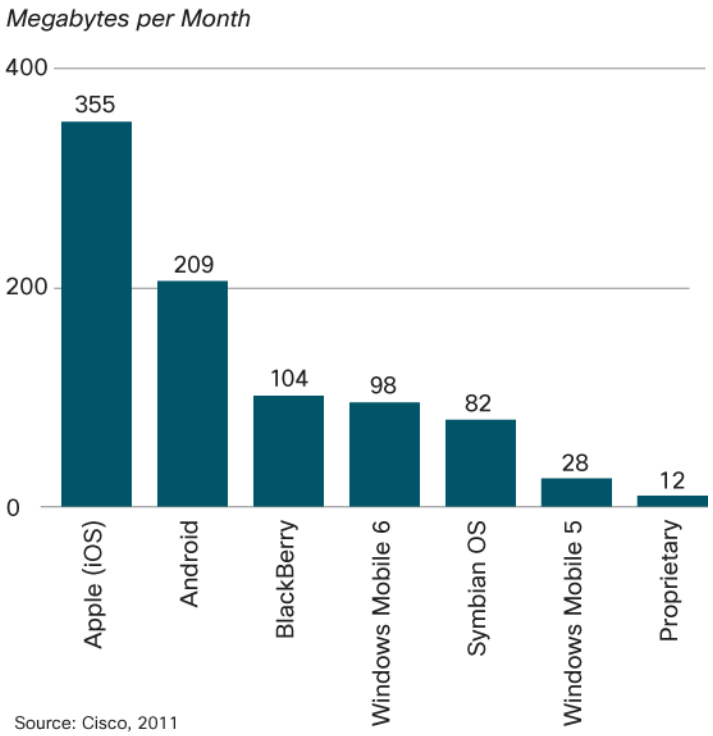
At the beginning of the study, iPhone consumption was at least 4 times higher than any other platform. In the final months of the study, iPhone consumption was only 1.75 times higher than the second-highest platform, Android. Android phones have experienced the highest month-to-month growth rate, 57 percent, roughly doubling every 2 months. Despite this growth, Android was one of the platforms that seemed to be affected the most by the introduction of tiered pricing, with monthly growth flattening in the final 3 months, and with a significant decline in month-to-month growth rates after the first 6 months.

Table 13. iPhones Generate 350 MB per Month; Android Phones in Second Place With 200 MB per Month

Operating System	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6*	Month 7	Month 8	Month 9	Average Monthly Growth
Android	20	55	50	146	264	331	186	200	240	56.7%
Blackberry	68	74	77	86	88	92	101	102	108	5.9%
Apple (iOS)	304	334	321	333	350	368	341	357	366	2.5%
Palm OS	3	4	3	5	5	6	11	7	12	27.8%
Proprietary	9	10	9	11	13	13	11	12	13	5.0%
Symbian OS	21	27	48	30	31	46	33	94	117	37.9%
Windows Mobile 5 and earlier	30	39	30	24	32	30	30	27	27	1.0%
Windows Mobile 6 and later	72	77	59	61	70	83	87	102	105	5.7%

Source: Cisco, 2011

Figure 10. Megabytes per Month by Operating System (Months 7 Through 9)



The Changing Role of the Top 1 Percent of Mobile Data Subscribers

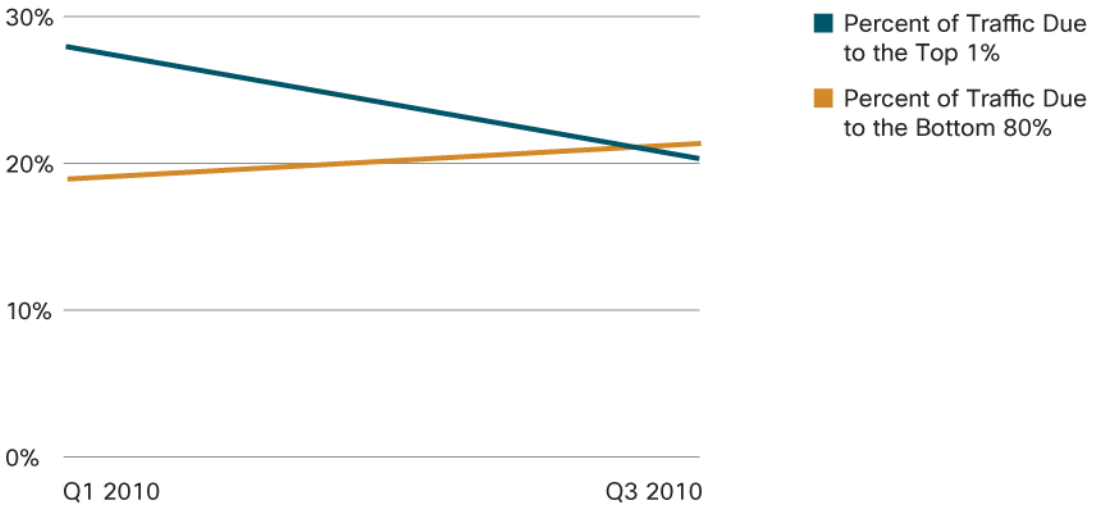
As with fixed broadband, the top 1 percent of mobile data subscribers is responsible for a disproportionate amount of mobile data traffic. However, according to the data from this study, this disproportion is becoming less pronounced with time. The amount of traffic due to the top 1 percent of subscribers declined from 28 percent in the first 3 months to 21 percent in the last 3 months. In contrast, the lowest 80 percent of data users was responsible for 21 percent of the total data traffic in the last 3 months, an increase from 19 percent in the first 3 months. For each tier, the change in the traffic share in the last 3 months of the study compared to the first 3 months was statistically significant. The shift does not appear to have been related to the introduction of tiered pricing, since the proportions for months 7 though 9 are similar to those of months 4 through 6 (Table 14 and Figure 11).

Table 14. Percentage of Traffic by User Tier

Data Users	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
% of traffic due to top 1%	29%	29%	26%	22%	22%	20%	20%	21%	22%
% of traffic due to top 5%	52%	52%	49%	46%	47%	45%	45%	46%	47%
% of traffic due to top 10%	66%	66%	64%	61%	62%	60%	60%	61%	62%
% of traffic due to top 20%	82%	82%	80%	79%	79%	77%	78%	79%	80%
% of traffic due to the bottom 80%	18%	18%	20%	21%	21%	23%	22%	21%	20%

Source: Cisco, 2011

Figure 11. Share of Traffic Due to the Top 1 Percent and Bottom 80 Percent



Source: Cisco, 2011

Although the traffic share of the top tiers may be declining, their volumes continue to increase. For each tier, the increase in the data volume in the 3 months after the pricing change was statistically significant. The lowest 80 percent, not shown in Tables 15 and 16, did not experience significant growth, and did experience a significant slowing of monthly growth rates.

Table 15. Average Traffic by User Tier in MB per Month

User Tier	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6*	Month 7	Month 8	Month 9	Average Monthly Growth
Top 1%	5,600	6,046	5,260	4,900	5,234	5,155	5,268	5,702	6,091	1.3%
Top 5%	1,834	1,996	1,852	1,918	2,046	2,079	2,110	2,257	2,376	3.4%
Top 10%	1,156	1,261	1,187	1,266	1,337	1,373	1,400	1,495	1,566	4.0%
Top 20%	718	781	744	811	851	883	905	963	1,005	4.4%
All data users	175	191	185	206	216	229	233	244	251	4.7%
All mobile users	91	99	94	108	114	121	124	133	137	5.4%

Source: Cisco, 2011

Table 16. Mobile Users Generated Significantly More Traffic After Pricing Change; Growth Rate Did Not Slow

User Tier	MB per User per Month 3 Months Before Pricing Change	MB per User per Month 3 Months After Pricing Change	Statistically Significant Increase in Volume?	Month-to-Month Growth 3 Months Before Pricing Change	Month-to-Month Growth 3 Months After Pricing Change	Statistically Significant Decline in Growth Rate?
Top 1%	5,096	5,687	Yes	-1.3%	5.8%	No
Top 5%	2,014	2,248	Yes	2.7%	4.6%	No
Top 10%	1,325	1,487	Yes	3.6%	4.5%	No
Top 20%	848	958	Yes	4.3%	4.4%	No
All data users	217	243	Yes	5.6%	3.1%	No
All mobile users	114	131	Yes	6.1%	4.3%	No

Source: Cisco, 2011

There are some early signs that tiered pricing is reducing growth in data usage in some segments, such as Android users. However, the overall measures displayed healthy growth with few signs of this growth slowing, and the move to tiered pricing does not appear to have an immediate effect.

Appendix C: Breaking the Electricity Barrier

Table 17 shows the number of off-grid mobile subscribers, in countries where they outnumber the on-grid population. Note that when mobile subscribers were compared to on-grid population in each country, only the on-grid population above the age of 4 was considered, in order to ensure that the subscriber and population figures were comparable.

Table 17. Number of Off-Grid Mobile Subscribers, 2009-2015

	2009	2010	2011	2012	2013	2014	2015
Africa							
Angola	482,308	853,370	1,884,950	2,271,429	2,367,742	2,343,201	2,300,185
Benin	292,571	648,280	663,462	1,048,626	1,305,244	1,470,962	1,594,037
Botswana	446,007	619,206	859,354	873,197	864,367	858,518	851,427
Burkina Faso	297,051	871,539	878,796	763,201	581,839	351,906	130,455
Cape Verde	9,213	22,025	98,759	124,236	135,693	141,479	145,038
Congo	530,782	1,084,594	1,082,697	1,228,579	1,283,650	1,303,378	1,313,965
Gabon	485,466	630,545	705,989	723,937	719,800	713,164	706,640
Gambia	167,598	274,193	362,936	389,401	389,087	380,151	373,485
Kenya	5,544,395	6,544,133	8,896,795	9,919,427	10,280,349	10,422,908	10,538,913
Lesotho	91,883	187,810	197,282	211,015	211,627	209,600	205,801
Malawi	304,853	658,370	776,539	835,942	821,094	772,951	722,034
Mauritania	361,564	645,926	772,180	791,941	779,487	767,203	764,958
Mayotte	249,266	409,478	446,839	453,875	457,413	464,244	474,595
Mozambique	845,784	1,295,417	2,094,999	2,793,392	3,196,299	3,397,365	3,484,592
Namibia	343,128	400,461	501,369	533,959	543,590	547,370	550,694
Réunion	379,769	498,957	507,476	503,024	494,521	490,621	490,731
South Africa	1,626,776	1,941,320	2,153,484	2,160,048	1,993,034	1,682,161	1,269,337
Tanzania	3,868,815	6,490,796	7,438,046	8,164,528	8,604,914	8,997,551	9,361,881
Togo	97,870	113,475	289,762	392,526	441,757	465,091	480,884
Uganda	5,600,481	7,558,505	9,291,441	10,692,302	11,757,826	12,545,900	13,208,306
Zambia	492,325	1,019,122	1,611,396	2,038,588	2,289,866	2,437,420	2,535,689
Equatorial Guinea		68,479	73,967	78,031	77,859	75,788	75,830
Nigeria		776,702	3,412,369	4,330,346	4,081,957	3,071,804	2,058,497
Senegal		189,147	737,270	956,884	1,033,212	1,016,715	969,095
Cote d'Ivoire			1,117,290	1,665,552	1,966,649	2,146,921	2,277,630
DR Congo			1,639,473	2,986,503	3,791,235	4,199,239	4,418,016
Guinea-Bissau			14,602	41,487	40,929	33,520	30,419
Madagascar			329,860	1,035,267	1,584,593	1,988,693	2,289,874

	2009	2010	2011	2012	2013	2014	2015
Asia Pacific							
Cambodia	1,323,113	3,258,396	3,422,926	3,811,302	4,102,216	4,323,389	4,509,292
East Timor	51,310	176,705	145,510	164,939	176,236	182,703	189,798
Fiji	21,213	74,925	88,036	103,288	109,863	111,509	111,781
Maldives	72,087	89,197	97,376	101,059	101,434	101,147	101,685
Indonesia		2,141,029	11,416,878	16,532,357	18,962,194	19,788,405	19,798,828
Mongolia		63,859	107,410	192,338	233,372	249,614	253,657
Bangladesh				167,765	3,541,292	7,882,612	12,543,435
Guam				568	7,324	15,350	22,329
Laos					66,043	252,666	373,561
India							18,251,589
Americas							
Honduras	708,481	1,134,211	2,632,564	3,061,564	3,320,503	3,465,424	3,567,260
Middle East							
Afghanistan	4,829,660	6,560,983	9,603,929	11,505,810	12,379,055	12,748,323	12,963,246
Yemen			290,615	600,856	718,288	722,749	762,205
World							
Total	**30,012,078**	**47,902,130**	**77,322,677**	**94,987,260**	**106,596,683**	**113,954,827**	**137,909,707**

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