



Cisco Visual Networking Index (VNI) and VNI Service Adoption Global Forecast Update, 2015–2020

Thomas Barnett, Jr. | Director, SP Thought Leadership

Arielle Sumits | Senior Analyst

Shruti Jain | Senior Analyst

Usha Andra | Senior Analyst

Taru Khurana | Senior Analyst

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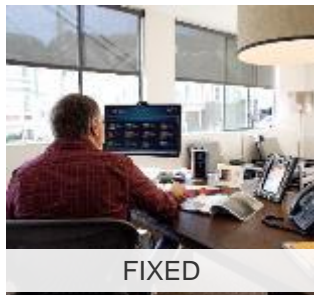


Cisco Visual Networking Index (VNI)

Global service adoption and IP traffic growth

Cisco VNI Forecasts are complementary and statistically aligned.

Fixed & Mobile
IP Traffic Forecast



VNI

Service Adoption
Forecast



Global IP Traffic & Service Adoption Drivers

By 2020



IP Broadband
Growth Drivers

	2015	2020
More Internet Users	3.0 Billion	4.1 Billion
More Devices and Connections	16.3 Billion	26.3 Billion
Faster Broadband Speeds	24.7 Mbps	47.7 Mbps
More Video Viewing	70% of Traffic	82% of Traffic

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Overview

Establishing the Zettabyte Era

By 2020, global IP traffic will reach an annual run rate of 2.3 zettabytes per year

2.3 zettabytes is equal to:

- 10X more than all IP traffic generated in 2010 (232 exabytes)
- 33 hours of ultra-HD video per person of the world population



한국은 40exabytes → 70 exabytes

What is a zettabyte?

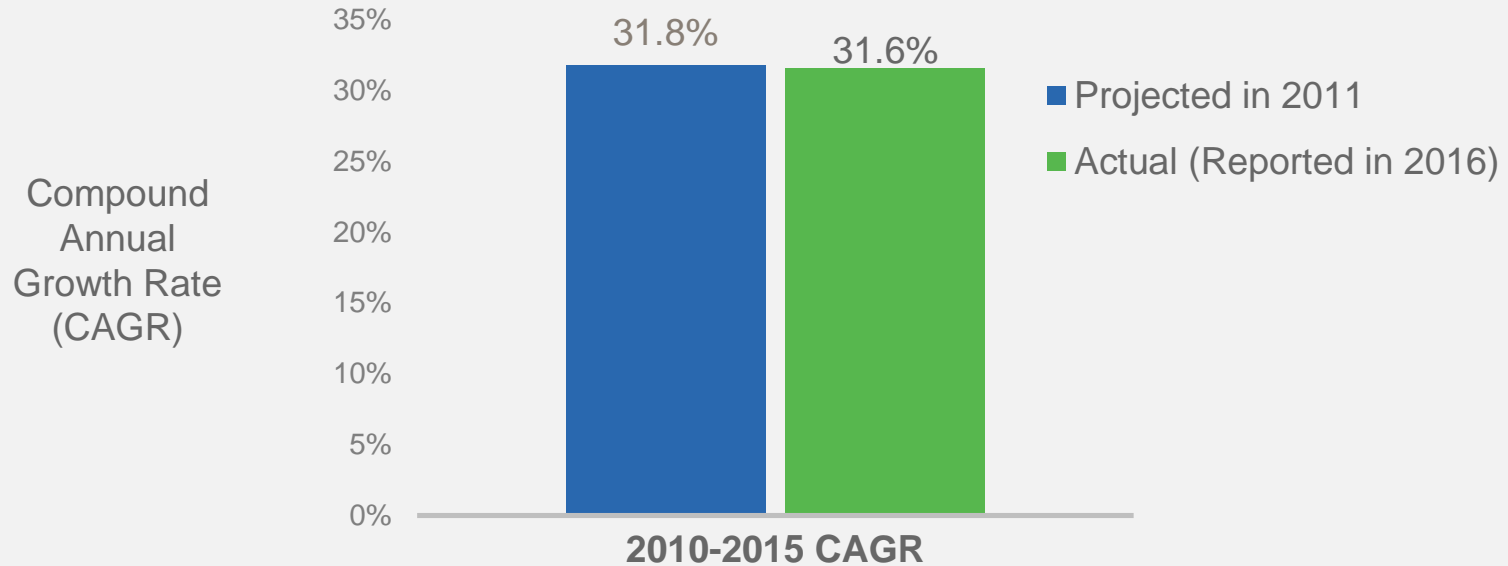
- One trillion gigabytes
- Approximately 10^{21} (1,000,000,000,000,000,000 bytes)



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

VNI Projections and Actuals (Global)

Actual growth has been within 10% of projected growth

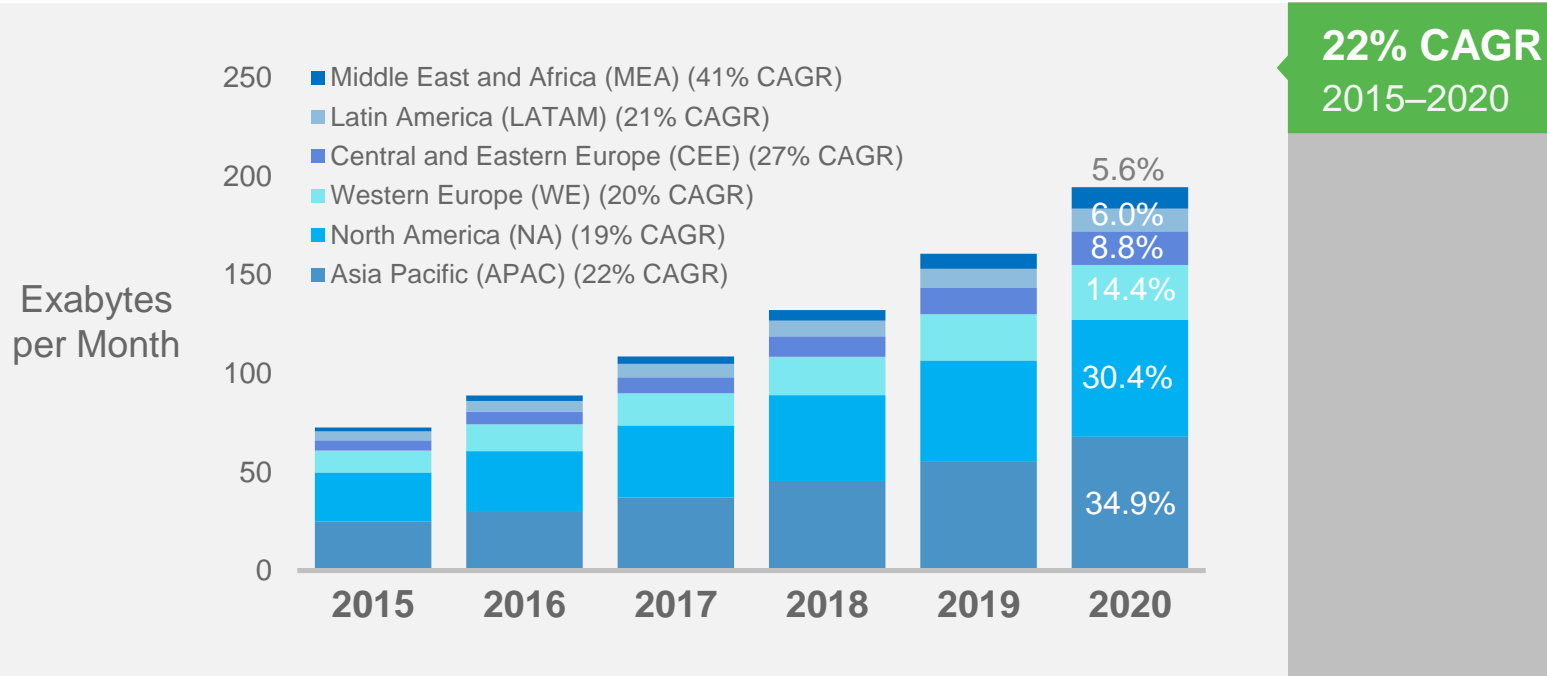


Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global IP Traffic Growth / Regions

MEA has the highest growth rate (41%) from 2015–2020

APAC will generate 35% of all IP traffic by 2020



VNI tool

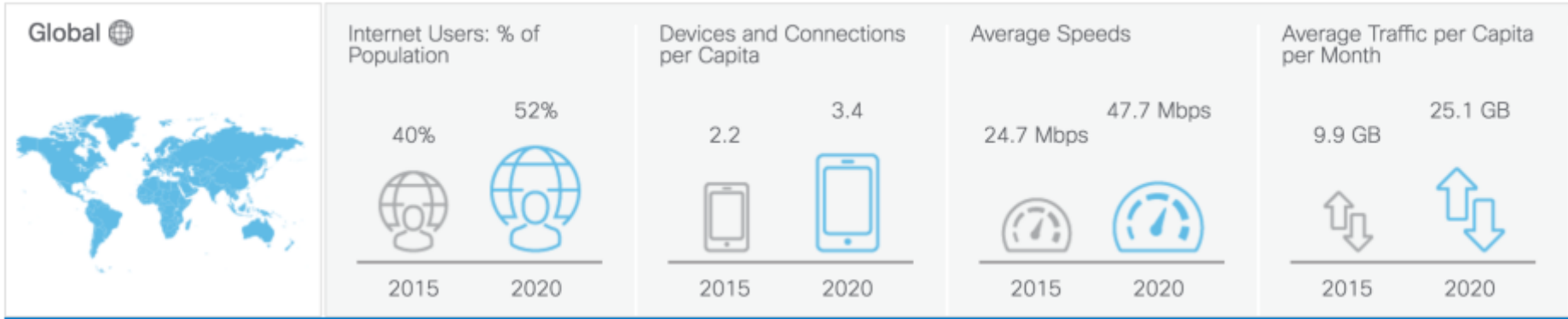
<http://www.cisco.com/c/en/us/solutions/service-provider/visual-networking-index-vni/index.html>

Launch Tool

http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html

VNI Complete Forecast Highlights Tool

Global  North America  Latin America  Western Europe  Central & Eastern Europe  Middle East & Africa  Asia Pacific 

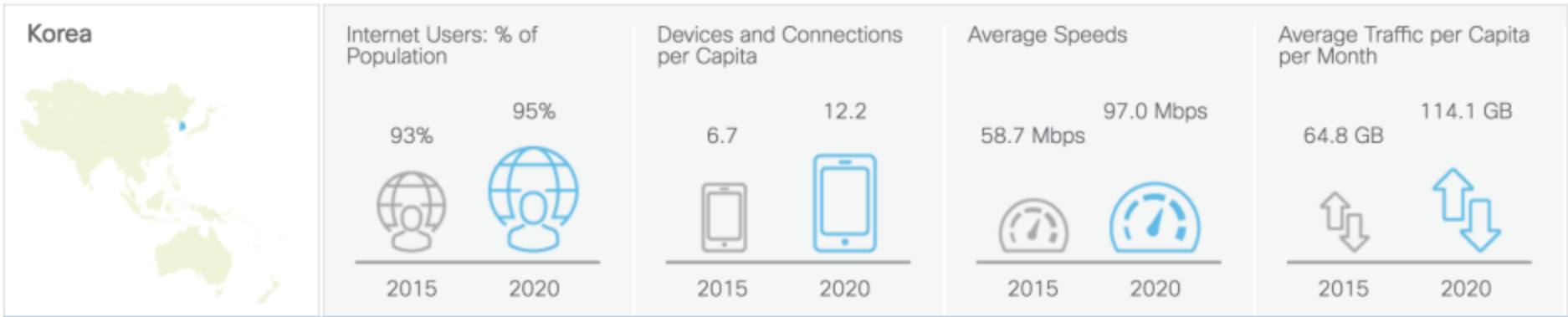


Select Category

- 2020 Forecast Highlights
- Accelerating Network Speeds
- Consumer Highlights
- Device Growth/Traffic Profiles
- Network Connections
- Mobile Highlights
- 2015 Year in Review
- Business Highlights
- Potential IPv6 Connections

VNI Complete Forecast Highlights Tool

Global  North America  Latin America  Western Europe  Central & Eastern Europe  Middle East & Africa  Asia Pacific 



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Top Trends

Top 10 Trends

Devices & Connections



- 1) Devices/Connections Mix
- 2) IoE/M2M by Verticals
- 3) IPv6 Adoption

Traffic Trends



- 4) Traffic Growth by App
- 5) “Cord-Cutting”
- 6) Wi-Fi Momentum
- 7) Traffic Pattern Analysis

Network Performance & User Experience



- 8) Accelerating Speeds
- 9) Service Adoption Trends
- 10) Security Analysis

Top 10 Trends

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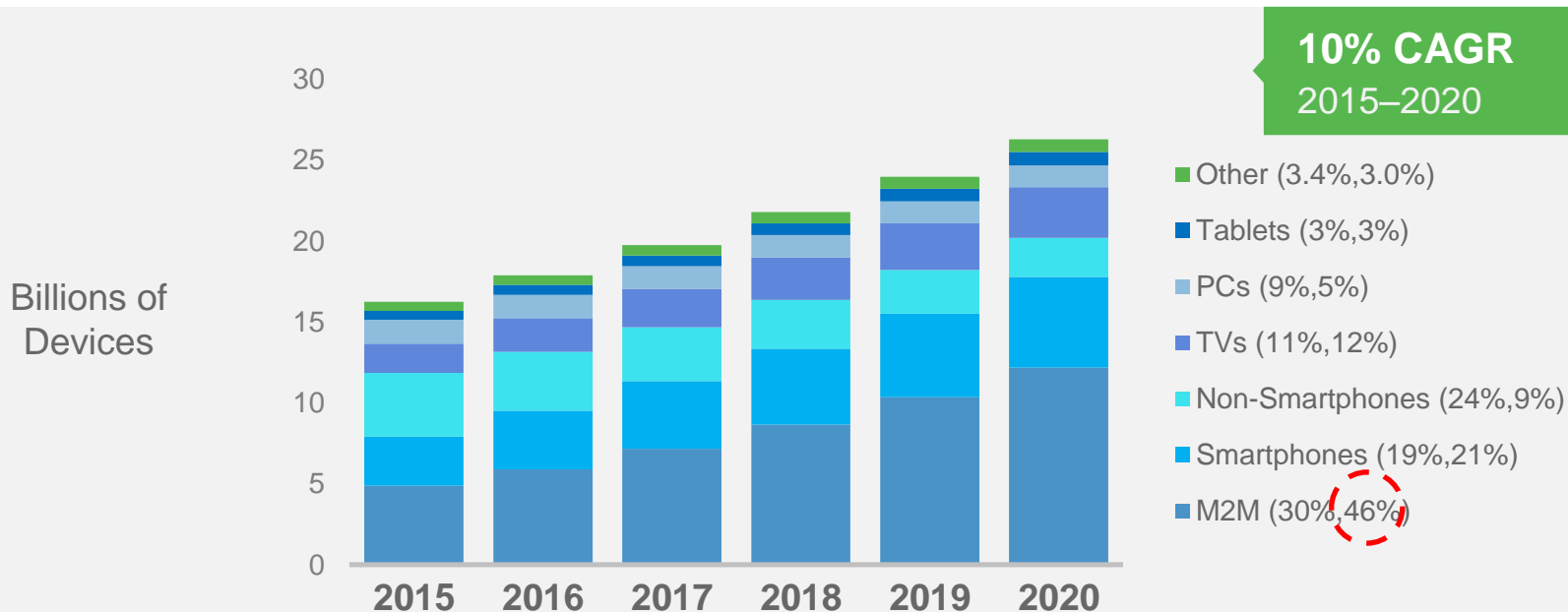
Network Performance & User Experience



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Global Device/Connection Growth by Type

By 2020, M2M connections will be more than 45% of total connections

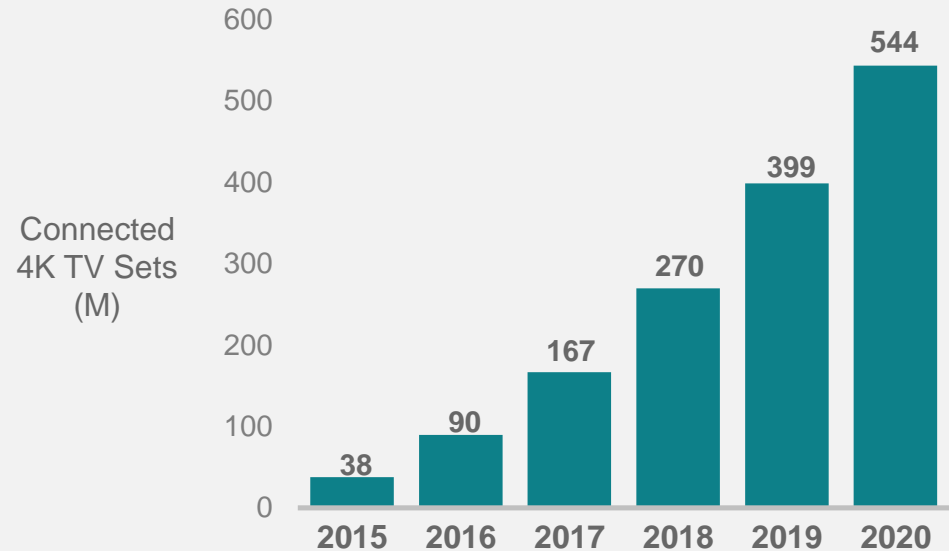
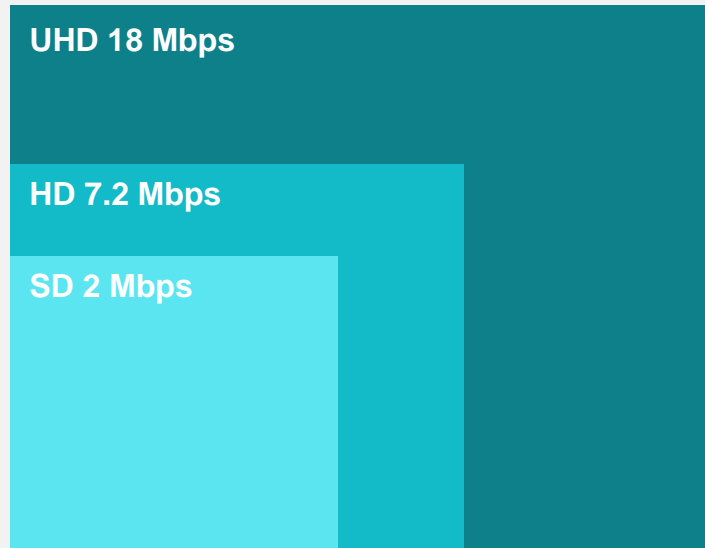


* Figures (n) refer to 2015, 2020 device share

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020







Increasing Video Definition

By 2020, 40% of connected flat panel TV sets will be 4K



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global Average IP Traffic Per Device

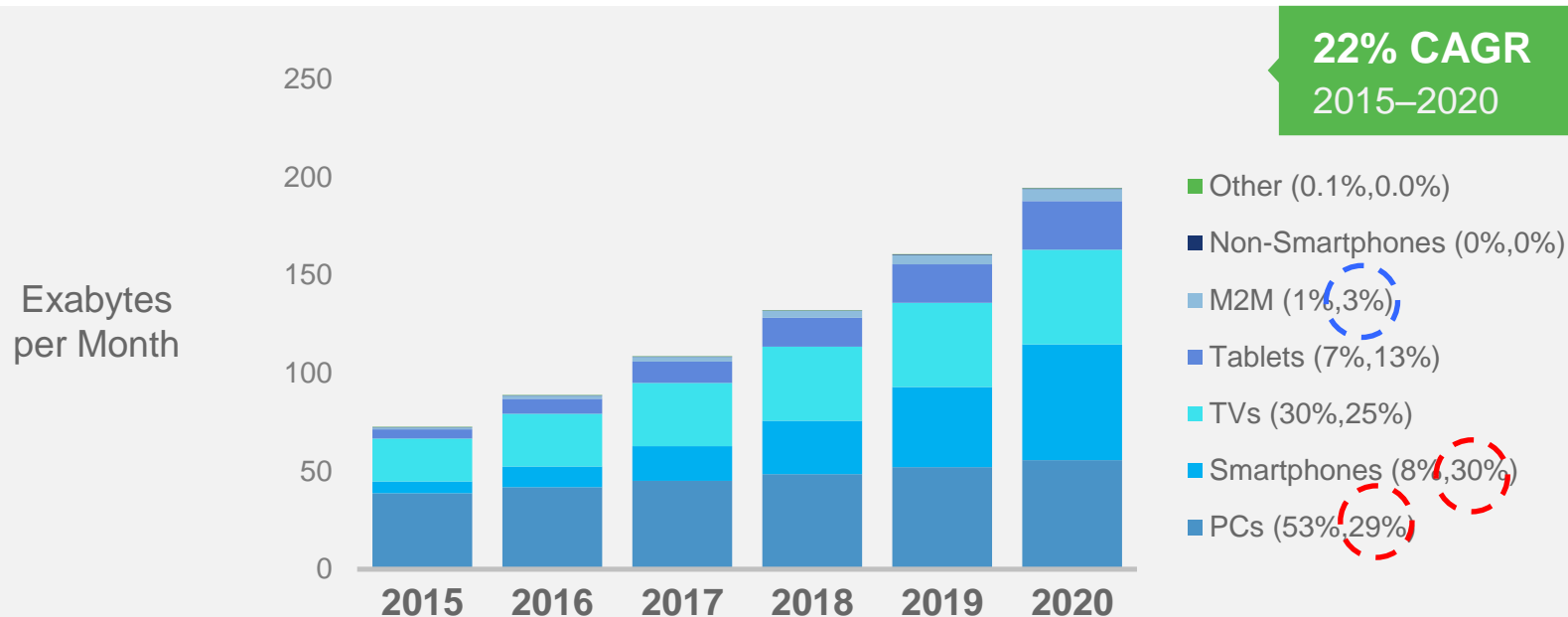
	2015 MBs per Month	2020 MBs per Month
 M2M Module	210	514
 Smartphone	1,969	10,542
 Tablet	8,929	29,559
 Internet Set-Top or Dongle	15,882	27,731
 Laptop / PC	26,039	41,201
 Ultra High Definition TV*	27,375	47,804

* Note: Includes IP VoD traffic

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global IP Traffic by Device Type

By 2020, non-PC devices will drive more than 70% of global IP traffic



* Figures (n) refer to 2015, 2020 device share

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By 2020, M2M modules will be **46%** (12.2 billion) of total global devices and connections and will account for **3%** (6.2 EBs/month) of total global IP traffic.

Connected Home



- Home automation
- Building security
- Network equipment – printers +
- Network infrastructure – routers +
- White goods
- Tracking applications
- Household information devices

Connected Work



- Office building automation
- Building security
- Office equipment – printers +
- Routers +
- Commercial appliances

Connected Car



- Fleet management
- In-vehicle entertainment systems, emergency calling, Internet
- Vehicle diagnostics, navigation
- Stolen vehicle recovery
- Lease, rental, insurance management

Connected Health



- Health monitors
- Assisted living – medicine dispensers +
- Clinical trials
- First responder connectivity
- Telemedicine

Connected Cities



- Environment and public safety – closed-circuit TV, street lighting, waste removal, information +
- Public space advertising
- Public transport
- Road traffic management

Retail



- Retail goods monitoring and payment
- Retail venue access and control
- Slot machines, vending machines

Manufacturing & Supply Chain



- Mining and extraction
- Manufacturing and processing
- Supply chain
- Warehousing and storage

Energy



- New energy sources – monitoring and power generation support apps
- Smart grid and distribution
- Micro-generation– generation of power, by residential, commercial and community users on their own property

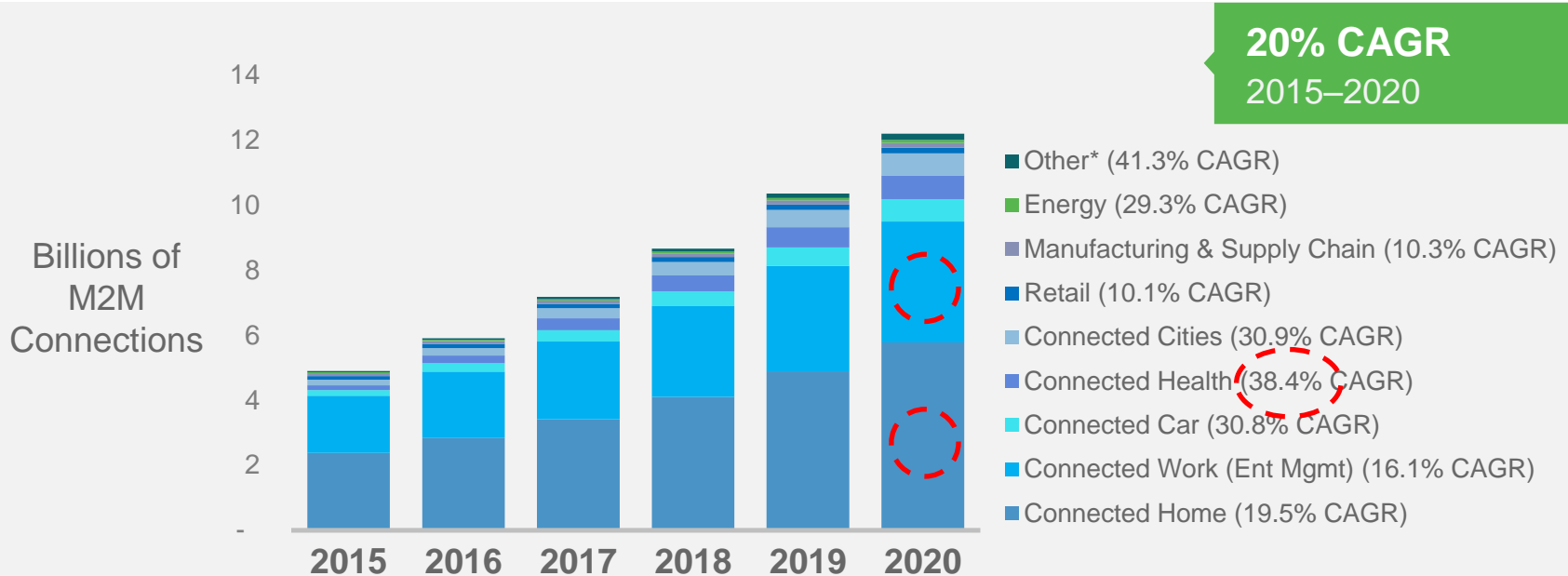
Other



- Agriculture – livestock, soil monitoring, water and resource conservation, temperature control for milk tanks +
- Construction: Site and equipment monitoring
- Emergency services and national security

Global M2M Connections / IoE Growth by Vertical

By 2020, connected home largest, connected health fastest growth



* Other includes Agriculture, Construction and Emergency Services

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Top 10 Trends

Devices & Connections



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- 3) **IPv6 Adoption**

Traffic Trends



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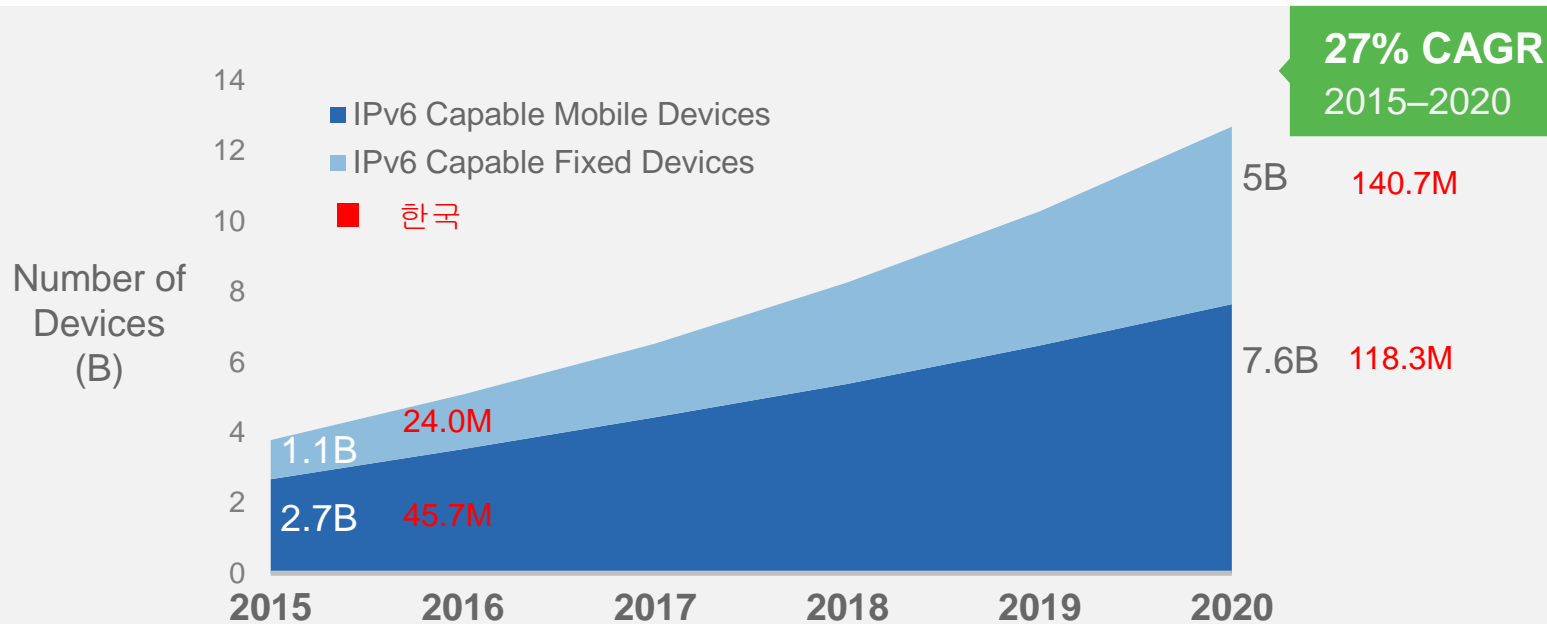


- 8) Accelerating Speeds
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Global IPv6-Capable Devices/Connections

By 2020, 48% of devices/connections will be IPv6 capable

41.5%



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Top 10 Trends

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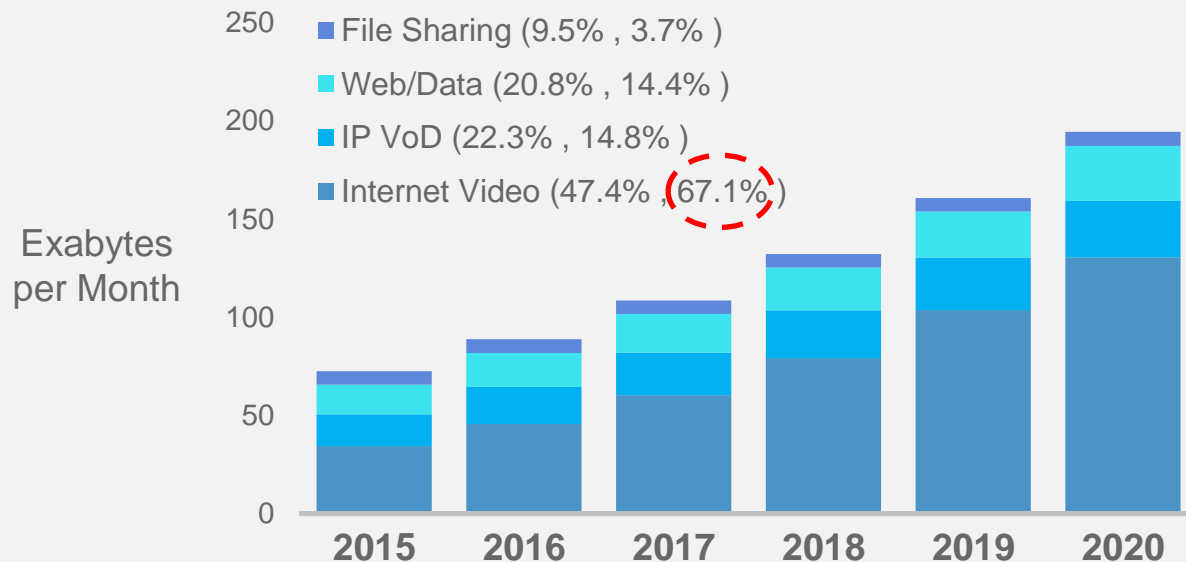
Network Performance & User Experience



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Global IP Video Traffic Growth

IP video will account for 82% of global IP traffic by 2020



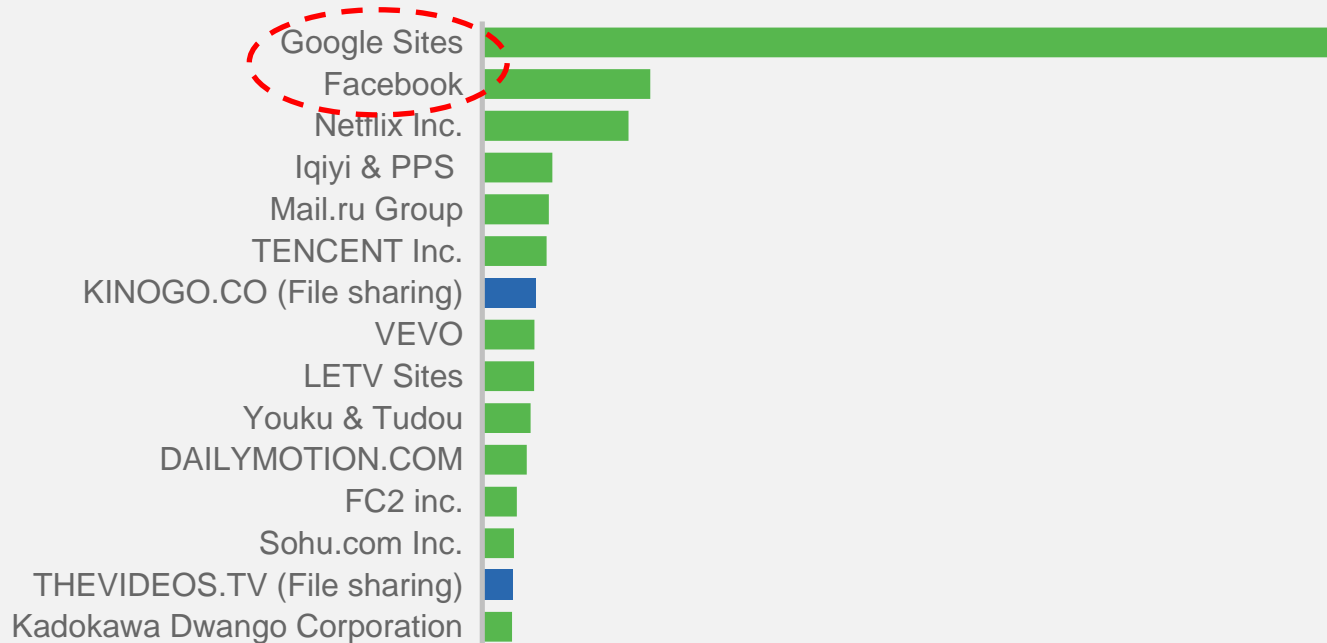
22% CAGR
2015–2020

* Figures (n) refer to 2015, 2020 traffic shares

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global Video Sites by Traffic Volume

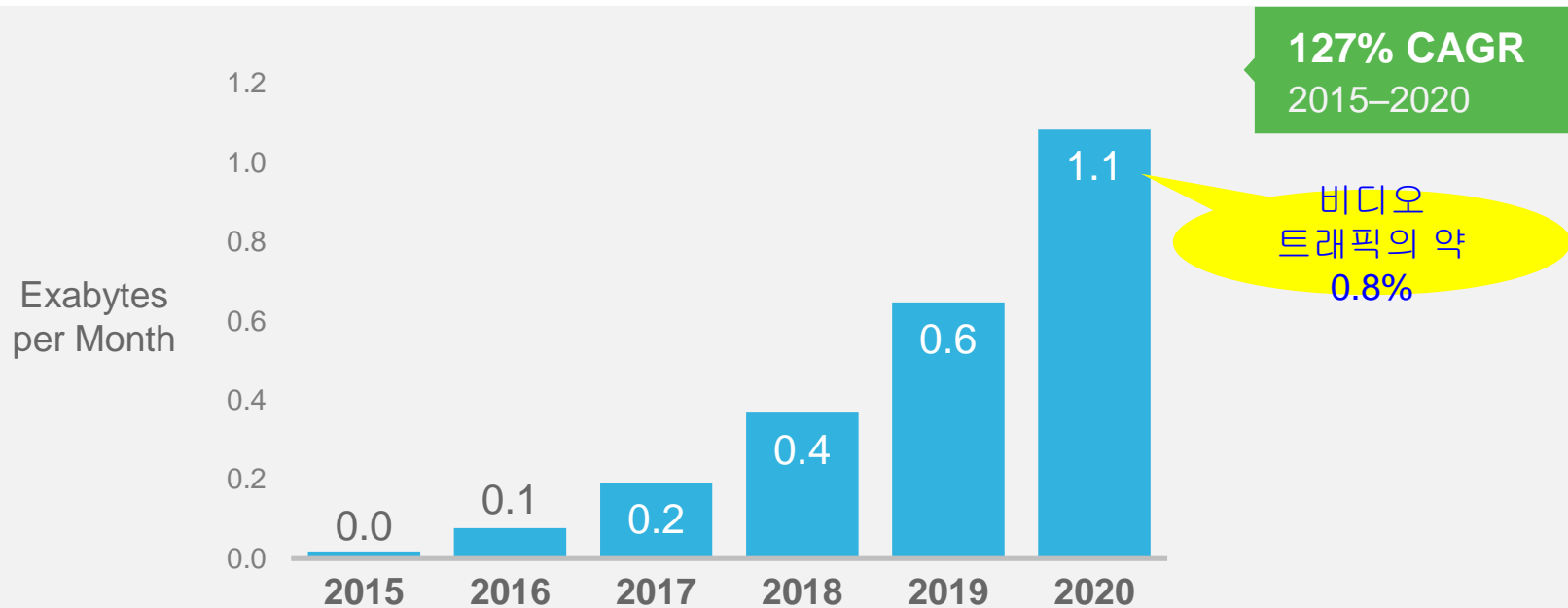
Video file sharing sites account for 2 of the top 15



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global Virtual Reality Traffic Growth

Virtual reality traffic quadrupled in the past year, and will increase 61-fold by 2020



* Figures (n) refer to 2015, 2020 traffic shares

Source: Cisco VNI Global IP Traffic Forecast, 2015-2020

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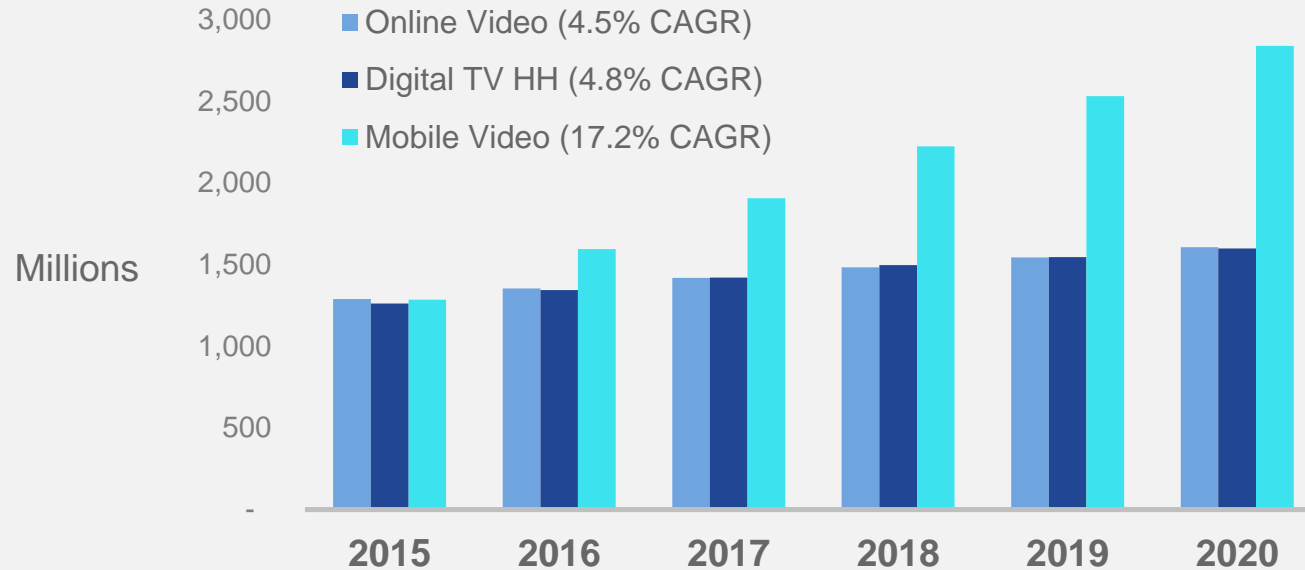
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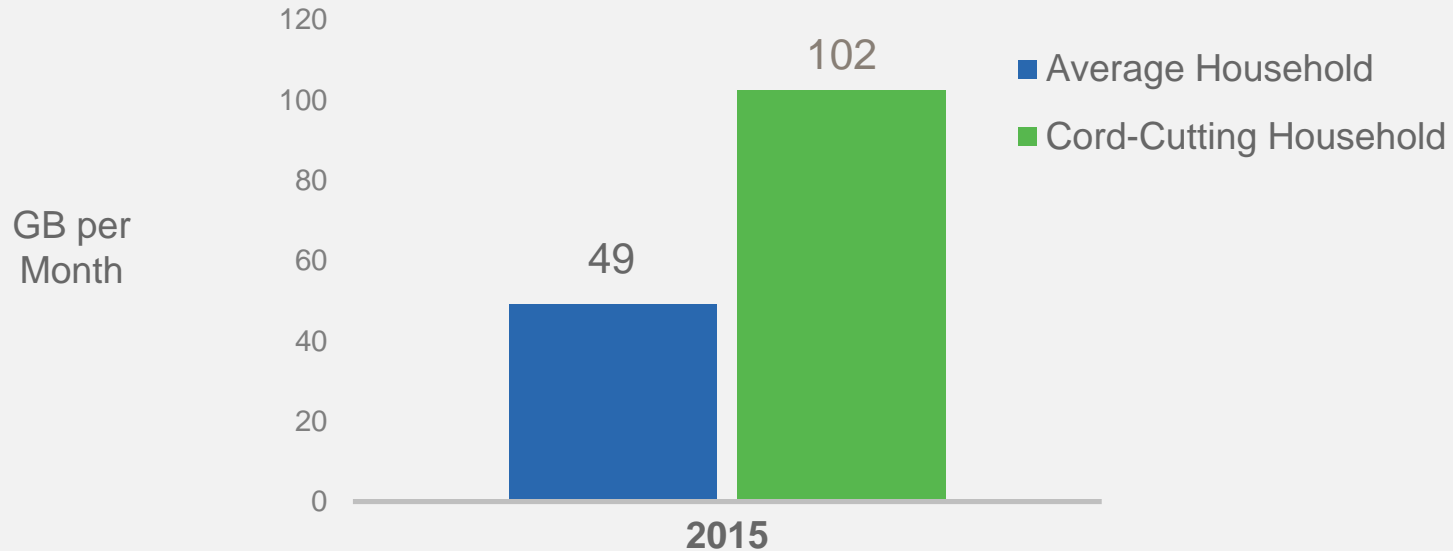
Global Video Users / Subscribers

Mobile video growing fastest; online video and digital TV at par



Global Cord-Cutting Generates Double the Traffic

A cord-cutting household generates 102 GB per month in 2016, compared to 49 GB per month for an average household



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

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Surge of Hotspots

Globally, there will be
433 million hotspots by 2020

By 2020, China will lead in total number of hotspots, followed by the US and France.

Western Europe is the “continent of Wi-Fi” with 45% of the world’s Wi-Fi estate in 2015. By 2020, Asia Pacific will lead.

By 2020, China will lead in total number of homespots, followed by the France and Japan.

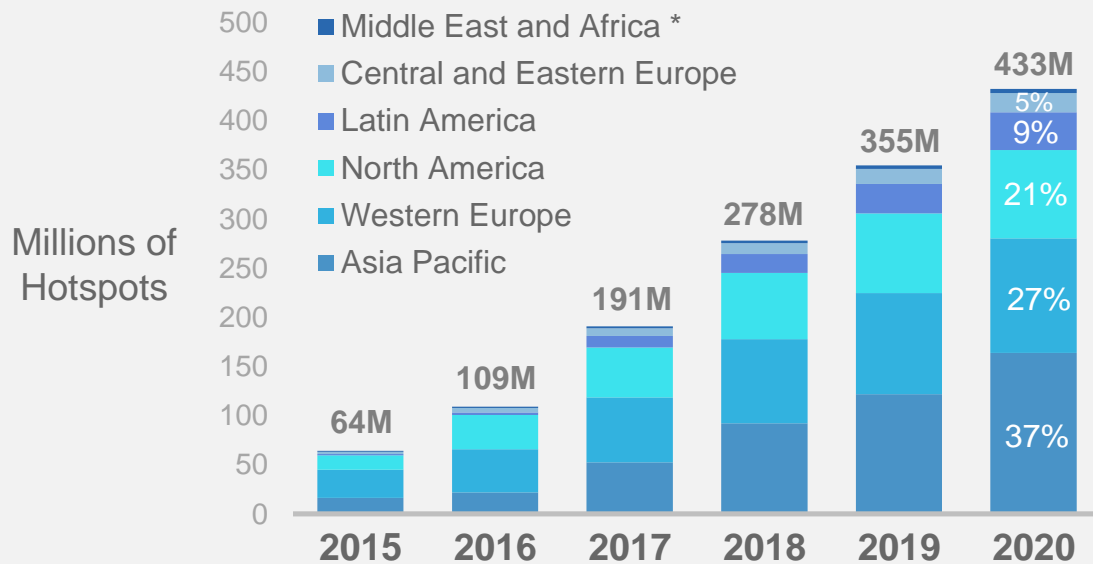
Homespots has been driven by Western Europe and then North America in 2015, but Asia Pacific will lead by 2020.



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020, Maravedis

Global Public Wi-Fi Hotspots

Asia Pacific leads with 164 million (37%) hotspots by 2020



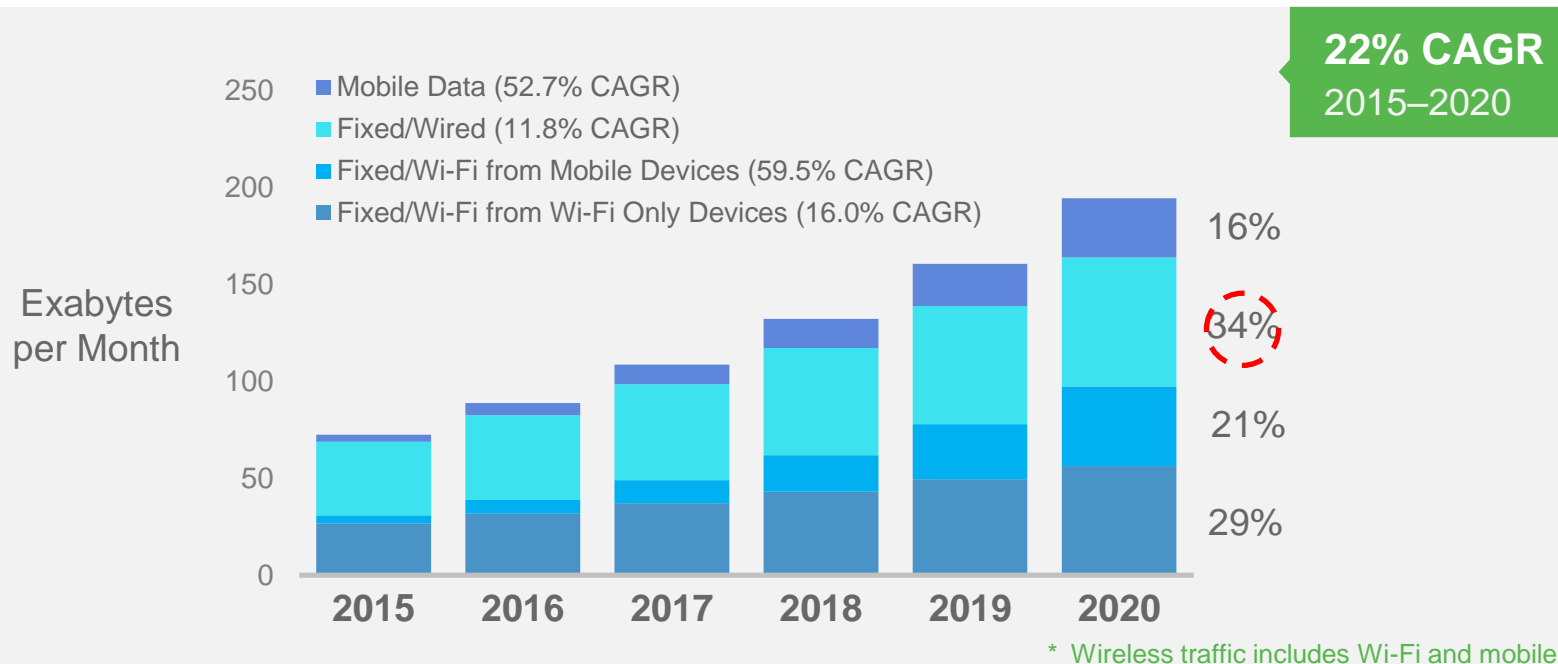
* Middle East and Africa represent 1% of global public Wi-Fi hotspots by 2020

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Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global IP Traffic by Local Access Technology

By 2020, two-thirds of total IP traffic will be wireless*



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

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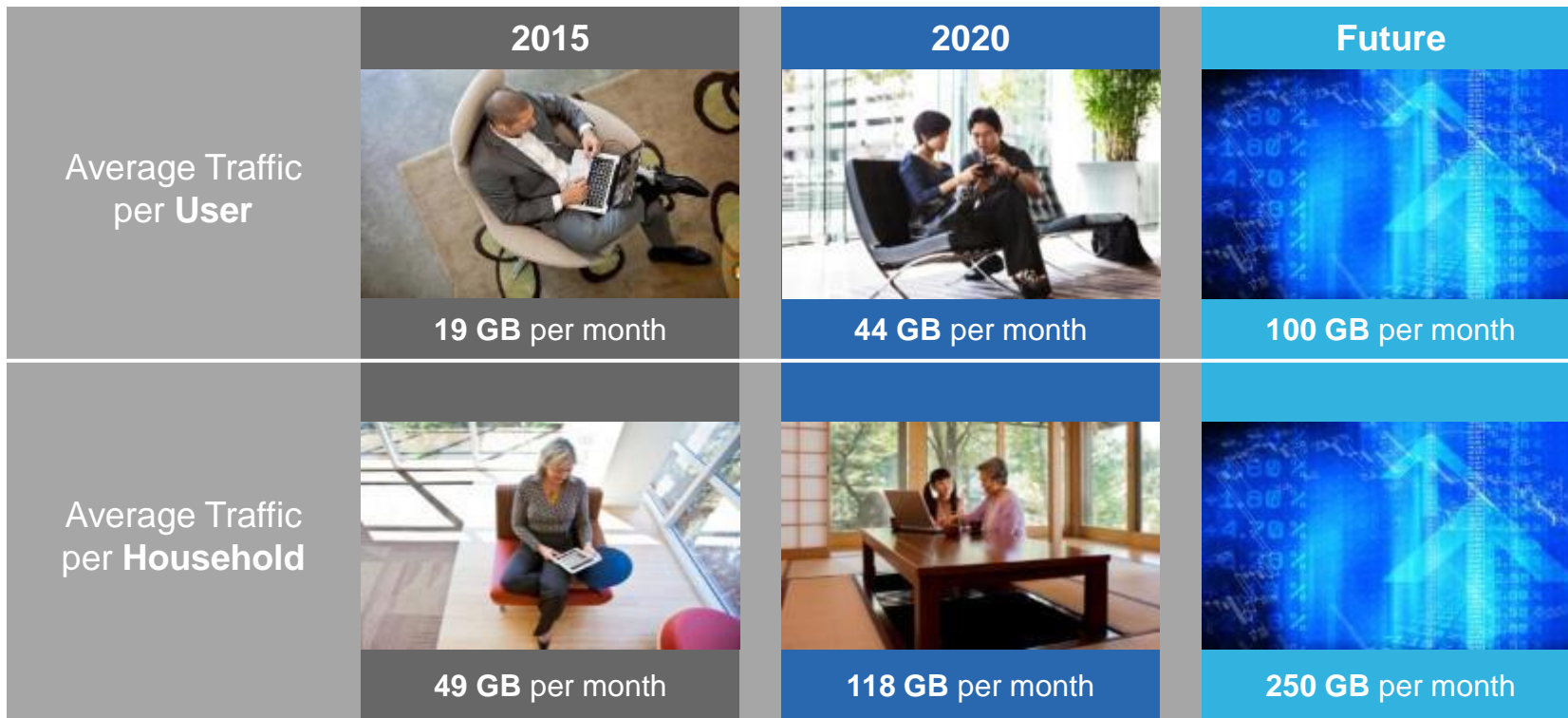
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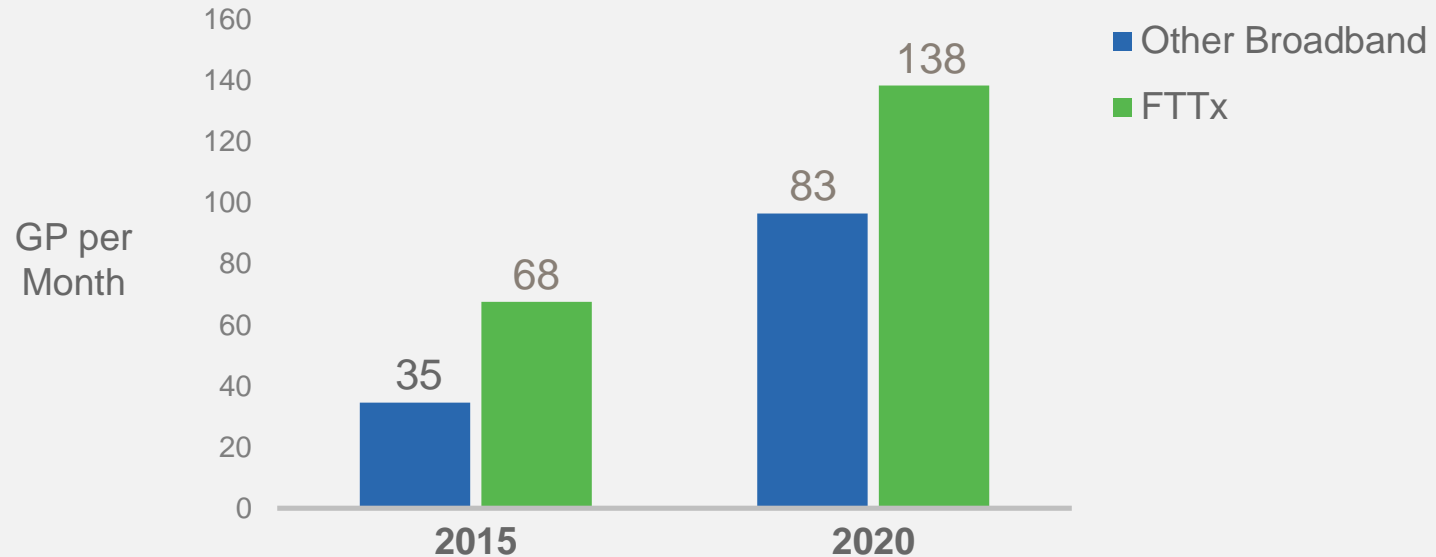
Average Global Internet Bandwidth Usage



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Globally, FTTx Traffic is 58% Higher than Non-FTTx

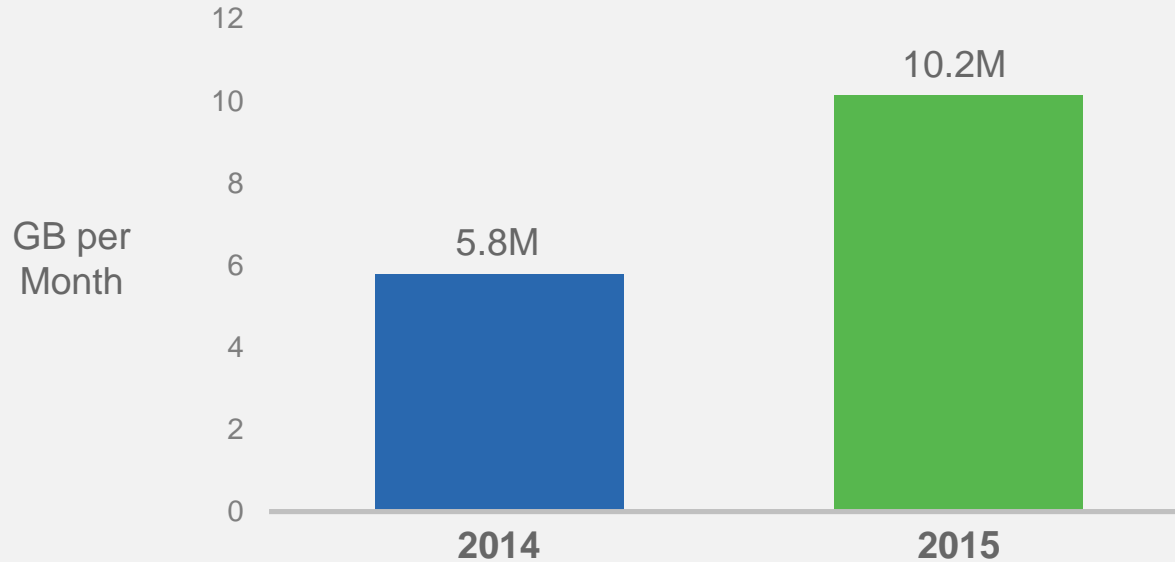
FTTx generates 68 GB per month in 2015 and 138 GB per month by 2020



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Internet HH Exceeding Fair Usage Limits

Internet households exceeding 500 GB nearly doubled in 2015



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Increase in data caps – Trending in 2016



Unlimited data plans for all broadband bundles – Offering Unlimited Data On ADSL, Cable And NBN Plans.

APAC Region

Bundled with “My Basics”, “My Entertainment” and “My Entertainment Plus” voice and TV packages.



Tripled Data Caps to 1 TB per month – or 1,000 gigabytes in trial markets where a 300-gigabyte monthly cap has previously been implemented. Launching a \$15 per month streaming pay TV service—Stream TV—that doesn’t count towards data caps

NA Region



Doubles Broadband Data Caps For Free – 100 GB broadband bundle will increase to 250 GB per month, 200 GB will increase to 500 GB per month and 500 GB bundle will increase to 1 TB per month.

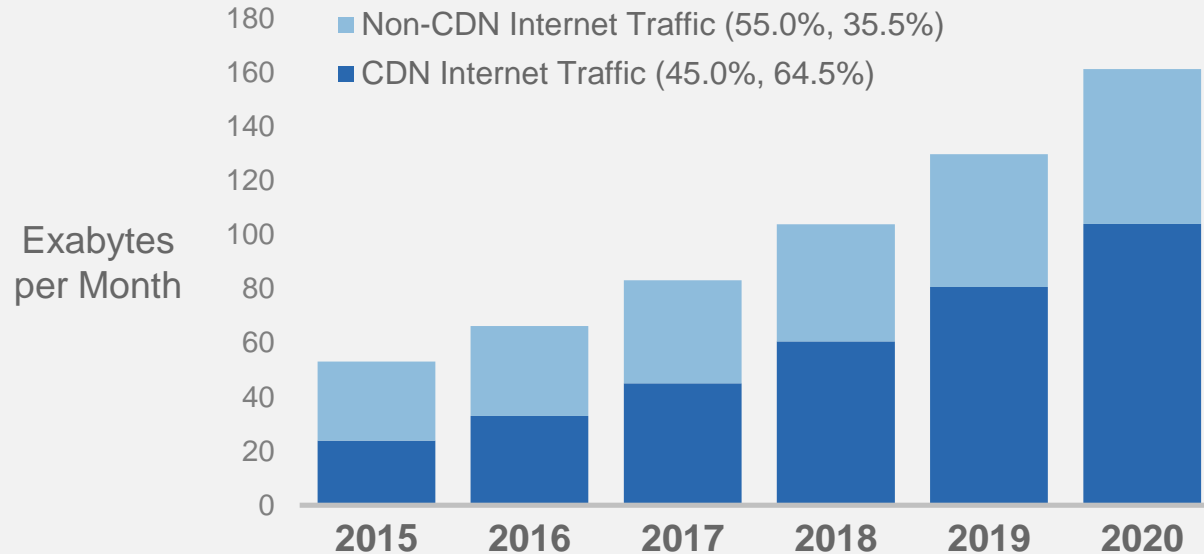
APAC Region



Unlimited Data Option For U-verse Home Internet Customers - U-verse Internet data allowances will automatically increase. 250 GB (gigabytes) will increase to 300 GB or 600 GB, and 500 GB to 1 TB.

NA Region

Global Content Delivery Network (CDN) Internet Traffic



Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

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Global Average Fixed Broadband Speeds

Doubling in speeds from 2015–2020

GLOBAL	2015	2020
Global Mbps	24.7	47.7
BY REGION		
North America	25.4	51.4
Western Europe	22.8	50.1
Central & Eastern Europe	26.3	46.3
Latin America	7.6	17.8
Asia-Pacific	28.1	51.3
Middle East & Africa	7.0	16.5

Mobile Network Speeds Increase 3.2X by 2020

Average cell connection speed (2.0 Mbps in 2015) will grow at a 26% CAGR—reaching 6.5 Mbps by 2020

GLOBAL	2015	2020
Global Mbps	2.0	6.5
BY REGION		
North America	5.9	15.3
Western Europe	4.1	14.1
Central & Eastern Europe	2.3	10.6
Latin America	1.5	4.9
Asia-Pacific	2.4	8.6
Middle East & Africa	0.8	4.8

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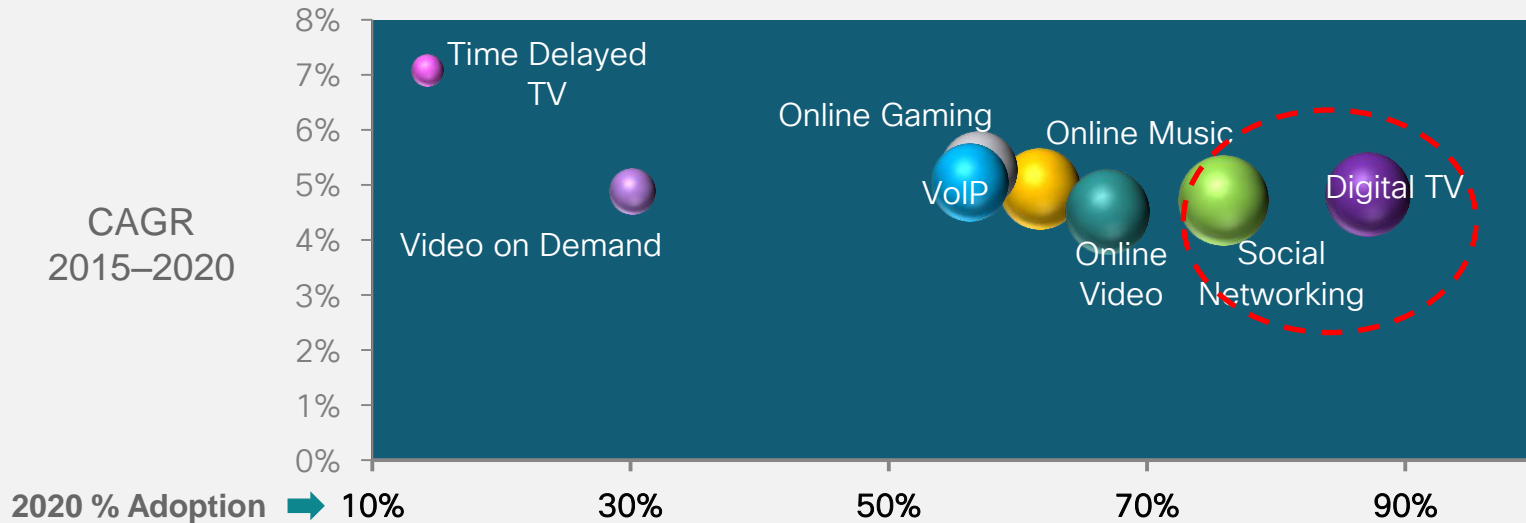
Network Performance & User Experience



- 8) Accelerating Speeds
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Global Residential Services

By 2020, **time delayed TV** will grow the fastest;
digital TV will have highest adoption

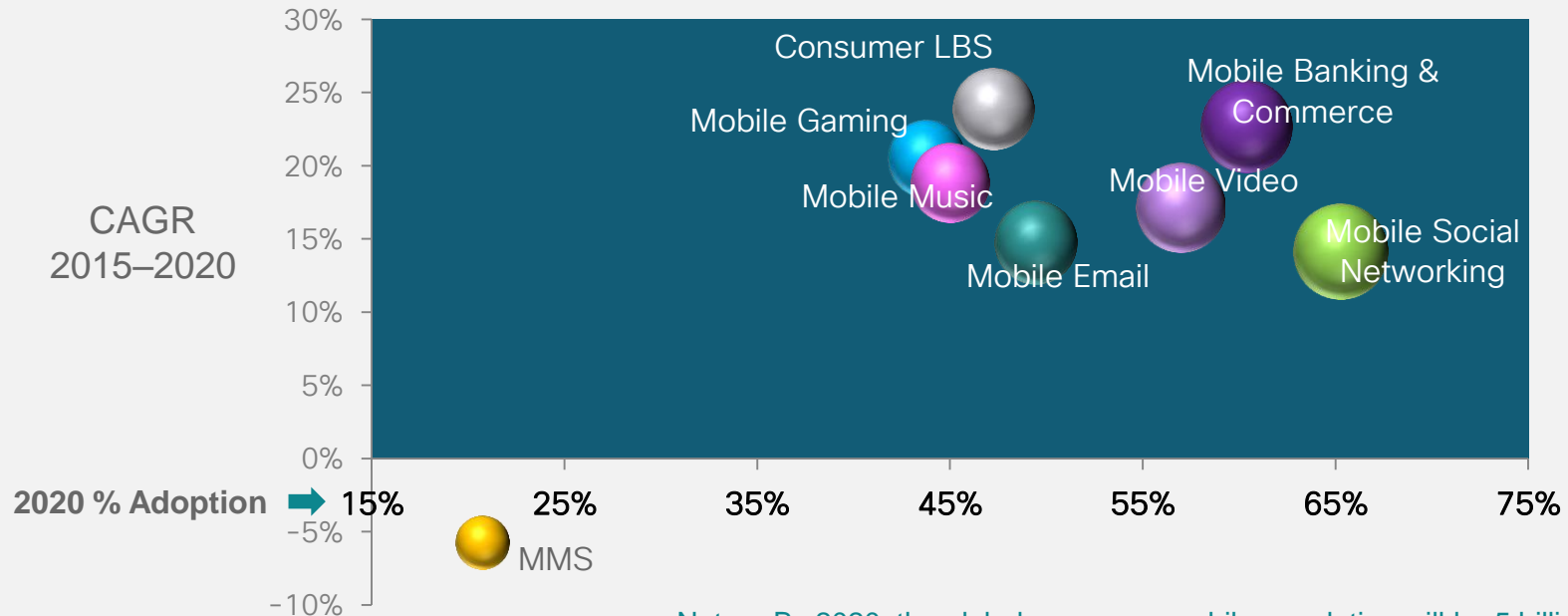


Note: By 2020, the global residential fixed Internet population will be 2.4 billion; the number of global TV households will be 1.8 billion

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Global Consumer Mobile Services

By 2020, **consumer LBS** will grow the fastest;
mobile social networking will have highest adoption

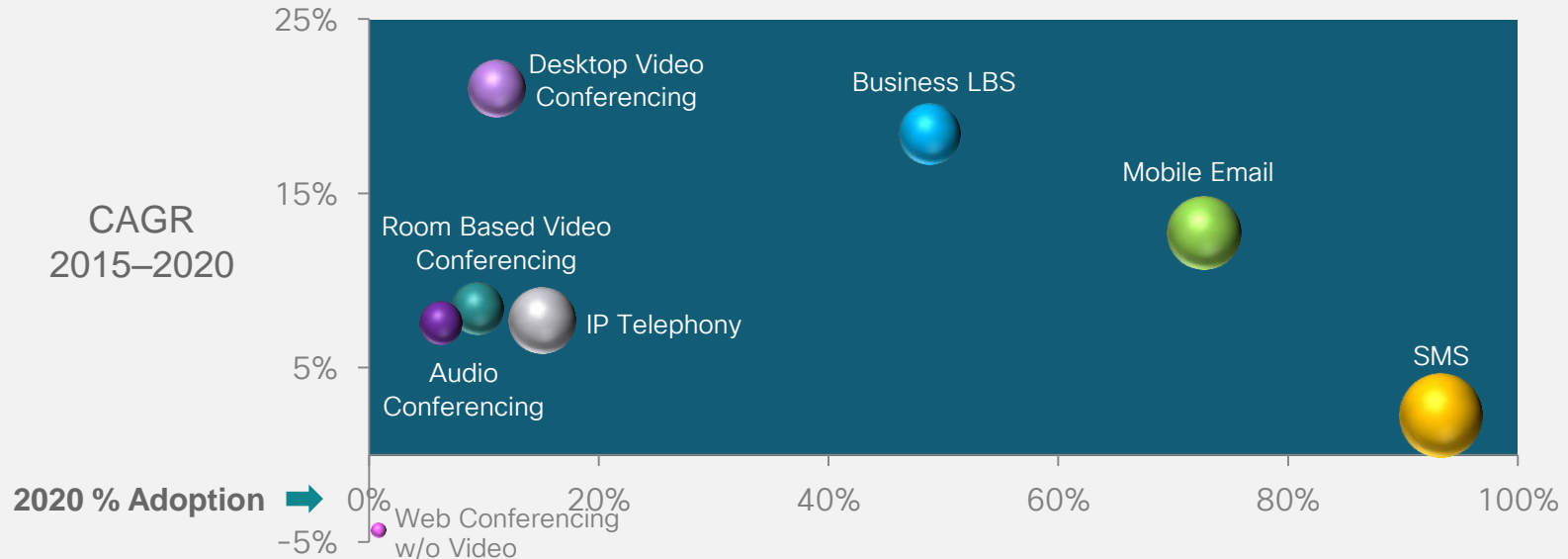


Note: By 2020, the global consumer mobile population will be 5 billion.

Source: Cisco VNI Global IP Traffic Forecast, 2015-2020

Global Business Services

By 2020, **personal video conferencing** will grow the fastest;
mobile SMS will have highest adoption



Note: By 2020, the global business Internet population will be 2.2 billion;
the number of business users will be 577 million.

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

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Security—Top of Mind

Frequency of DDoS attacks has increased over 2.5 times over the last three years — Arbor Networks

458% increase in the number of times hackers searched IoT connections for vulnerabilities — AT&T

Spear-phishing campaigns targeting employees increased 55% last year — Symantec

Malware attacks nearly doubled to 8.19 billion, with Android ecosystem being the prime target — Dell

There's a 221% increase in compromised WordPress sites — Cisco

89% of all cyber attacks involve financial or espionage motivations — Verizon



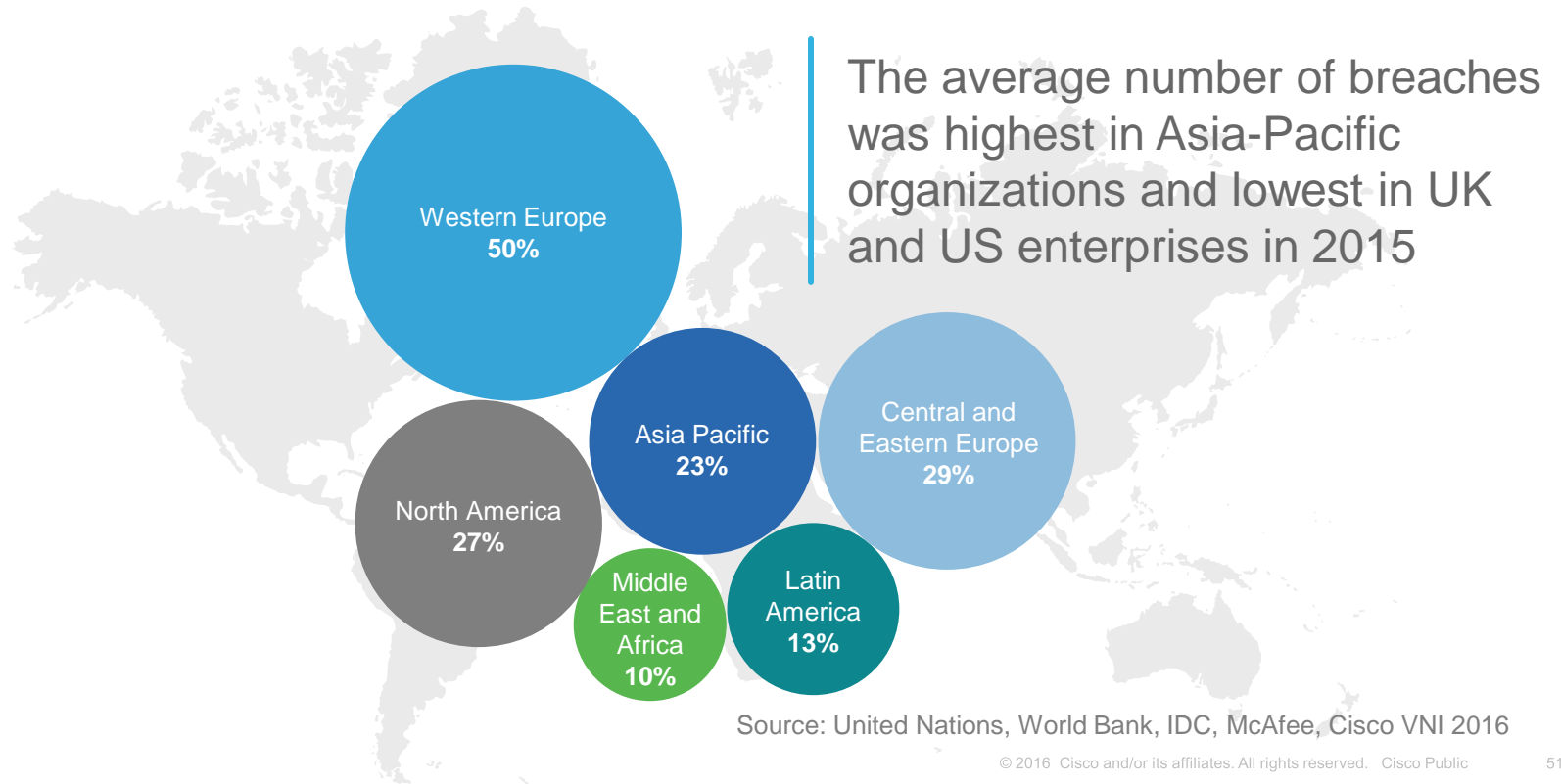
228K Records Stolen Per Breach

Total Breaches: 780

Records Stolen: 177,866,236

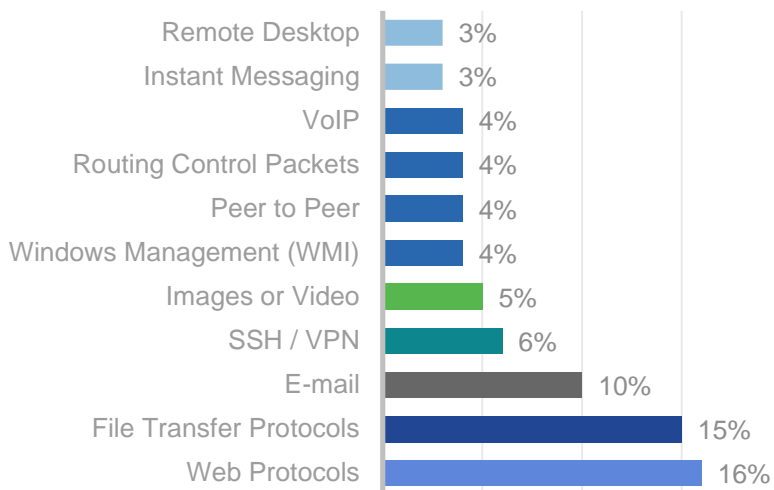
Enabling Authentication and Secure Internet

Percentage of secure internet servers to all web facing servers



How is Data Being Breached?

60% of data stolen via web protocols, file transfer and tunneling protocols, or email



Two-thirds of breaches involve traditional corporate networks

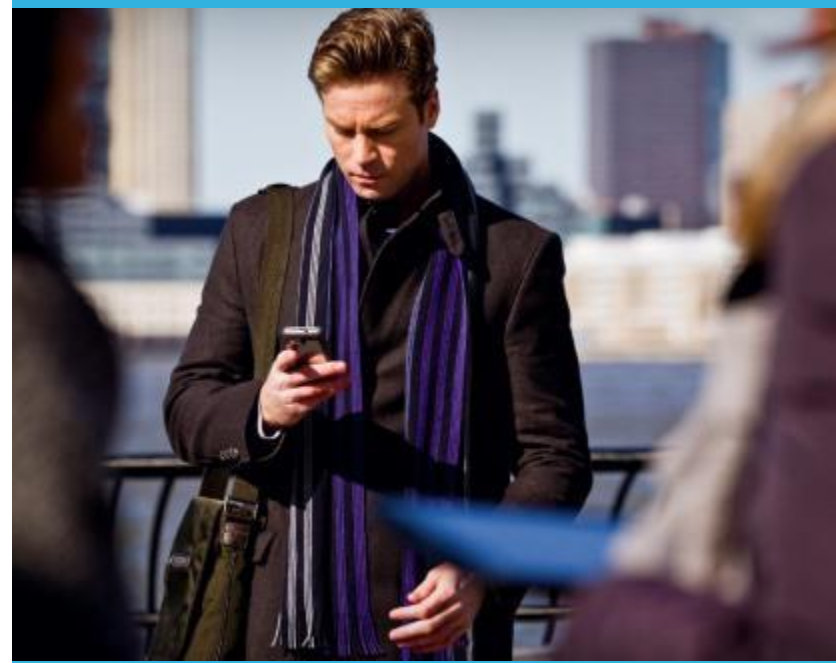


Cloud break-in's account for the other one third

Focus on Security: DDoS Attacks Increase at Roughly the Same Rate as Traffic

Peak attack size continues to increase at between 10-25% per year.

DDoS attacks can represent up to 10% of a country's total Internet traffic while they are occurring.



Source: Arbor Networks, Cisco VNI Global IP Traffic Forecast, 2015–2020

Conclusion

Cisco VNI Global IP Forecast, 2015–2020

Key takeaways / summary

Global Internet Users	By 2020, there will be 4.1 Billion (49M) global internet users, representing 52% (95%) of the global population.
Global Devices/Connections	By 2020, there will be 3.4 devices/ connections (12.2) per capita globally.
Global Broadband Speeds	By 2020, average broadband connection speed will nearly double (24.7 Mbps to 47.7 Mbps). (58.7Mbps to 97.0Mbps)
Global IP Video Traffic	By 2020, 82% (76%) of the world's IP traffic will be video.
Global Mobile Traffic	By 2020, 16% (11%) of IP traffic will be carried over cell networks.
Global Wi-Fi Traffic	By 2020, Fixed Wi-Fi will generate 50% (49%) of global IP traffic.
Global IP Traffic	By 2020, global IP traffic will reach 194 Ebs (5.8EB) /per month (2.3 ZBs annually). (70.2EBs annually)

Source: Cisco VNI Global IP Traffic Forecast, 2015–2020

Cisco VNI Web Sites

IP Traffic & Service Adoption Forecasts: <http://www.cisco.com/go/vni>

- [Press Release](#)
- [White Papers / FAQs](#)
- [Cisco VNI Web-based Tools / Free Apps](#)

IP Traffic & Service Adoption inquiries: traffic-inquiries@cisco.com

