Cisco Visual Networking Index (VNI)
Mobile Data Traffic Update, 2015–2020
Cisco Knowledge Network (CKN)

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February 23, 2016

Cisco Visual Networking Index (VNI)
Expanding the Scope of Cisco's IP Thought Leadership

Cisco® VNI Forecast research is an ongoing initiative to predict global traffic growth. This study focuses on consumer and business mobile data traffic and its key drivers.

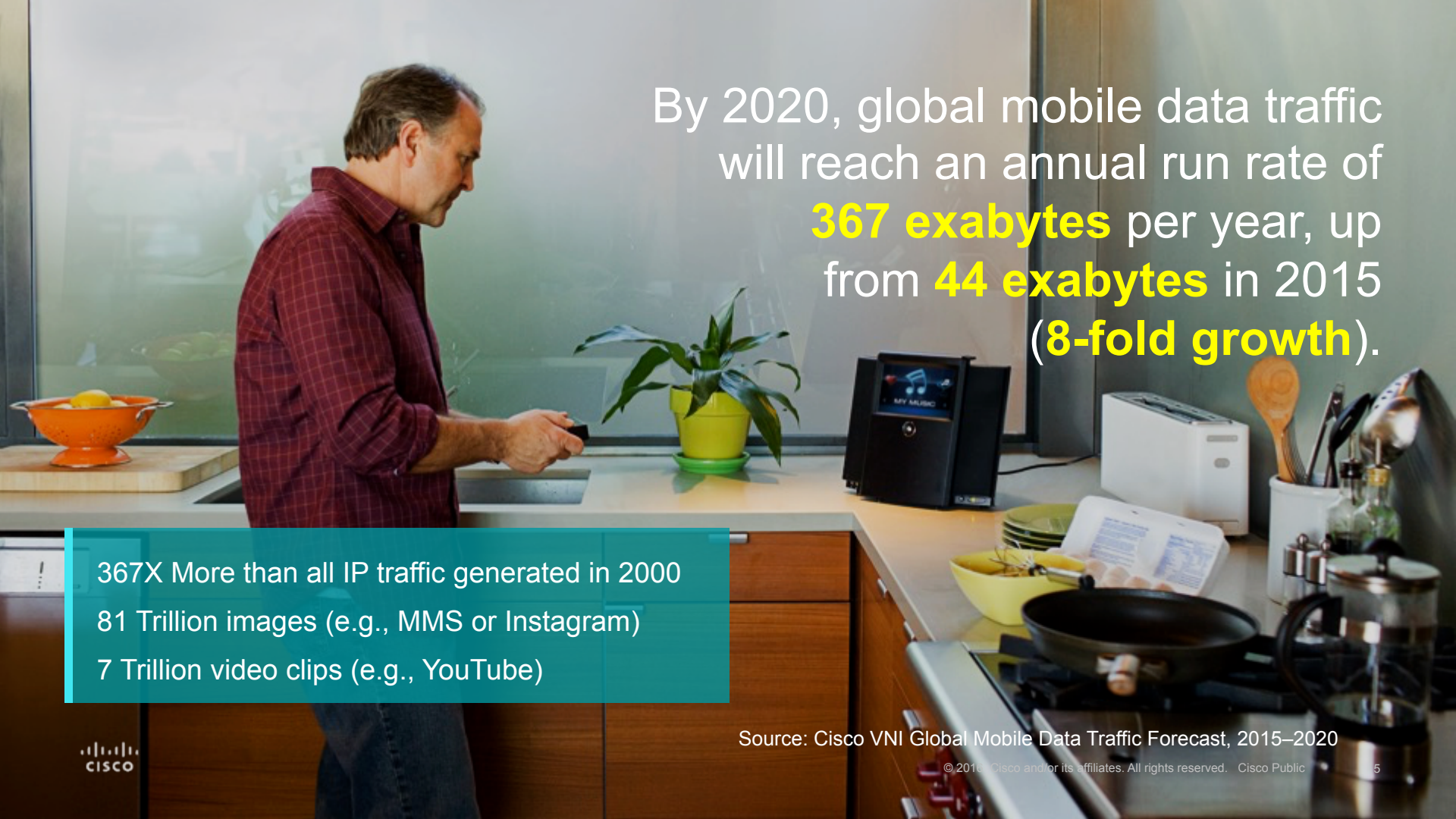
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Data Traffic Drivers

Mobile Momentum Metrics

		2015	2020
More Mobile Users		4.8 Billion	5.5 Billion
More Mobile Connections		7.9 Billion	11.6 Billion
Faster Mobile Speeds		2.0 Mbps	6.5 Mbps
More Mobile Video		55% of Traffic	75% of Traffic

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020



By 2020, global mobile data traffic will reach an annual run rate of **367 exabytes** per year, up from **44 exabytes** in 2015 (**8-fold growth**).

367X More than all IP traffic generated in 2000

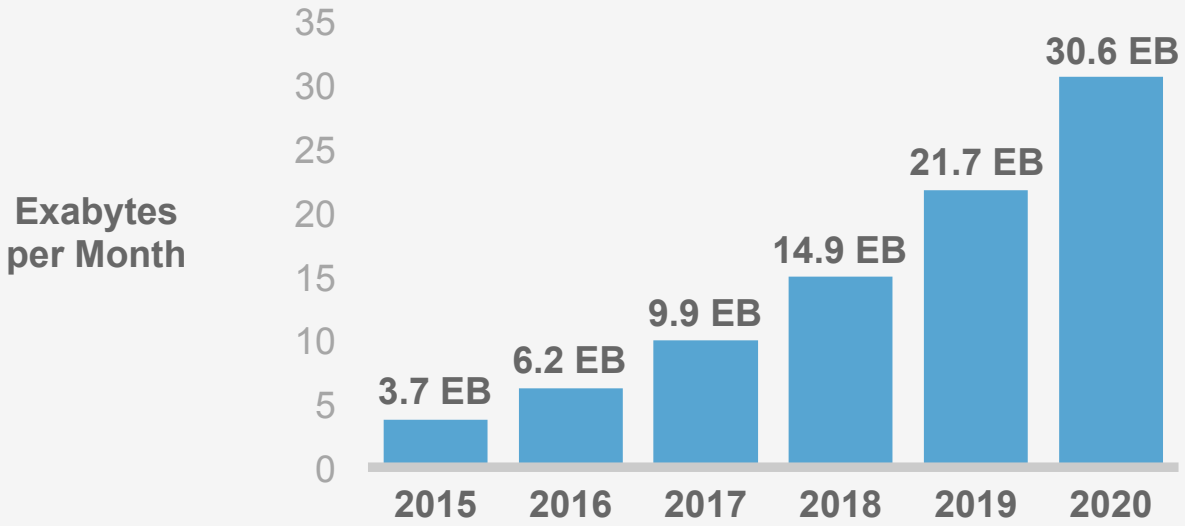
81 Trillion images (e.g., MMS or Instagram)

7 Trillion video clips (e.g., YouTube)

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Data Traffic Growth / Top-Line

Global Mobile Data Traffic will Increase 8-Fold from 2015–2020

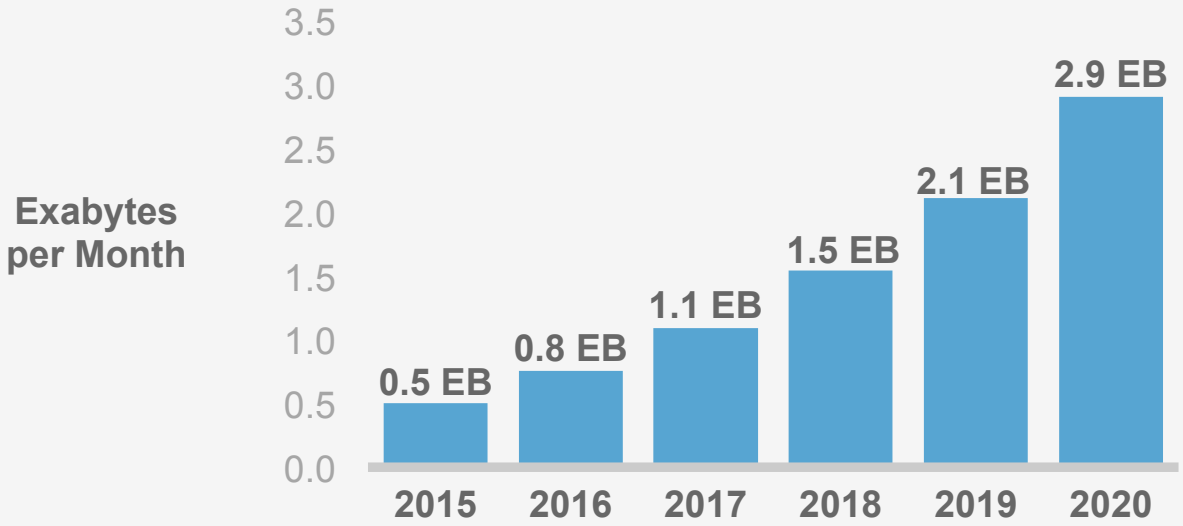


53% CAGR
2015–2020

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

US Mobile Data Traffic Growth / Top-Line

US Mobile Data Traffic will Increase 6-Fold from 2015–2020

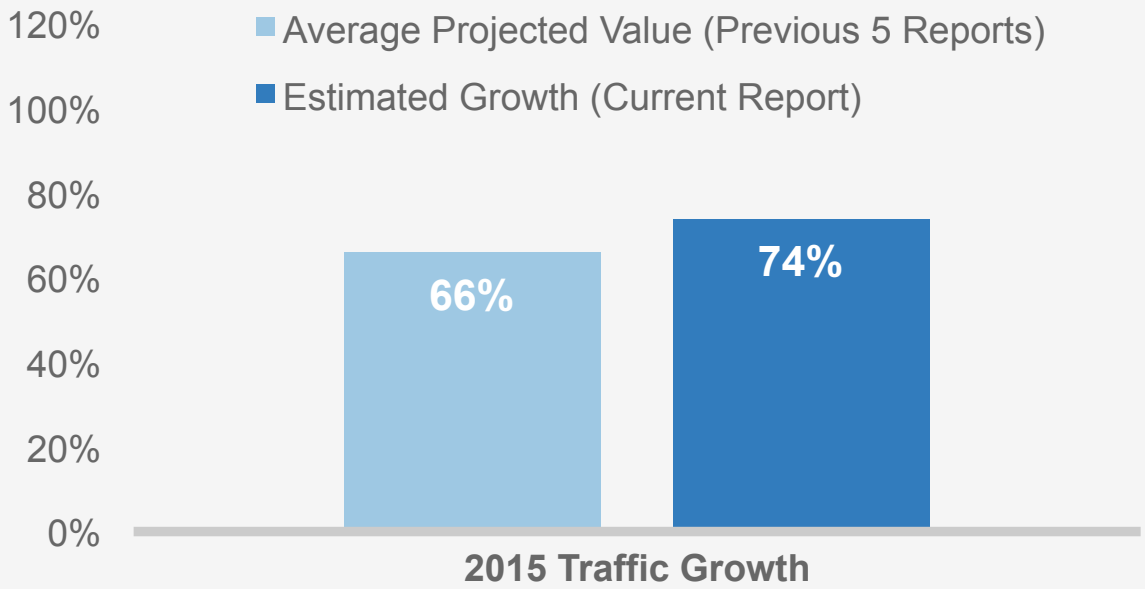


42% CAGR
2015–2020

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Data Traffic Forecast Accuracy

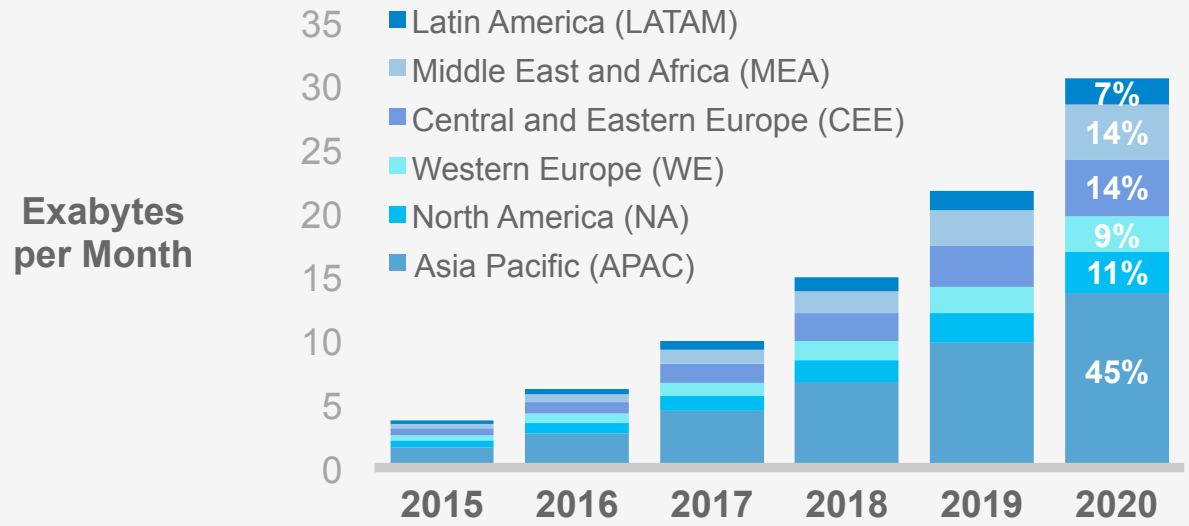
VNI Projections for 2015 within ±10% of Actual Traffic Growth



Source: Cisco VNI Global Mobile Data Traffic Forecasts, 2010, 2011, 2012, 2013, 2014, 2015

Global Mobile Data Traffic Growth / Regions

MEA has the Highest Growth Rate (71%) from 2015–2020
APAC will Generate 45% of all Mobile Data Traffic by 2020

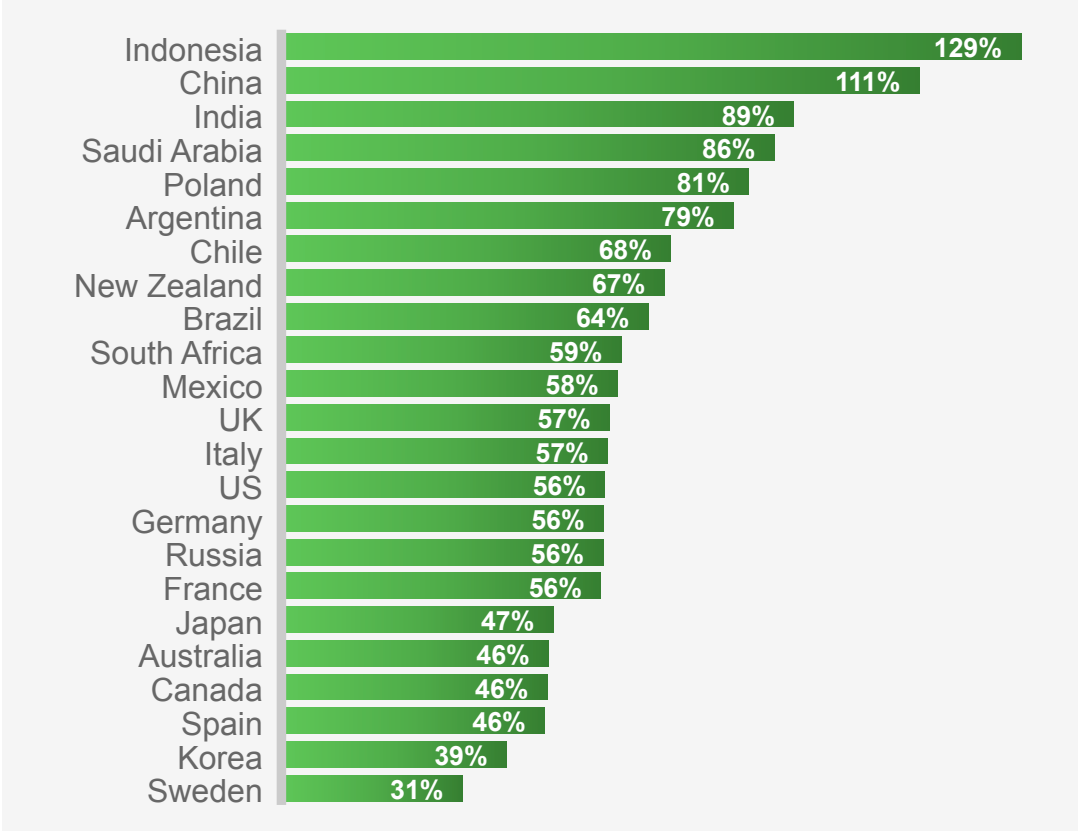


53% CAGR
2015–2020

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Cisco VNI Mobile Year in Review—2015

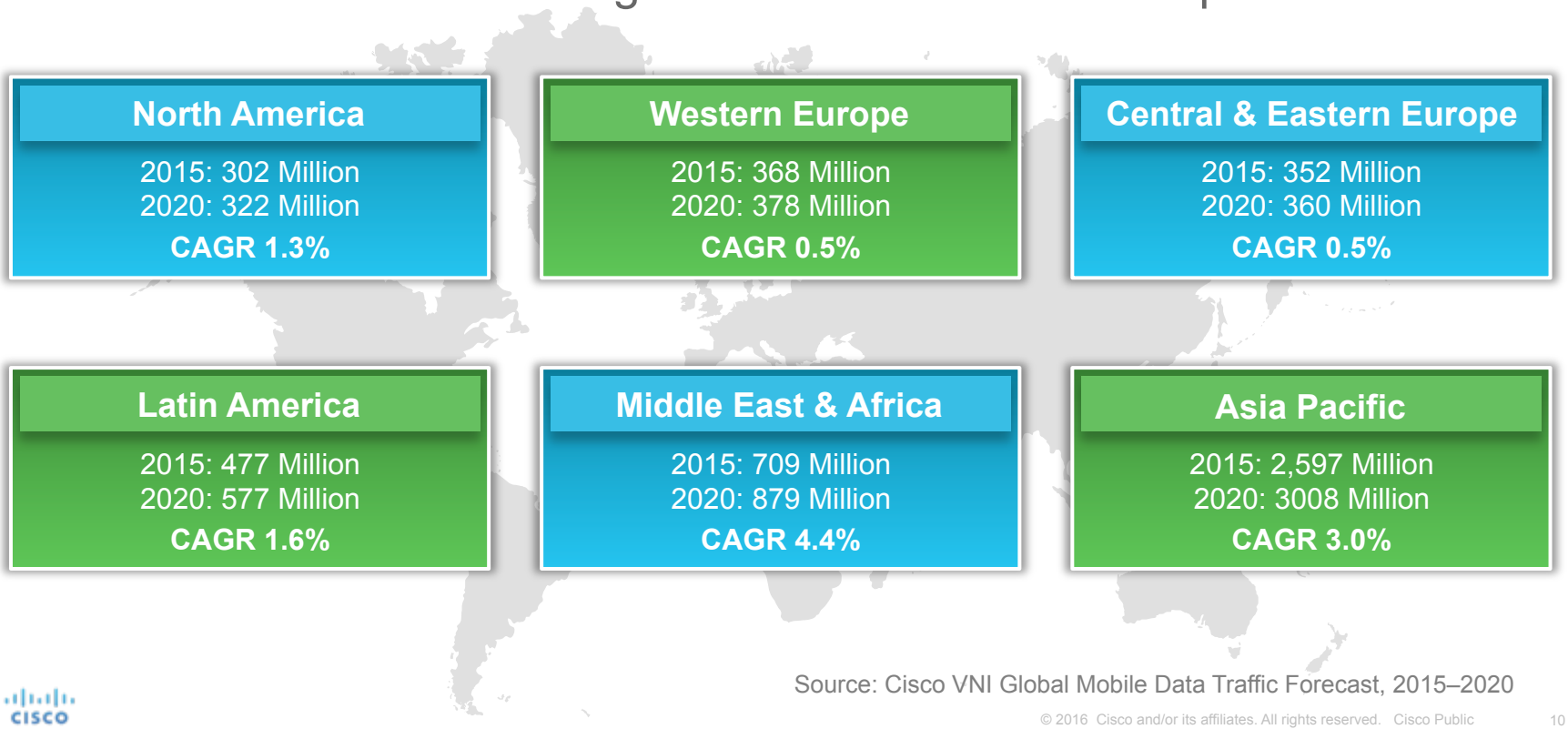
Strong Growth Worldwide



Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Users

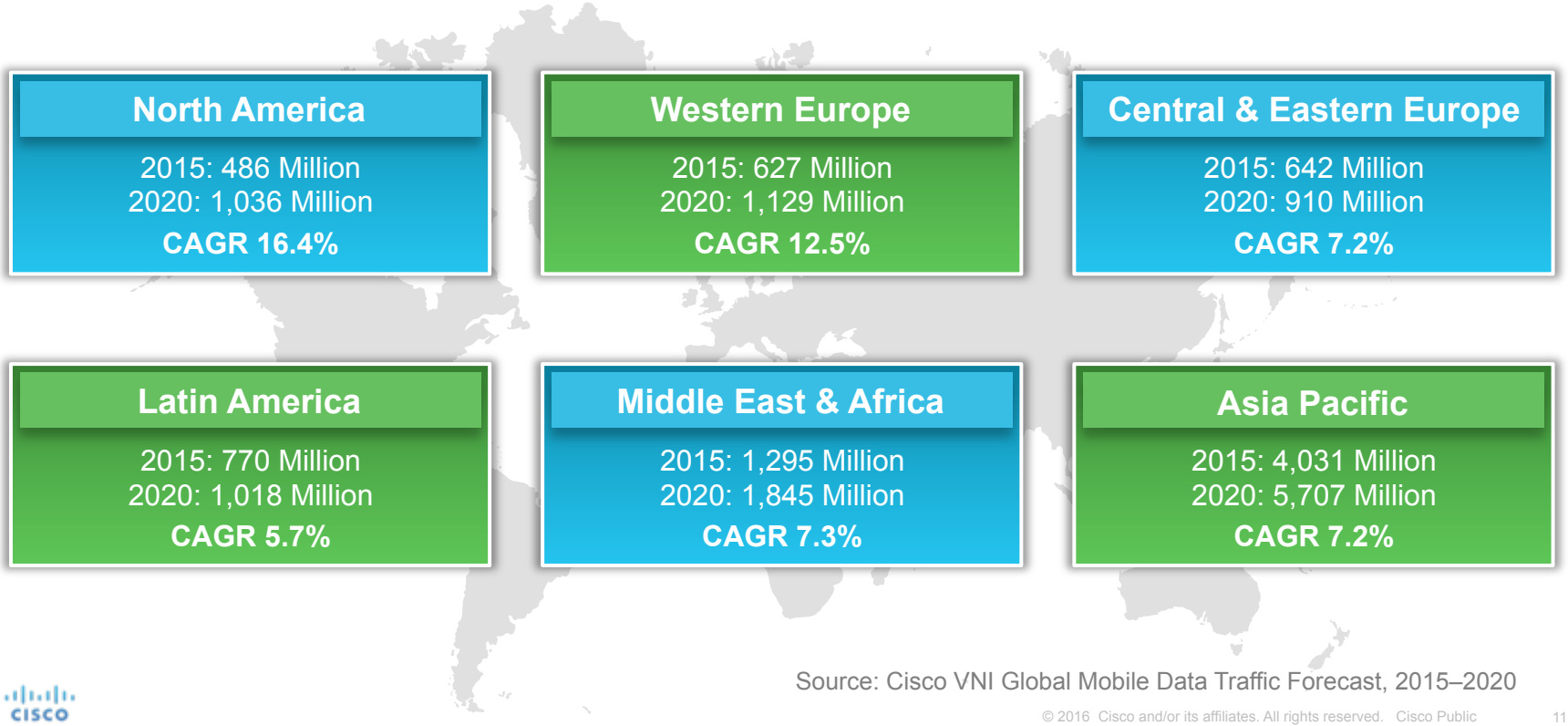
From 65% (4.8B) in 2015 to 70% (5.5B) of Global Population by 2020
Global Mobile Users Growing 2X Faster than Global Population



Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Device and Connections

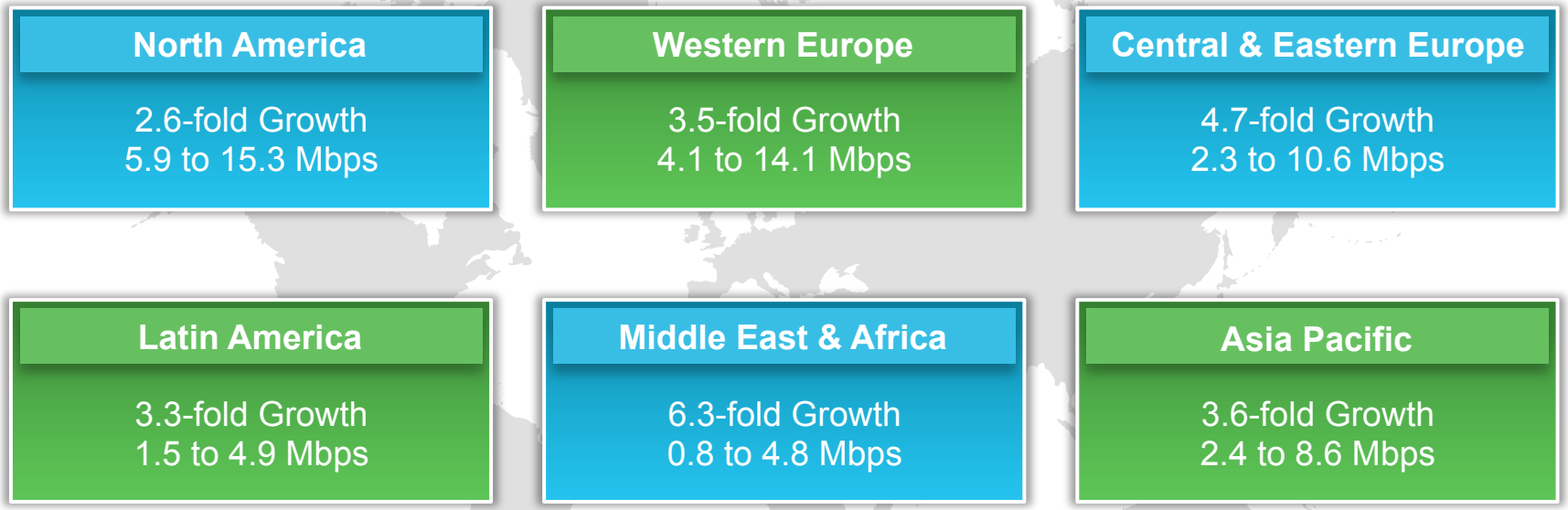
From 7.9 Billion in 2015 to 11.6 Billion by 2020 at 8% CAGR



Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Speed Growth

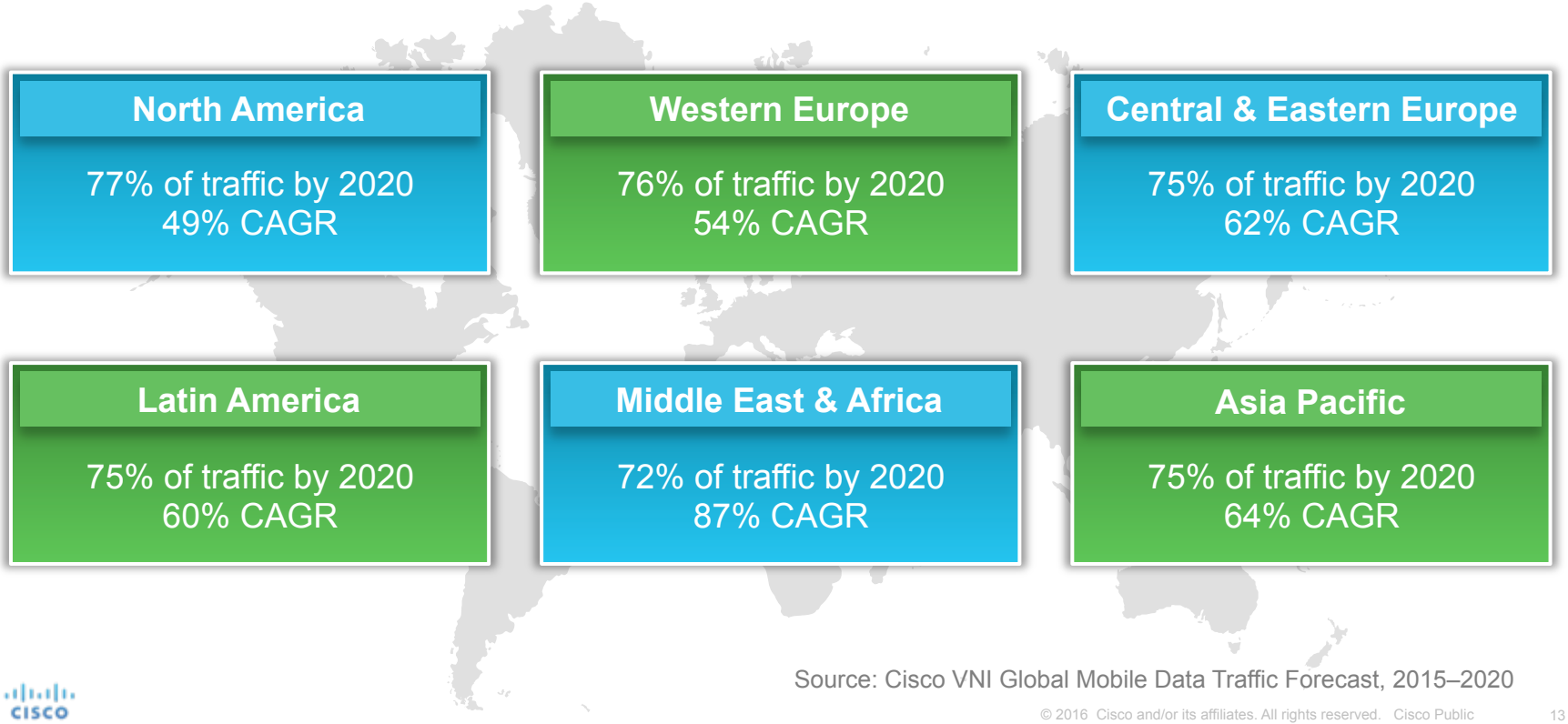
Average Mobile Speed Will More Than Triple from 2.0 Mbps (2015) to 6.5 Mbps (2020)



Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Video Traffic

By 2020, Video Will Drive 75% of Mobile Traffic, Up from 55% in 2015



Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

VNI Mobile Forecast Update, 2015–2020
Top Mobile Networking Trends

1. Adapting to Smarter Mobile Devices
2. Defining Cell Network Advances – 2G, 3G, 4G (5G Perspectives)
3. Measuring Mobile IoE Adoption—M2M and Emerging Wearables
4. Tracking Wi-Fi Growth
5. Profiling Mobile Applications Use and Bandwidth Consumption Patterns
6. Comparing Mobile Network Speed Improvements

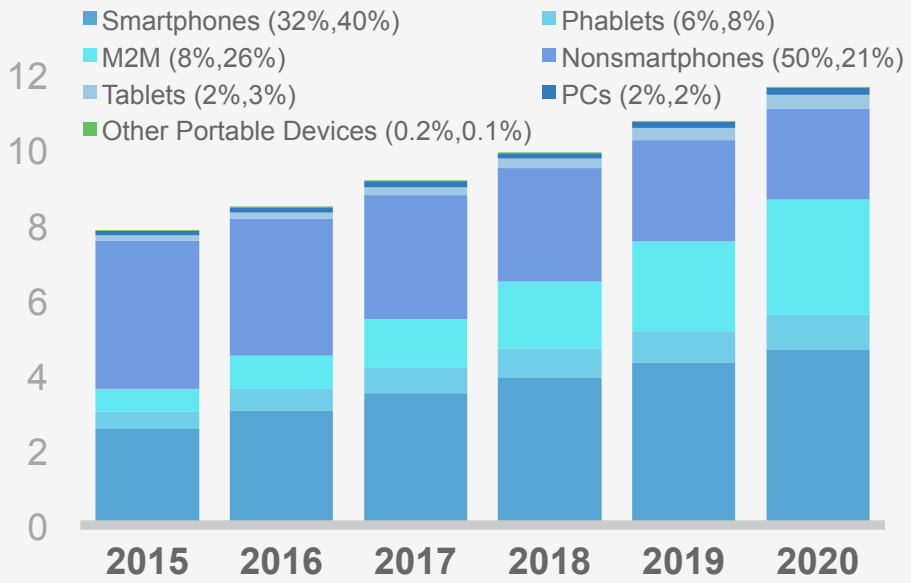
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Trend 1
Adapting to Smarter Mobile Devices

- Total devices and connections growth
- Traffic by device category
- Smarter devices growth
- Smart devices traffic
- IPv6 Analysis

Global Mobile Device Growth by Type

By 2020, Smartphones / Phablets Attain Largest Share Reaching Nearly 50%



8% CAGR
2015–2020

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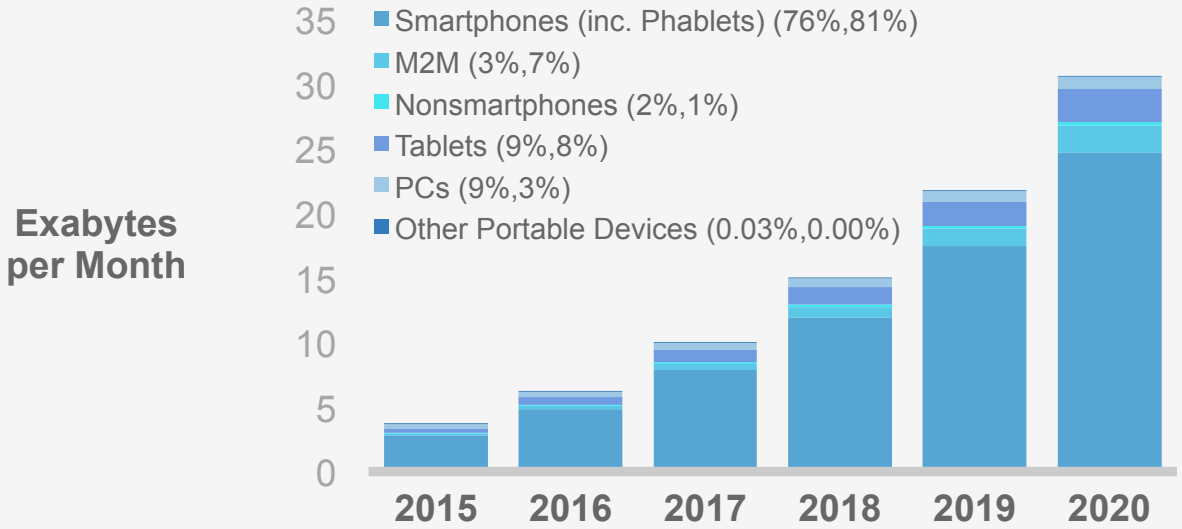
*** Figures (n) refer to 2015, 2020 device share**

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Traffic Growth by Device Type

Globally, Smartphones / Phablets Will Continue to Dominate Mobile Traffic, but M2M Will Gain Share by 2020



53% CAGR
2015–2020

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

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

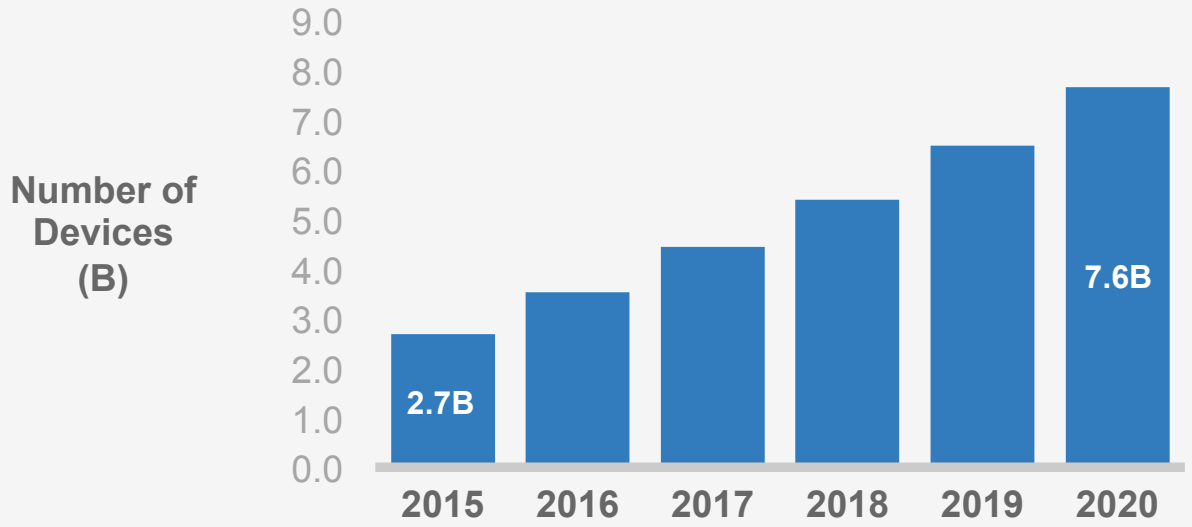
Globally, in 2015, a smart device generated **14 times** more traffic than a nonsmart device.

* Smart devices are those having advanced multimedia/computing capabilities with a minimum of 3G connectivity

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global IPv6-Capable Mobile Devices/Connections

By 2020, 66% of Mobile Devices/Connections Will be IPv6-Capable



23% CAGR
2015–2020

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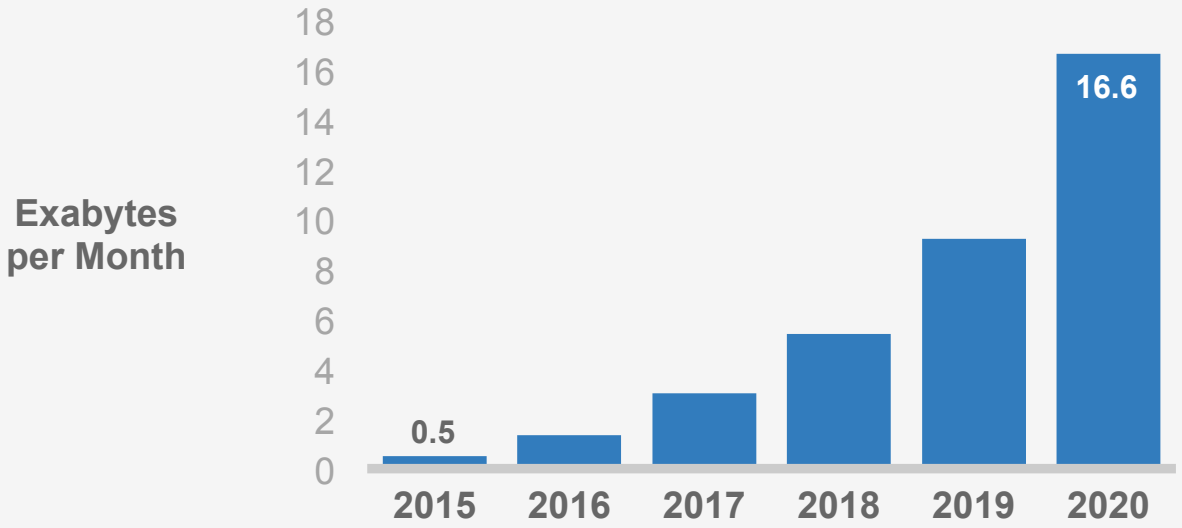
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global IPv6 Mobile Data Traffic Forecast

By 2020, IPv6 Traffic Projected to be 54% of Mobile Data Traffic



102% CAGR
2015–2020

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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

By 2020, IPv6 M2M modules will be **1.5 billion** a **27% increase** during the forecast period, **62% CAGR**.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

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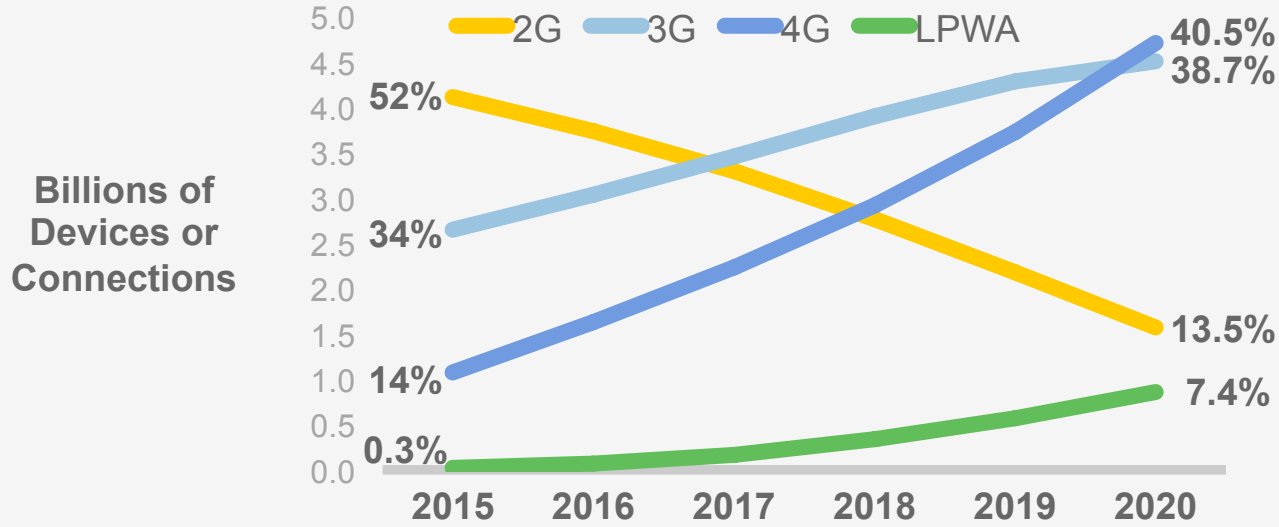
Trend 2

Defining Cell Network Advances—2G, 3G, 4G (5G Perspectives)

- Total Connections by Network Type
- Network Connectivity for M2M
- Traffic by Network Connectivity
- 5G Perspectives

Global Connections by Network Type

By 2017, 3G Surpasses 2G Connections
By 2020, 4G Connectivity Surpasses All Other Connection Types



*Includes M2M

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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Connections by Network Type
Regional Share by 2020

	2G	3G	4G	LPWA
Global	13%	39%	40%	7%
BY REGION				
North America	3%	14%	59%	24%
Western Europe	9%	21%	53%	16%
Central & Eastern Europe	8%	42%	42%	8%
Latin America	15%	52%	32%	1%
Asia-Pacific	14%	37%	43%	6%
Middle East & Africa	22%	60%	17%	1%

Includes M2M

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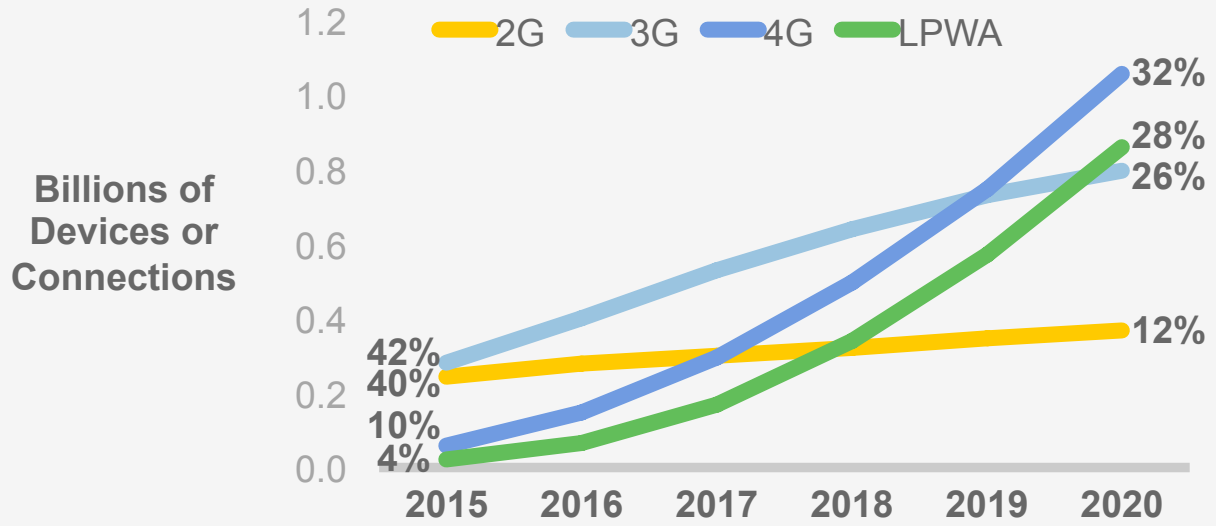
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global M2M Connections by Network Type

By 2020, 4G and LPWA Lead M2M Connections



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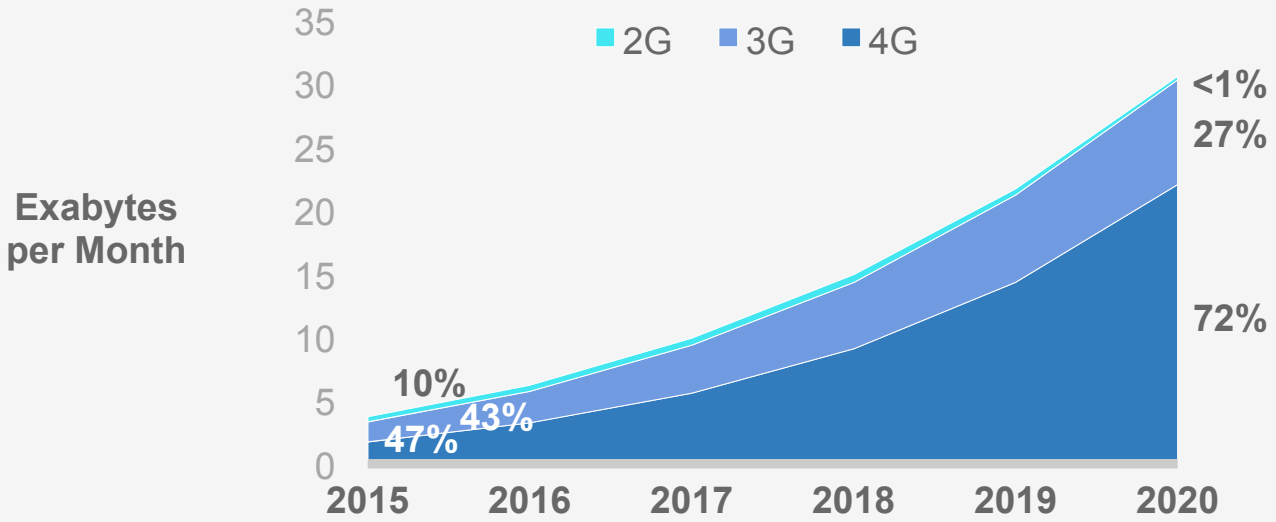
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Data Traffic Growth: 4G

Globally, 4G Already Carries Largest Share of Traffic – 47%
By 2020, 4G Will Support 72% of Mobile Traffic



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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

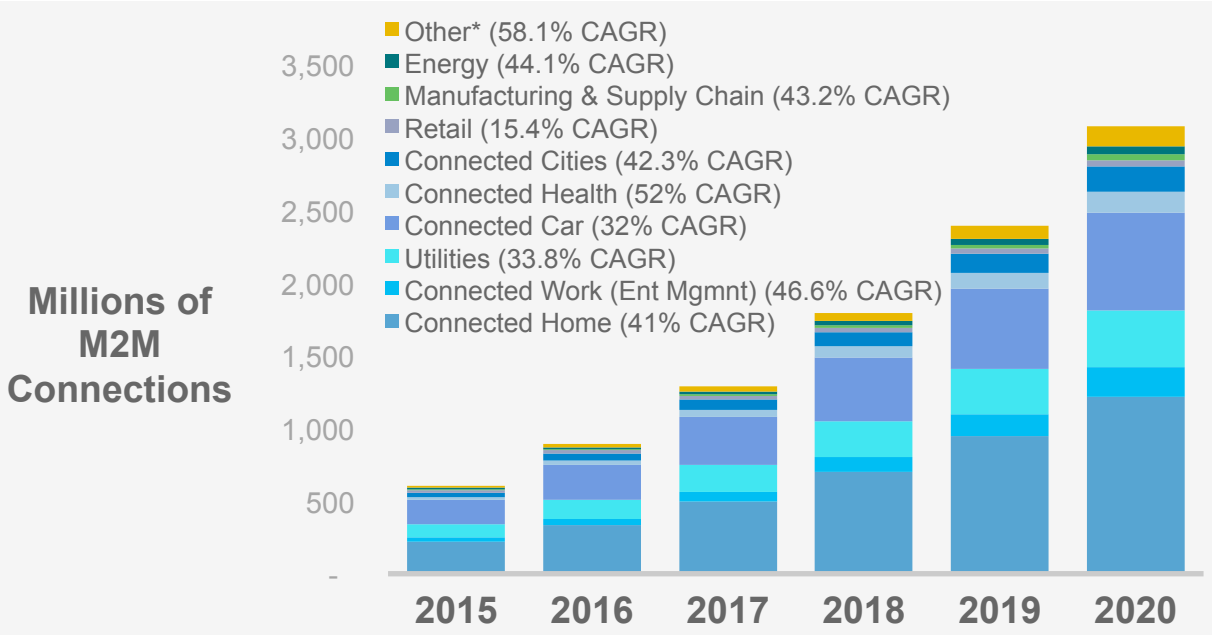
Trend 3

Measuring Mobile IoE Adoption—M2M and Emerging Wearables

- M2M Connections growth
- M2M by vertical
- M2M Device usage—traffic examples
- Wearables analysis

Global Mobile M2M Connections By Vertical

By 2020, Connected Home Largest, Connected Health Fastest Growth



38% CAGR
2015–2020

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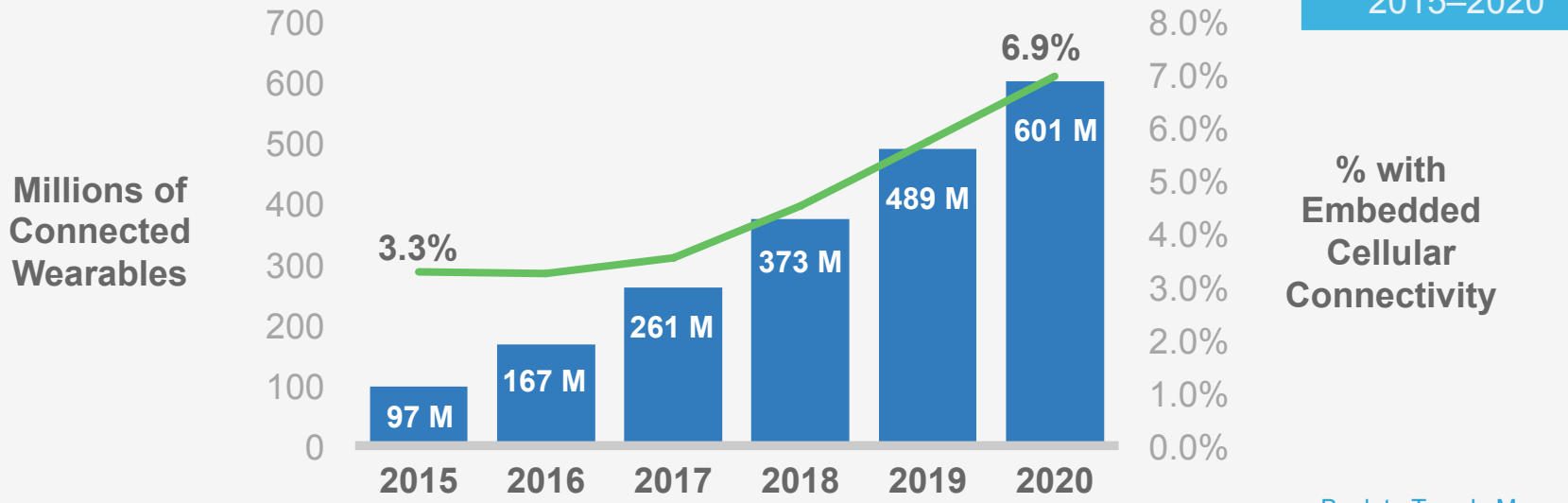
***Other includes Agriculture, Construction & Emergency Services**

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Connected Wearable Devices

Global Connected Wearables will Grow 6-Fold from 2015-2020; By 2020, 7 Percent will Have Embedded Cellular Connectivity

44% CAGR
2015–2020



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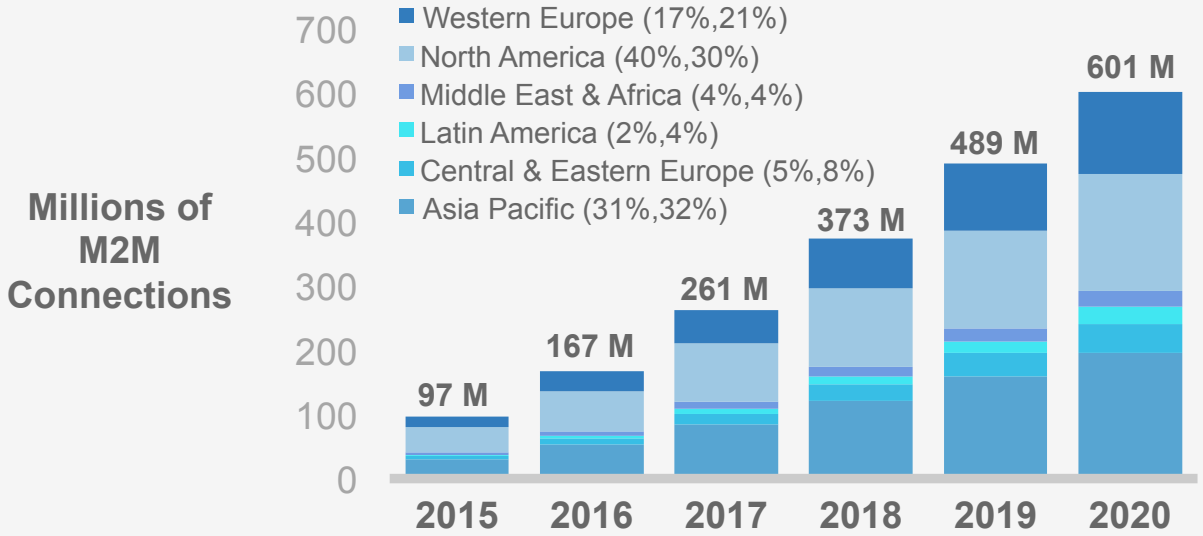
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Regional Connected Wearable Devices
Asia Pacific Will Have the Largest Share by 2020



44% CAGR
2015–2020

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*** Figures (n) refer to 2015, 2020 regional wearable devices share**

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

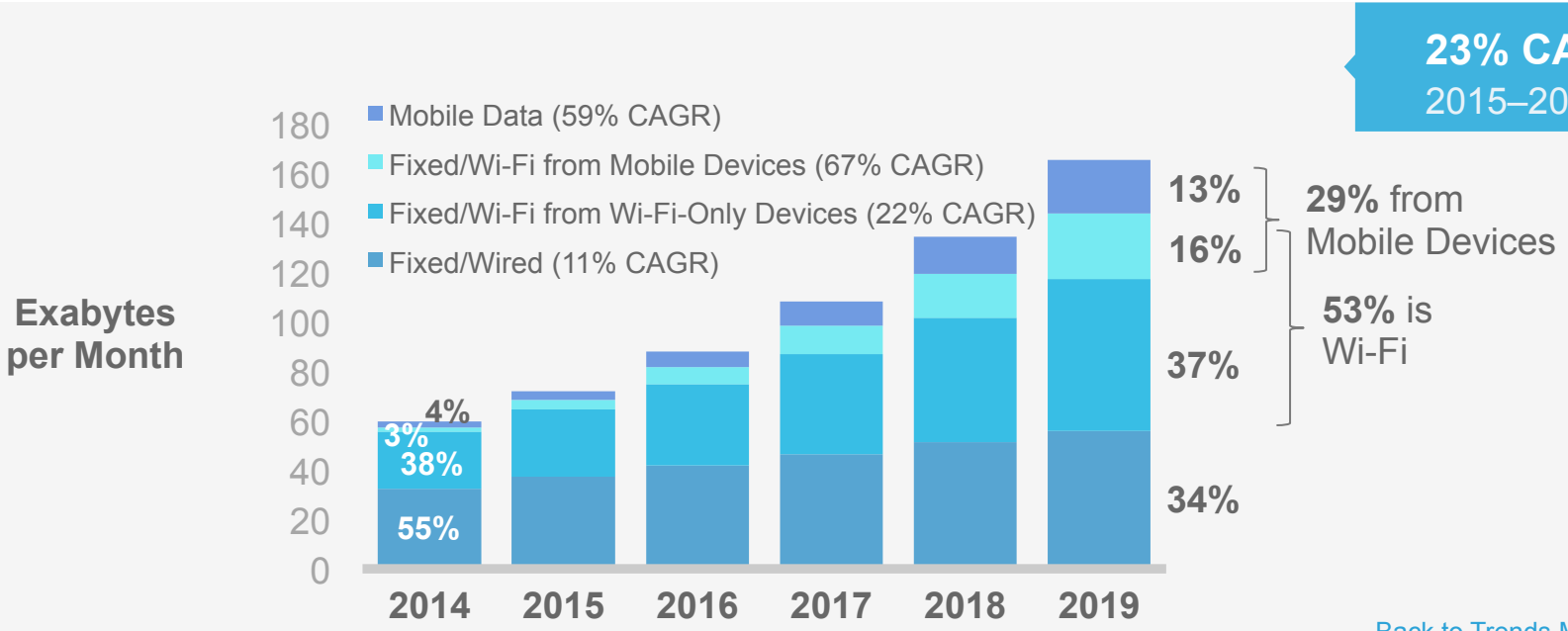
Trend 4

Tracking Wi-Fi Growth

- Total mobile vs. Wi-Fi vs. fixed traffic growth
- Mobile offload
- Growth of Wi-Fi hotspots
- Day in connected life/ day-parting
- VoWiFi vs. other types of mobile voice

Global IP Traffic by Local Access Technology

Starting in 2017, Fixed/Wi-Fi Traffic Surpasses Fixed/Wired Traffic



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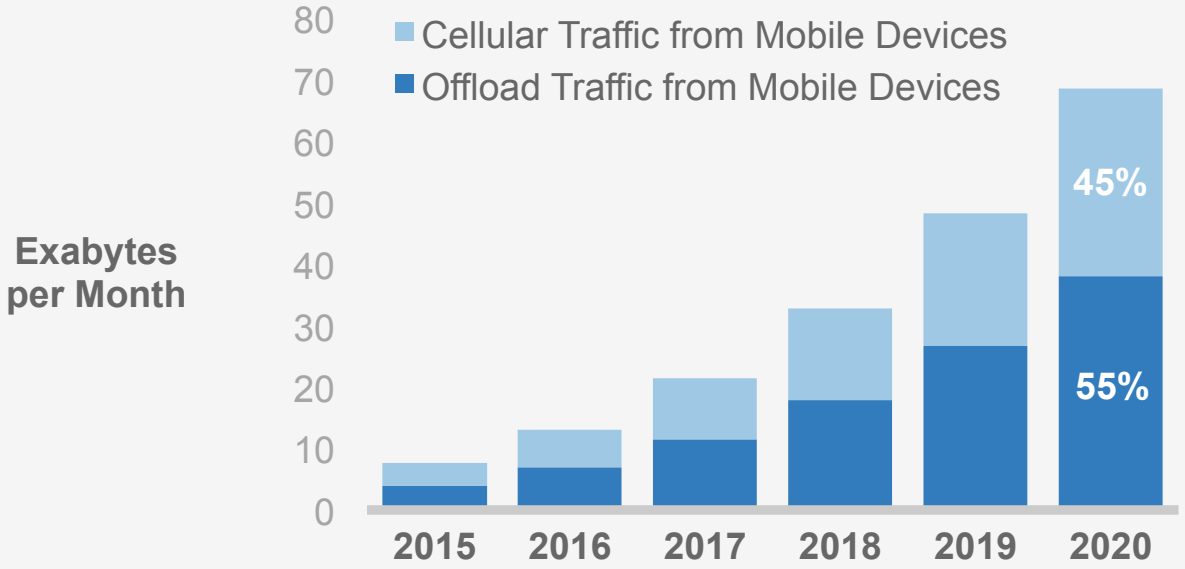
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Data Traffic Offload*

55% of Mobile Traffic to be Offloaded by 2020
51% of Mobile Traffic Offloaded in 2015



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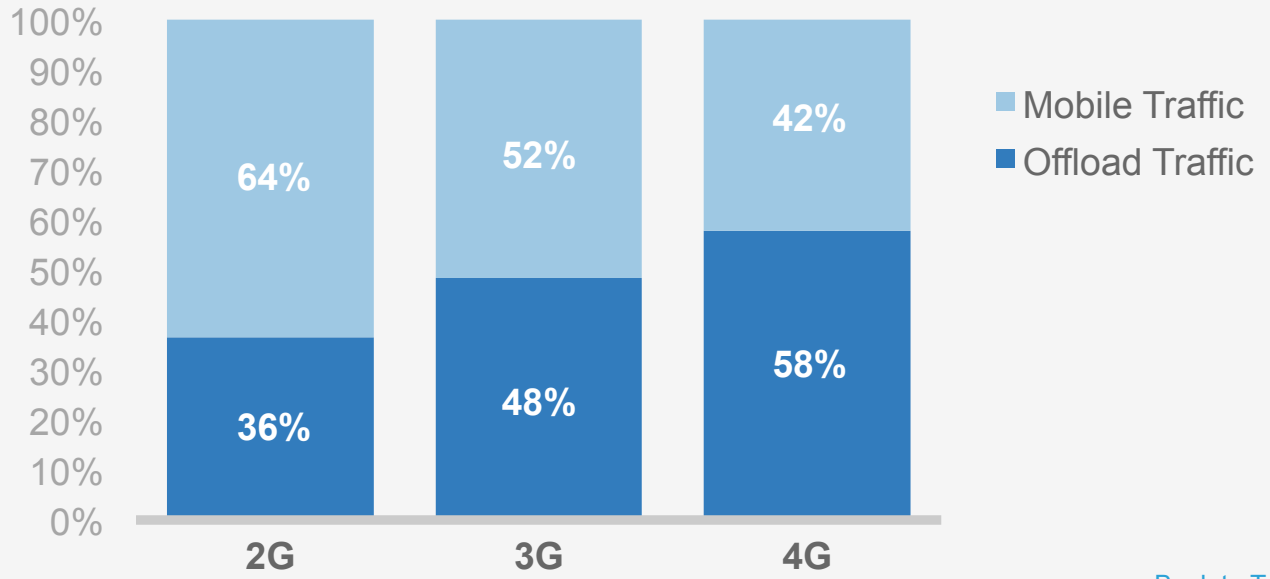
*Offload includes traffic from dual-mode devices (i.e., supports cell & Wi-Fi, excl. PCs) over Wi-Fi/small cell networks

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Data Traffic and Offload Traffic, 2020

4G Devices Offload More Traffic Than 3G and 2G

Mobile and Offload Traffic from Mobile-Connected Devices



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***Offload includes traffic from dual-mode devices (i.e., supports cell & Wi-Fi, excl. PCs) over Wi-Fi/small cell networks**

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Globally, the amount of traffic offloaded from tablets will be **71%** by 2020.

Globally, the amount of traffic offloaded from smartphones/ phablets will be **56%** by 2020.

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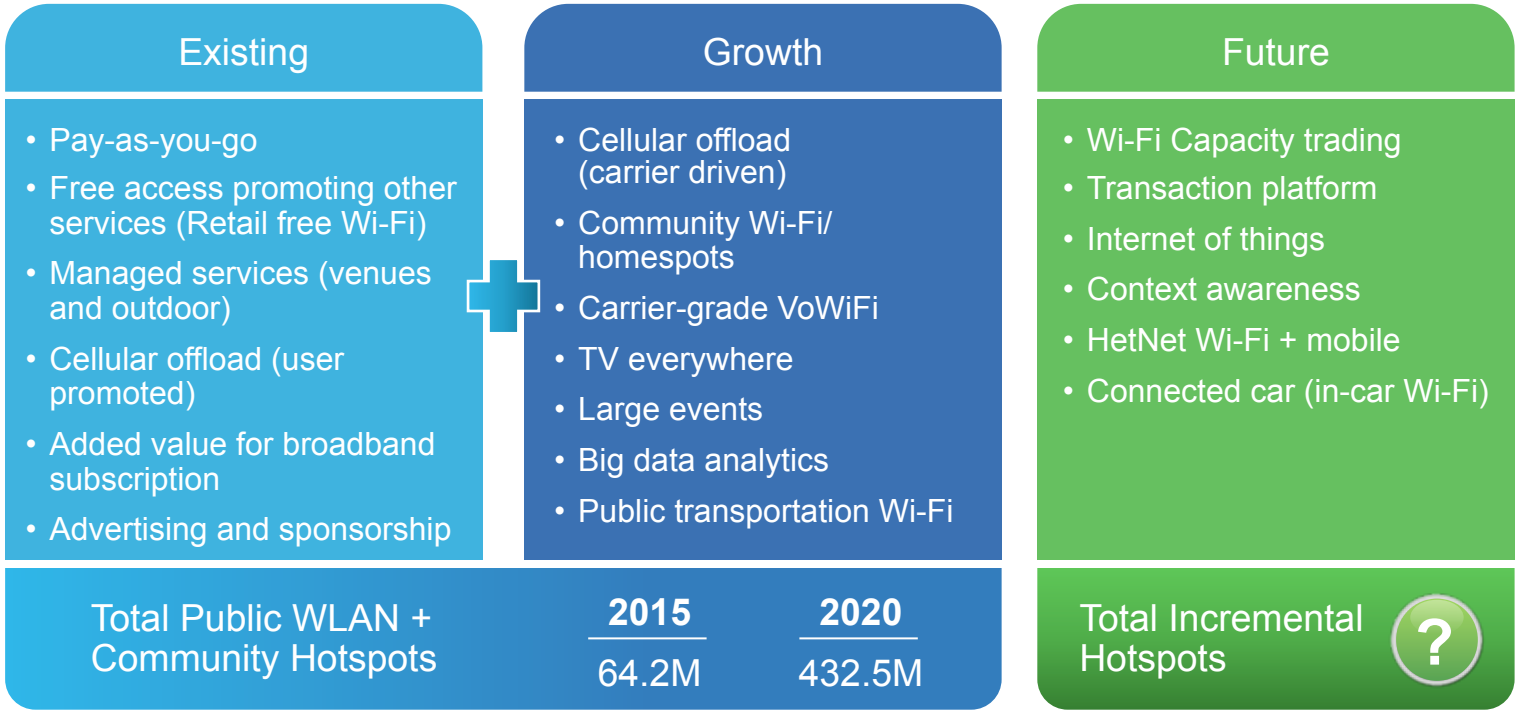
***Offload includes traffic from dual-mode devices (i.e., supports cell & Wi-Fi, excl. PCs) over Wi-Fi/small cell networks**

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Wi-Fi Hotspot Coverage and Availability



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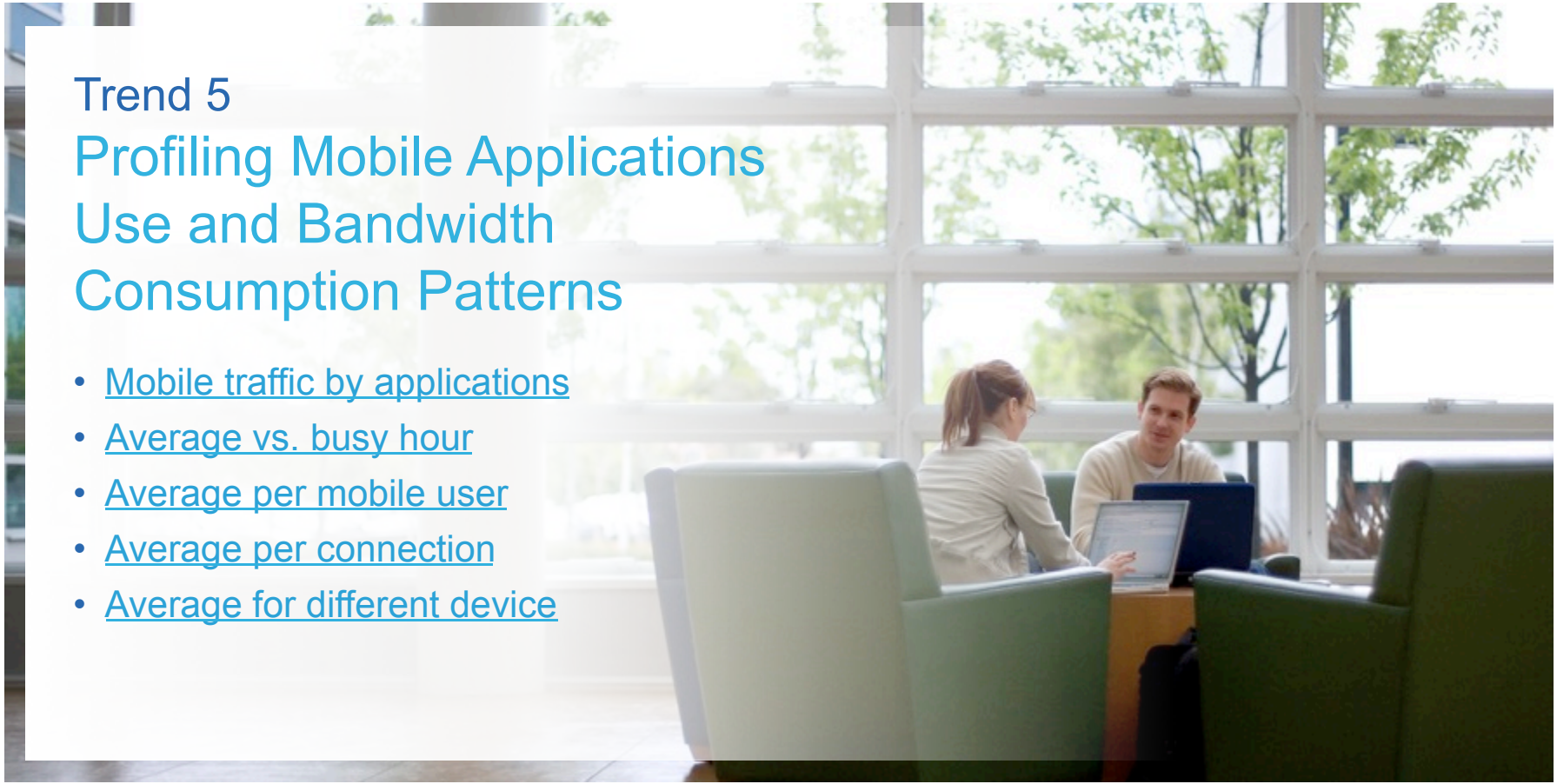
Trend 5

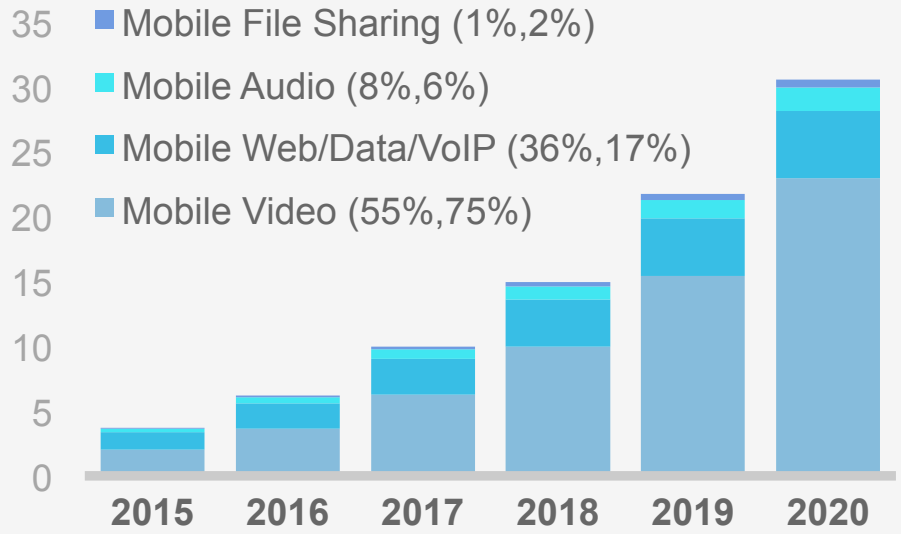
Profiling Mobile Applications Use and Bandwidth Consumption Patterns

- Mobile traffic by applications
- Average vs. busy hour
- Average per mobile user
- Average per connection
- Average for different device



Global Mobile Data Traffic Growth / Apps

Video Three-fourths of Mobile Data Traffic by 2020



53% CAGR
2015–2020

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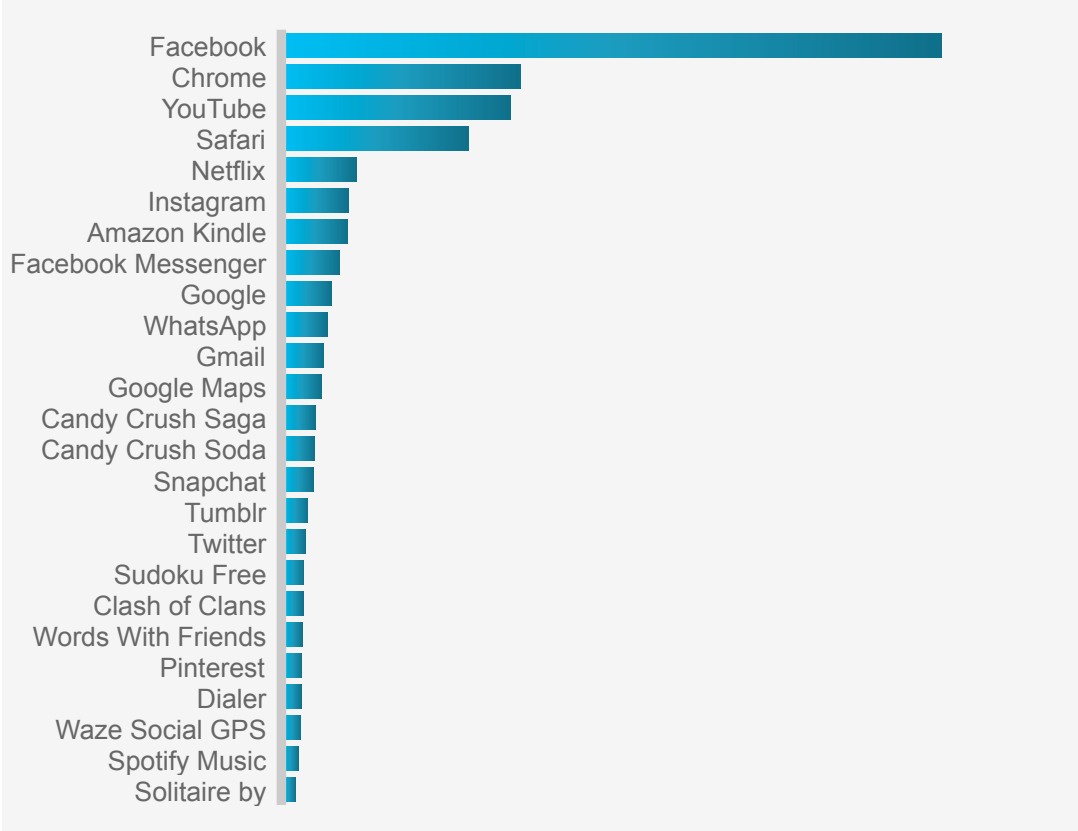
*** Figures (n) refer to 2015 and 2020 mobile data traffic shares**

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

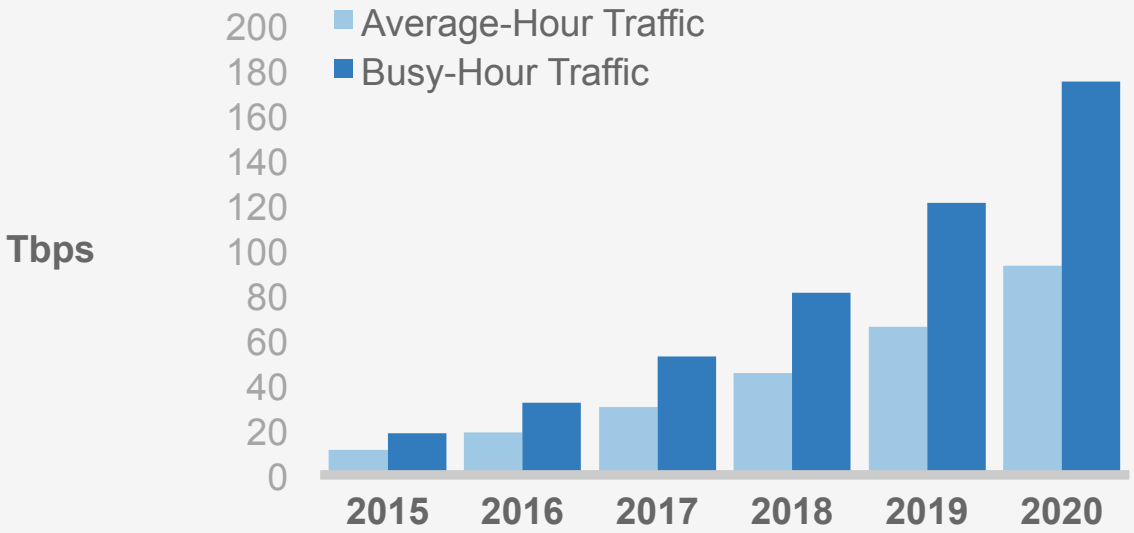
Top Apps on Tablet and Smartphone by Time Spend—2015



Source: Cisco, Verto Analytics

Busy Hour Mobile Data Traffic

Busy Hour Is 66% Higher than Average Hour in 2015, 88% in 2020



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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Average Mobile User (Cellular Traffic per Month)

GLOBAL	2015	2020
Global MB per Month	746	5,216
BY REGION		
North America	1,792	8,887
Western Europe	1,134	6,528
Central & Eastern Europe	1,529	11,835
Asia-Pacific	588	4,237
Latin America	568	3,785
Middle East & Africa	409	4,790

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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Trend 6

Comparing Mobile Network Speed Improvements

- Mobile speeds
- Wi-Fi Speeds
- Mobile speed by device
- Mobile speed by network

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	4.0	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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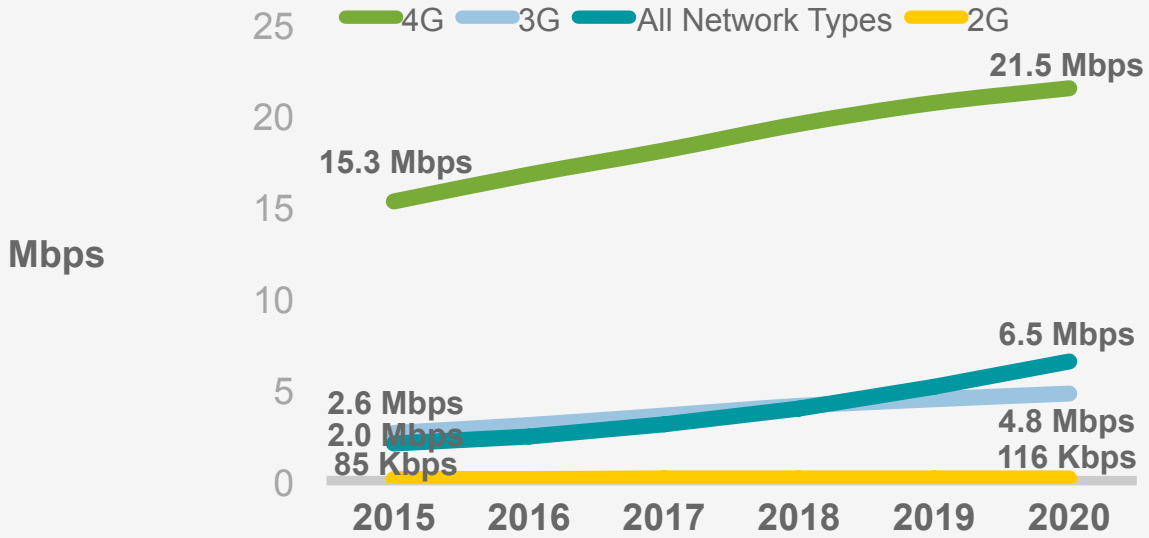
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Speeds by Network Type

4G Speeds will be 3.3X Higher than Average by 2020
Average Speeds will Surpass 3-3.5G Speeds by 2020



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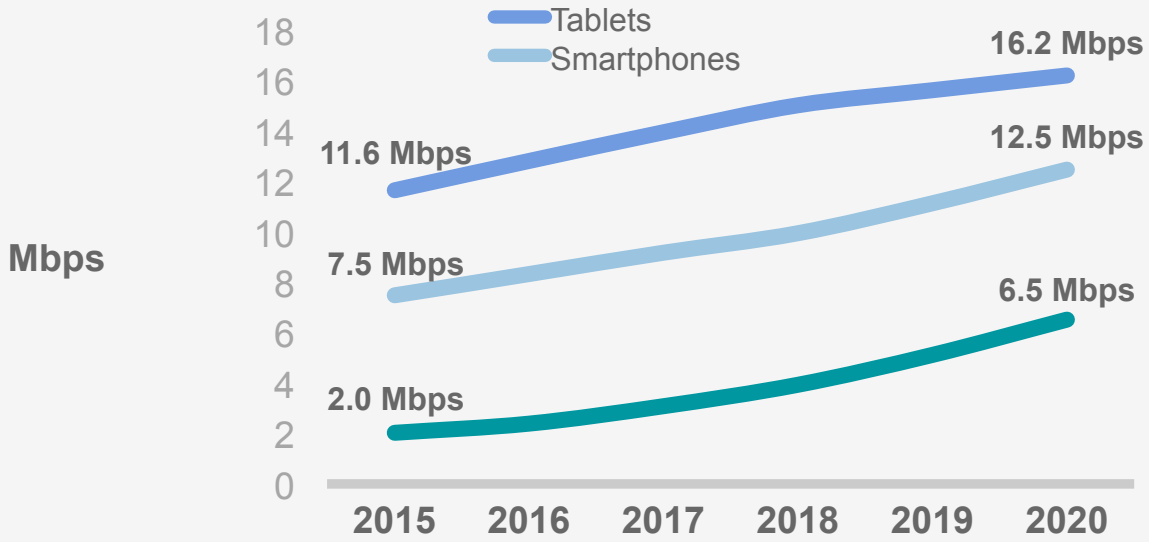
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Mobile Speeds by Device Type

Tablet Speeds are 2.5x Higher than Average by 2020
Smartphone Speeds are 1.9x Higher than Average by 2020



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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Global Average Wi-Fi Speeds

Wi-Fi Exceeds Average Mobile (Cell) Speeds During 2015-2020

GLOBAL	2015	2020
Global Mbps	12.5	19.9
BY REGION		
North America	17.4	31.9
Western Europe	13.9	22.4
Central & Eastern Europe	13.4	24.0
Latin America	5.9	9.1
Asia Pacific	11.4	18.3
Middle East & Africa	4.4	6.8

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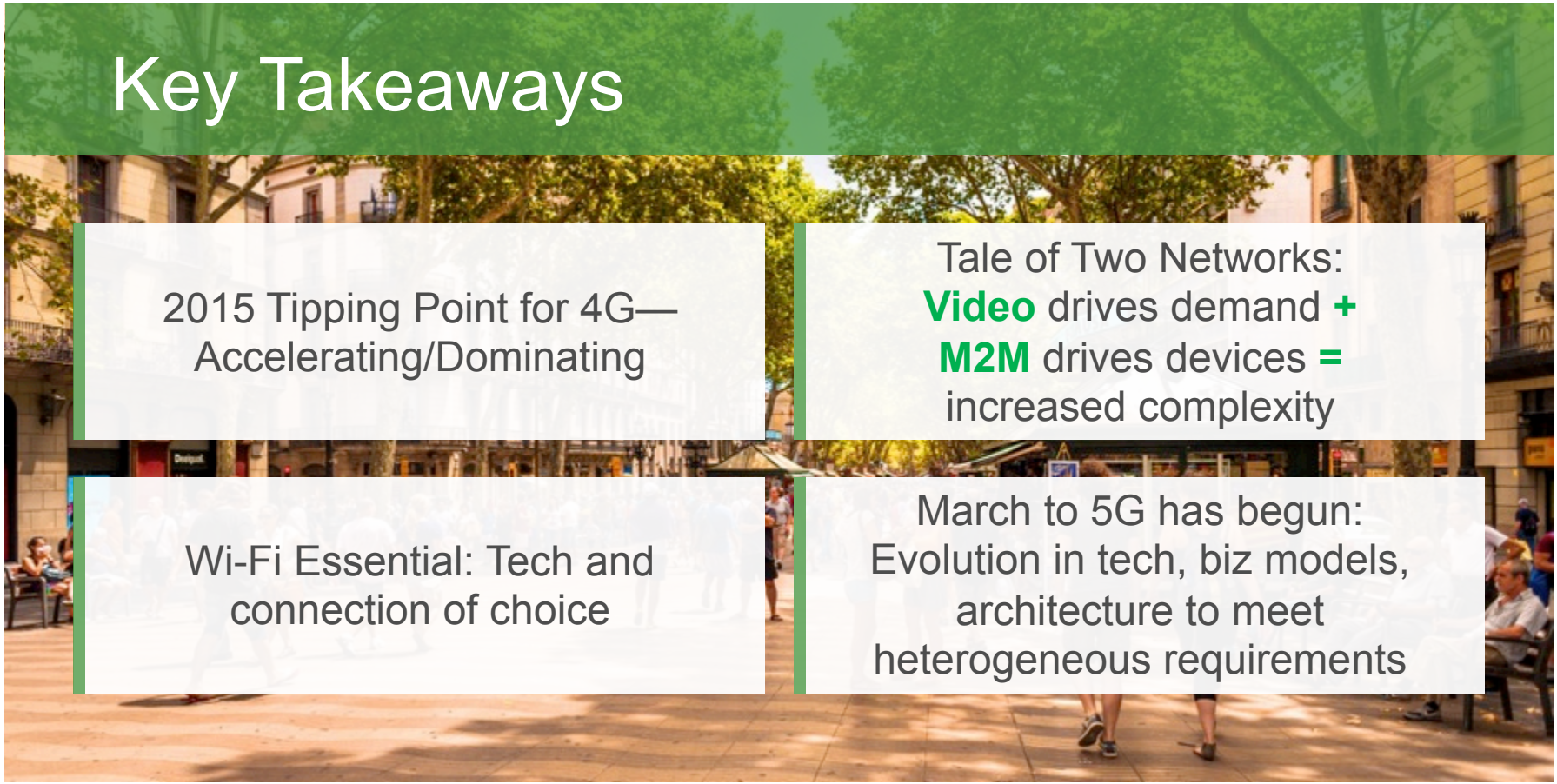
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020

Forecast Implications

Key Takeaways



2015 Tipping Point for 4G—Accelerating/Dominating

Tale of Two Networks: **Video** drives demand **+** **M2M** drives devices **=** increased complexity

Wi-Fi Essential: Tech and connection of choice

March to 5G has begun: Evolution in tech, biz models, architecture to meet heterogeneous requirements

5G Requirements (Still Evolving)

Diverse devices; user interactions

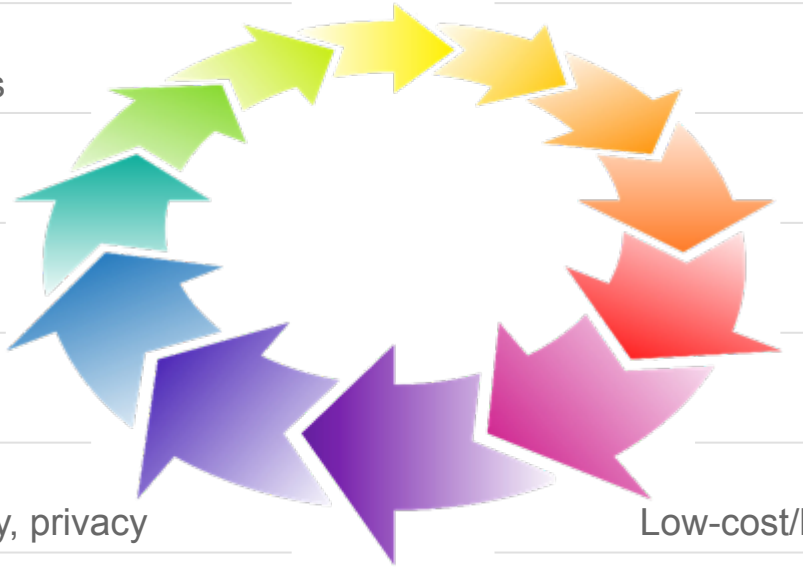
Various access technologies

High user mobility

Power efficient

Broadcast-like services

Ensure security, trust identify, privacy



Greater throughput—50+ Mbps

Ultra-high reliability

Ultra-low latency

Ultra density

Broadband MTC

Low-cost/long-range/low-power MTC

Source: NGMN
https://www.ngmn.org/fileadmin/ngmn/content/downloads/Technical/2015/NGMN_5G_White_Paper_V1_0.pdf

Conclusion

Cisco VNI Mobile Forecast; 2015–2020

Get more info—see Tools and Resources

www.cisco.com/go/vni
traffic-inquiries@cisco.com

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CISCO

Generations of Mobile Technology—A Snapshot

Generation	1G	2G	3G	4G	5G
Deployment	1970–84	1980–99	1990–2002	2000–10	2020+
Bandwidth	2 Kbps	14–64 Kbps	2 Mbps	200 Mbps	1 Gbps+
Service	Analog voice	Digital voice, SMS, MMS	Integrated high quality audio, video and data	Dynamic information access, variable devices	Dynamic information access with AI capabilities–IoE, Wearable devices

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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2015–2020