Cisco Visual Networking Index (VNI) Complete Forecast Update, 2017–2022

Americas/EMEAR Cisco Knowledge Network (CKN) Presentation

Thomas Barnett, Jr. | Director, SP Thought Leadership

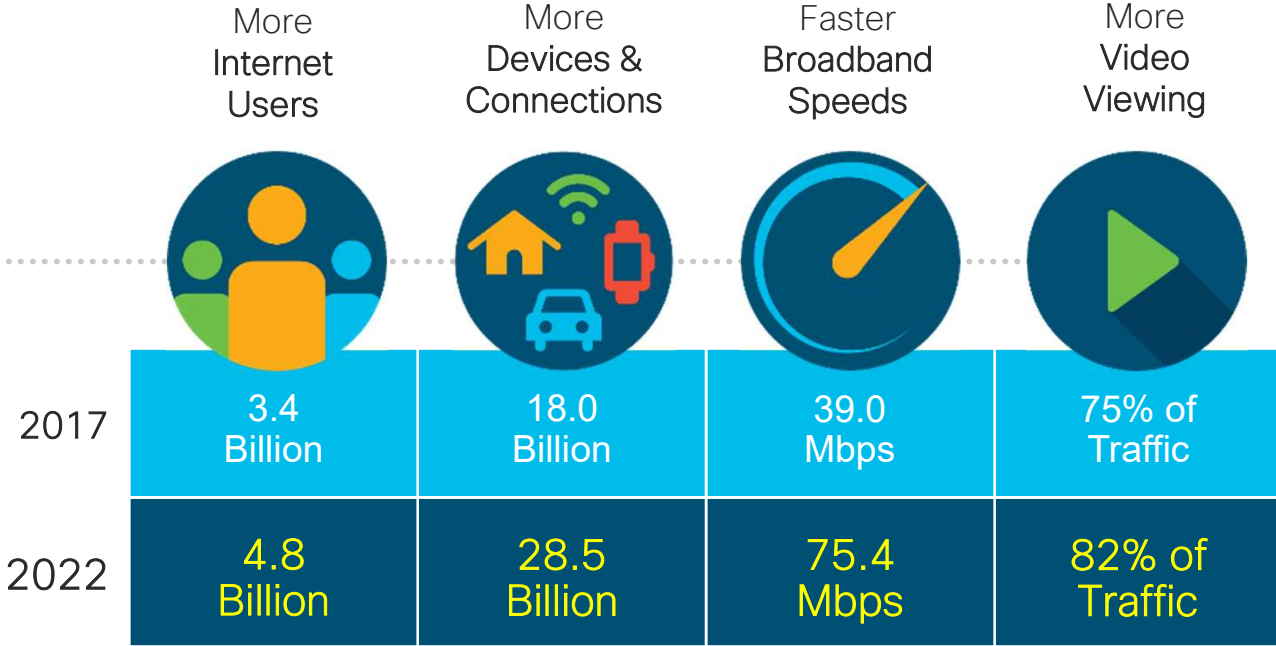**Shruti Jain** | Senior Analyst

Usha Andra | Senior Analyst

Taru Khurana | Senior Analyst

December 2018

Global Internet Growth and Trends
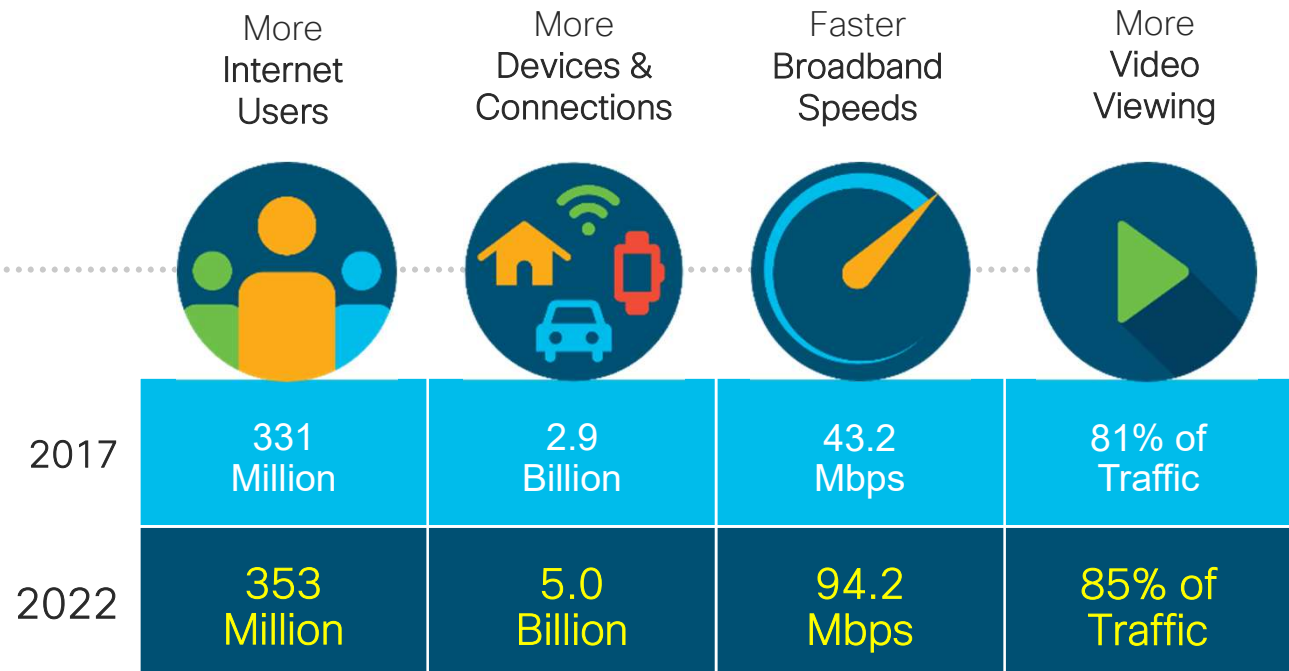
Key Digital Transformers

By 2022

	More Internet Users	More Devices & Connections	Faster Broadband Speeds	More Video Viewing
2017	3.4 Billion	18.0 Billion	39.0 Mbps	75% of Traffic
2022	4.8 Billion	28.5 Billion	75.4 Mbps	82% of Traffic

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

North America Internet Growth and Trends

Key Digital Transformers

By 2022

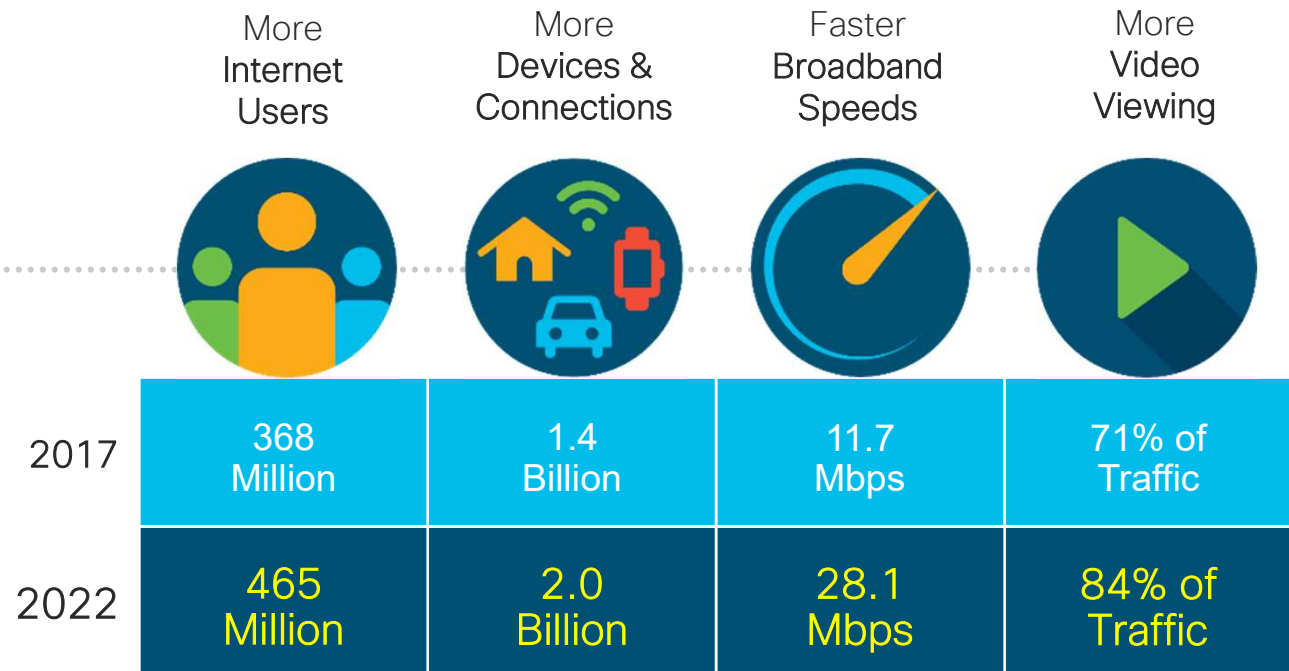|	More Internet Users	More Devices & Connections	Faster Broadband Speeds	More Video Viewing
2017	331 Million	2.9 Billion	43.2 Mbps	81% of Traffic
2022	353 Million	5.0 Billion	94.2 Mbps	85% of Traffic

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM Internet Growth and Trends

Key Digital Transformers

By 2022

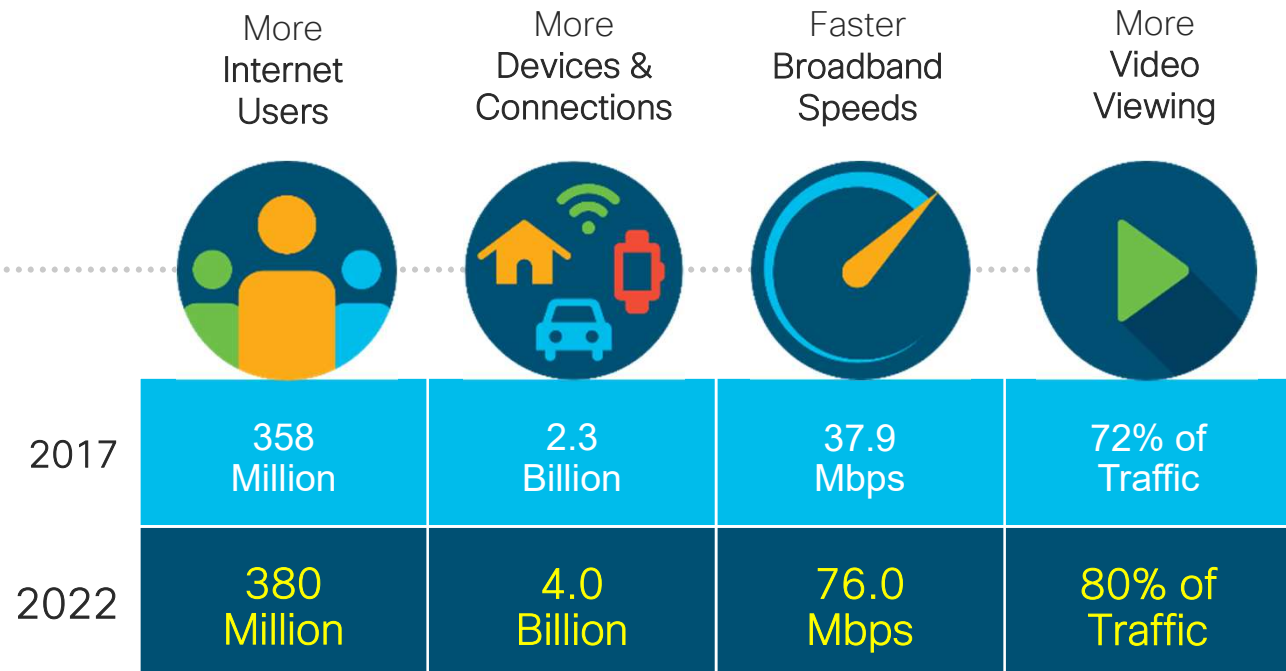|	More Internet Users	More Devices & Connections	Faster Broadband Speeds	More Video Viewing
2017	368 Million	1.4 Billion	11.7 Mbps	71% of Traffic
2022	465 Million	2.0 Billion	28.1 Mbps	84% of Traffic

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE Internet Growth and Trends

Key Digital Transformers

By 2022

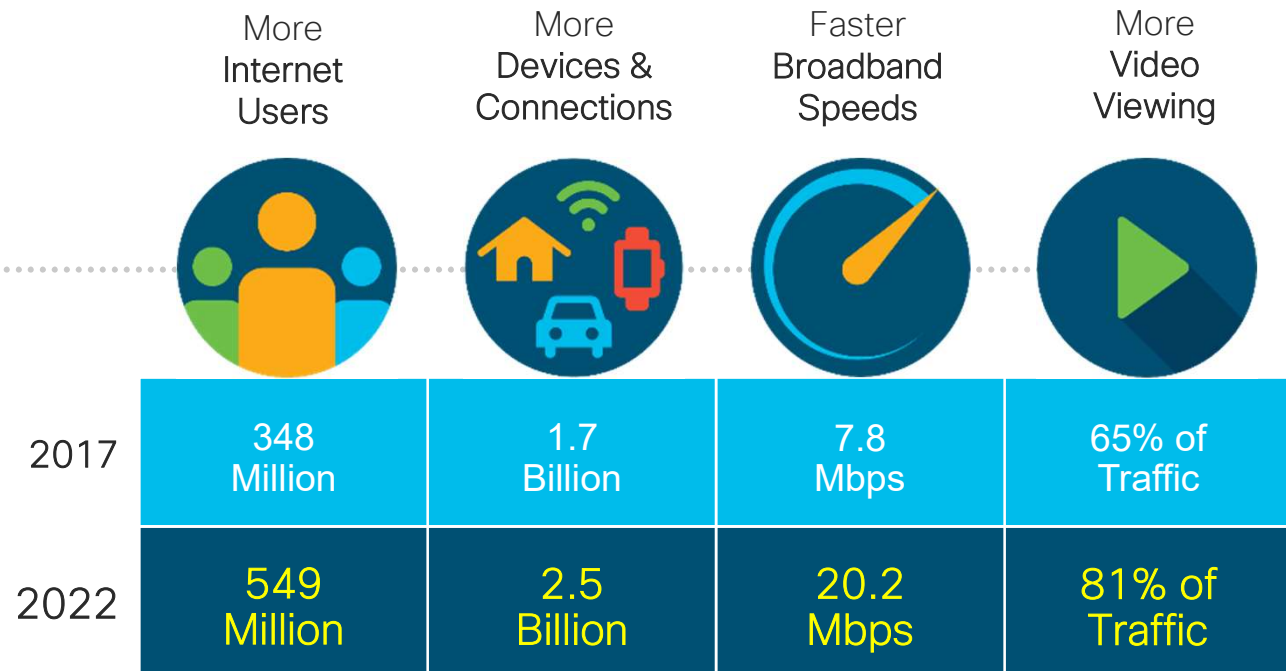|	More Internet Users	More Devices & Connections	Faster Broadband Speeds	More Video Viewing
2017	358 Million	2.3 Billion	37.9 Mbps	72% of Traffic
2022	380 Million	4.0 Billion	76.0 Mbps	80% of Traffic

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA Internet Growth and Trends

Key Digital Transformers

By 2022

	More Internet Users	More Devices & Connections	Faster Broadband Speeds	More Video Viewing
2017	348 Million	1.7 Billion	7.8 Mbps	65% of Traffic
2022	549 Million	2.5 Billion	20.2 Mbps	81% of Traffic

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Overview

Entering the Multi-Zettabyte Era

By 2022, global IP traffic will reach an annual run rate of 4.8 zettabytes per year

What is a zettabyte?

One trillion gigabytes

Approximately 10^{21}
(1,000,000,000,000,000,000,000 bytes)

4.8 zettabytes is equal to:

- Nearly 11X more than all IP traffic generated in 2012 (437 exabytes)

- All movies ever made crossing global IP networks in less than a minute (53 seconds)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

VNI Projections and Actuals (Global)
Actual growth has been within ±10% of projected growth

Compound Annual Growth Rate (CAGR)

2012–2017 CAGR

22.6% Projected in 2013
27.4% Actual (Reported in 2018)
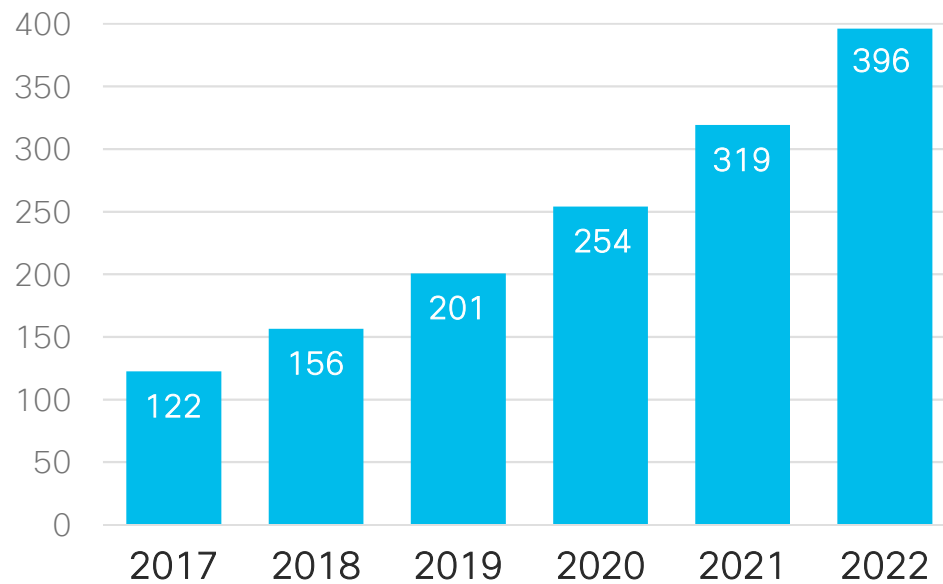
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
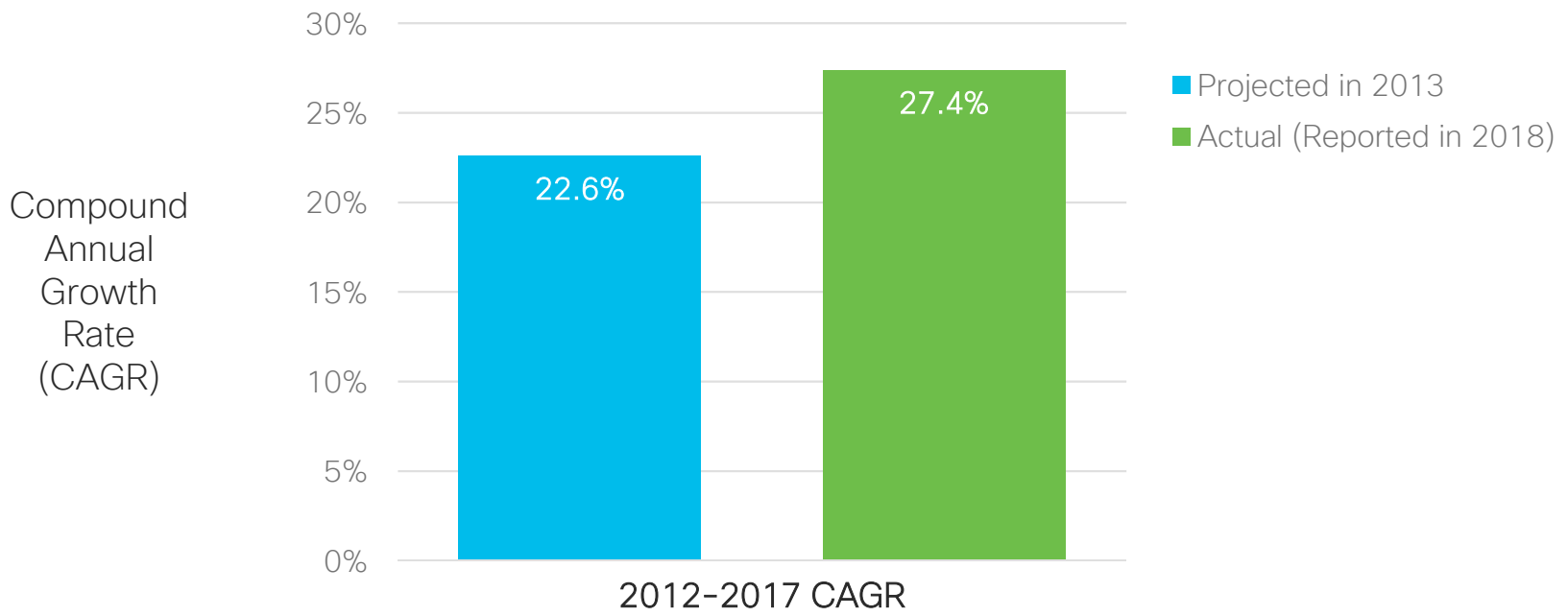
Global IP Traffic Growth
Global IP traffic will increase 3-fold from 2017 to 2022

26% CAGR
2017–2022

Exabytes
per Month

400						396
350					319	
300						
250				254		
200			201			
150		156				
100	122					
50						
0	2017	2018	2019	2020	2021	2022

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
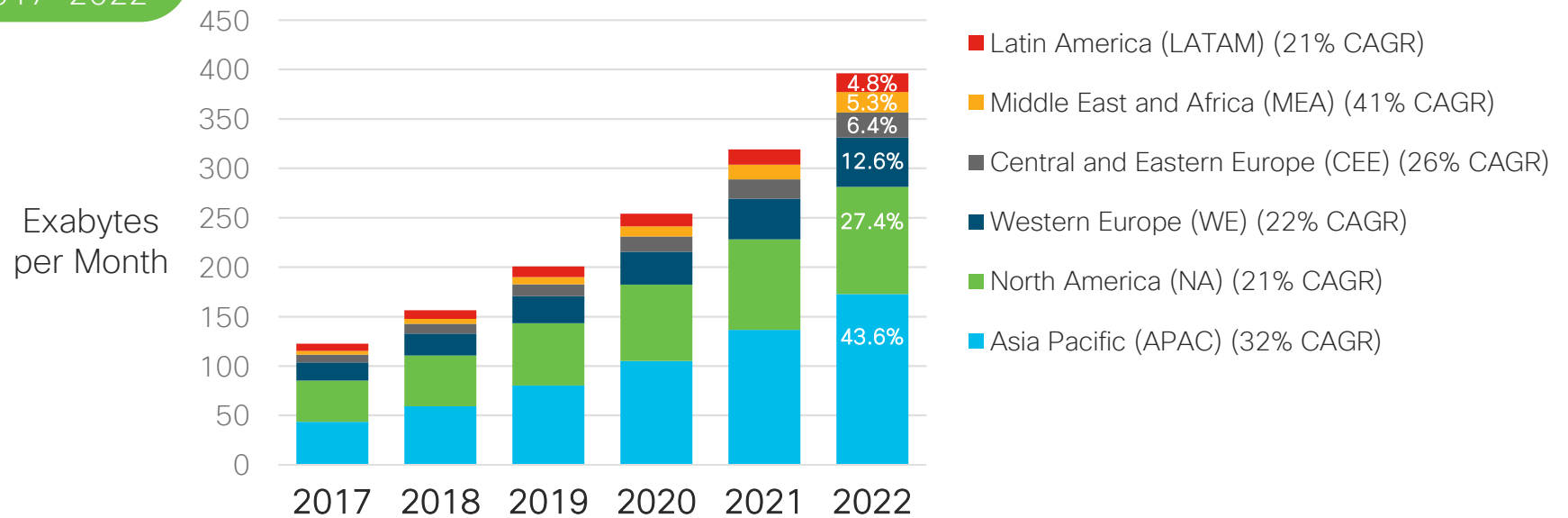
Fixed and Mobile Growth in 2017
Most countries have higher mobile than fixed growth
But there are a growing number of exceptions

Mobile Growth in 2017

200%
180%
160%
140%
120%
100%
80%
60%
40%
20%
0%

China
France
India
Australia
UK Japan
Indonesia
Canada
Korea
US

0%   10%   20%   30%   40%

Fixed Internet Growth in 2017
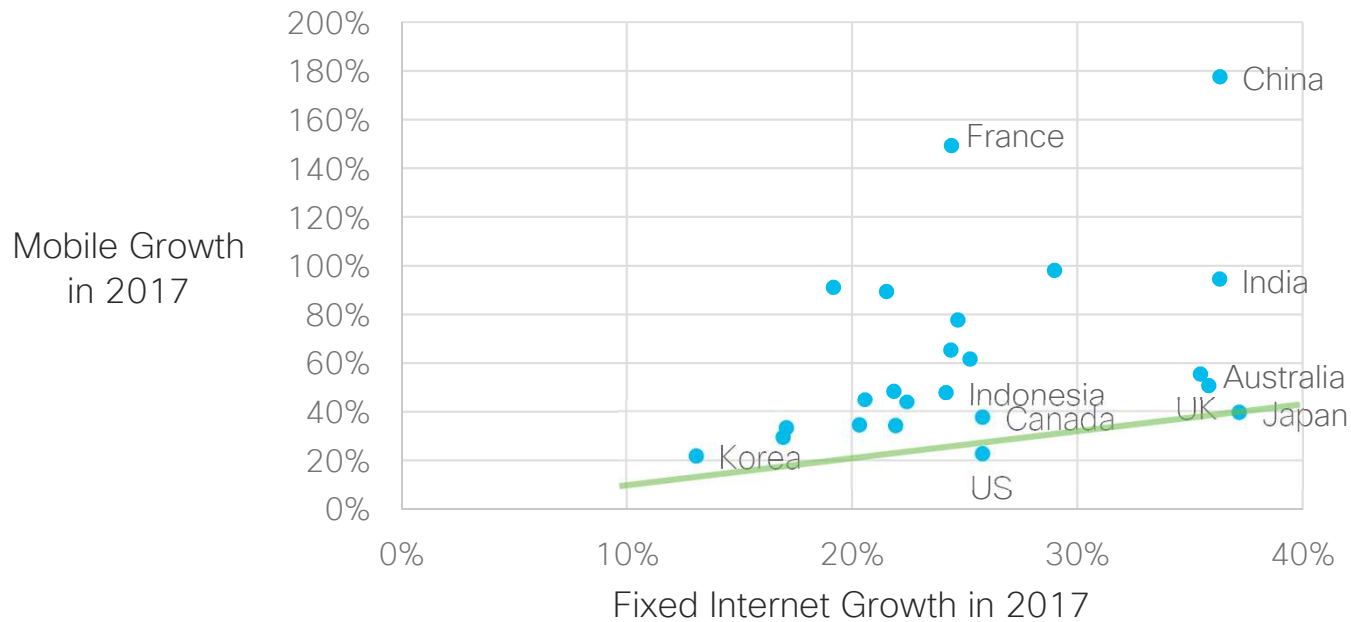
Top Trends

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends

❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

Network Performance and User Experience

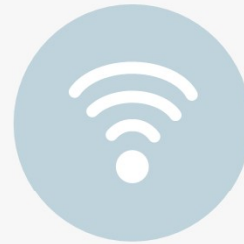❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends

❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

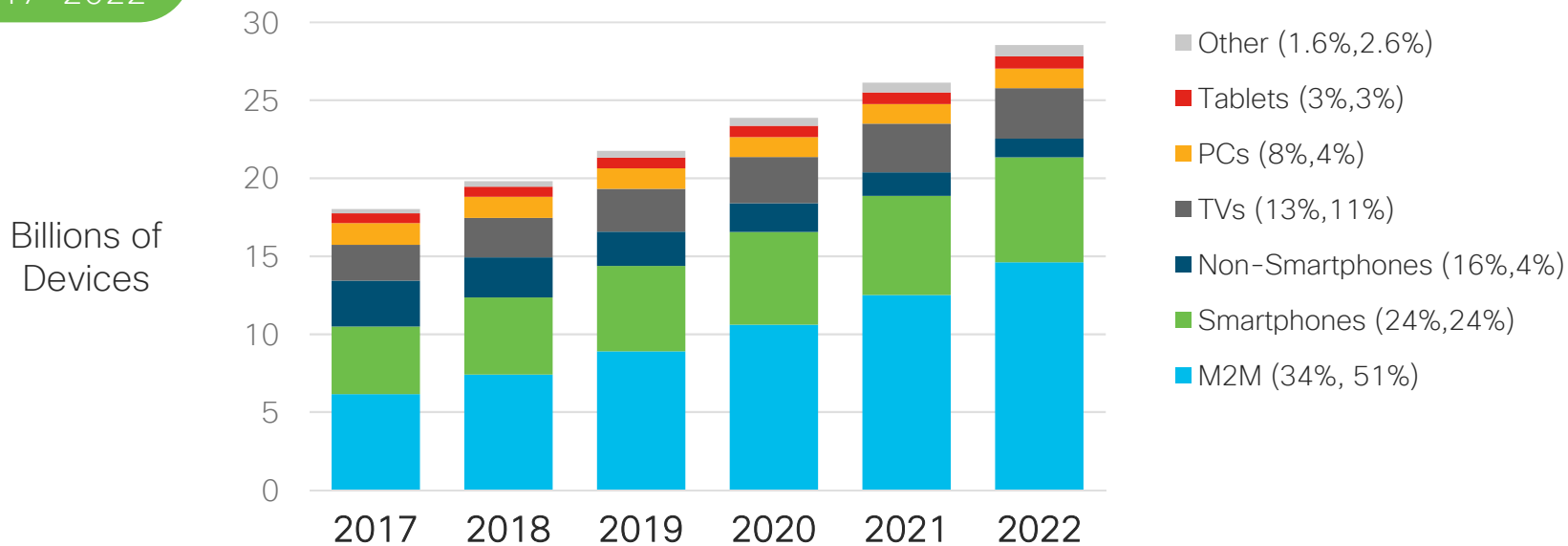## Network Performance and User Experience

❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Global Device/Connection Growth by Type

By 2022, M2M connections will be more than half of total connections
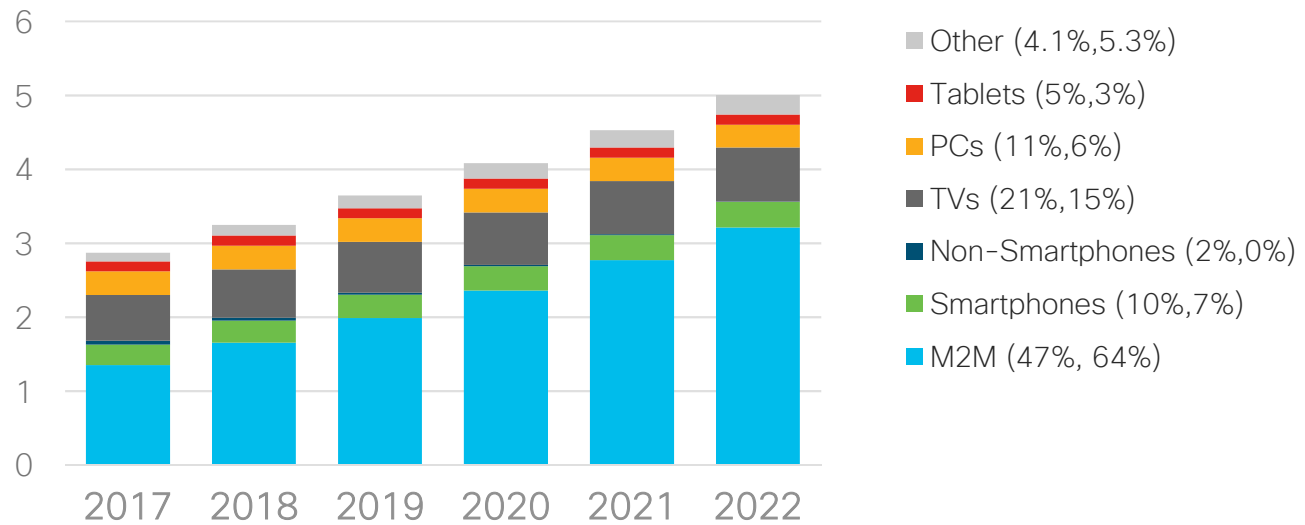
10% CAGR
2017–2022

Billions of Devices

Legend:
- Other (1.6%,2.6%)
- Tablets (3%,3%)
- PCs (8%,4%)
- TVs (13%,11%)
- Non-Smartphones (16%,4%)
- Smartphones (24%,24%)
- M2M (34%, 51%)

Chart x-axis: 2017, 2018, 2019, 2020, 2021, 2022
Chart y-axis: 0, 5, 10, 15, 20, 25, 30

* Figures (n) refer to 2017, 2022 device share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA Device/Connection Growth by Type
By 2022, M2M connections will be nearly two-thirds of total connections

12% CAGR
2017–2022

Billions of Devices

- Other (4.1%,5.3%)
- Tablets (5%,3%)
- PCs (11%,6%)
- TVs (21%,15%)
- Non-Smartphones (2%,0%)
- Smartphones (10%,7%)
- M2M (47%, 64%)
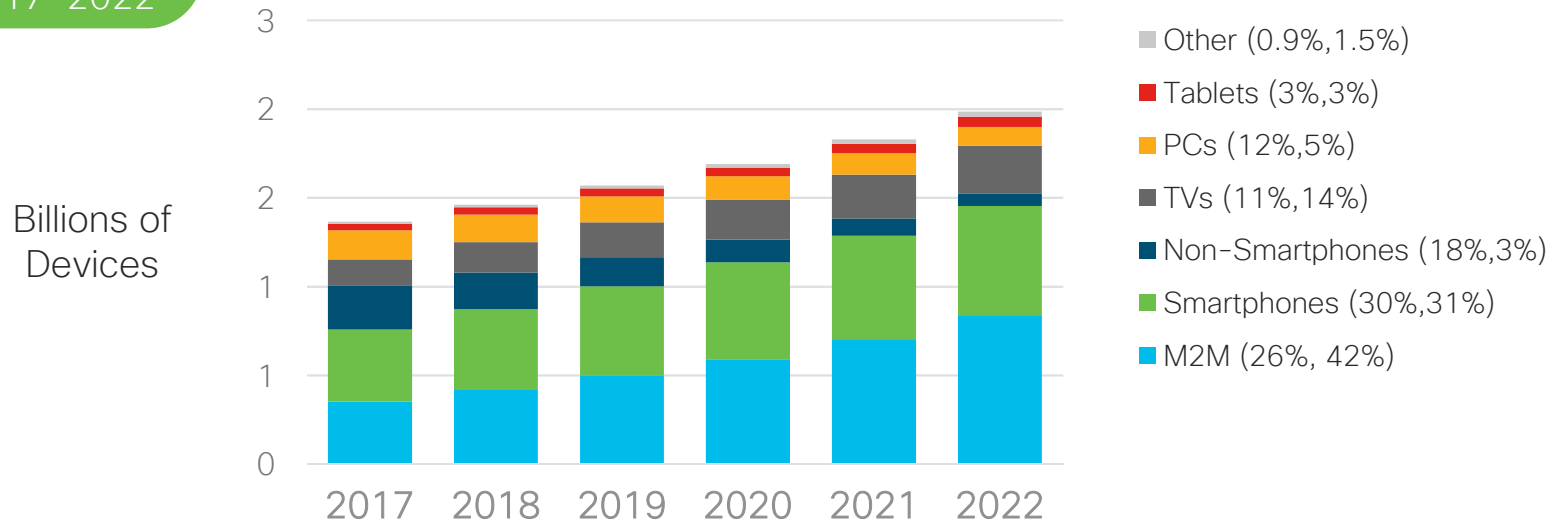
2017 2018 2019 2020 2021 2022

* Figures (n) refer to 2017, 2022 device share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM Device/Connection Growth by Type
By 2022, M2M connections will be over forty percent of total connections

8% CAGR
2017–2022

Billions of Devices

■ Other (0.9%,1.5%)
■ Tablets (3%,3%)
■ PCs (12%,5%)
■ TVs (11%,14%)
■ Non-Smartphones (18%,3%)
■ Smartphones (30%,31%)
■ M2M (26%, 42%)

2017 2018 2019 2020 2021 2022

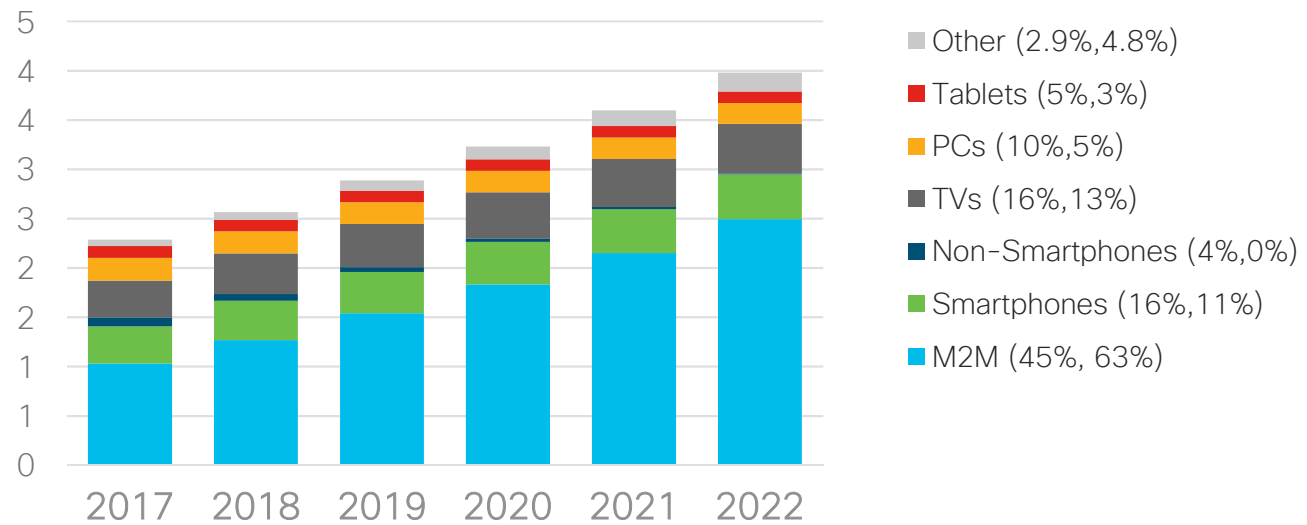* Figures (n) refer to 2017, 2022 device share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE Device/Connection Growth by Type

By 2022, M2M connections will be nearly two-thirds of total connections

Billions of Devices

Legend:
- Other (2.9%, 4.8%)
- Tablets (5%, 3%)
- PCs (10%, 5%)
- TVs (16%, 13%)
- Non-Smartphones (4%, 0%)
- Smartphones (16%, 11%)
- M2M (45%, 63%)

Years: 2017, 2018, 2019, 2020, 2021, 2022

Y-axis: 0, 1, 2, 3, 4, 5
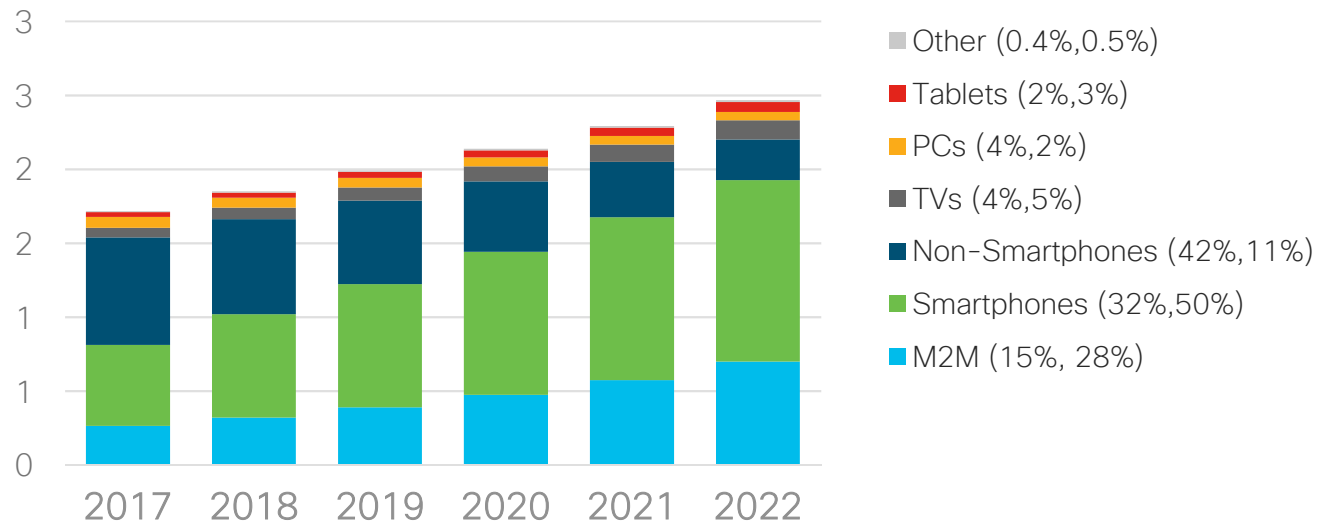
* Figures (n) refer to 2017, 2022 device share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA Device/Connection Growth by Type
By 2022, M2M connections will be nearly a third of total connections

8% CAGR
2017–2022

Billions of Devices

Legend:
- Other (0.4%,0.5%)
- Tablets (2%,3%)
- PCs (4%,2%)
- TVs (4%,5%)
- Non-Smartphones (42%,11%)
- Smartphones (32%,50%)
- M2M (15%, 28%)
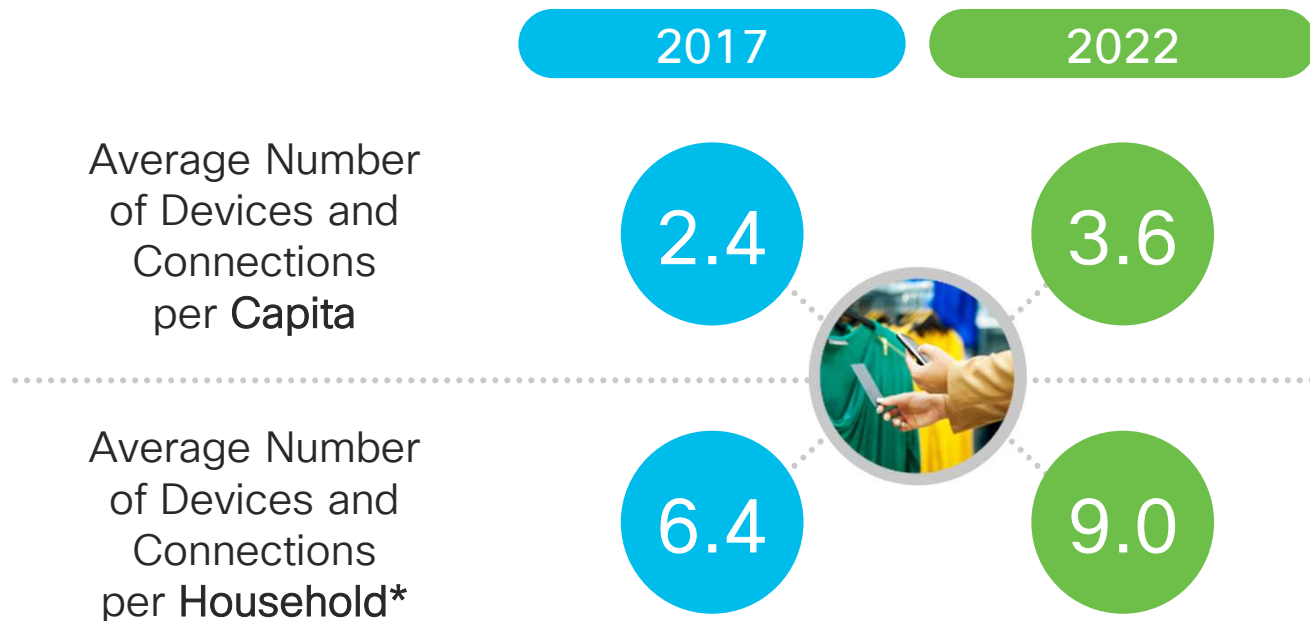
2017 2018 2019 2020 2021 2022

* Figures (n) refer to 2017, 2022 device share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Devices and Connections
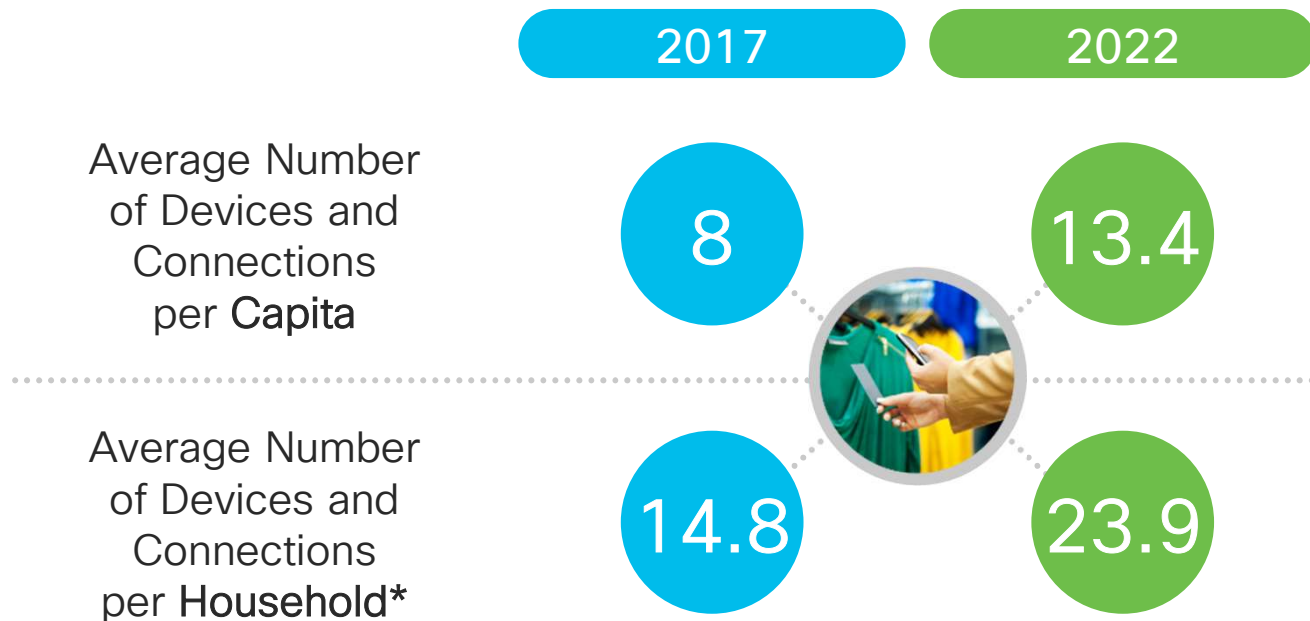## Average per capita and per household

2017	2022

Average Number of Devices and Connections per Capita

2.4 (2017) · 3.6 (2022)

Average Number of Devices and Connections per Household*

6.4 (2017) · 9.0 (2022)

* Household average includes only Consumer devices and connections

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA Devices and Connections
Average per capita and per household

2017	2022

Average Number of Devices and Connections per Capita

8   13.4

Average Number of Devices and Connections per Household*

14.8   23.9

* Household average includes only Consumer devices and connections

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM Devices and Connections
Average per capita and per household

| 2017 | 2022 |

Average Number of Devices and Connections per Capita

2.1   2.9

Average Number of Devices and Connections per Household*

5.8   7.5

* Household average includes only Consumer devices and connections

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE Devices and Connections
Average per capita and per household

2017	2022

Average Number of Devices and Connections per Capita

5.4   9.4

Average Number of Devices and Connections per Household*

8.9   14.8

* Household average includes only Consumer devices and connections

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA Devices and Connections
Average per capita and per household

2017	2022

Average Number of Devices and Connections per Capita

2017: 1.1   2022: 1.4

Average Number of Devices and Connections per Household*

2017: 4.1   2022: 4.9

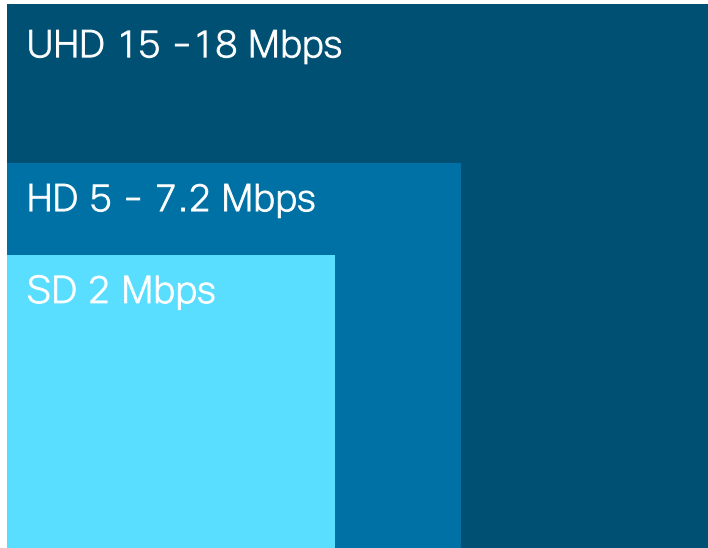* Household average includes only Consumer devices and connections
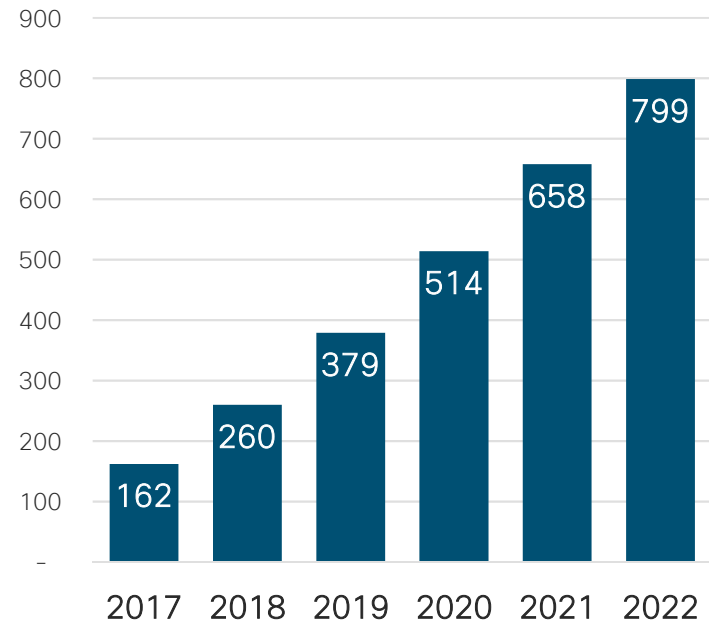
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Increasing Video Definition
By 2022, nearly two-thirds (62%) of connected flat panel TVs will support 4K

38% CAGR
2017–2022

UHD 15 -18 Mbps
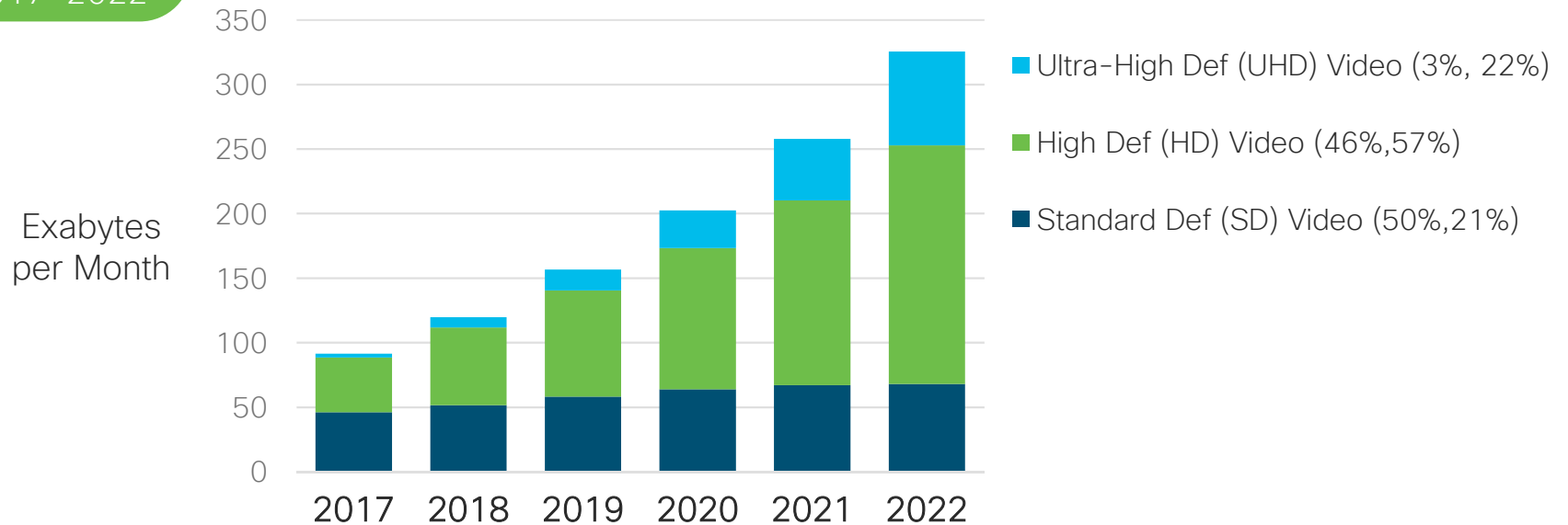
HD 5 - 7.2 Mbps

SD 2 Mbps

Connected
4K TV Sets
(M)

2017	2018	2019	2020	2021	2022
162	260	379	514	658	799

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

High Definition Content Impacts IP Video Growth
UHD IP video will account for 22% of global IP video traffic by 2022

29% CAGR
2017–2022

Exabytes
per Month

350
300
250
200
150
100
50
0

2017　2018　2019　2020　2021　2022

■ Ultra-High Def (UHD) Video (3%, 22%)

■ High Def (HD) Video (46%,57%)

■ Standard Def (SD) Video (50%,21%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE High Definition Content Impacts IP Video Growth
UHD IP video will account for 22% of WE IP video traffic by 2022

Exabytes
per Month

45
40
35
30
25
20
15
10
5
0

2017 2018 2019 2020 2021 2022

■ Ultra-High Def (UHD) Video (3%, 22%)

■ High Def (HD) Video (48%,60%)

■ Standard Def (SD) Video (50%,17%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA High Definition Content Impacts IP Video Growth
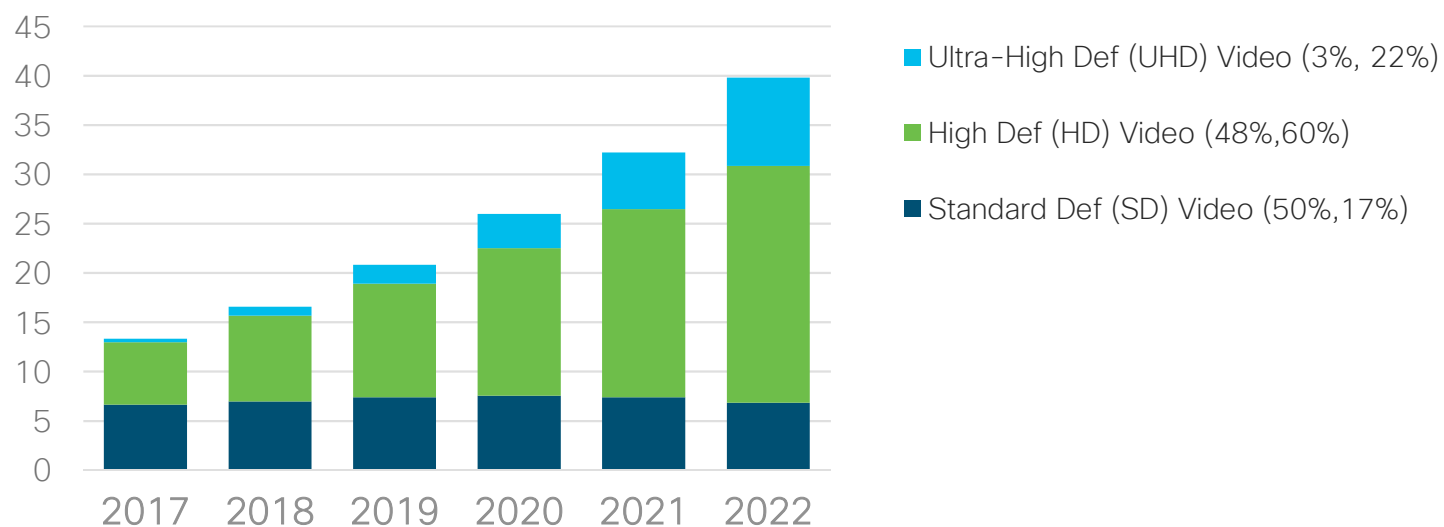## UHD IP video will account for 35% of NA IP video traffic by 2022

21% CAGR
2017–2022

Exabytes
per Month

100
90
80
70
60
50
40
30
20
10
0

2017   2018   2019   2020   2021   2022

■ Ultra-High Def (UHD) Video (4%, 35%)

■ High Def (HD) Video (55%,55%)

■ Standard Def (SD) Video (40%,10%)

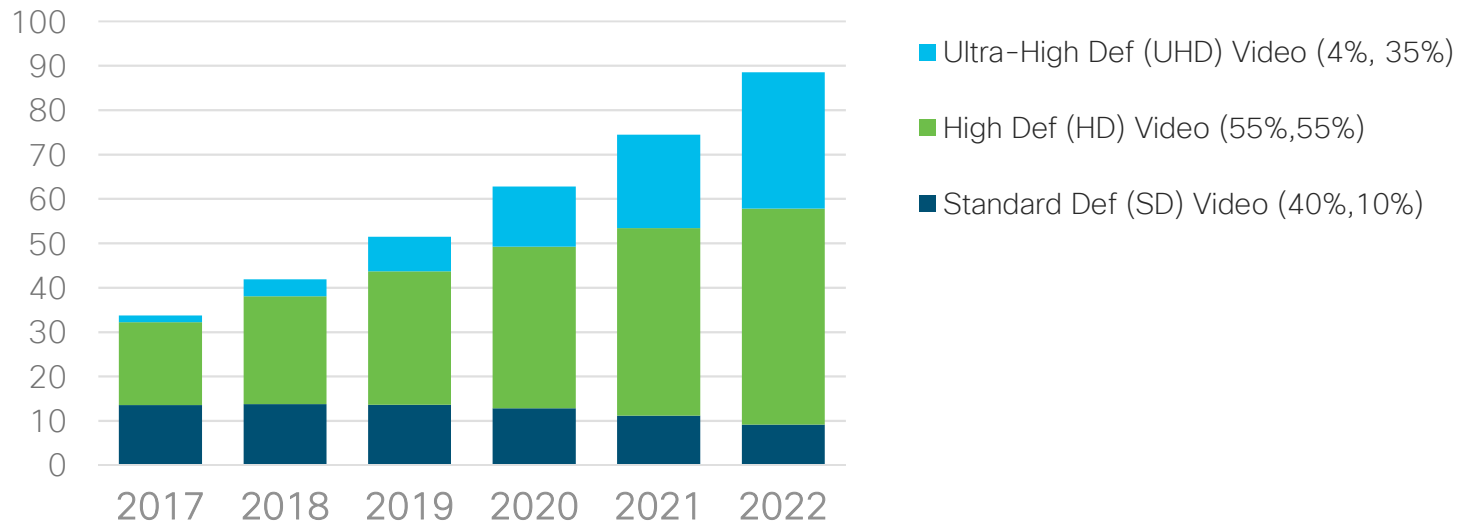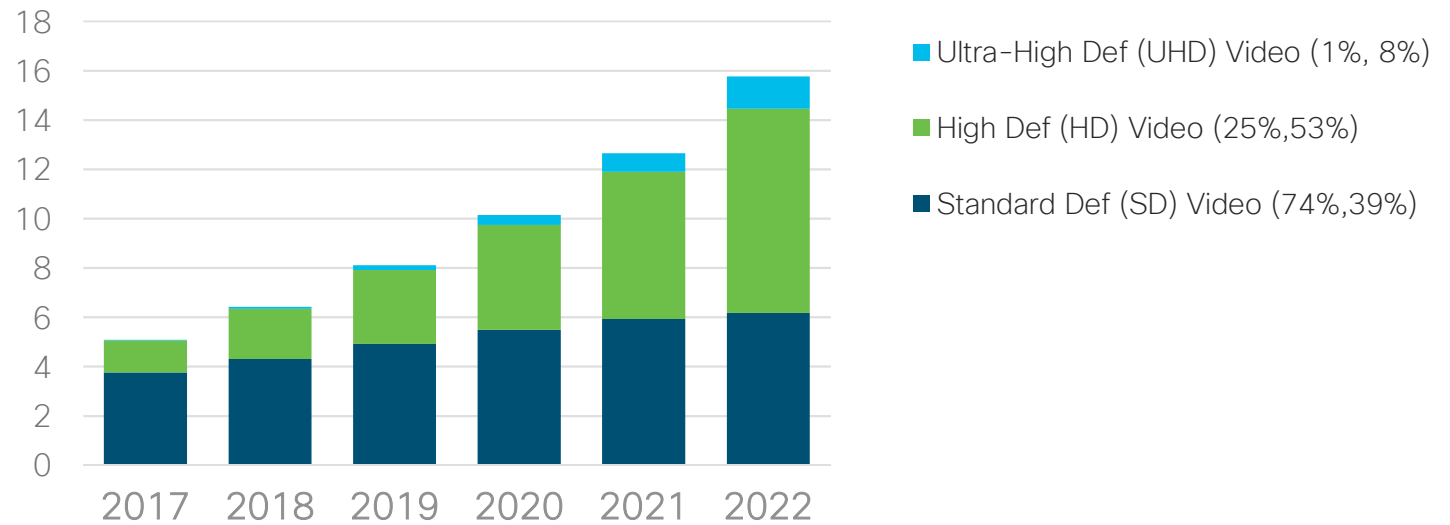* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM High Definition Content Impacts IP Video Growth

UHD IP video will account for 8% of LATAM IP video traffic by 2022

25% CAGR
2017–2022

Exabytes
per Month

18
16
14
12
10
8
6
4
2
0

2017   2018   2019   2020   2021   2022

- Ultra-High Def (UHD) Video (1%, 8%)
- High Def (HD) Video (25%,53%)
- Standard Def (SD) Video (74%,39%)

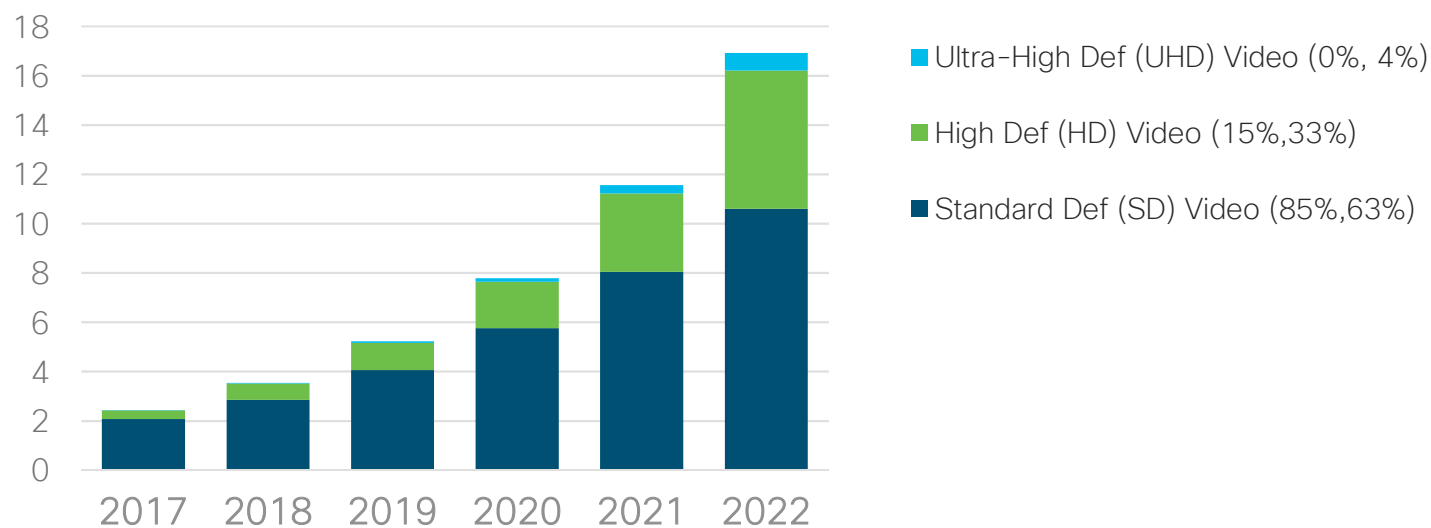* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA High Definition Content Impacts IP Video Growth
UHD IP video will account for 4% of MEA IP video traffic by 2022

47% CAGR
2017–2022

Exabytes per Month

18
16
14
12
10
8
6
4
2
0

2017 2018 2019 2020 2021 2022

■ Ultra-High Def (UHD) Video (0%, 4%)

■ High Def (HD) Video (15%,33%)

■ Standard Def (SD) Video (85%,63%)

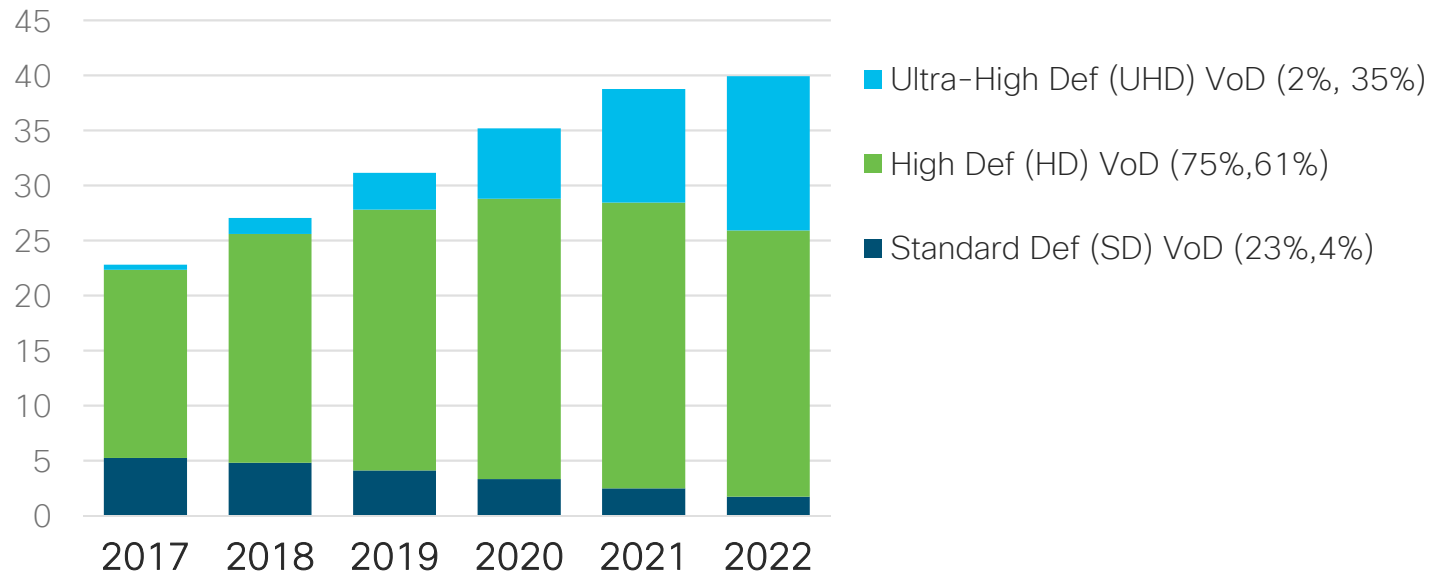* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

High Definition Content Impacts IP VoD Growth
UHD VoD will account for 35% of global IP VoD traffic by 2022

12% CAGR
2017–2022

Exabytes
per Month

■ Ultra-High Def (UHD) VoD (2%, 35%)

■ High Def (HD) VoD (75%,61%)

■ Standard Def (SD) VoD (23%,4%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Average IP Traffic Per Device

		2017 MBs per Month	2022 MBs per Month
	M2M Module	610	1,730
	Smartphone	5,110	26,100
	Tablet	10,380	31,140
	Laptop / PC	35,950	59,250
	Ultra High Definition TV*	7,520	35,840

* Includes IP VoD traffic

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global IP Traffic by Device Type
By 2022, non-PC devices will drive 81% of global IP traffic

26% CAGR
2017–2022

Exabytes
per Month

Other (0.01%,0.02%)

Non-Smartphones (0.1%,0.1%)

Tablets (5%,6%)

M2M (3%, 6%)

PCs (41%,19%)

TVs (32%,24%)

Smartphones (18%,44%)

* Figures (n) refer to 2017, 2022 traffic share
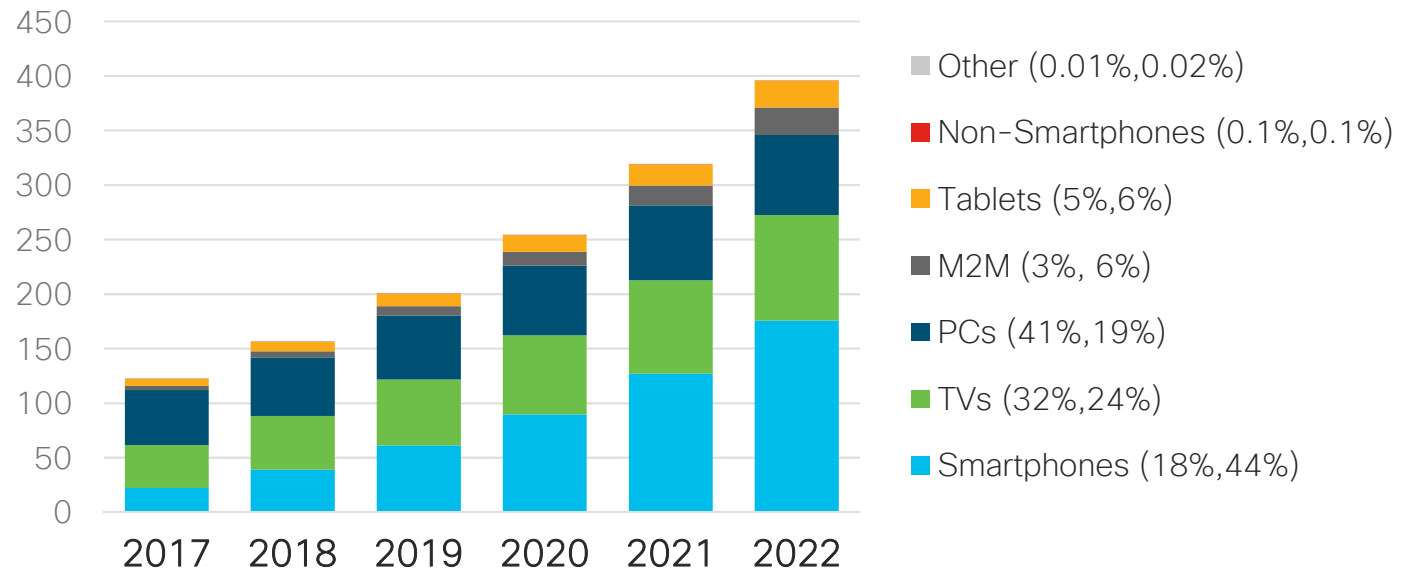
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA IP Traffic by Device Type
By 2022, non-PC devices will drive 76% of regional IP traffic
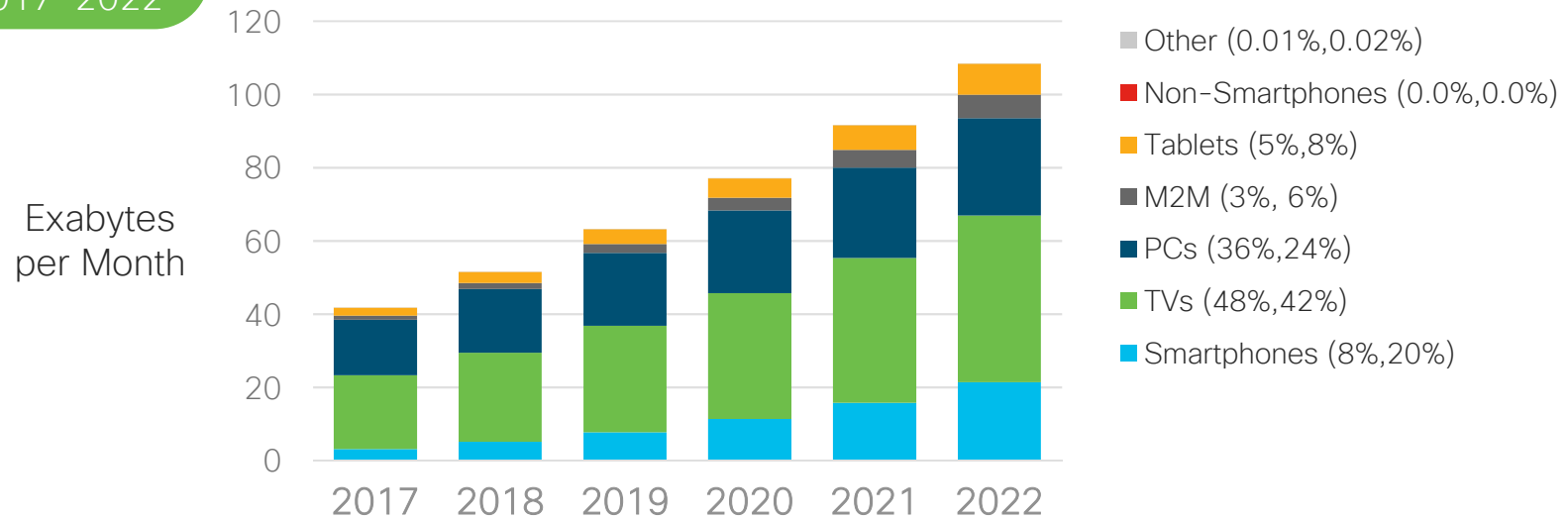
21% CAGR
2017–2022

Exabytes per Month

- Other (0.01%,0.02%)
- Non-Smartphones (0.0%,0.0%)
- Tablets (5%,8%)
- M2M (3%, 6%)
- PCs (36%,24%)
- TVs (48%,42%)
- Smartphones (8%,20%)

Chart: stacked bar chart, vertical axis "Exabytes per Month" from 0 to 120, horizontal axis years 2017, 2018, 2019, 2020, 2021, 2022

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM IP Traffic by Device Type
By 2022, non-PC devices will drive 78% of regional IP traffic

21% CAGR
2017–2022

Exabytes
per Month

20
18
16
14
12
10
8
6
4
2
0

2017   2018   2019   2020   2021   2022

- Other (0.01%,0.01%)
- Non-Smartphones (0.1%,0.0%)
- Tablets (4%,6%)
- M2M (2%, 6%)
- PCs (62%,22%)
- TVs (15%,19%)
- Smartphones (18%,47%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE IP Traffic by Device Type
By 2022, non-PC devices will drive 75% of regional IP traffic

22% CAGR
2017–2022

Exabytes per Month

Other (0.02%,0.04%)
Non-Smartphones (0.0%,0.0%)
Tablets (6%,8%)
M2M (5%, 10%)
PCs (48%,25%)
TVs (30%,30%)
Smartphones (12%,26%)

2017 2018 2019 2020 2021 2022

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA IP Traffic by Device Type
By 2022, non-PC devices will drive 91% of regional IP traffic

41% CAGR
2017–2022

Exabytes per Month

25
20
15
10
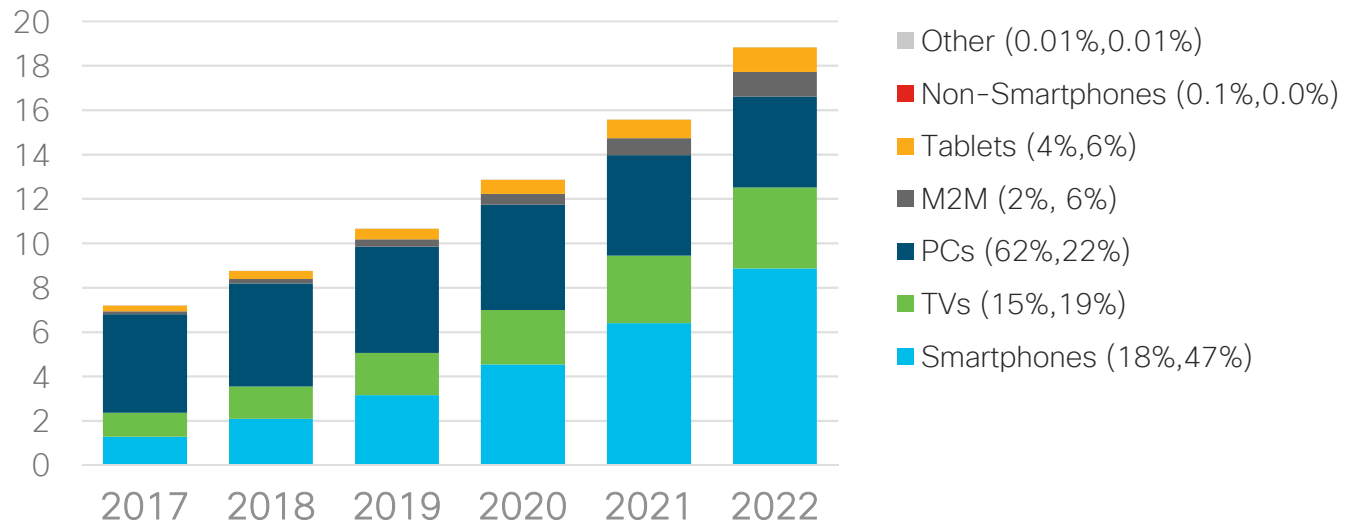5
0

2017 2018 2019 2020 2021 2022

■ Other (0.00%,0.00%)
■ Non-Smartphones (0.6%,0.3%)
■ Tablets (4%,5%)
■ M2M (3%, 4%)
■ PCs (40%,9%)
■ TVs (8%,4%)
■ Smartphones (44%,77%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Internet Traffic by Device Type
By 2022, non-PC devices will drive 81% of global Internet traffic

30% CAGR
2017–2022

Exabytes
per Month

Legend:
- Other (0.01%, 0.03%)
- Non-Smartphones (0.2%, 0.1%)
- Tablets (7%, 7%)
- M2M (4%, 7%)
- TVs (17%, 16%)
- PCs (49%, 19%)
- Smartphones (23%, 50%)

Y-axis: 0, 50, 100, 150, 200, 250, 300, 350, 400

X-axis: 2017, 2018, 2019, 2020, 2021, 2022

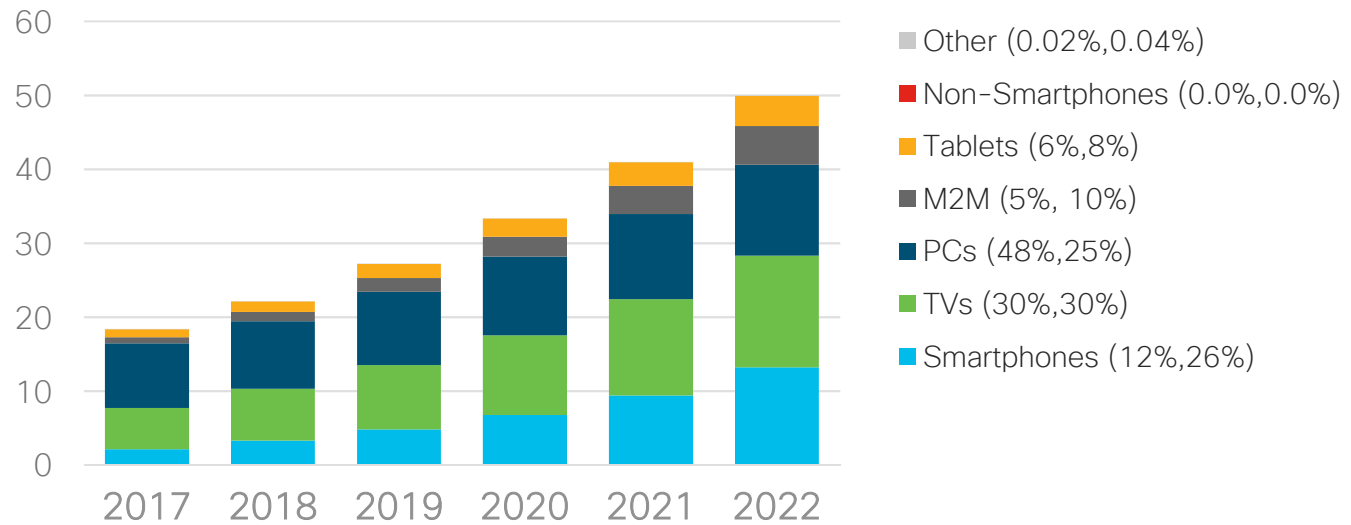* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA Internet Traffic by Device Type
By 2022, non-PC devices will drive 73% of regional Internet traffic

25% CAGR
2017–2022

Exabytes per Month
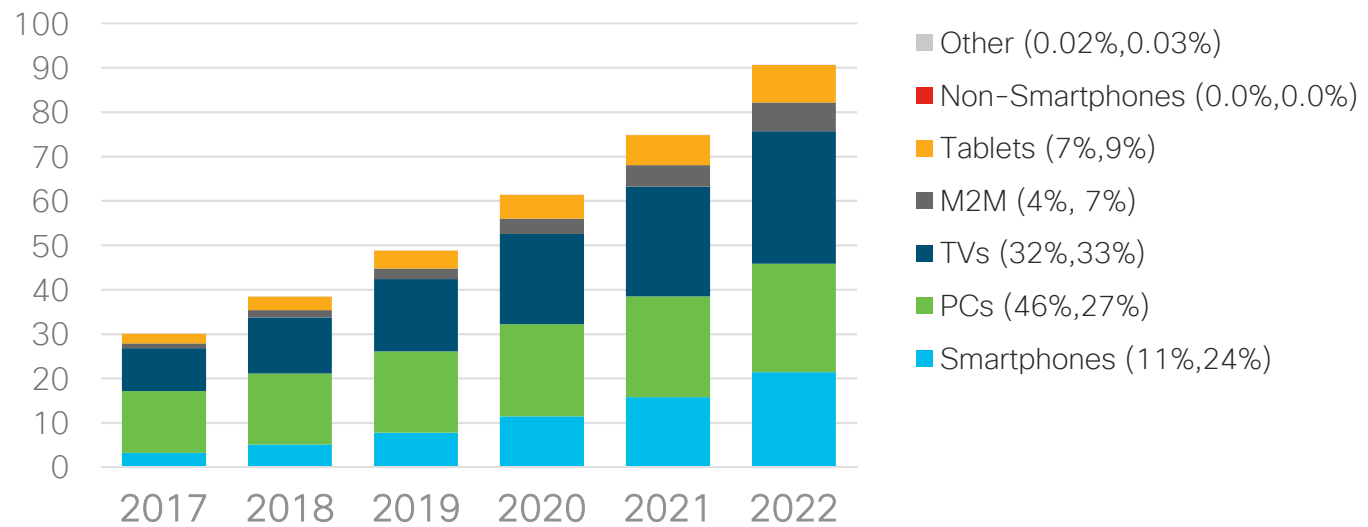
Legend:
- Other (0.02%,0.03%)
- Non-Smartphones (0.0%,0.0%)
- Tablets (7%,9%)
- M2M (4%, 7%)
- TVs (32%,33%)
- PCs (46%,27%)
- Smartphones (11%,24%)

X-axis: 2017 2018 2019 2020 2021 2022

Y-axis: 0 10 20 30 40 50 60 70 80 90 100

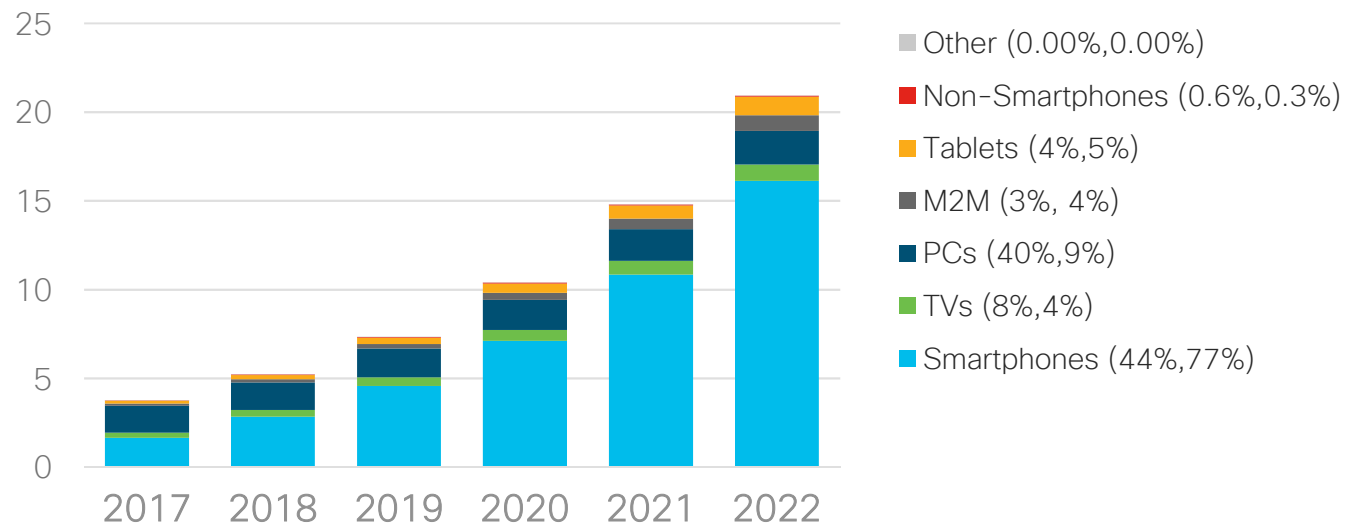* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM Internet Traffic by Device Type
By 2022, non-PC devices will drive 77% of regional Internet traffic

21% CAGR
2017–2022

Exabytes
per Month

Other (0.01%,0.01%)
Non-Smartphones (0.1%,0.0%)
Tablets (4%,7%)
M2M (2%, 7%)
TVs (6%,10%)
PCs (67%,23%)
Smartphones (20%,53%)

18
16
14
12
10
8
6
4
2
0

2017   2018   2019   2020   2021   2022
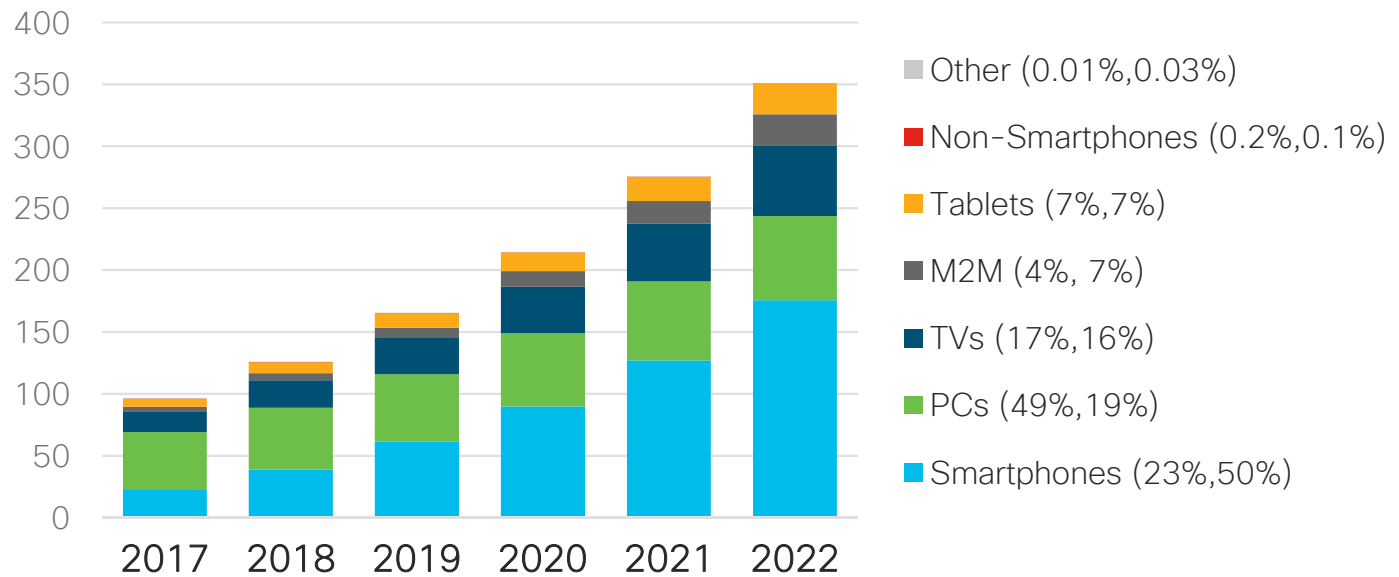
* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE Internet Traffic by Device Type
By 2022, non-PC devices will drive 75% of regional Internet traffic

Exabytes
per Month

Other (0.02%,0.04%)

Non-Smartphones (0.0%,0.0%)

Tablets (7%,9%)

M2M (5%, 12%)

TVs (20%,25%)

PCs (54%,25%)

Smartphones (14%,29%)

50
45
40
35
30
25
20
15
10
5
0

2017 2018 2019 2020 2021 2022

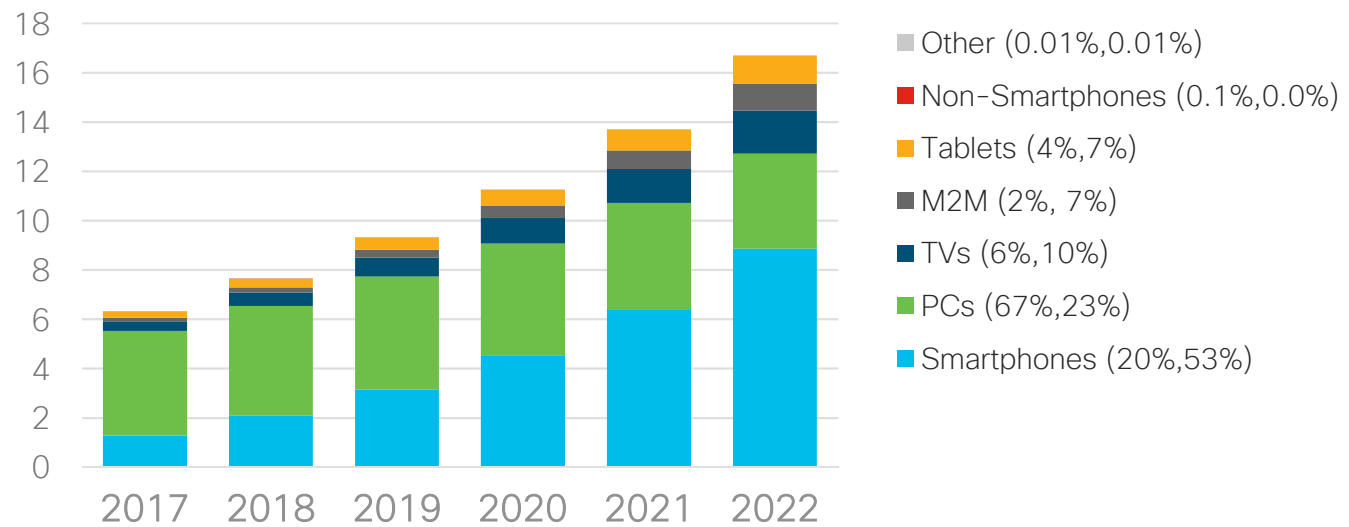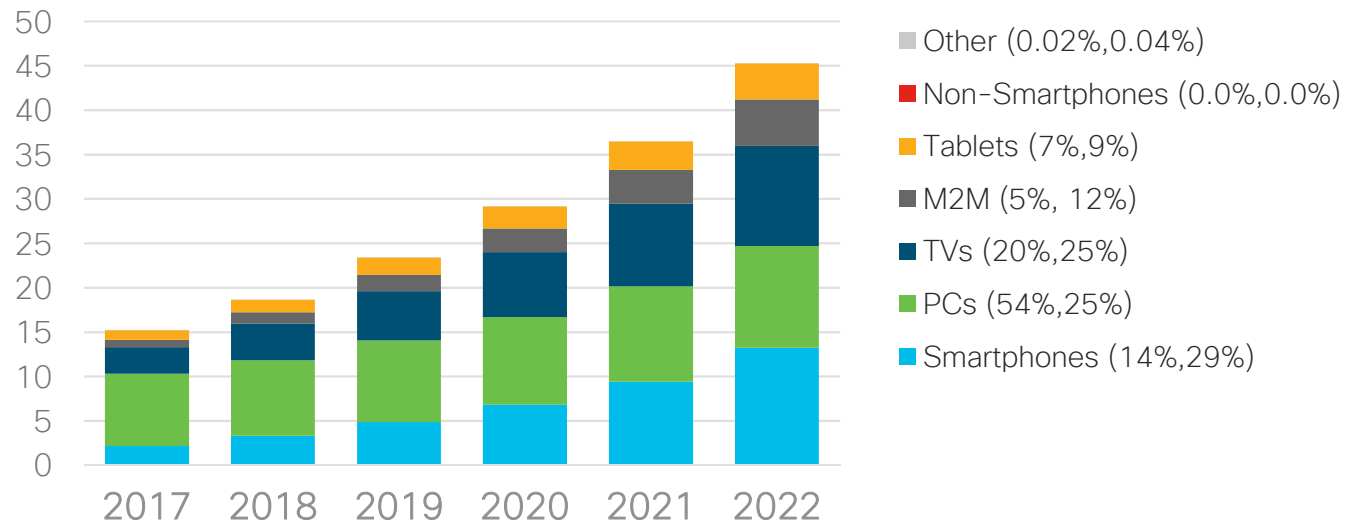* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA Internet Traffic by Device Type

By 2022, non-PC devices will drive 91% of regional Internet traffic

42% CAGR
2017–2022

Exabytes
per Month
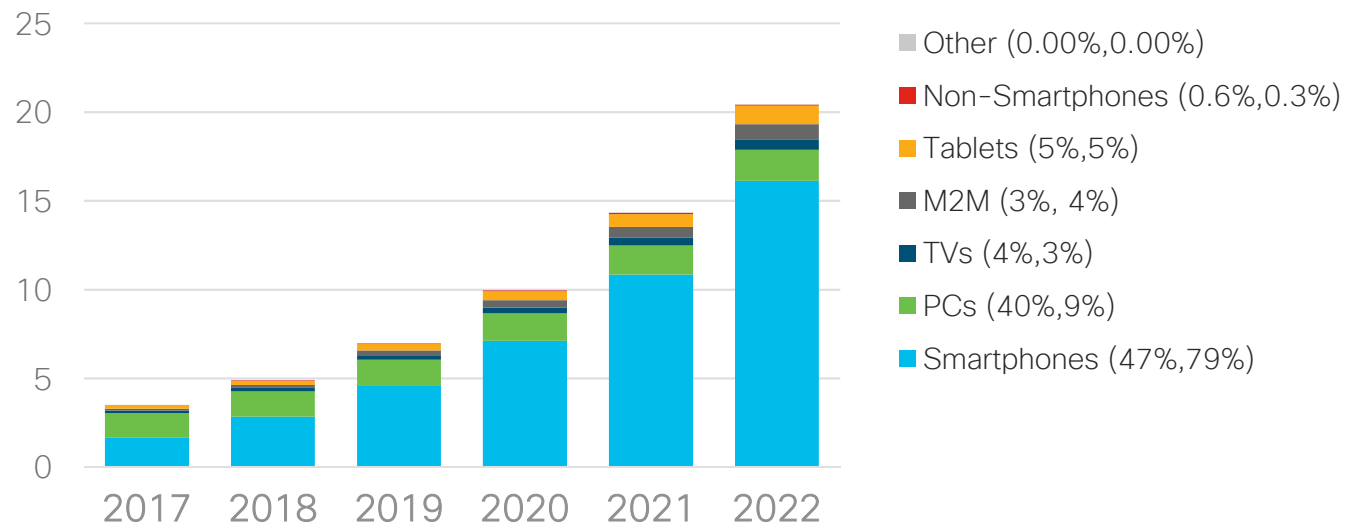
Legend:
- Other (0.00%,0.00%)
- Non-Smartphones (0.6%,0.3%)
- Tablets (5%,5%)
- M2M (3%, 4%)
- TVs (4%,3%)
- PCs (40%,9%)
- Smartphones (47%,79%)

Y-axis: 0, 5, 10, 15, 20, 25

X-axis: 2017, 2018, 2019, 2020, 2021, 2022

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends

❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

Network Performance and User Experience

❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Global M2M Connections / IoT Growth
By 2022, 1.8 M2M connections per capita globally

19% CAGR
2017–2022

Billions of M2M Connections

Middle East and Africa (21% CAGR)

Latin America (19% CAGR)

Central and Eastern Europe (21% CAGR)

Western Europe (19% CAGR)

North America (19% CAGR)

Asia Pacific (18% CAGR)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
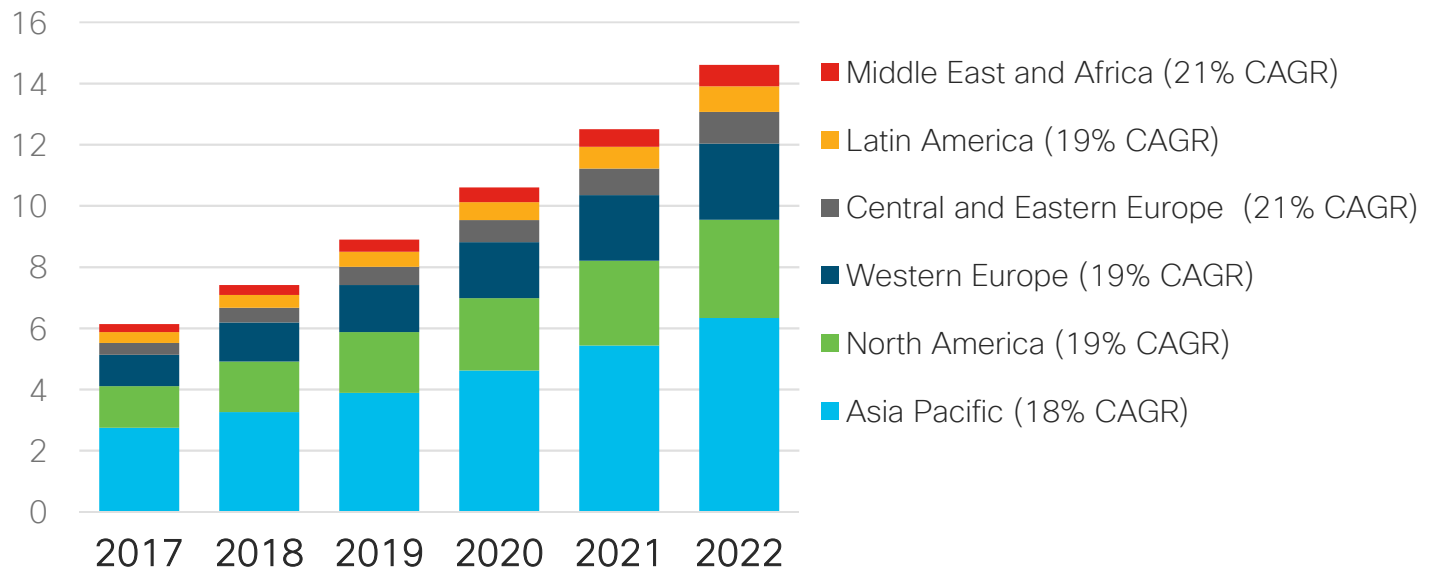
Global M2M Traffic Growth
M2M traffic will grow more than 7-fold from 2017 to 2022

47% CAGR
2017–2022

Exabytes per Month

Legend:
- Middle East and Africa (51% CAGR)
- Latin America (52% CAGR)
- Central and Eastern Europe (57% CAGR)
- Western Europe (45% CAGR)
- North America (42% CAGR)
- Asia Pacific (49% CAGR)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
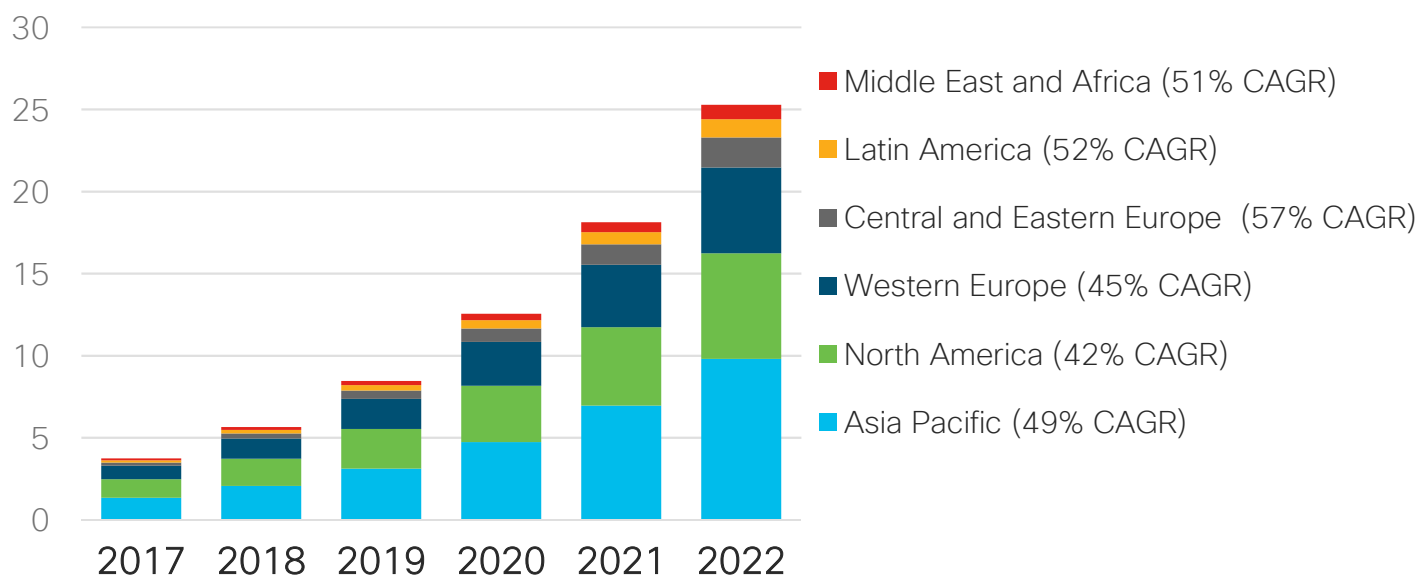
By 2022, M2M modules will be 51% *(14.6 billion)* of total global devices and connections and will account for 6% *(25.3 EBs/month)* of total global IP traffic.

By 2022, M2M modules will be **64% (3.2 billion)** of total **NA** devices and connections and will account for **6% (6.4 EBs/month)** of total regional IP traffic.

By 2022, M2M modules will be **42% (839 million)** of total **LATAM** devices and connections and will account for **6% (1.1 EBs/month)** of total regional IP traffic.

By 2022, M2M modules will be **63% *(2.5 billion)*** of total **WE** devices and connections and will account for **10%** *(5.2 EBs/month)* of total regional IP traffic.

By 2022, M2M modules will be **28% (700 million)** of total **MEA** devices and connections and will account for **4% (0.9 EBs/month)** of total regional IP traffic.
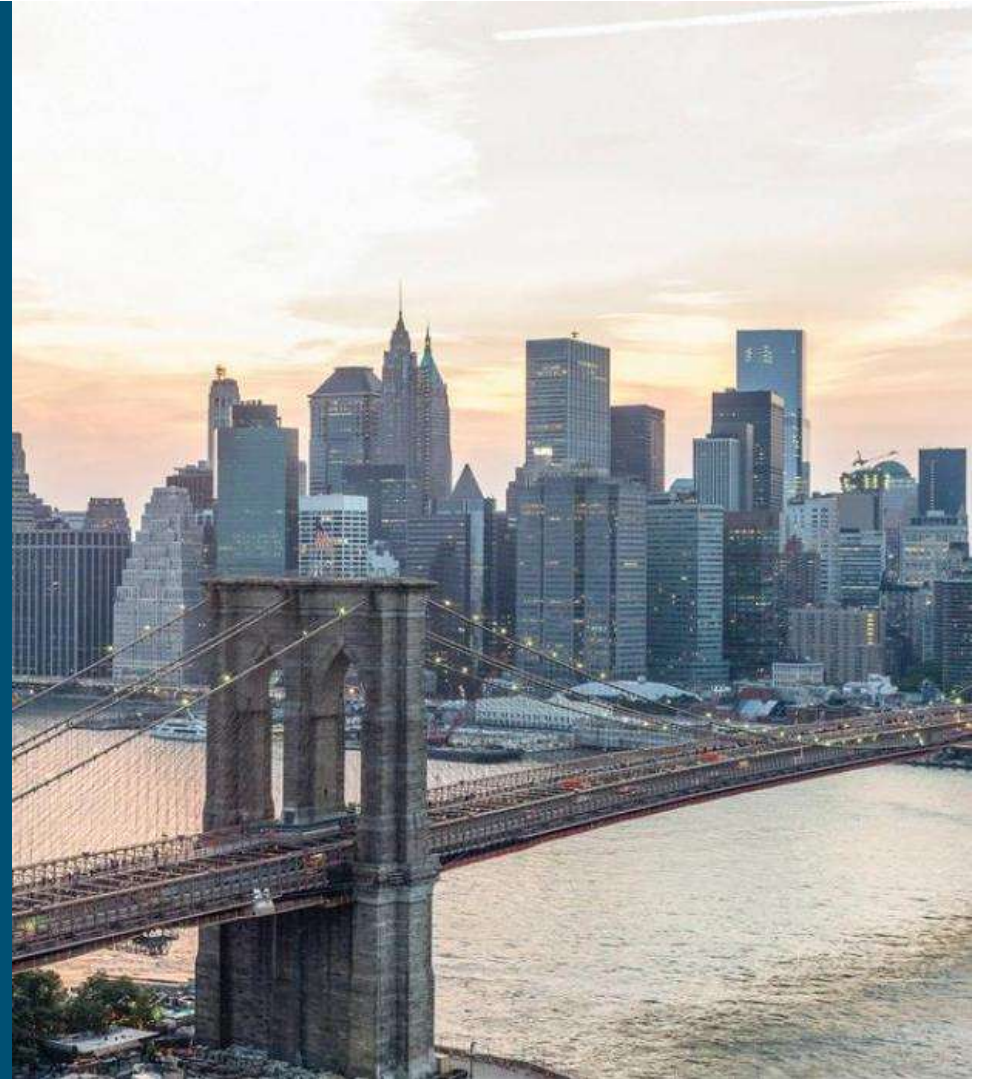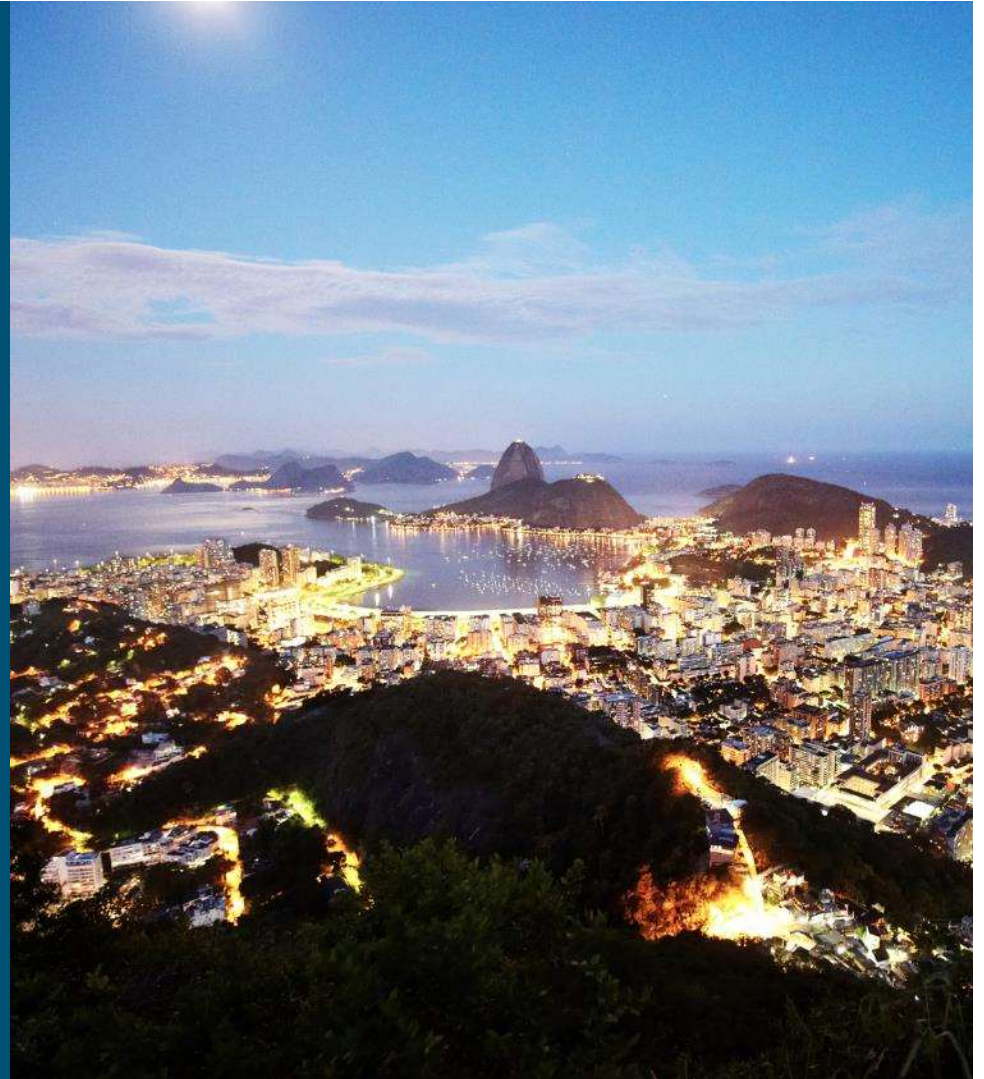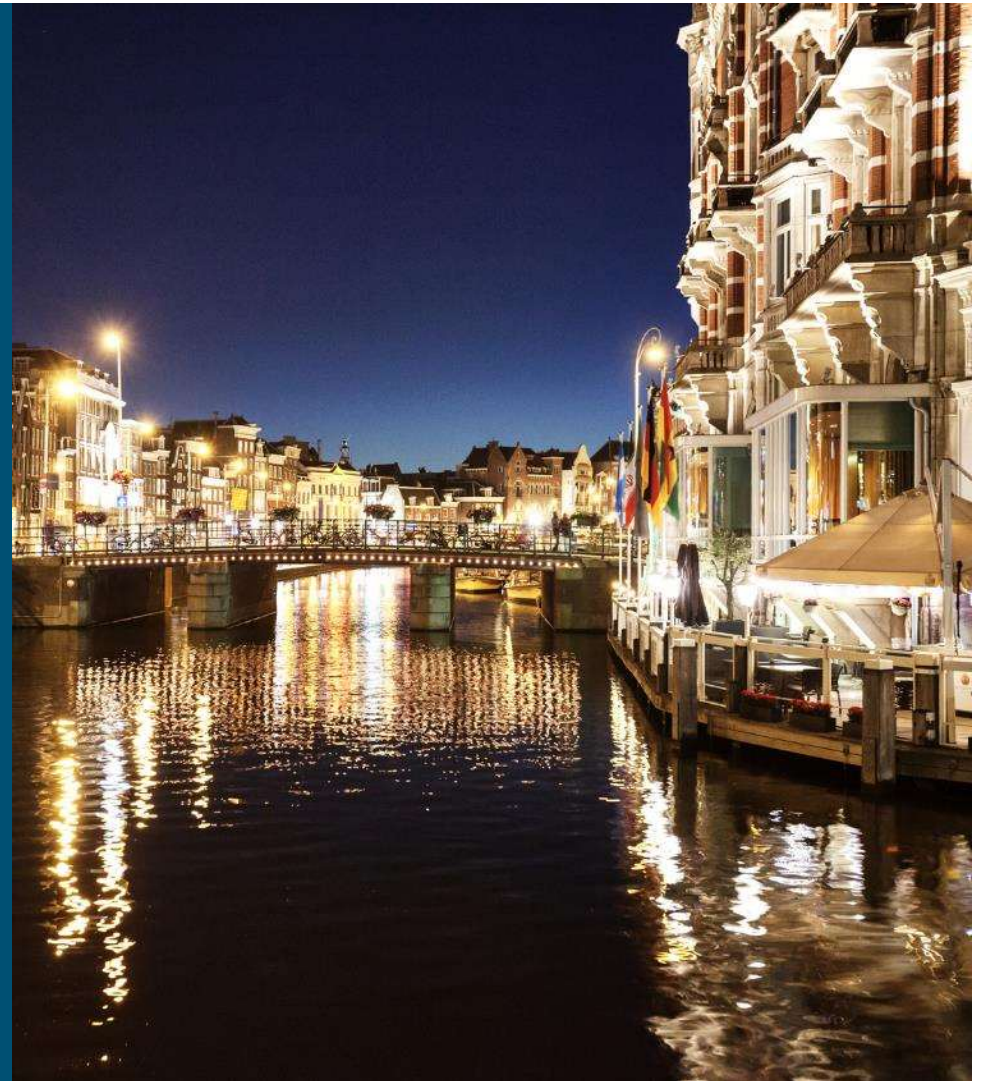
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

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 / IoT Growth by Vertical
By 2022, connected home largest, connected car fastest growth

19% CAGR
2017–2022

Billions of
M2M
Connections

- Other (30% CAGR)
- Energy (24% CAGR)
- Retail (10% CAGR)
- Mfg & Supply Chain (10% CAGR)
- Connected Car (28% CAGR)
- Connected Cities (26% CAGR)
- Connected Health (22% CAGR)
- Connected Work (15% CAGR)
- Connected Home (20% CAGR)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA M2M Connections / IoT Growth by Vertical
By 2022, connected home largest, connected cities fastest growth

19% CAGR
2017–2022

Billions of M2M Connections

Legend:
- Other (29% CAGR)
- Energy (22% CAGR)
- Retail (10% CAGR)
- Mfg & Supply Chain (9% CAGR)
- Connected Car (23% CAGR)
- Connected Cities (28% CAGR)
- Connected Health (20% CAGR)
- Connected Work (16% CAGR)
- Connected Home (19% CAGR)

Y-axis: 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5

X-axis: 2017, 2018, 2019, 2020, 2021, 2022

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM M2M Connections / IoT Growth by Vertical
By 2022, connected home largest, connected cities fastest growth

19% CAGR
2017–2022

Billions of M2M Connections

Legend:
- Other (30% CAGR)
- Energy (19% CAGR)
- Retail (9% CAGR)
- Mfg & Supply Chain (17% CAGR)
- Connected Car (20% CAGR)
- Connected Cities (38% CAGR)
- Connected Health (37% CAGR)
- Connected Work (14% CAGR)
- Connected Home (19% CAGR)

Y-axis: 0.00, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 0.90

X-axis: 2017, 2018, 2019, 2020, 2021, 2022

WE M2M Connections / IoT Growth by Vertical
By 2022, connected home largest, connected cities fastest growth

19% CAGR
2017–2022

Billions of
M2M
Connections

3.0
2.5
2.0
1.5
1.0
0.5
0.0

2017   2018   2019   2020   2021   2022

- Other (31% CAGR)
- Energy (23% CAGR)
- Retail (9% CAGR)
- Mfg & Supply Chain (8% CAGR)
- Connected Car (26% CAGR)
- Connected Cities (29% CAGR)
- Connected Health (25% CAGR)
- Connected Work (15% CAGR)
- Connected Home (19% CAGR)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
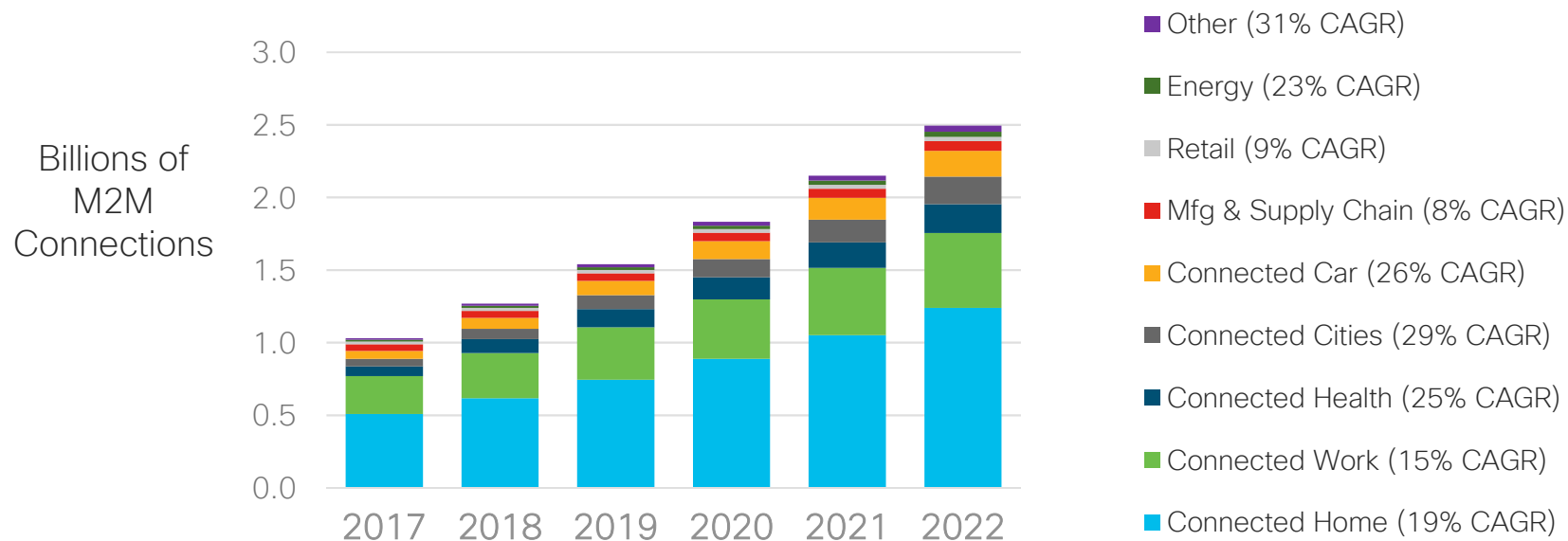
MEA M2M Connections / IoT Growth by Vertical
By 2022, connected home largest, connected cities fastest growth

21% CAGR
2017–2022
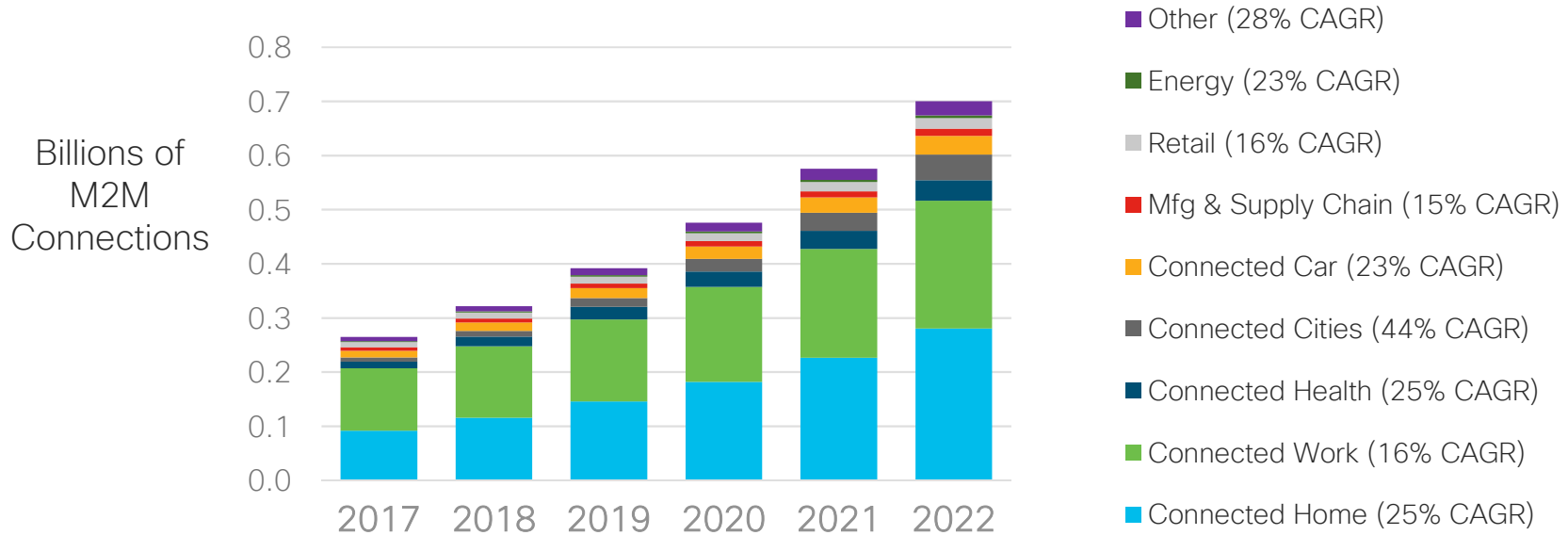
Billions of M2M Connections

Legend:
- Other (28% CAGR)
- Energy (23% CAGR)
- Retail (16% CAGR)
- Mfg & Supply Chain (15% CAGR)
- Connected Car (23% CAGR)
- Connected Cities (44% CAGR)
- Connected Health (25% CAGR)
- Connected Work (16% CAGR)
- Connected Home (25% CAGR)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends
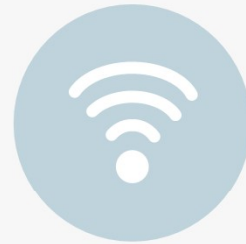
❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

Network Performance and User Experience

❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Global IPv6-Capable Devices/Connections
By 2022, 64% of devices/connections will be IPv6-capable

26% CAGR
2017–2022

Number of
Devices
(Billions)

20
18
16
14
12
10
8
6
4
2
0

1.8 B

4 B

8.9 B

9.4 B

2017   2018   2019   2020   2021   2022

■ IPv6 Capable Mobile Devices

■ IPv6 Capable Fixed Devices
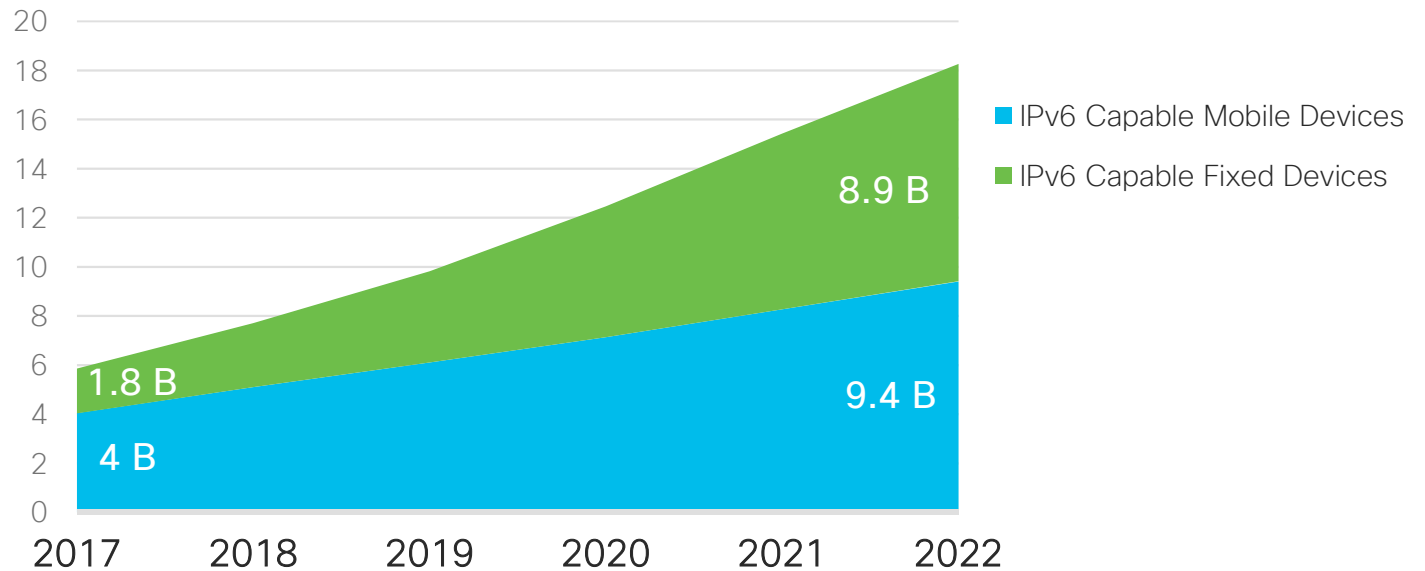
NA IPv6-Capable Devices/Connections
By 2022, nearly 74% of devices/connections will be IPv6-capable

33% CAGR
2017–2022

Number of
Devices
(Billions)

4.0
3.5
3.0
2.5 — 2.6 B
2.0
1.5
1.0 — 0.4 B
0.5 — 0.4 B — 1 B
0.0

2017   2018   2019   2020   2021   2022

■ IPv6 Capable Mobile Devices

■ IPv6 Capable Fixed Devices

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM IPv6-Capable Devices/Connections
By 2022, nearly 70% of devices/connections will be IPv6-capable

22% CAGR
2017–2022

Number of
Devices
(Billions)

1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0

0.1 B

0.4 B

0.5 B

0.8 B

2017   2018   2019   2020   2021   2022

■ IPv6 Capable Mobile Devices

■ IPv6 Capable Fixed Devices
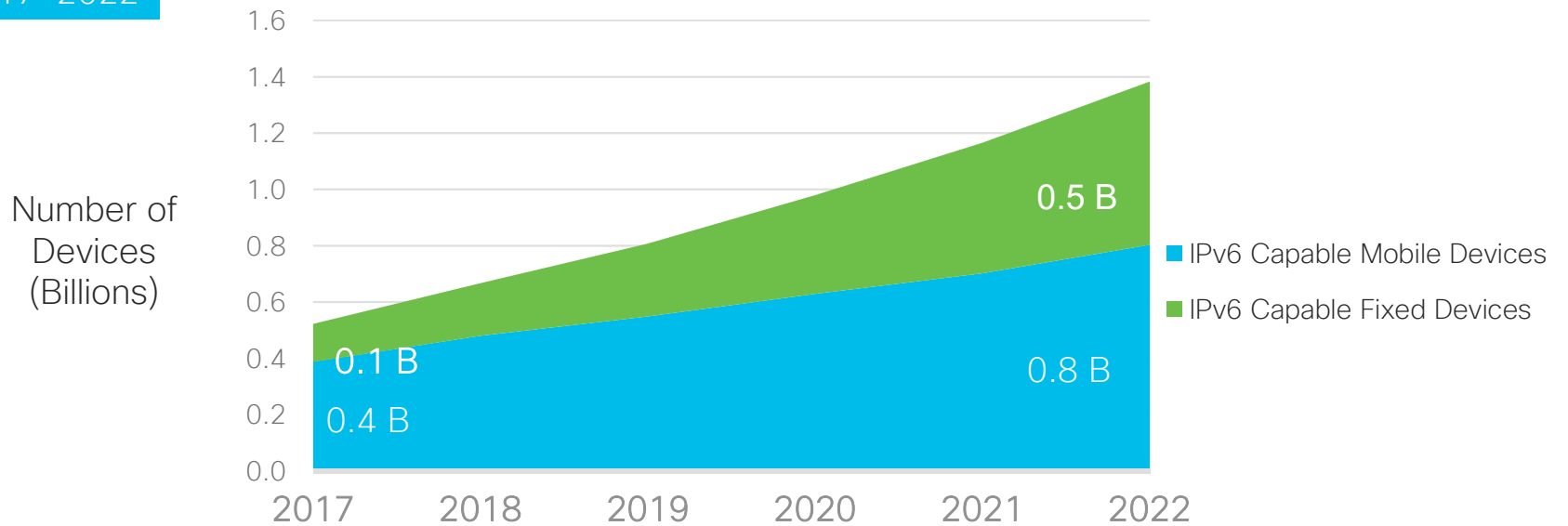
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE IPv6-Capable Devices/Connections
By 2022, nearly 70% of devices/connections will be IPv6-capable

25% CAGR
2017–2022

Number of
Devices
(Billions)

3.0

2.5

1.7 B

2.0

1.5

1.0

0.4 B

1 B

0.5

0.4 B

0.0

2017　2018　2019　2020　2021　2022

■ IPv6 Capable Mobile Devices

■ IPv6 Capable Fixed Devices
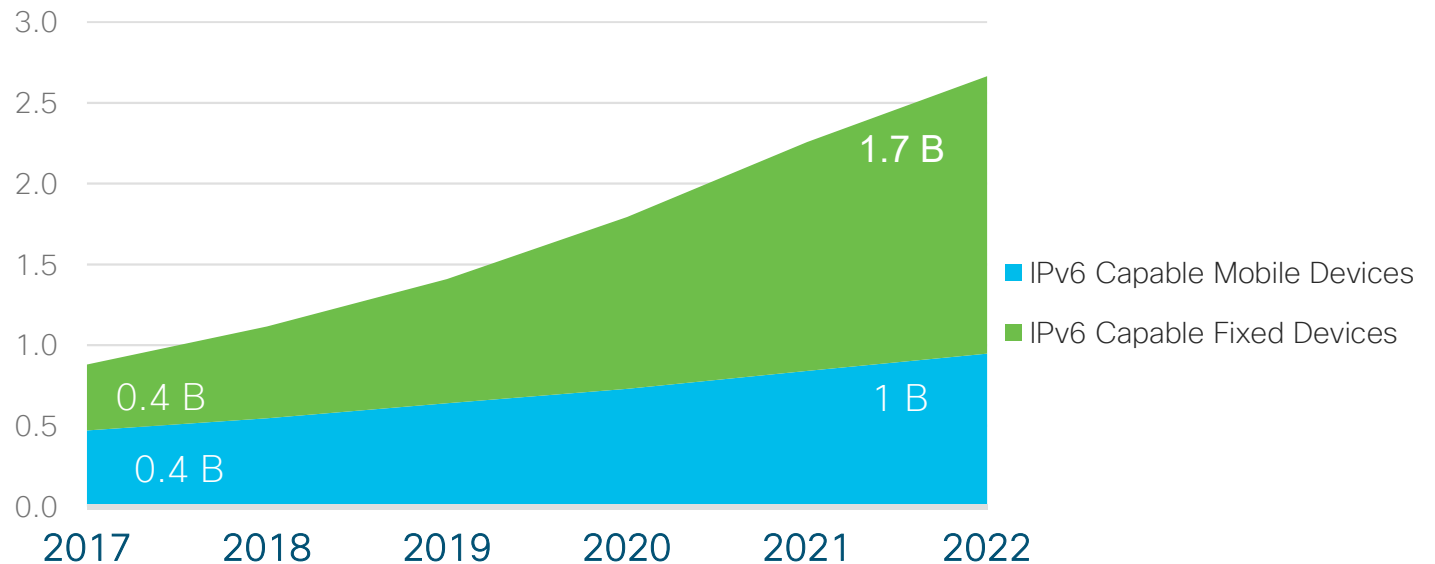
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA IPv6-Capable Devices/Connections
By 2022, nearly 70% of devices/connections will be IPv6-capable

28% CAGR
2017–2022

Number of
Devices
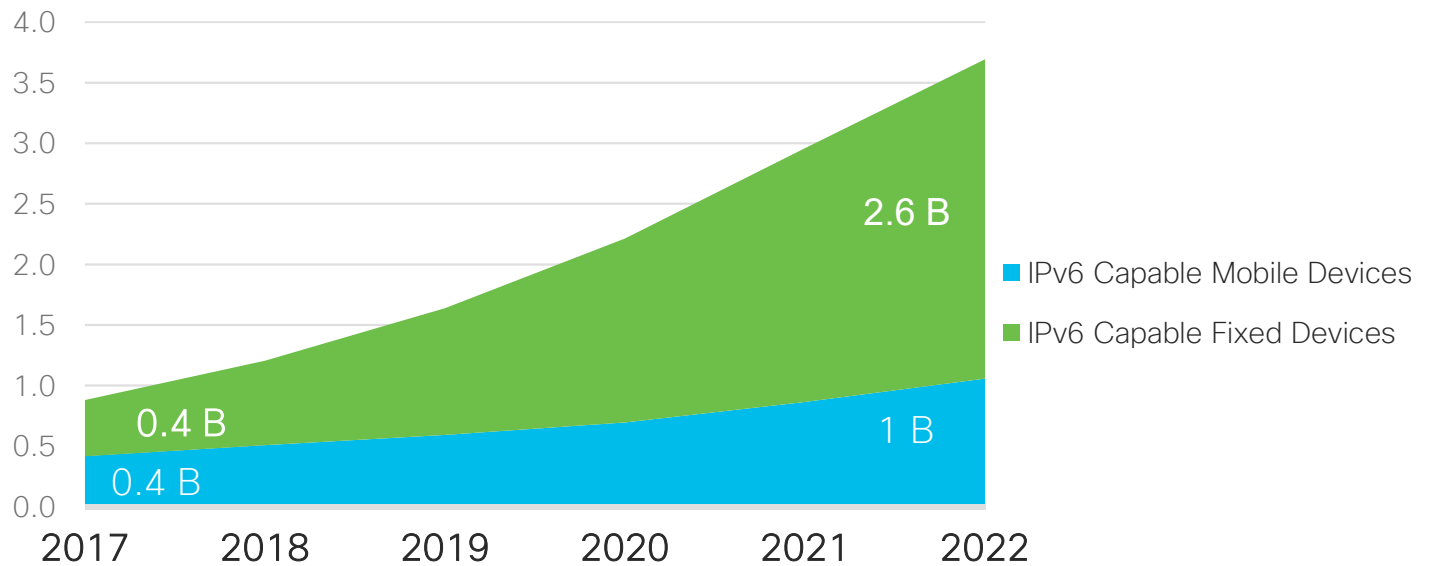(Billions)

2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0

0.3 B

0.05 B

1.5 B

0.4 B

2017   2018   2019   2020   2021   2022

■ IPv6 Capable Mobile Devices

■ IPv6 Capable Fixed Devices
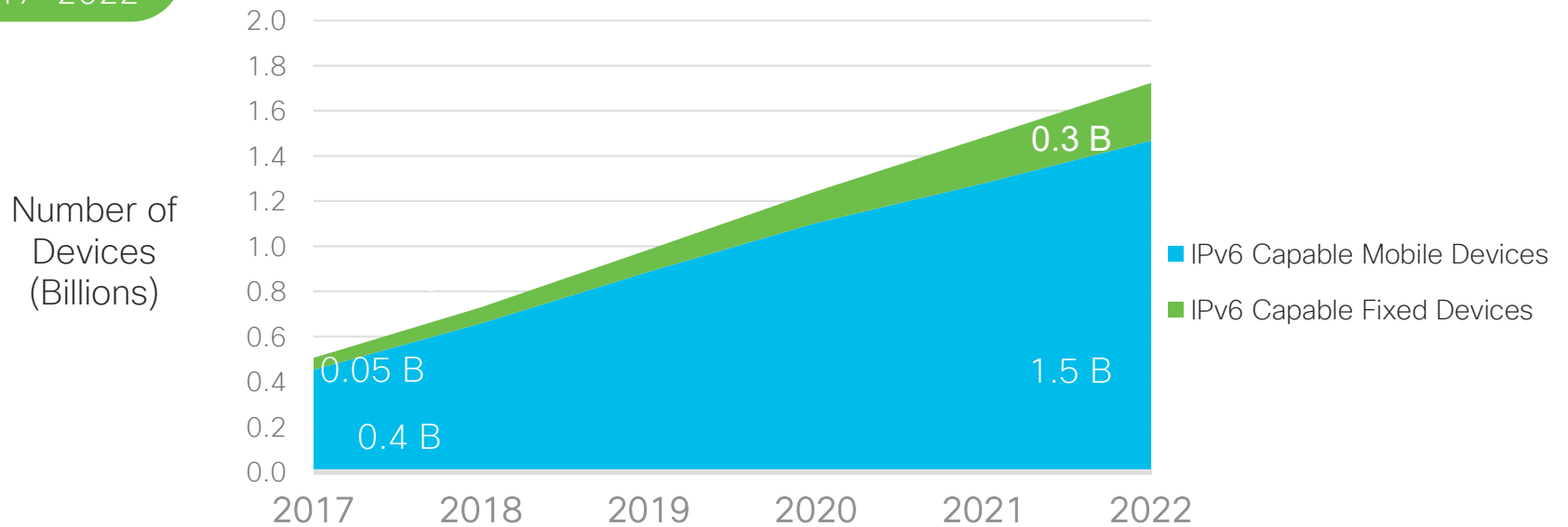
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global IPv6 Traffic Growth / Regions
By 2022, IPv6 will represent 38% of total Internet traffic

77% CAGR
2017–2022
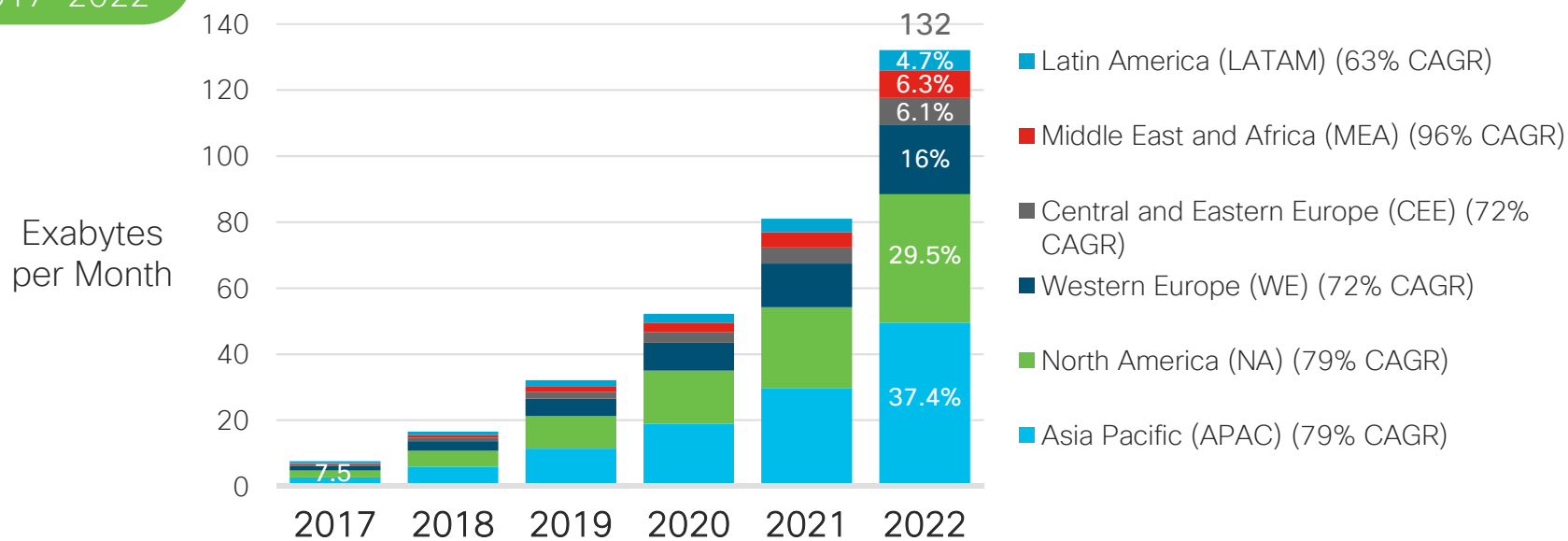
Exabytes per Month

- Latin America (LATAM) (63% CAGR)
- Middle East and Africa (MEA) (96% CAGR)
- Central and Eastern Europe (CEE) (72% CAGR)
- Western Europe (WE) (72% CAGR)
- North America (NA) (79% CAGR)
- Asia Pacific (APAC) (79% CAGR)

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Top Trends

Devices & Connections	Traffic Trends	Network Performance and User Experience
❶ Devices/Connections Mix	❹ **Traffic Growth by App**	❼ Wi-Fi Momentum
❷ IoT/M2M by Verticals	❺ Traffic Pattern Analysis	❽ Accelerating Speeds
❸ IPv6 Adoption	❻ "Cord-Cutting"	❾ Security Analysis

Global IP Traffic by Application Type
By 2022, video will account for 82% of global IP traffic
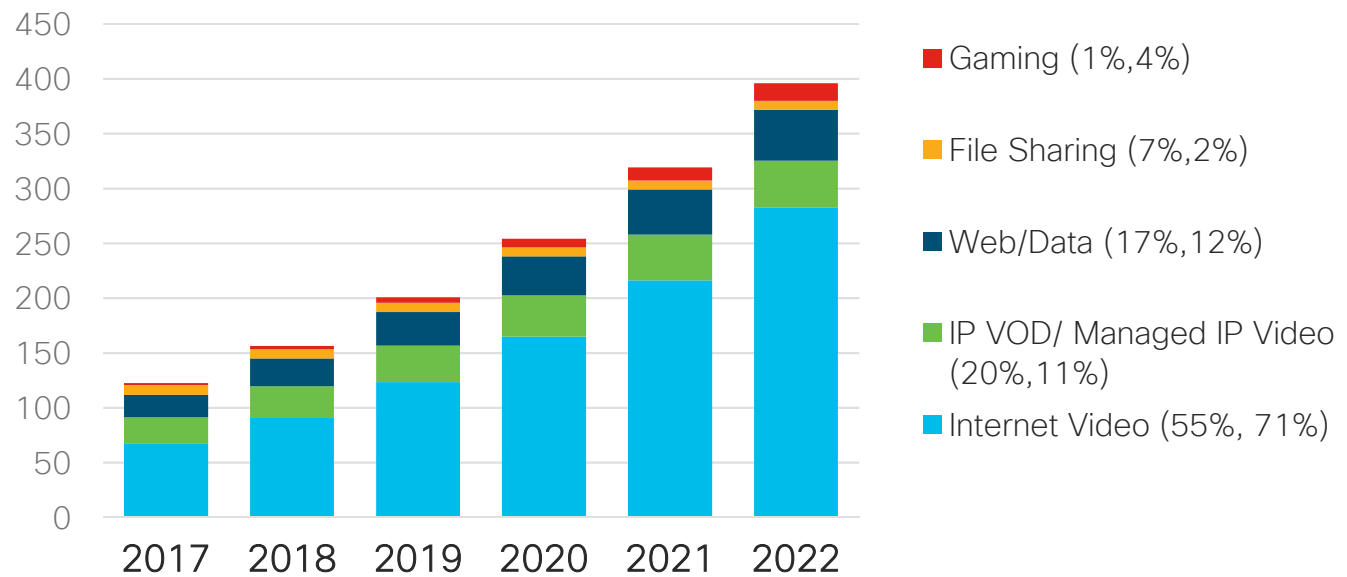
26% CAGR
2017–2022

Exabytes
per Month

450
400
350
300
250
200
150
100
50
0

2017 2018 2019 2020 2021 2022

■ Gaming (1%,4%)

■ File Sharing (7%,2%)

■ Web/Data (17%,12%)

■ IP VOD/ Managed IP Video
(20%,11%)

■ Internet Video (55%, 71%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

North America IP Traffic by Application Type
By 2022, video will account for 82% of North America IP traffic

Exabytes per Month

- Gaming (2%,7%)
- File Sharing (4%,2%)
- Web/Data (13%,9%)
- IP VOD/ Managed IP Video (26%,16%)
- Internet Video (54%, 66%)

120
100
80
60
40
20
0

2017 2018 2019 2020 2021 2022

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Latin America IP Traffic by Application Type
By 2022, video will account for 84% of Latin America IP traffic

21% CAGR
2017–2022

Exabytes
per Month

20
18
16
14
12
10
8
6
4
2
0

2017 2018 2019 2020 2021 2022

■ Gaming (2%,2%)

■ File Sharing (12%,2%)

■ Web/Data (16%,12%)

■ IP VOD/ Managed IP Video (11%,11%)

■ Internet Video (60%, 73%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Western Europe IP Traffic by Application Type
By 2022, video will account for 80% of Western Europe IP traffic

22% CAGR
2017–2022
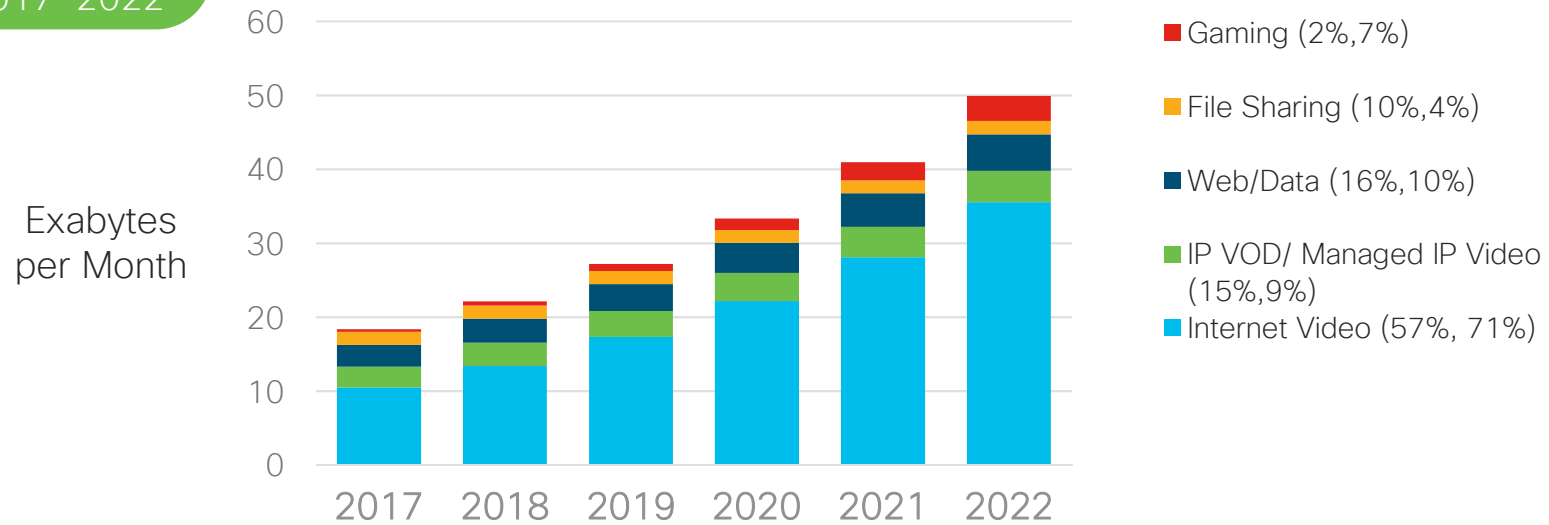
Exabytes
per Month

■ Gaming (2%,7%)

■ File Sharing (10%,4%)

■ Web/Data (16%,10%)

■ IP VOD/ Managed IP Video (15%,9%)

■ Internet Video (57%, 71%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA IP Traffic by Application Type
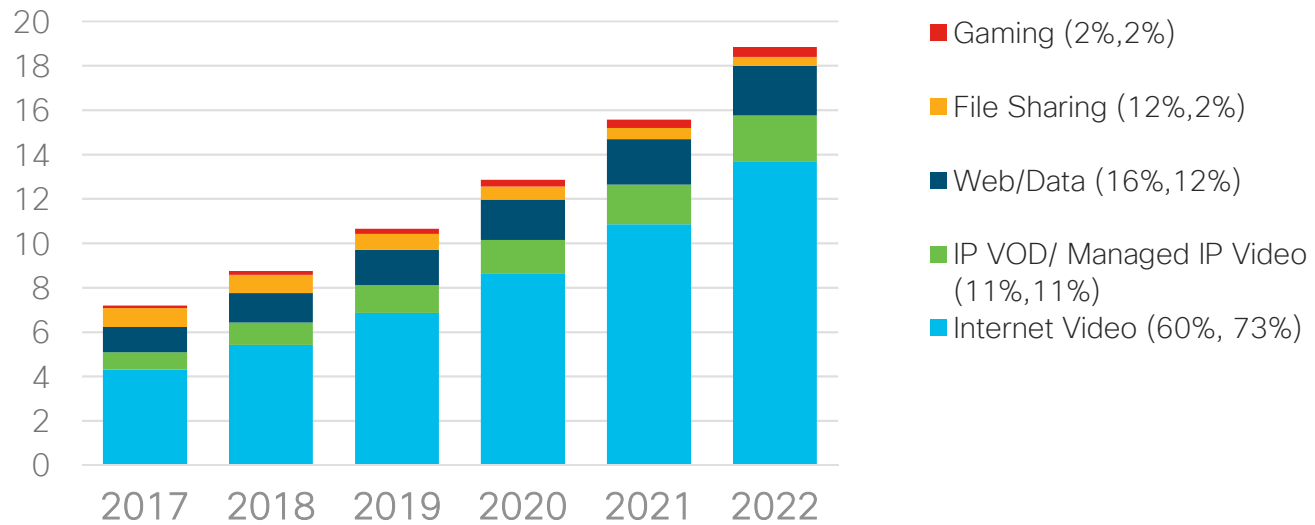## By 2022, video will account for 81% of MEA IP traffic
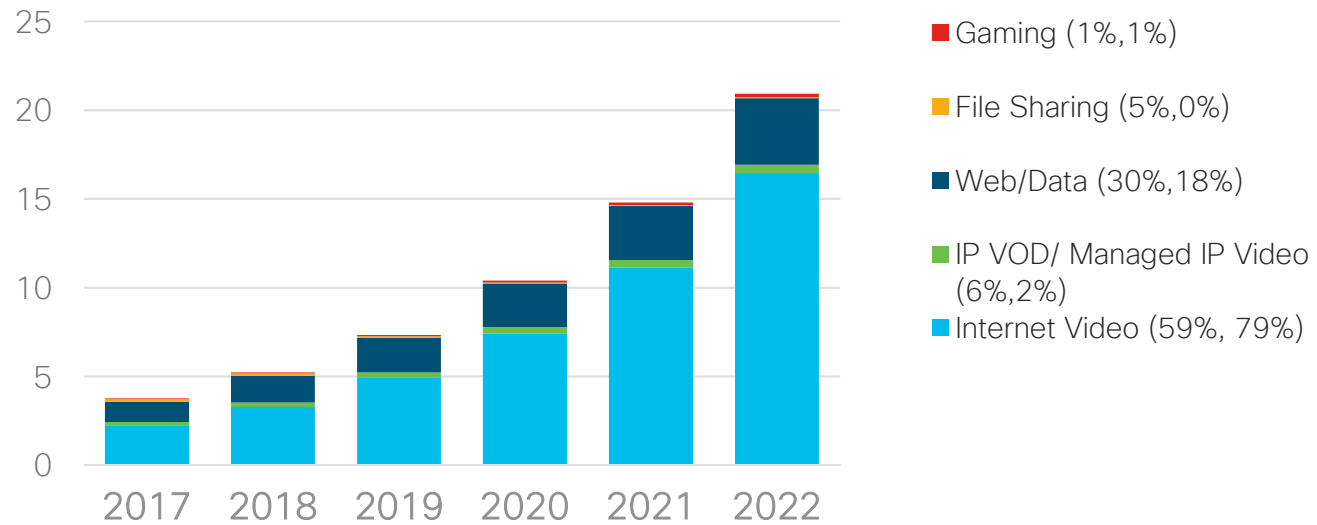
Exabytes
per Month

■ Gaming (1%,1%)

■ File Sharing (5%,0%)

■ Web/Data (30%,18%)

■ IP VOD/ Managed IP Video
(6%,2%)

■ Internet Video (59%, 79%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Internet Video Traffic by Type

By 2022, live video will increase 15-fold and reach 17% of Internet video traffic

33% CAGR
2017–2022

Exabytes per Month

- Video Surveillance (2%,3%)
- Live Internet Video (5%,17%)
- Long-Form Internet VoD (61%,62%)
- Short-Form Internet VoD (32%, 18%)

* Figures (n) refer to 2017, 2022 traffic share
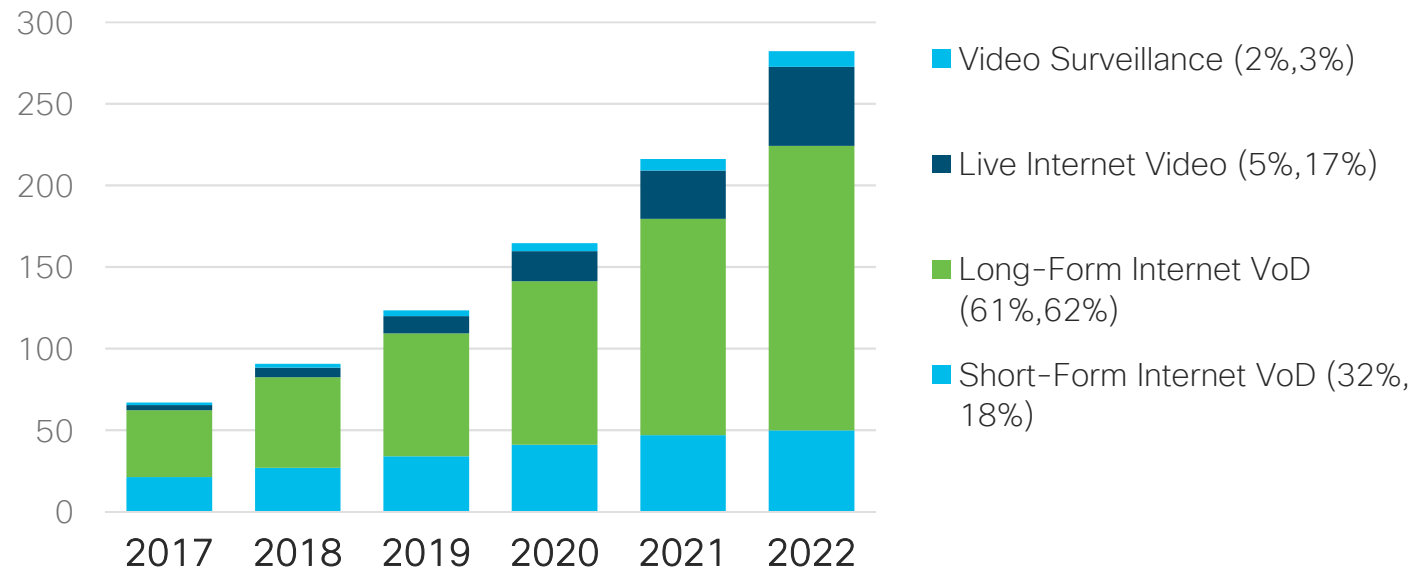
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Virtual and Augmented Reality Traffic

By 2022, VR/AR traffic will increase 12-fold

65% CAGR
2017–2022
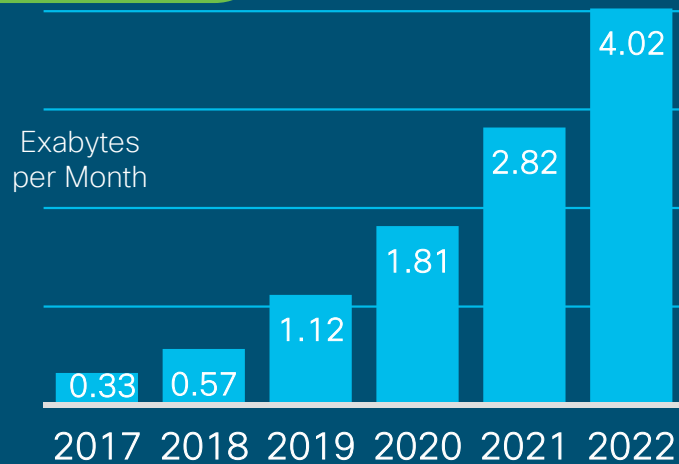
Exabytes per Month

0.33 — 2017
0.57 — 2018
1.12 — 2019
1.81 — 2020
2.82 — 2021
4.02 — 2022

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends

❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

Network Performance and User Experience

❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Average Global Internet Bandwidth Usage

	2017	2022	Future?
Average Traffic per **User** per Month	29 GB	85 GB	200 GB
Average Traffic per **Household*** per Month	82 GB	240 GB	500 GB

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
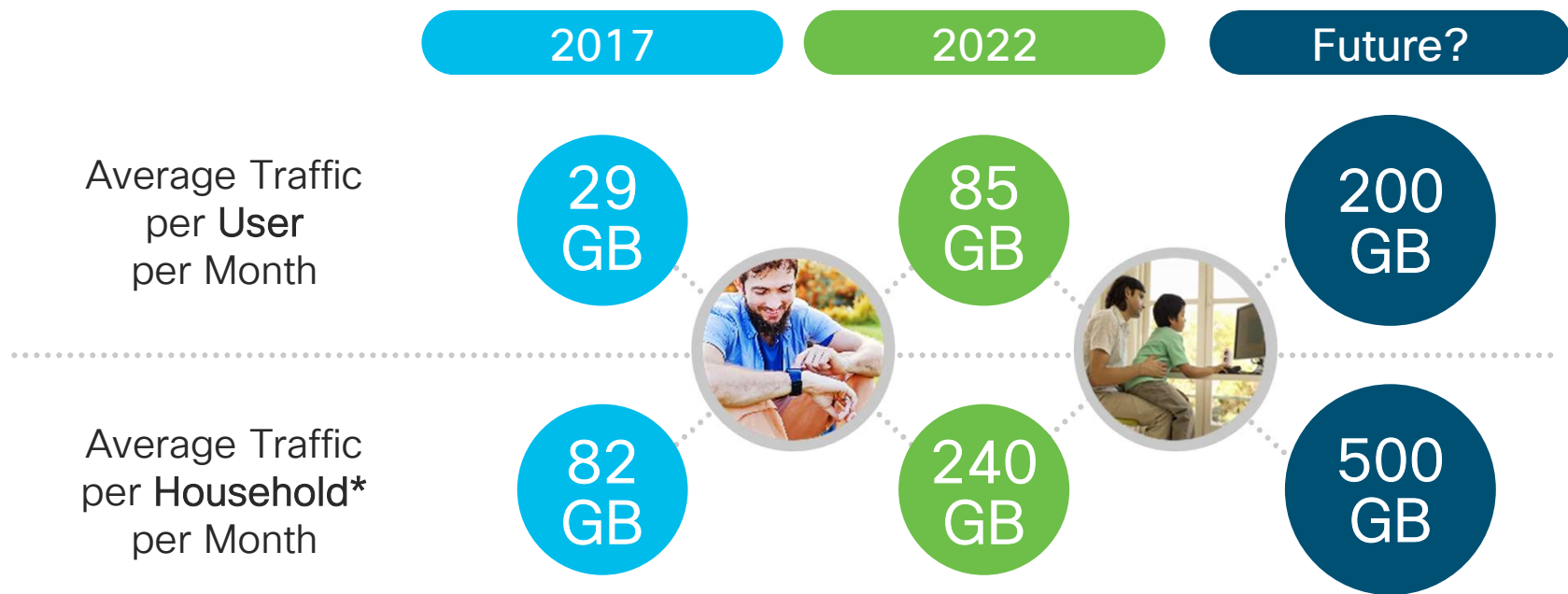
Average NA Internet Bandwidth Usage

	2017	2022	Future?
Average Traffic per User per Month	94 GB	261 GB	500 GB
Average Traffic per Household* per Month	241 GB	676 GB	1 TB

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
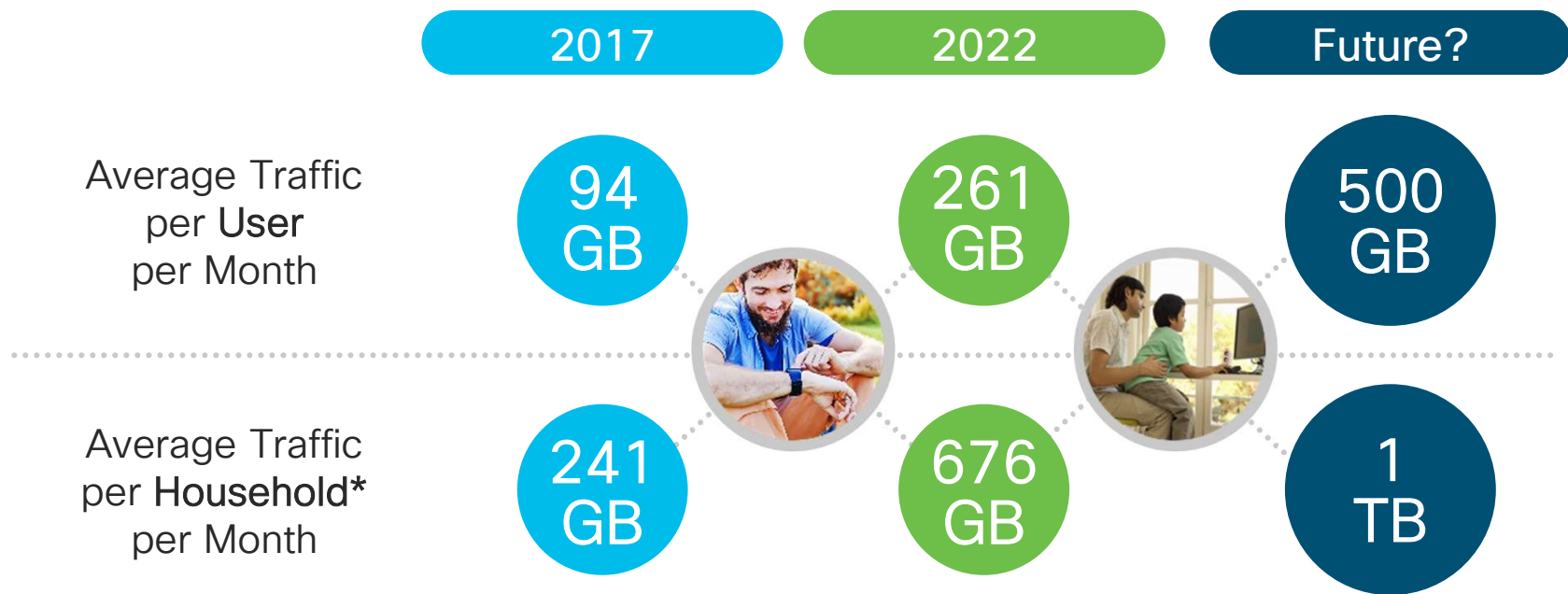
Average LATAM Internet Bandwidth Usage

	2017	2022	Future?
Average Traffic per **User** per Month	20 GB	38 GB	200 GB
Average Traffic per **Household*** per Month	66 GB	126 GB	500 GB

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
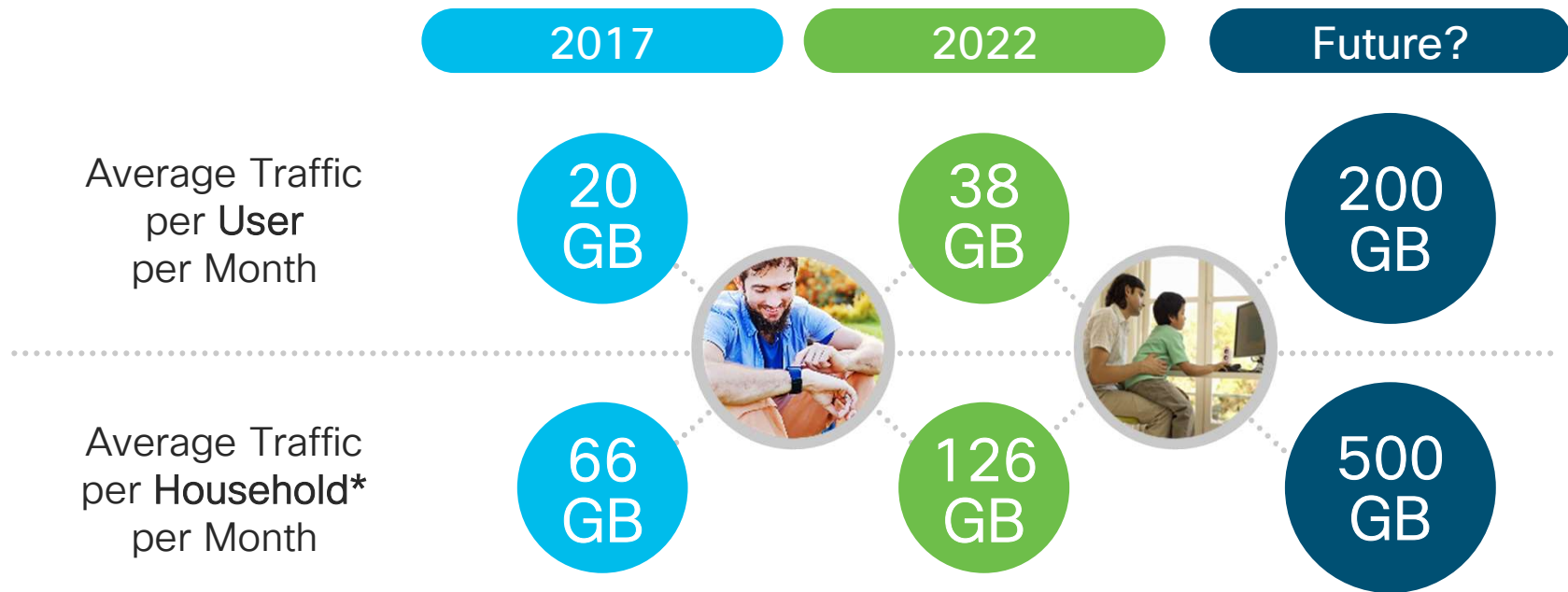
Average WE Internet Bandwidth Usage

	2017	2022	Future?
Average Traffic per **User** per Month	36 GB	98 GB	200 GB
Average Traffic per **Household*** per Month	79 GB	211 GB	500 GB

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
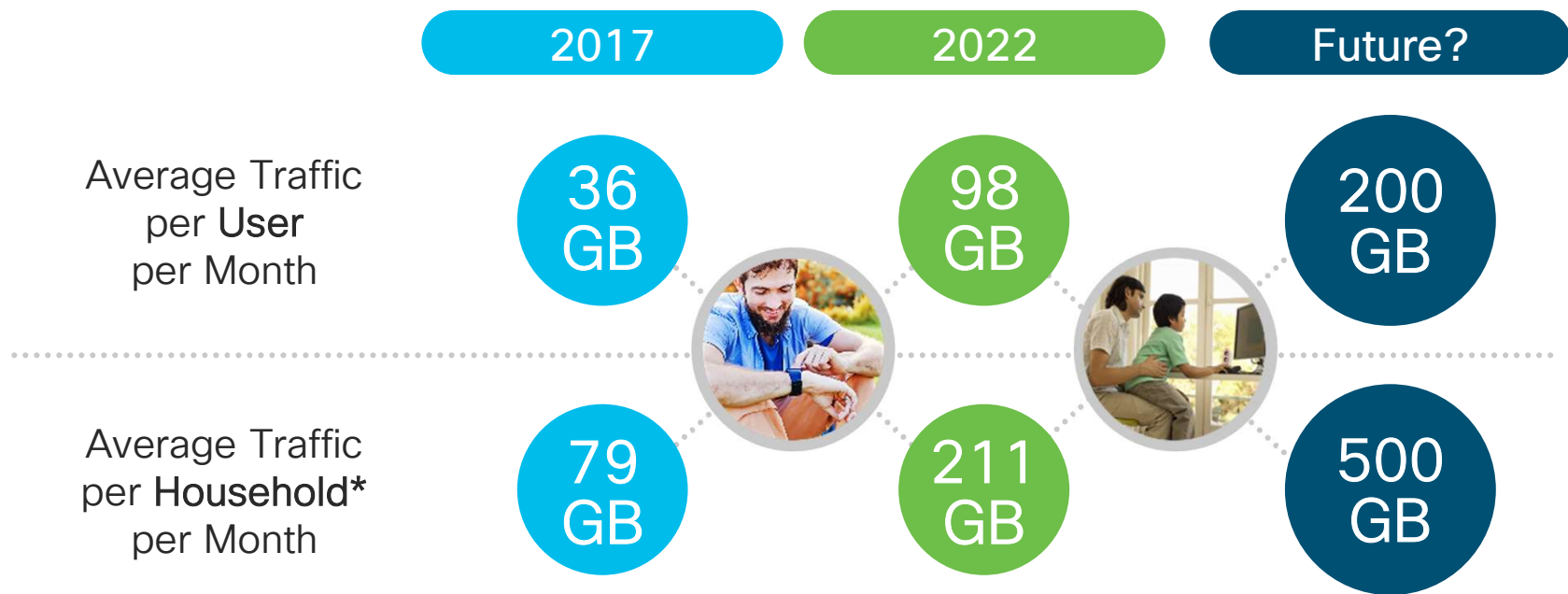
Average MEA Internet Bandwidth Usage

	2017	2022	Future?
Average Traffic per User per Month	9 GB	37 GB	200 GB
Average Traffic per Household* per Month	35 GB	155 GB	500 GB

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
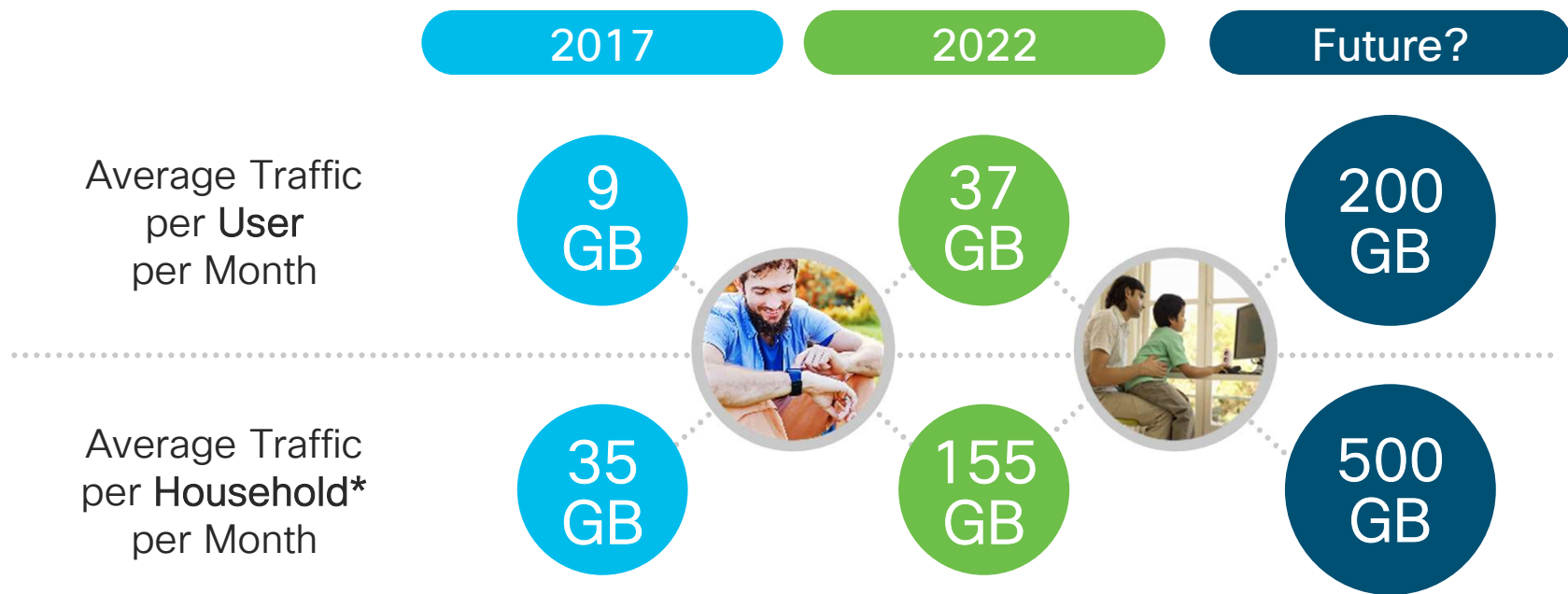
Internet Households Reshape Usage Limits
Internet households exceeding 1 TB more than doubled in 2017

Terabyte
Households
(Millions)

9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0

4.2 — 2016

8.5 — 2017

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
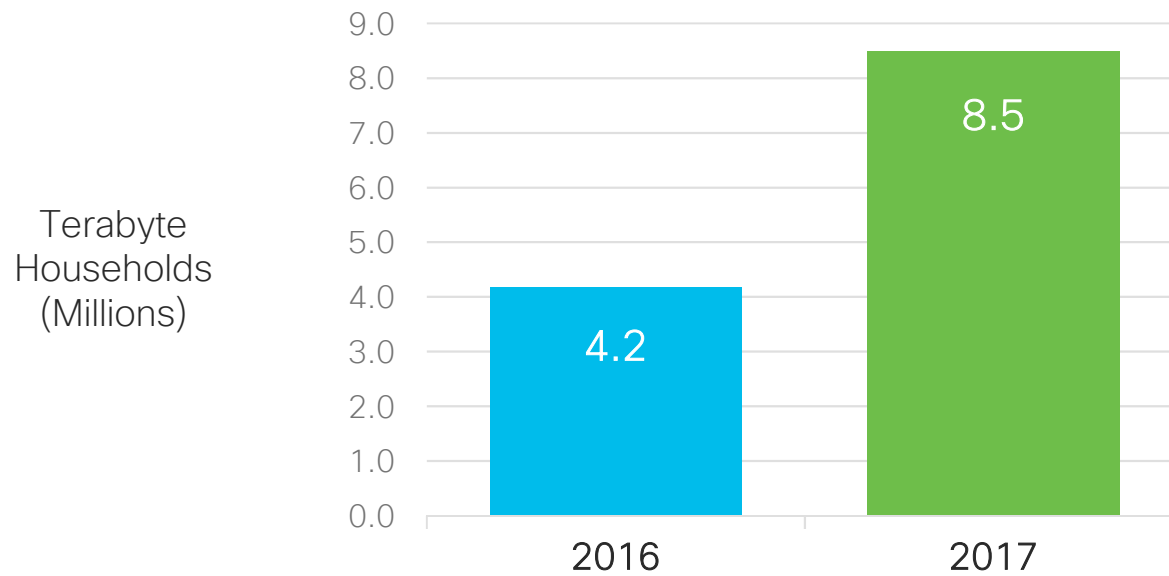
Global Busy-Hour vs. Average Hour Internet Traffic
By 2022, busy Internet traffic will be nearly 6X greater than average traffic

Pbps

Legend:
- Busy Hour Internet Traffic (CAGR 37%)
- Average Internet Traffic (CAGR 30%)

X-axis: 2017, 2018, 2019, 2020, 2021, 2022

Y-axis: 0, 1, 2, 3, 4, 5, 6, 7

NA Busy-Hour vs. Average Hour Internet Traffic
By 2022, busy Internet traffic will be 7X greater than average traffic

Pbps

— Busy Hour Internet Traffic (CAGR 31%)
— Average Internet Traffic (CAGR 25%)

2.5
2.0
1.5
1.0
0.5
0.0
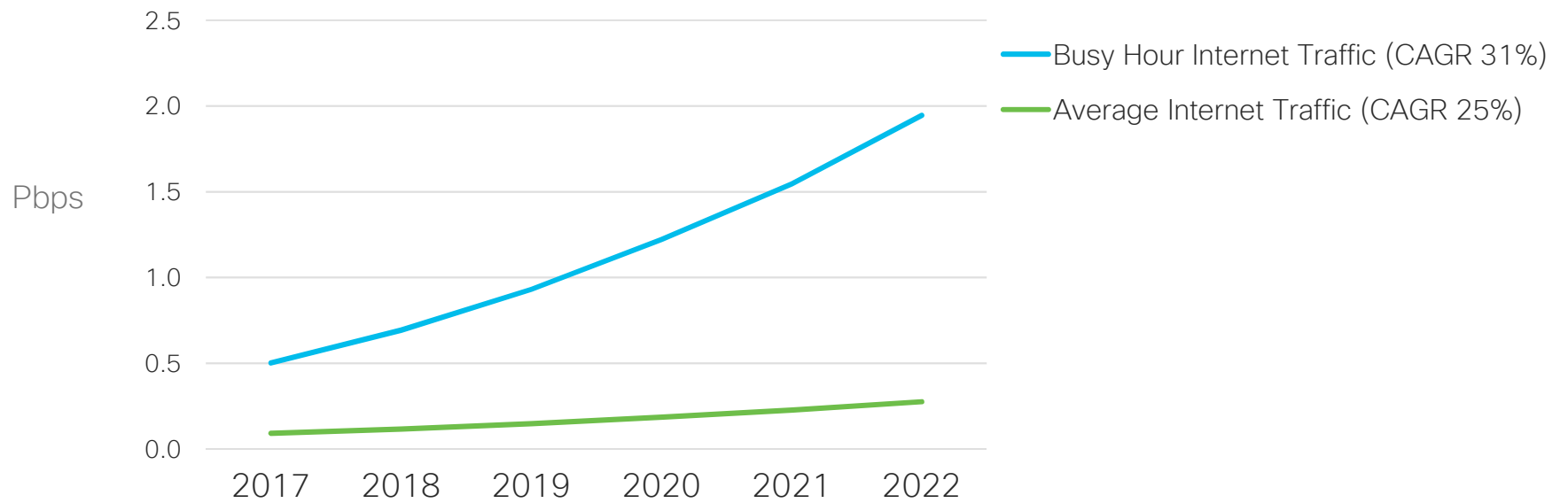
2017 2018 2019 2020 2021 2022

LATAM Busy-Hour vs. Average Hour Internet Traffic
By 2022, busy Internet traffic will be 6X greater than average traffic

Tbps

— Busy Hour Internet Traffic (CAGR 31%)
— Average Internet Traffic (CAGR 21%)

350
300
250
200
150
100
50
0
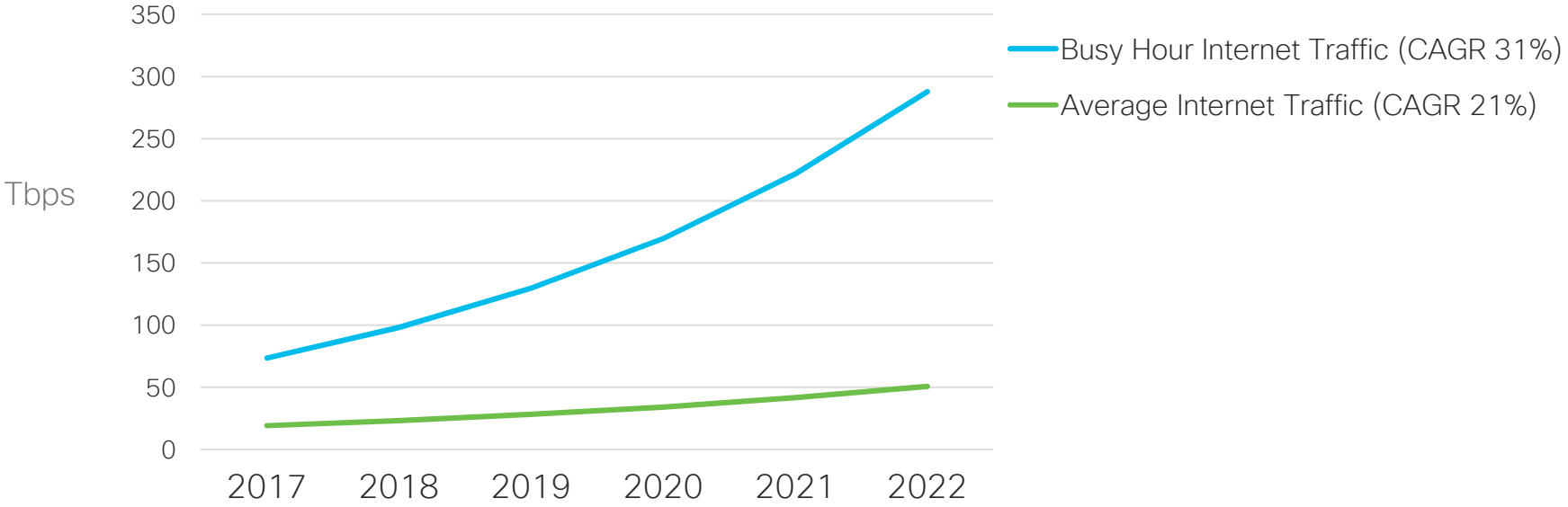
2017 2018 2019 2020 2021 2022

WE Busy-Hour vs. Average Hour Internet Traffic
By 2022, busy Internet traffic will be 7X greater than average traffic
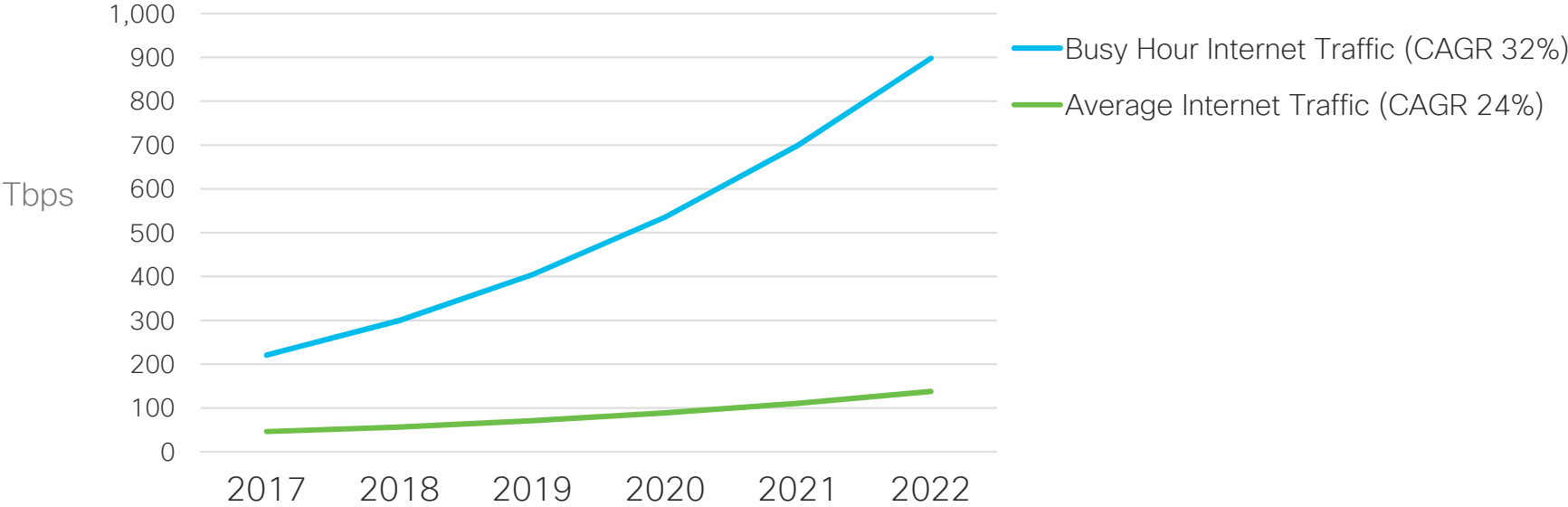
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA Busy-Hour vs. Average Hour Internet Traffic
By 2022, busy Internet traffic will be 5X greater than average traffic

Tbps

— Busy Hour Internet Traffic (CAGR 52%)

— Average Internet Traffic (CAGR 42%)

350
300
250
200
150
100
50
0
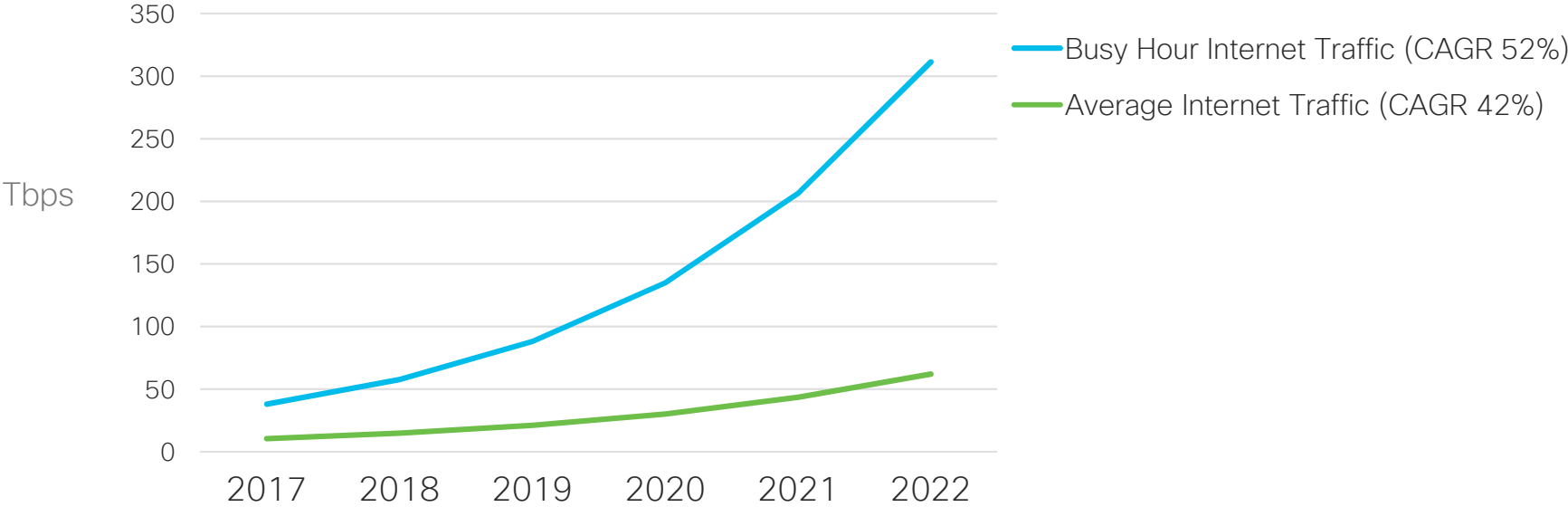
2017   2018   2019   2020   2021   2022

Global Content Delivery Network (CDN) Traffic
CDNs will deliver 72 percent of Internet traffic by 2022

30% CAGR
2017–2022

Exabytes
per Month

400
350
300
250
200
150
100
50
0

2017 2018 2019 2020 2021 2022

■ Non-CDN Internet Traffic
(44%,28%)

■ CDN Internet Traffic
(56%, 72%)

* Figures (n) refer to 2017, 2022 traffic share

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
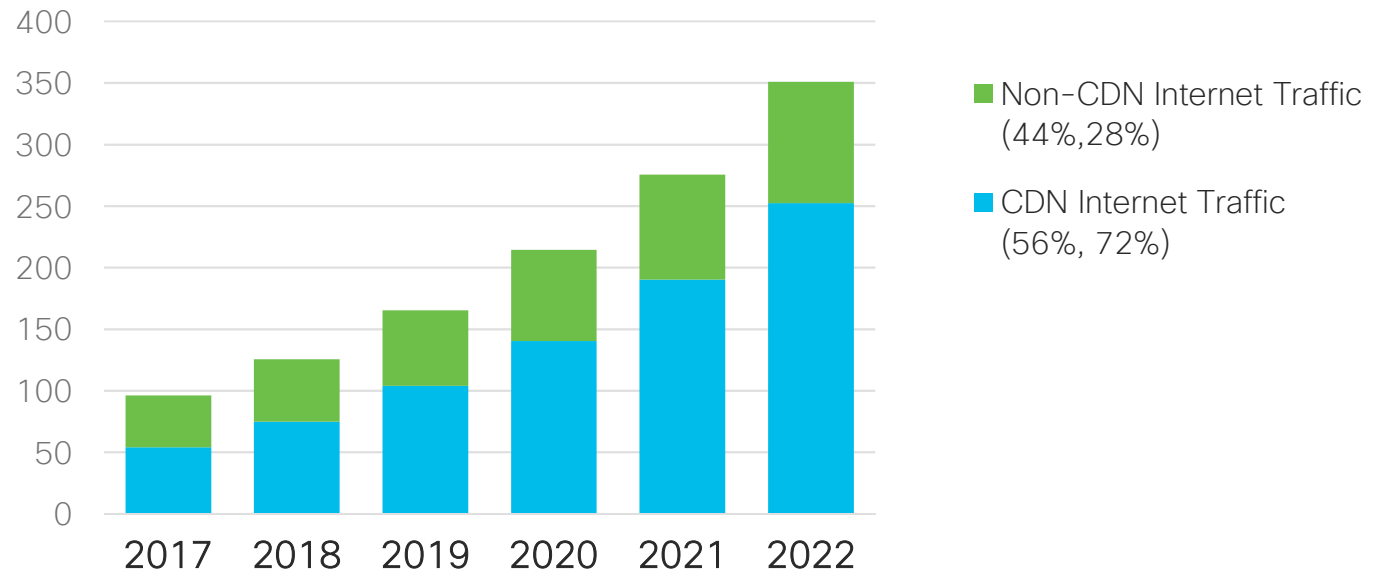
SP Network Capacity Moving Closer to the Edge
Over one-third of capacity will bypass core completely by 2022
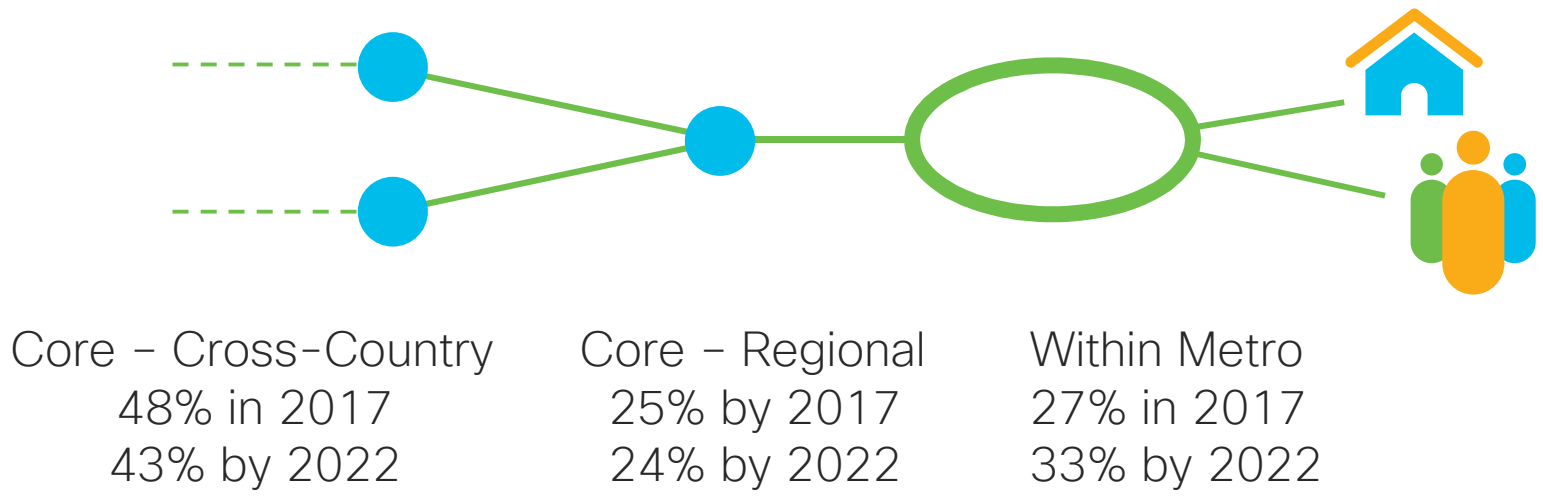
Core – Cross-Country
48% in 2017
43% by 2022

Core – Regional
25% by 2017
24% by 2022

Within Metro
27% in 2017
33% by 2022

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends

❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

Network Performance and User Experience

❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Global Digital Media Adapters* Growth

By 2022, DMAs will represent 9% of global Internet connected TV
by 2022, DMAs will represent 18% of global Internet connected TV traffic

10% CAGR
2017–2022

22% CAGR
2017–2022

Digital Media Adapters (M)

Year	Value
2017	173.0
2018	204.6
2019	231.8
2020	252.0
2021	265.2
2022	273.7

DMA Traffic (EB/Month)

Year	Value
2017	6.3
2018	8.5
2019	10.9
2020	13.2
2021	15.3
2022	17.1
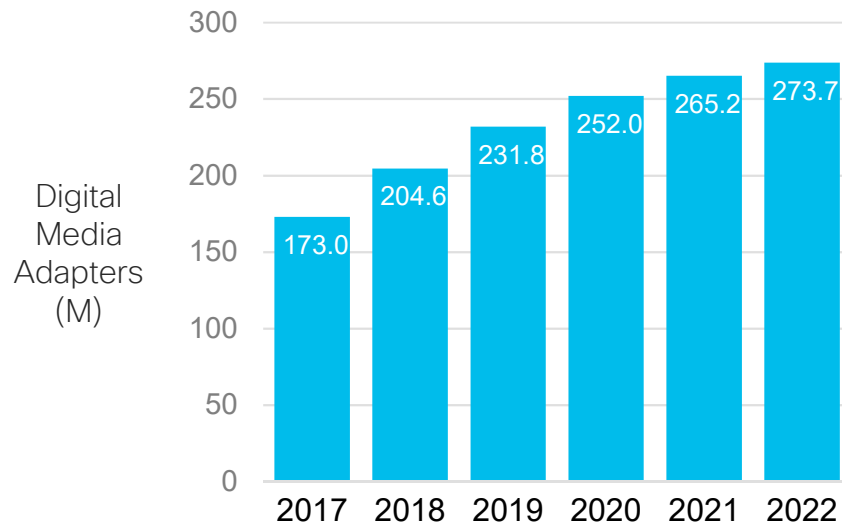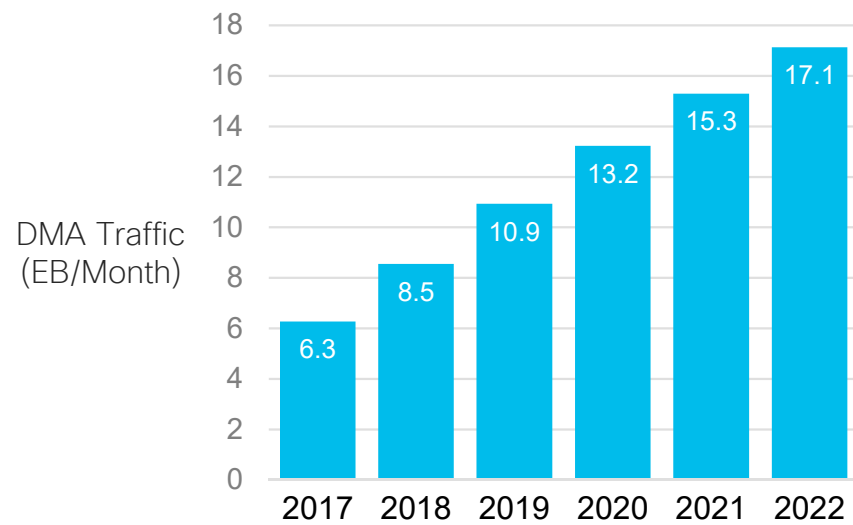
* DMAs include devices such as Roku, Apple TV, Chromecast

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Cord-Cutting Household Traffic Is 72% Higher
A global cord-cutting household generates 141 GB per month in 2017, compared to 82 GB per month for an average household
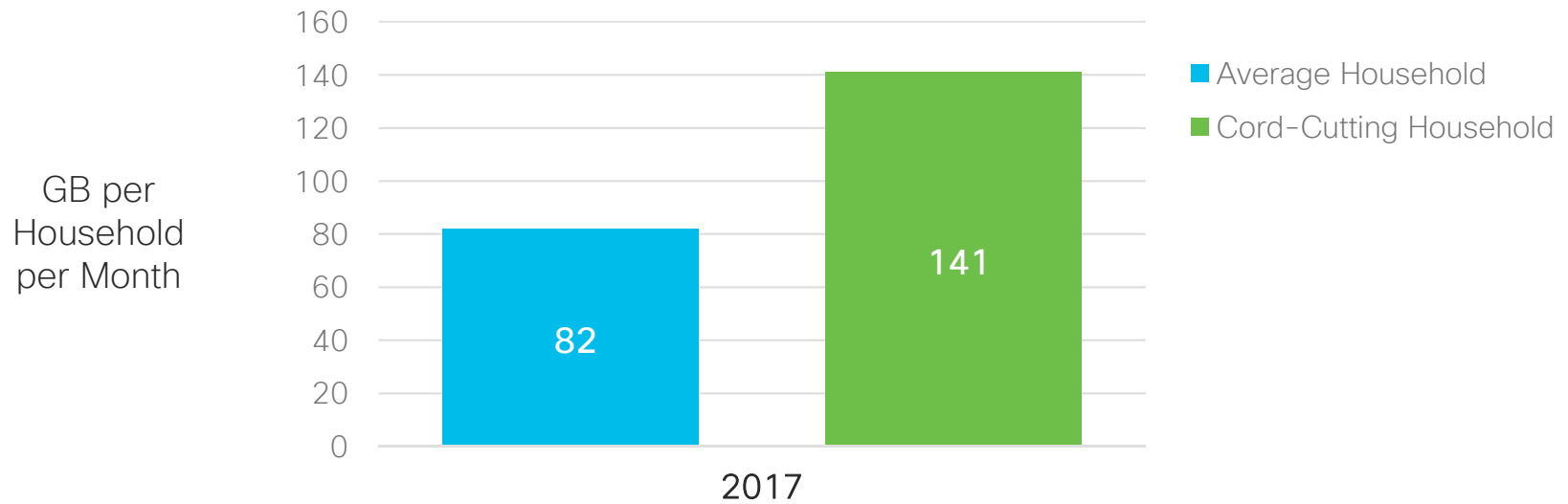
GB per Household per Month

■ Average Household
■ Cord-Cutting Household

82

141

2017

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Top Trends
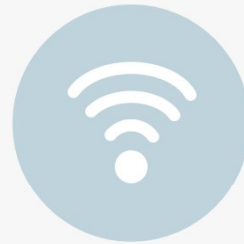
Devices & Connections	Traffic Trends	Network Performance and User Experience
❶ Devices/Connections Mix	❹ Traffic Growth by App	❼ Wi-Fi Momentum
❷ IoT/M2M by Verticals	❺ Traffic Pattern Analysis	❽ Accelerating Speeds
❸ IPv6 Adoption	❻ "Cord-Cutting"	❾ Security Analysis

Global Wi-Fi Hotspot Coverage and Availability

Existing

- Pay-as-you-go
- Free access promoting other services (Retail free Wi-Fi)
- Managed services (venues and outdoor)
- Cellular offload (user promoted)
- Added value for broadband subscription
- Advertising & sponsorship

Growth

- Cellular offload (carrier driven)
- Community Wi-Fi/ homespots
- Carrier-grade VoWiFi
- TV everywhere
- Large events
- Big data analytics
- Public transportation Wi-Fi

Future

- Wi-Fi Capacity trading
- Transaction platform
- Internet of things
- Context awareness
- HetNet Wi-Fi + mobile
- Connected car (in-car Wi-Fi)

Total Public WLAN + Community Hotspots	2017	2022
	124 M	549 M

Total Incremental Hotspots **?**

Source: Maravedis, Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Public Wi-Fi Hotspots
Asia Pacific leads with 261 Million (47%) Hotspots by 2022

35% CAGR
2017–2022

Millions of Hotspots

- **Middle East and Africa (26% CAGR)**
- **Central and Eastern Europe (30% CAGR)**
- **Latin America (75% CAGR)**
- **North America (26% CAGR)**
- **Western Europe (17% CAGR)**
- **Asia Pacific (57% CAGR)**

600
500
400
300
200
100
0

2017 — 124
2018
2019
2020
2021
2022 — 549

2022 segments:
- 4%
- 9%
- 17%
- 23%
- 45%
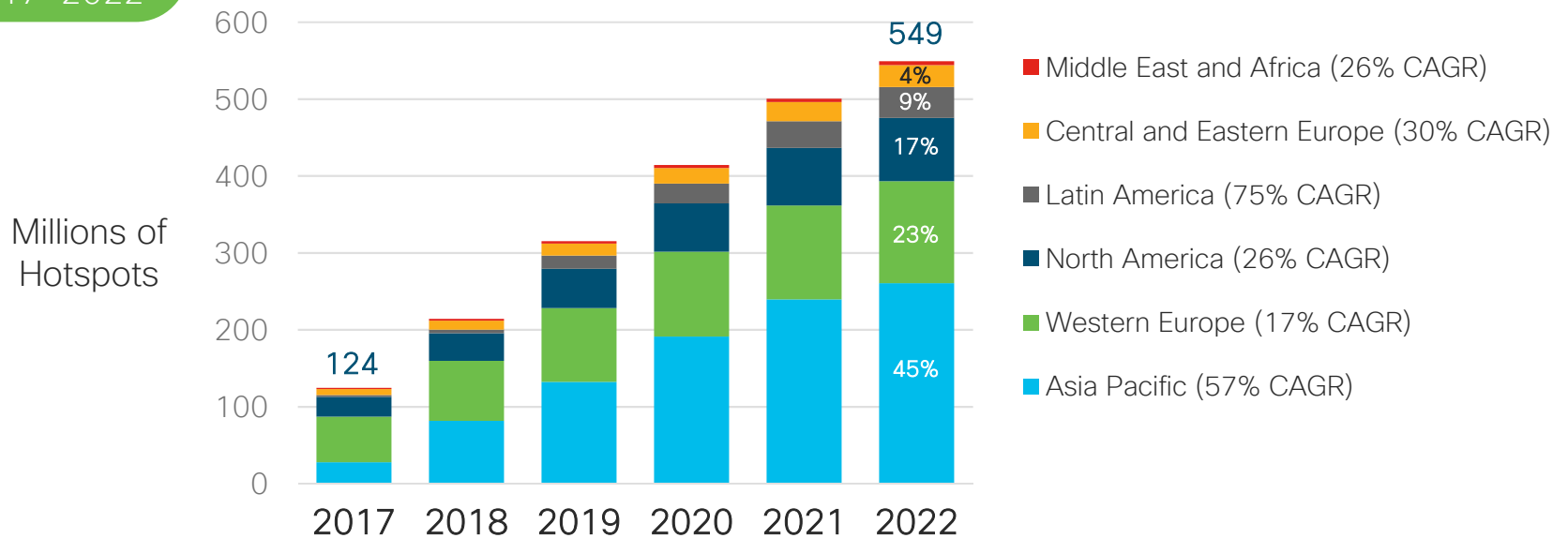
* Middle East and Africa represents 1% of global public Wi-Fi hotspots by 2022

Source: Maravedis, Cisco VNI Global IP Traffic Forecast, 2017–2022

By 2022, China will have 34% of global hotspots, the most number of hotspots (185 million) in the world.

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022
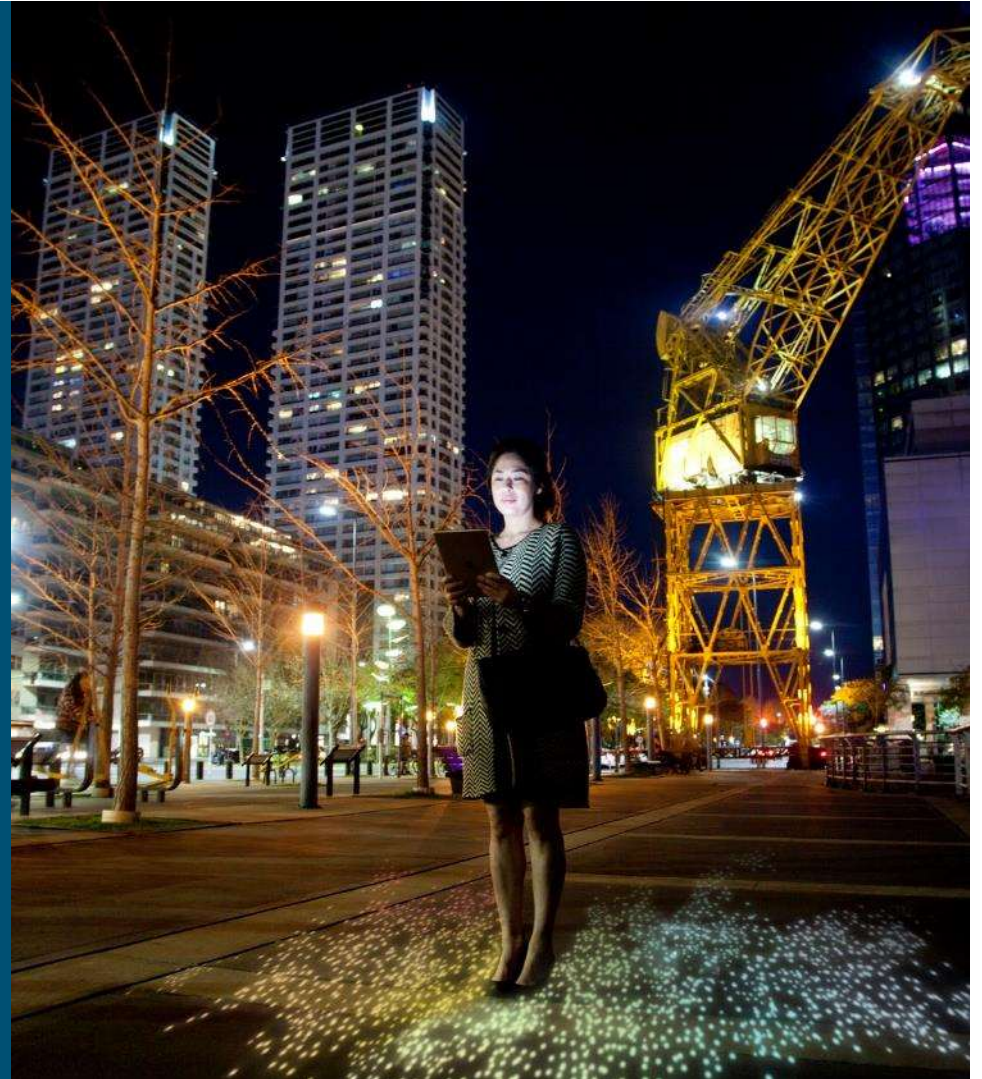
The United States will have 93% of NA hotspots, the most number of hotspots in NA, 77 M by 2022.
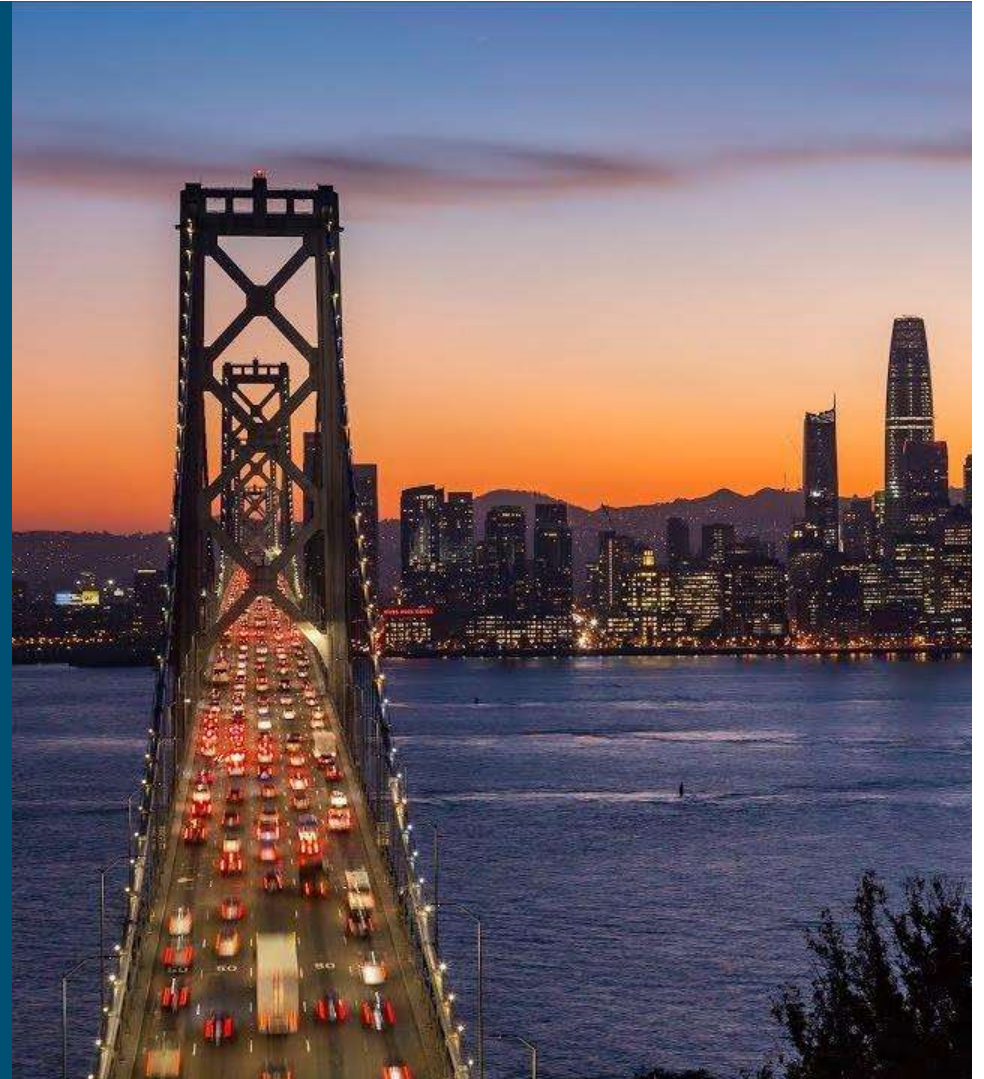
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Brazil will have 45% of LATAM hotspots, the most number in the region, 18 M by 2022.
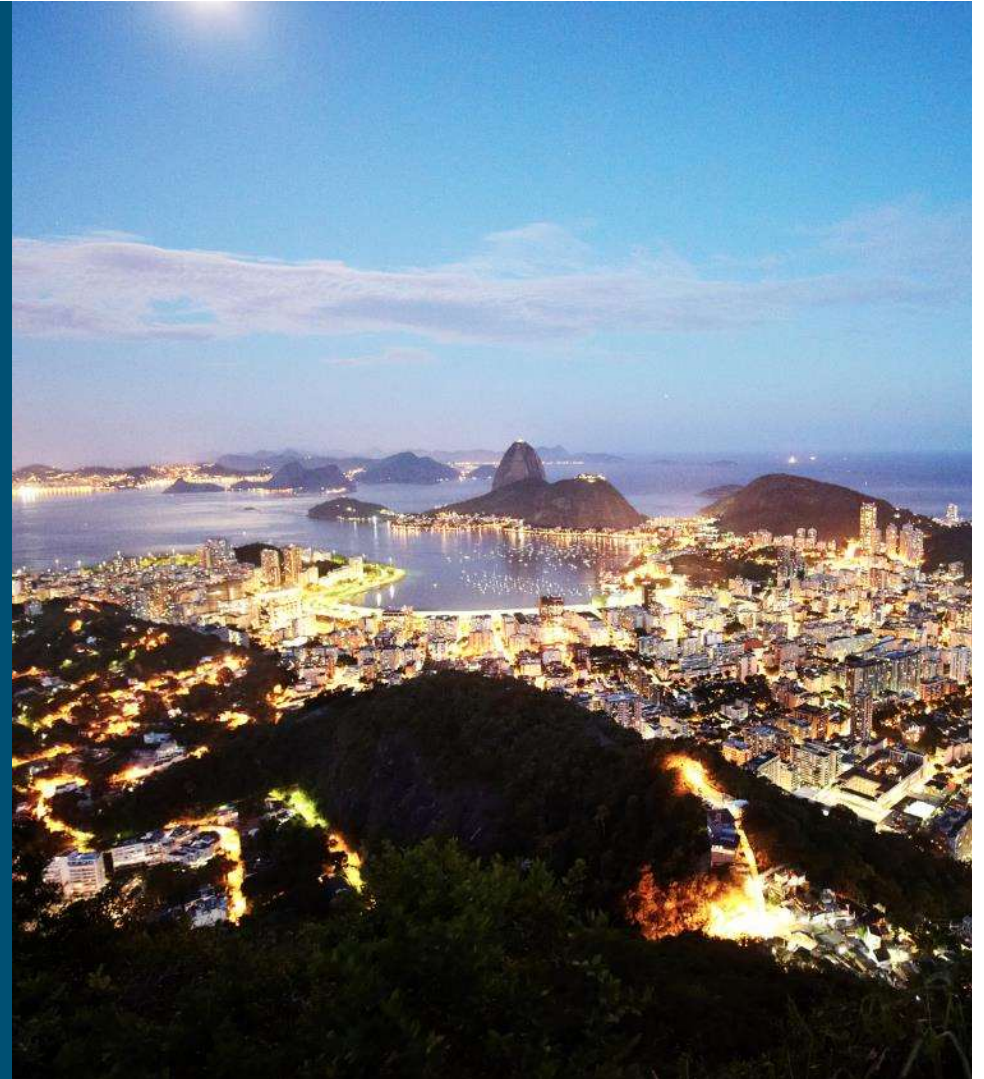
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

France will have
23% of WE
hotspots, the most
number of hotspots
in WE, 30 million by
2022
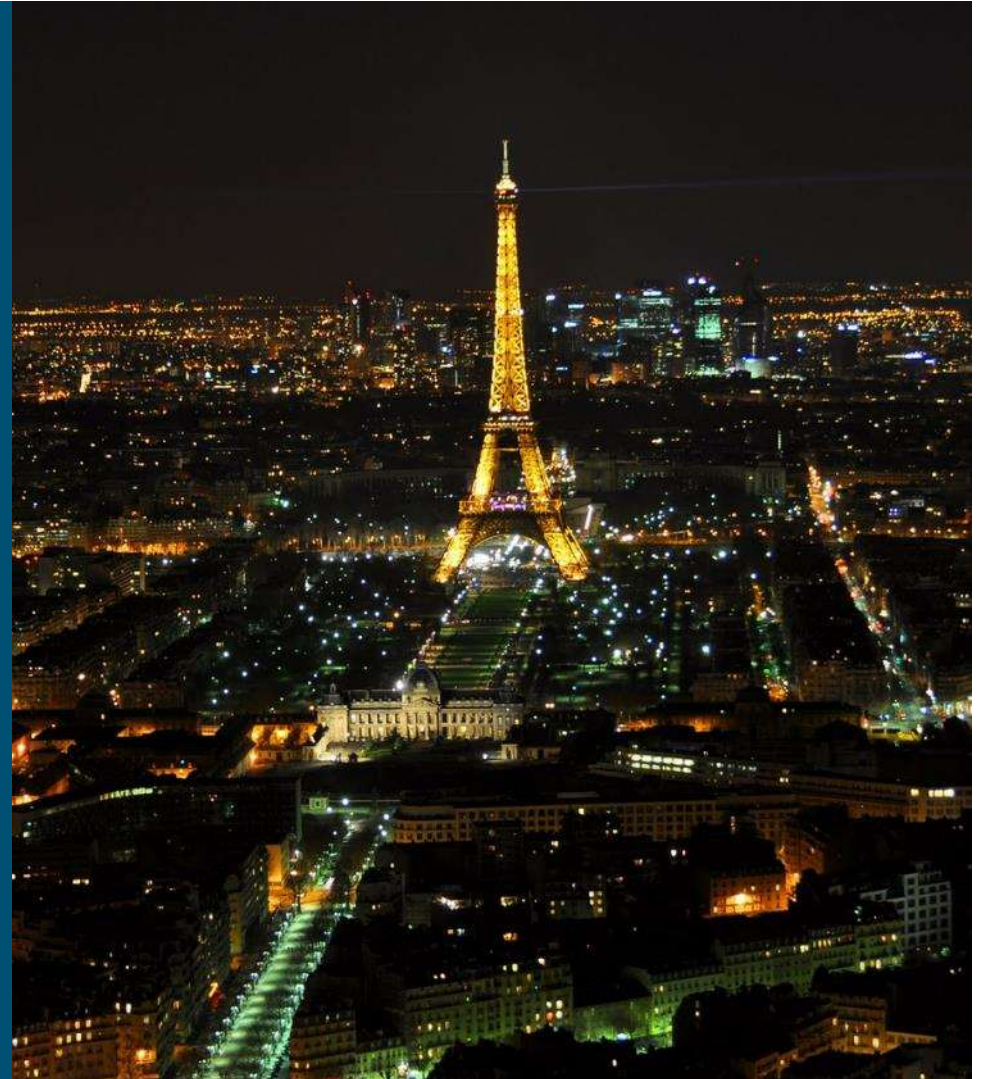
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

South Africa will have 30% of MEA hotspots, the most number in the region, 1.2 M by 2022
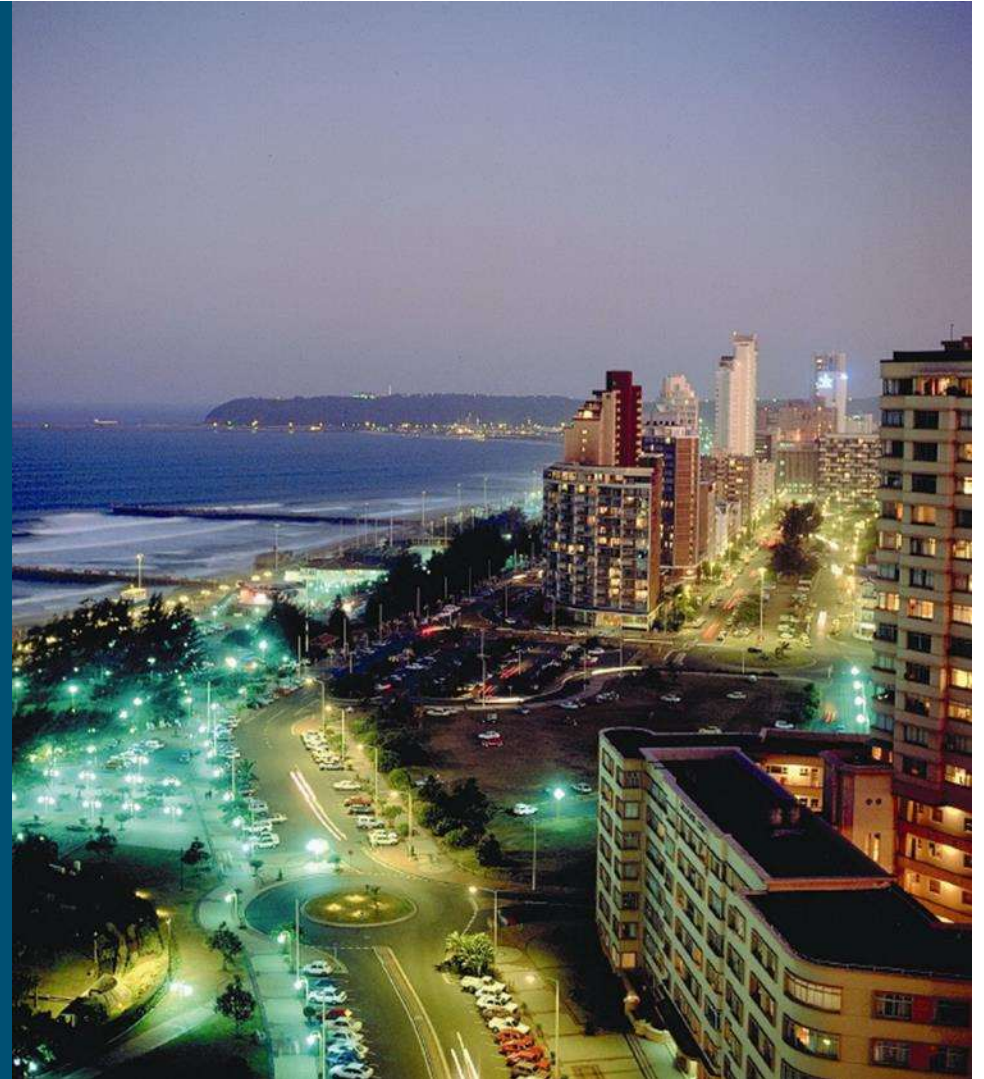
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Future of Wired and Wireless Technologies

By 2022, 9.5% of total SOHO will be equipped with 802.11ax
By 2022, 86.9% of total SOHO will be equipped with 802.11ac
Future Wi-Fi Enables Virtualization, IoT, Speech Processing, Security, Data Analytics

802.11n

600 Mbps Max

Medium Resolution Video

802.11ac

3.6 Gbps Max

High Resolution Video

Wired Complement

802.11ax

10 Gbps Max

Dense IoT Deployment

| 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2017 | 2016 | 2017 | 2018 | 2019 |

DOCSIS 3.0

38 Mbps per channel

VDSL2

100 Mbps Max

Medium Resolution Video

DOCSIS 3.1

54 Mbps

VDSL2-VPlus

300 Mbps Max

Full Duplex

DOCSIS 3.1

10 Gbps symmetrical

G.fast

150-1000 Mbps Max.

Vast majority of 1Gig deployments will be DOCSIS 3.1
Fiber being moved even closer to subscribers
Future Wired Enables 4K, Immersive 360 video, VR, High Dynamic Range, High Frame Rate, 8K

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global IP Traffic by Local Access Technology
By 2022, 71% of total IP traffic will be wireless*

26% CAGR
2017–2022

Exabytes
per Month

Mobile (46% CAGR)

Fixed/Wi-Fi from Wi-Fi-Only Devices
(18% CAGR)

Fixed/Wi-Fi from Mobile Devices
(53% CAGR)

Fixed/Wired (15% CAGR)

Year	Mobile	Fixed/Wi-Fi Wi-Fi-Only	Fixed/Wi-Fi Mobile	Fixed/Wired
2022	19.6%	22.9%	28.1%	29.4%

* Wireless traffic includes Wi-Fi and mobile
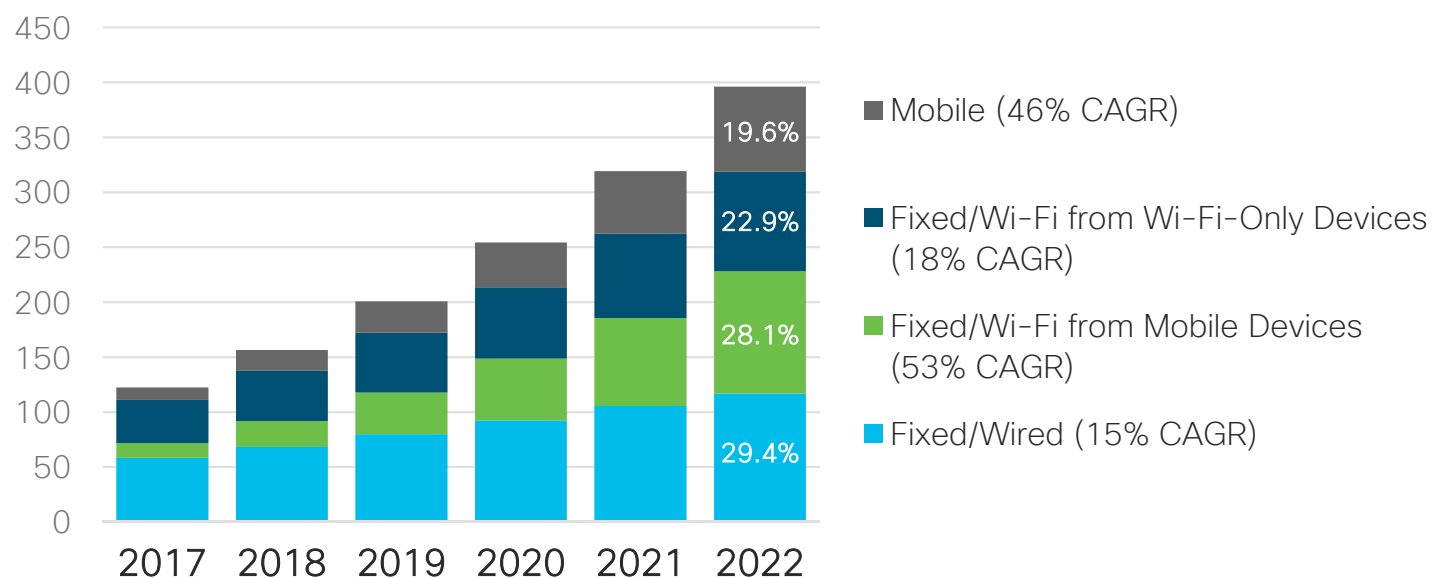
Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA IP Traffic by Local Access Technology
By 2022, 54% of total IP traffic will be wireless*

Exabytes
per Month

■ Mobile (36% CAGR)

■ Fixed/Wi-Fi from Wi-Fi-Only Devices (21% CAGR)

■ Fixed/Wi-Fi from Mobile Devices (48% CAGR)

■ Fixed/Wired (15% CAGR)

5.4%

31.3%

17.2%

46.1%

120

100

80

60

40

20

0

2017   2018   2019   2020   2021   2022

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM IP Traffic by Local Access Technology
By 2022, 75% of total IP traffic will be wireless*

21% CAGR
2017–2022

Exabytes
per Month

20
18
16
14
12
10
8
6
4
2
0

2017 2018 2019 2020 2021 2022

2022 values:
- 23.6%
- 23.8%
- 28.0%
- 24.6%

- ■ Mobile (43% CAGR)
- ■ Fixed/Wi-Fi from Wi-Fi-Only Devices (6% CAGR)
- ■ Fixed/Wi-Fi from Mobile Devices (50% CAGR)
- ■ Fixed/Wired (14% CAGR)

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE IP Traffic by Local Access Technology
By 2022, 65% of total IP traffic will be wireless*

Exabytes
per Month

Mobile (38% CAGR)

Fixed/Wi-Fi from Wi-Fi-Only Devices (19% CAGR)

Fixed/Wi-Fi from Mobile Devices (47% CAGR)

Fixed/Wired (15% CAGR)

	2017	2018	2019	2020	2021	2022

2022 segment labels: 10.3%, 34.7%, 19.8%, 35.2%

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA IP Traffic by Local Access Technology
By 2022, 93% of total IP traffic will be wireless*

41% CAGR
2017–2022

Exabytes
per Month

Mobile (56% CAGR)

Fixed/Wi-Fi from Wi-Fi-Only Devices (15% CAGR)

Fixed/Wi-Fi from Mobile Devices (59% CAGR)

Fixed/Wired (13% CAGR)

53.4%

11.2%

28.7%

6.7%

25
20
15
10
5
0

2017 2018 2019 2020 2021 2022

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Internet Traffic by Local Access Technology
By 2022, 79% of total Internet traffic will be wireless*

30% CAGR
2017–2022

Exabytes
per Month

Mobile (46% CAGR)

Fixed/Wi-Fi from Wi-Fi-Only Devices
(17% CAGR)

Fixed/Wi-Fi from Mobile Devices
(53% CAGR)

Fixed/Wired (18% CAGR)

Year	Mobile	Fixed/Wi-Fi from Wi-Fi-Only Devices	Fixed/Wi-Fi from Mobile Devices	Fixed/Wired
2022	22.1%	25.0%	31.8%	21.1%

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

NA Internet Traffic by Local Access Technology
By 2022, 63% of total Internet traffic will be wireless*

23% CAGR
2017–2022

Exabytes
per Month
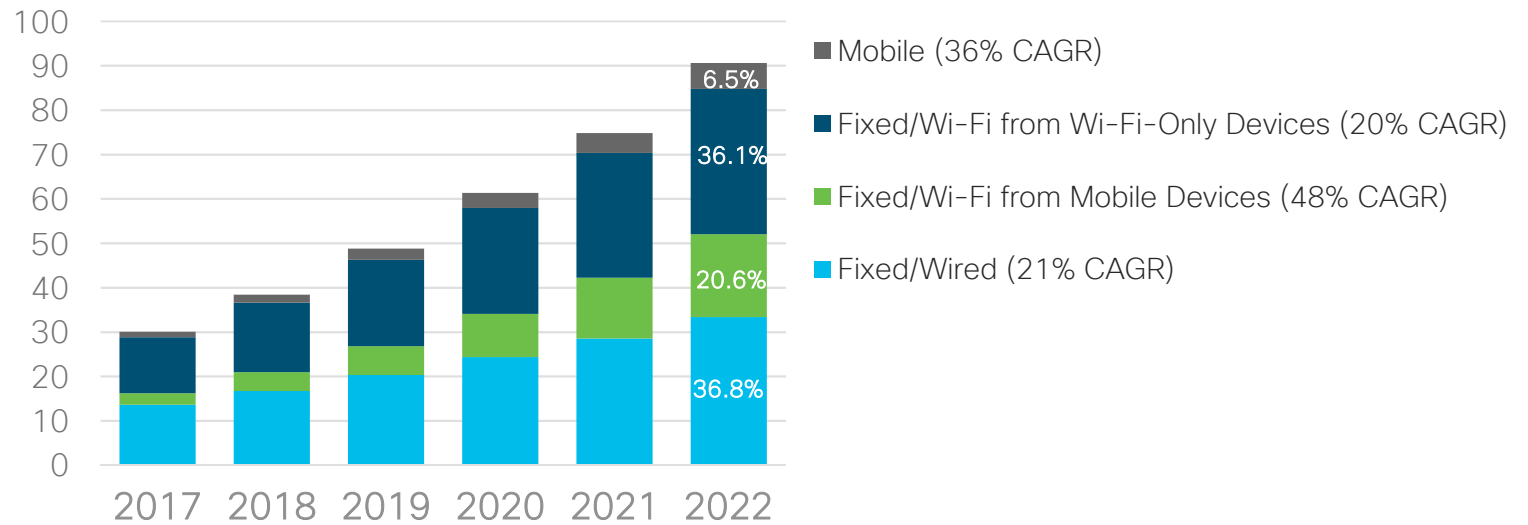
Mobile (36% CAGR)

Fixed/Wi-Fi from Wi-Fi-Only Devices (20% CAGR)

Fixed/Wi-Fi from Mobile Devices (48% CAGR)

Fixed/Wired (21% CAGR)

6.5%
36.1%
20.6%
36.8%

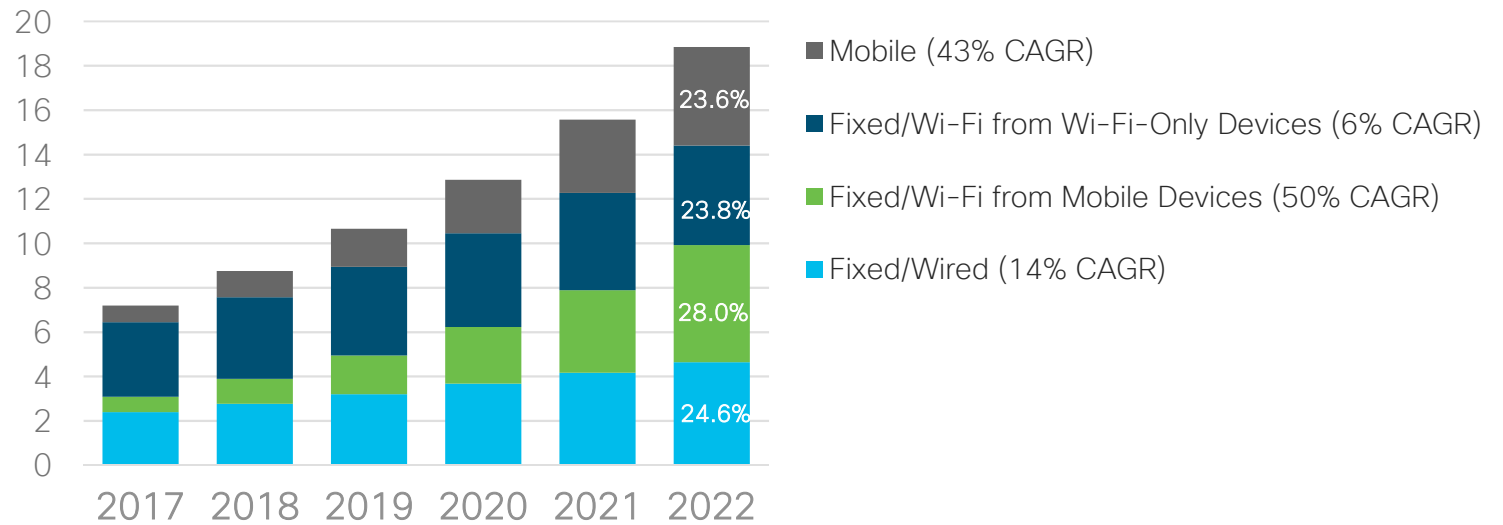|	2017	2018	2019	2020	2021	2022

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

LATAM Internet Traffic by Local Access Technology
By 2022, 84% of total Internet traffic will be wireless*

17% CAGR
2017–2022

Exabytes per Month
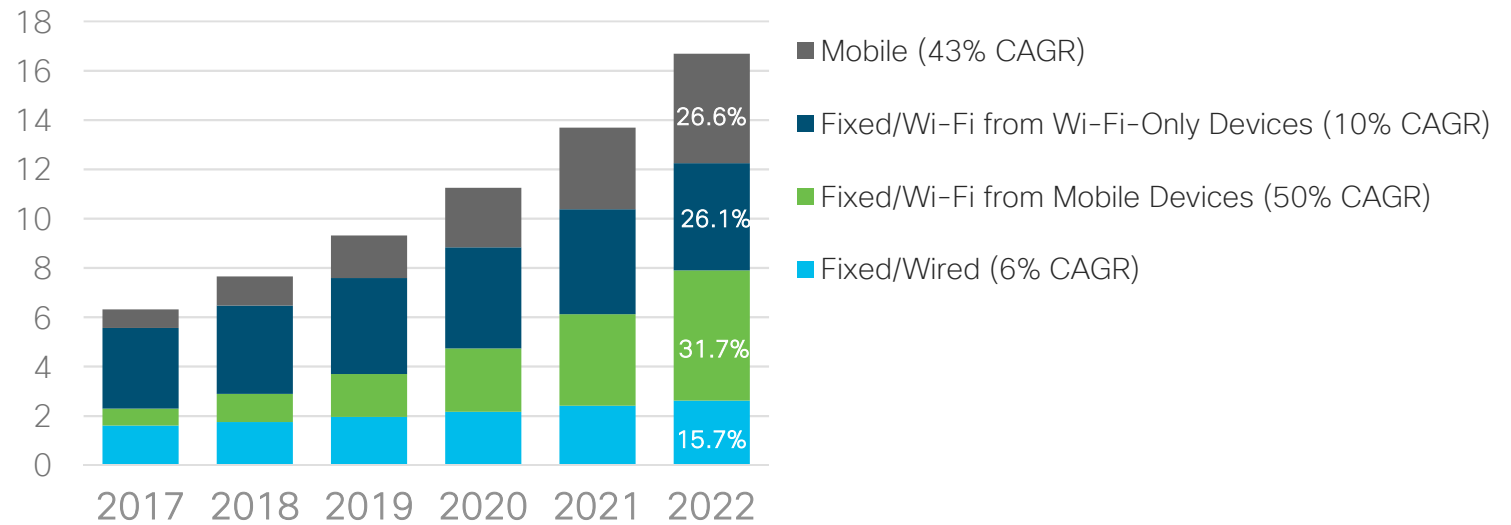
Chart axis values: 18, 16, 14, 12, 10, 8, 6, 4, 2, 0

Years: 2017, 2018, 2019, 2020, 2021, 2022

2022 bar labels: 26.6%, 26.1%, 31.7%, 15.7%

Legend:
- Mobile (43% CAGR)
- Fixed/Wi-Fi from Wi-Fi-Only Devices (10% CAGR)
- Fixed/Wi-Fi from Mobile Devices (50% CAGR)
- Fixed/Wired (6% CAGR)
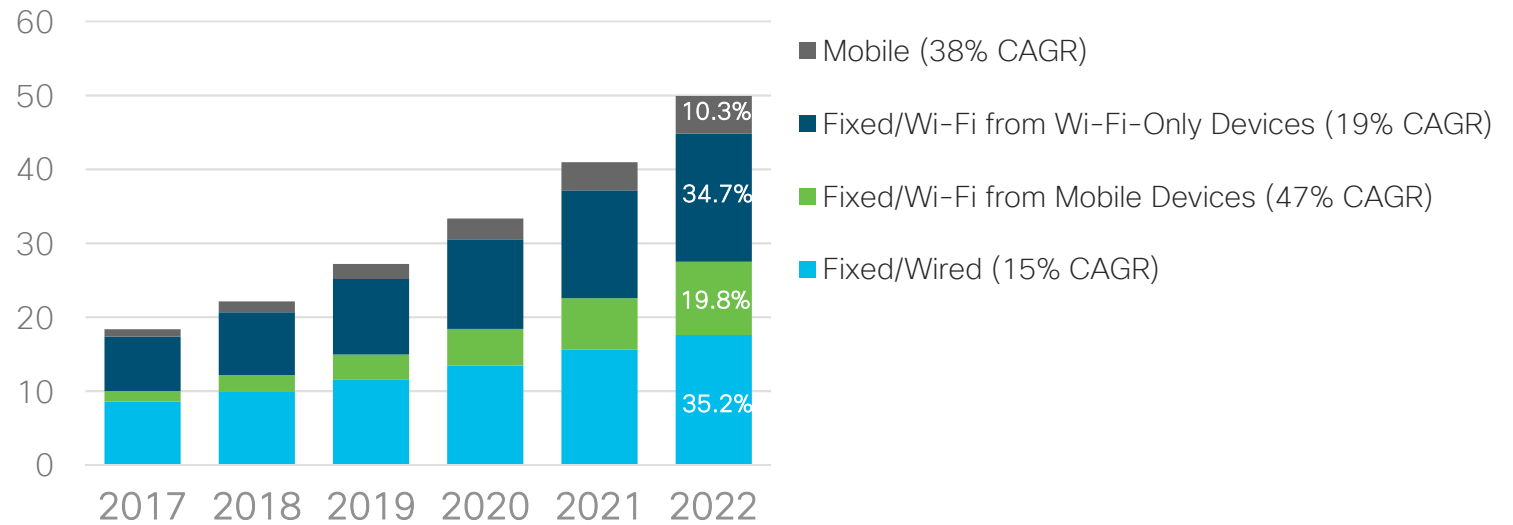
* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

WE Internet Traffic by Local Access Technology
By 2022, 70% of total Internet traffic will be wireless*

22% CAGR
2017–2022

Exabytes
per Month
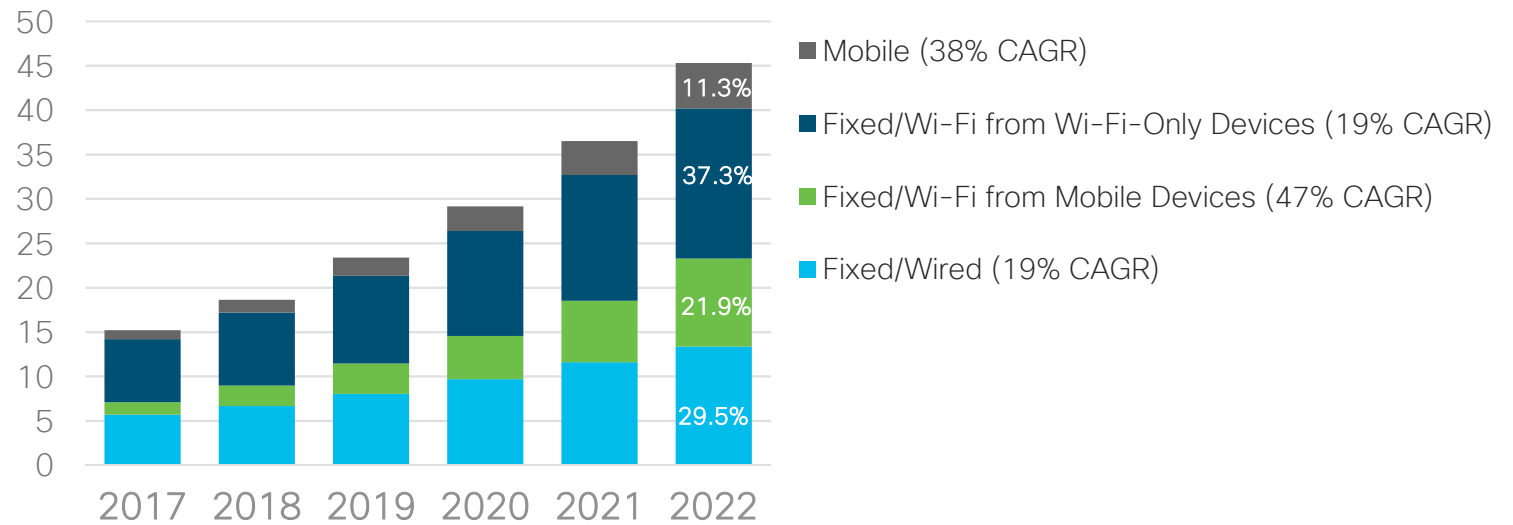
Mobile (38% CAGR)

Fixed/Wi-Fi from Wi-Fi-Only Devices (19% CAGR)

Fixed/Wi-Fi from Mobile Devices (47% CAGR)

Fixed/Wired (19% CAGR)

11.3%

37.3%

21.9%

29.5%

2017   2018   2019   2020   2021   2022
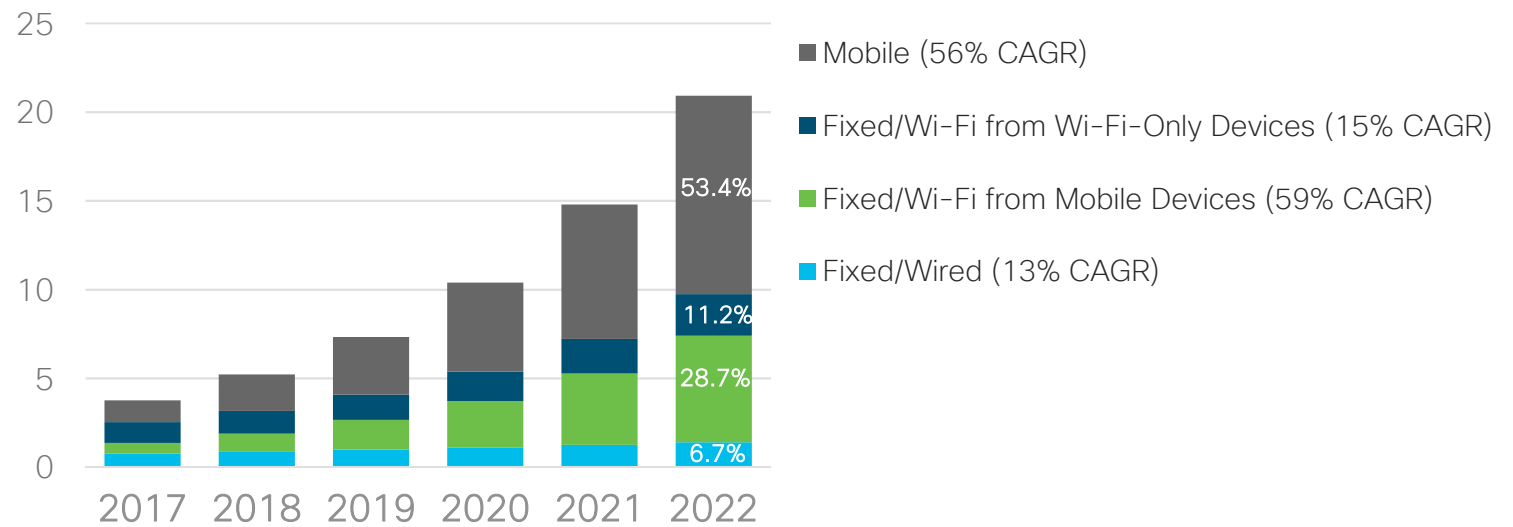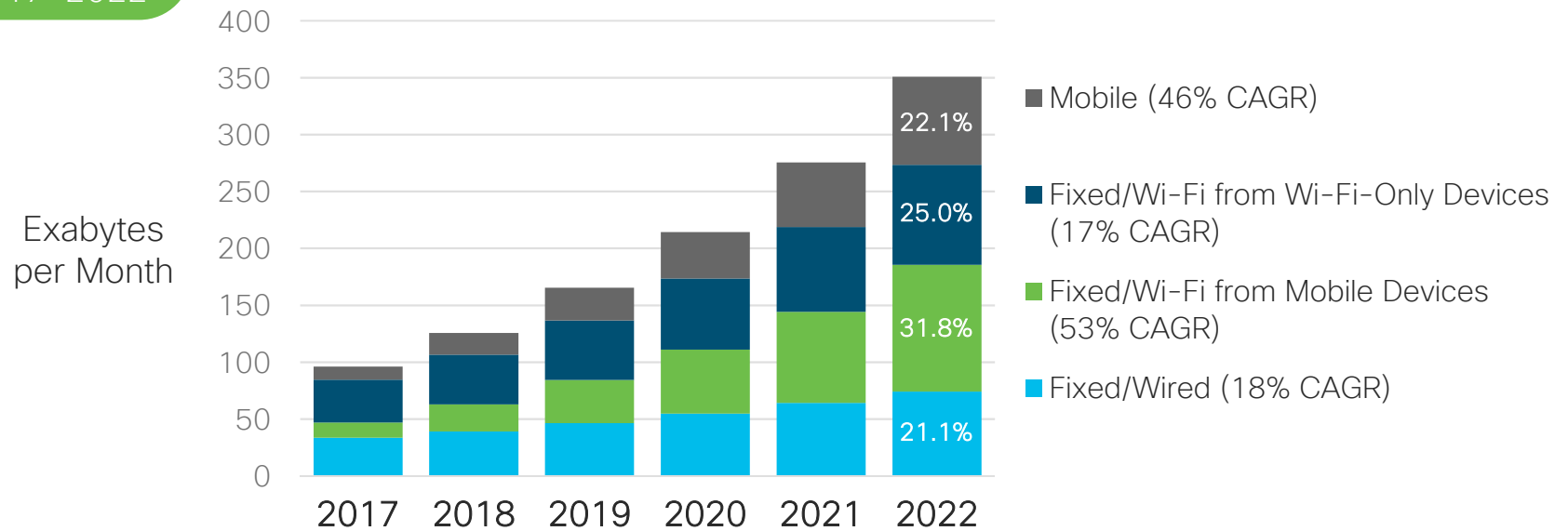
* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

MEA Internet Traffic by Local Access Technology
By 2022, 95% of total Internet traffic will be wireless*

42% CAGR
2017–2022

Exabytes
per Month
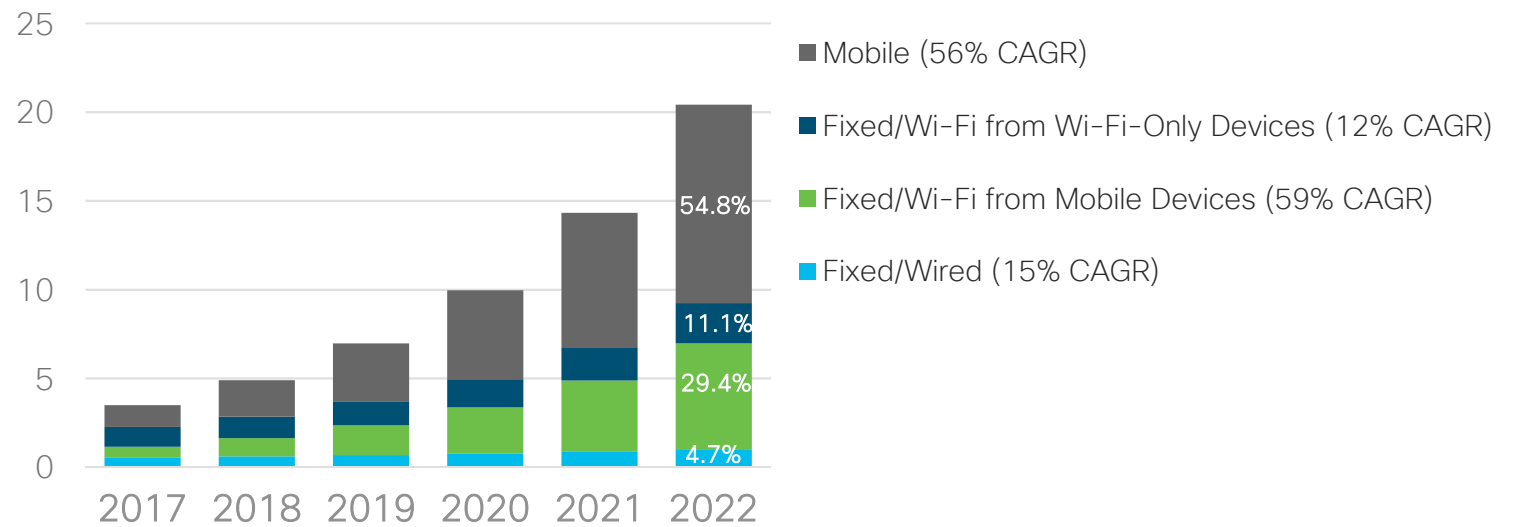
25

20

15

10

5

0

2017 2018 2019 2020 2021 2022

■ Mobile (56% CAGR)

■ Fixed/Wi-Fi from Wi-Fi-Only Devices (12% CAGR)

■ Fixed/Wi-Fi from Mobile Devices (59% CAGR)

■ Fixed/Wired (15% CAGR)

54.8%

11.1%

29.4%

4.7%

* Wireless traffic includes Wi-Fi and mobile

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Top Trends

Devices & Connections

❶ Devices/Connections Mix

❷ IoT/M2M by Verticals

❸ IPv6 Adoption

Traffic Trends

❹ Traffic Growth by App

❺ Traffic Pattern Analysis

❻ "Cord-Cutting"

Network Performance and User Experience

❼ Wi-Fi Momentum

❽ Accelerating Speeds

❾ Security Analysis

Global Average Fixed Broadband Speeds
Doubling in speeds from 2017–2022

In Mbps	2017	2022
GLOBAL		
Global	39.0	75.4
BY REGION		
Asia Pacific	46.2	98.8
Latin America	11.7	28.1
North America	43.2	94.2
Western Europe	37.9	76.0
Central and Eastern Europe	32.8	46.7
Middle East & Africa	7.8	20.2

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Faster Networks Enable Better Experiences

10 Mbps	25 Mbps	100 Mbps	1 Gbps

95% of all broadband connections by 2022

79% of all broadband connections by 2022

24% of all broadband connections by 2022

Futuristic

Online Video
(HD movie download)
22 minutes

Online Video
(HD movie download)
9 minutes

Online Video
(HD movie download)
2 minutes

Online Video
(HD movie download)
1.2 ms

(UHD movie download)
2 hours

(UHD movie download)
48 minutes

(UHD movie download)
12 minutes

(UHD movie download)
7.2 ms

NA Faster Networks Enable Better Experiences

10 Mbps	25 Mbps	100 Mbps	1 Gbps
95% of all broadband connections by 2022	**88%** of all broadband connections by 2022	**36%** of all broadband connections by 2022	**Futuristic**
Online Video (HD movie download) **22** minutes	Online Video (HD movie download) **9** minutes	Online Video (HD movie download) **2** minutes	Online Video (HD movie download) **1.2** ms
(UHD movie download) **2** hours	(UHD movie download) **48** minutes	(UHD movie download) **12** minutes	(UHD movie download) **7.2** ms

LATAM Faster Networks Enable Better Experiences

10 Mbps	25 Mbps	100 Mbps	1 Gbps
72% of all broadband connections by 2022	**36%** of all broadband connections by 2022	**1%** of all broadband connections by 2022	**Futuristic**
Online Video (HD movie download) **22** minutes	Online Video (HD movie download) **9** minutes	Online Video (HD movie download) **2** minutes	Online Video (HD movie download) **1.2** ms
(UHD movie download) **2** hours	(UHD movie download) **48** minutes	(UHD movie download) **12** minutes	(UHD movie download) **7.2** ms

WE Faster Networks Enable Better Experiences

10 Mbps	25 Mbps	100 Mbps	1 Gbps
90% of all broadband connections by 2022	**72%** of all broadband connections by 2022	**19%** of all broadband connections by 2022	**Futuristic**
Online Video (HD movie download) **22** minutes	Online Video (HD movie download) **9** minutes	Online Video (HD movie download) **2** minutes	Online Video (HD movie download) **1.2** ms
(UHD movie download) **2** hours	(UHD movie download) **48** minutes	(UHD movie download) **12** minutes	(UHD movie download) **7.2** ms

MEA Faster Networks Enable Better Experiences

10 Mbps	25 Mbps	100 Mbps	1 Gbps

45% of all broadband connections by 2022

Online Video
(HD movie download)
22 minutes

(UHD movie download)
2 hours

14% of all broadband connections by 2022

Online Video
(HD movie download)
9 minutes

(UHD movie download)
48 minutes

4% of all broadband connections by 2022

Online Video
(HD movie download)
2 minutes

(UHD movie download)
12 minutes

Futuristic

Online Video
(HD movie download)
1.2 ms

(UHD movie download)
7.2 ms

Video in the Home of Today and the Future
Significant demand for video in the home of the future

Today

Future

2 8 8 16 17
51
100
167
500

- ■ HD Camera
- ■ IP Video
- ■ 2 UHD Cameras
- ■ UHD Streaming
- ■ VR
- ■ UHD IP Video
- ■ 8K Wall TV
- ■ HD VR
- ■ UHD VR

Today

Future

Application requirements In Mbps

Global Average Wi-Fi Speeds
Wi-Fi speeds double from 2017–2022

In Mbps	2017	2022
GLOBAL		
Global	24.4	54.2
BY REGION		
Asia Pacific	26.7	63.3
Latin America	9.0	16.8
North America	37.1	83.8
Western Europe	25.0	49.5
Central and Eastern Europe	19.5	32.8
Middle East & Africa	6.2	11.2

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

Global Average Cellular Speeds
Mobile/Cellular speeds double from 2017–2022

In Mbps	2017	2022
GLOBAL		
Global	8.7	28.5
BY REGION		
Asia Pacific	10.6	28.8
Latin America	4.9	17.7
North America	16.3	42.0
Western Europe	16.0	50.5
Central and Eastern Europe	10.1	26.2
Middle East & Africa	4.4	15.3

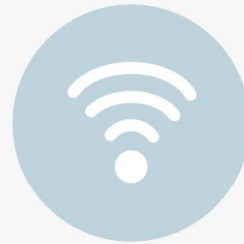Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

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DDoS Attack Size and Traffic Increasing

Peak attack size increased 174% Y/Y.*

DDoS attacks can represent up to 25% of a country's total Internet traffic while they are occurring.

Average DDoS attack size between 1-2 Gbps increased 37% Y/Y which is faster than Internet traffic at 33% Y/Y.
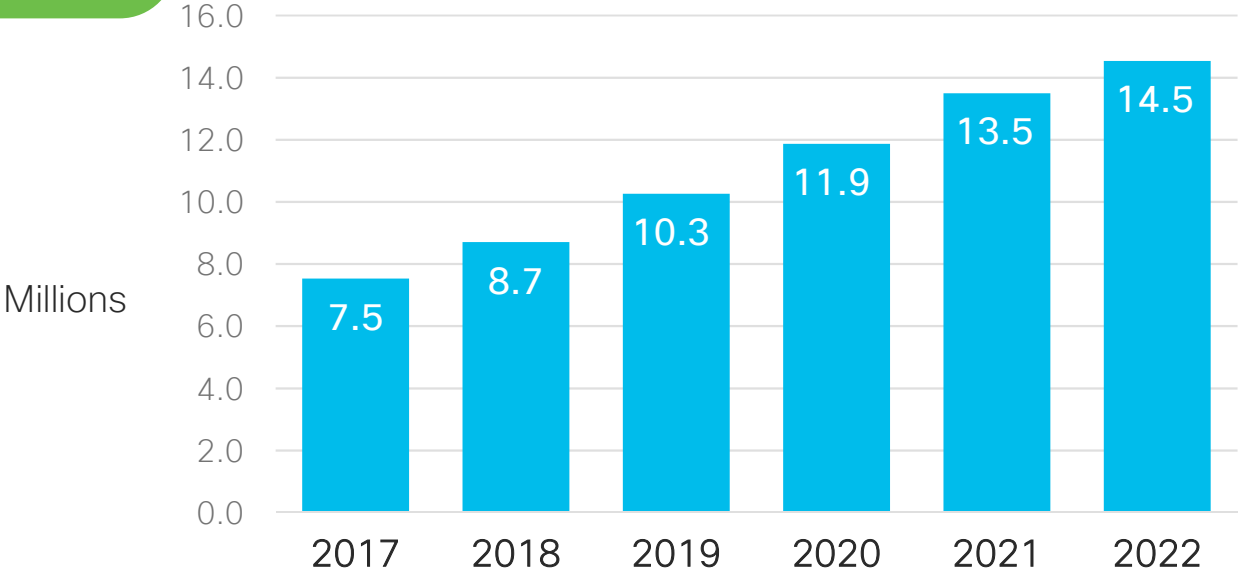
* 1H2017– 1H2018

Source: Arbor Networks, Cisco VNI Global IP Traffic Forecast, 2017–2022

Number of DDoS Attacks
Attacks will double to 14.5 million by 2022 globally

14% CAGR
2017–2022

Millions

Year	Value
2017	7.5
2018	8.7
2019	10.3
2020	11.9
2021	13.5
2022	14.5

Source: Cisco VNI Global IP Traffic Forecast, 2017–2022

39,554 Records Exposed per Breach

Total Breaches: 864 | Records Exposed: 34.2 Million

Highest in Business: 46.8% | Highest in Business: 63.7%

Source: 2018 Identity Theft Resource Center

Accessing Cisco VNI Forecast Resources

Complete VNI Forecast: http://www.cisco.com/go/vni

- Press Release

- White Paper / FAQ

- Cisco VNI Web-based Tools

SalesConnect: https://salesconnect.cisco.com/#/program/PAGE-10578
Cisco VNI Forecast Inquiries: traffic-inquiries@cisco.com
Cisco VNI/ GCI Community: https://cisco.com/go/discussions-vni-gci