Global Mobile Data Drivers

Mobile Momentum Metrics

By 2022

2017

5.0 Billion

8.6 Billion

8.7 Mbps

59% of Traffic

2022

5.7 Billion

12.3 Billion

28.5 Mbps

79% of Traffic

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Mobile Data Drivers

Mobile Momentum Metrics

By 2022

2017

More Mobile Users: 307 Million
More Mobile Connections: 539 Million
Faster Mobile Speeds: 16.3 Mbps
More Mobile Video: 64% of Traffic

2022

More Mobile Users: 327 Million
More Mobile Connections: 1.1 Billion
Faster Mobile Speeds: 42.0 Mbps
More Mobile Video: 80% of Traffic

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Latin America Mobile Data Drivers

Mobile Momentum Metrics

By 2022

2017

More Mobile Users: 480 Million
More Mobile Connections: 748 Million
Faster Mobile Speeds: 4.9 Mbps
More Mobile Video: 60% of Traffic

2022

More Mobile Users: 519 Million
More Mobile Connections: 967 Million
Faster Mobile Speeds: 17.7 Mbps
More Mobile Video: 79% of Traffic

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Western Europe Mobile Data Drivers

Mobile Momentum Metrics

By 2022

<table>
<thead>
<tr>
<th></th>
<th>More Mobile Users</th>
<th>More Mobile Connections</th>
<th>Faster Mobile Speeds</th>
<th>More Mobile Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>357 Million</td>
<td>671 Million</td>
<td>16.0 Mbps</td>
<td>61% of Traffic</td>
</tr>
<tr>
<td>2022</td>
<td>366 Million</td>
<td>1.2 Billion</td>
<td>50.5 Mbps</td>
<td>80% of Traffic</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Approaching the Mobile Zettabyte Era
By 2022, annual global mobile data will nearly reach the zettabyte milestone

By 2022, global mobile data traffic will reach an annual run rate of 930 exabytes per year

What is a zettabyte?
- One trillion gigabytes
- Approximately $10^{21}$ (1,000,000,000,000,000,000 bytes)

930 exabytes is equal to:
- Nearly 113X more than mobile traffic generated in 2012 (8.2 exabytes)
- All movies ever made crossing global mobile networks every 5 minutes

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Data Traffic Growth
Global mobile data traffic will increase 7-fold from 2017 to 2022

46% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Data Traffic Forecast Accuracy

Actual growth has been within ±10% of projected growth

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Data Traffic Growth by Region

MEA has the highest growth rate (56%) from 2017 to 2022

APAC will generate 56% of all mobile data traffic by 2022

46% CAGR 2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Average Mobile User and Connection
Cellular Traffic per Month

Average Traffic per User
- 2017: 2.3 GB per month
- 2022: 13.3 GB per month

Average Traffic per Connection
- 2017: 1.3 GB per month
- 2022: 6.3 GB per month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Average Mobile User and Connection
Cellular Traffic per Month

<table>
<thead>
<tr>
<th>Average Traffic per User</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 GB per month</td>
<td>17.0 GB per month</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Traffic per Connection</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3 GB per month</td>
<td>5.1 GB per month</td>
<td></td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Latin America Average Mobile User and Connection
Cellular Traffic per Month

Average Traffic per User
- 2017: 1.5 GB per month
- 2022: 8.3 GB per month

Average Traffic per Connection
- 2017: 1.0 GB per month
- 2022: 4.6 GB per month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Western Europe Average Mobile User and Connection
Cellular Traffic per Month

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Traffic per User</th>
<th>Average Traffic per Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>2.7 GB per month</td>
<td>1.5 GB per month</td>
</tr>
<tr>
<td>2022</td>
<td>13.1 GB per month</td>
<td>4.4 GB per month</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017~2022
Top Trends
VNI Mobile Forecast Update, 2017–2022
Top Mobile Networking Trends

1. Evolving Toward Smarter Multimedia Mobile Devices
3. Measuring Mobile IoT Adoption—M2M and Emerging Wearables
4. Identifying New Mobile Applications and Requirements
5. Comparing Mobile Network Speed Improvements
6. Analyzing the Expanding Role and Coverage of Wi-Fi
7. Reviewing Tiered Pricing—Unlimited Data and Shared Plans

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Device Growth
By 2022, smartphones* will exceed 50% share of total mobile devices/connections

7% CAGR
2017–2022

Billions of Devices

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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

* Smartphone category including phablets

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North America Mobile Device Growth
By 2022, M2M will exceed 60% share of total mobile devices/connections

16% CAGR
2017–2022

Billions of Devices

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2017, 2022 device share
Latin America Mobile Device Growth
By 2022, smartphones* will exceed 60% share of total mobile devices/connections

5% CAGR 2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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

* Smartphone category including phablets

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Western Europe Mobile Device Growth
By 2022, M2M will exceed 50% share of total mobile devices/connections

12% CAGR
2017–2022

12% CAGR 2017–2022

Billions of Devices

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

© 2019 Cisco and/or its affiliates. All rights reserved. Cisco Public
Global Average Cellular Traffic Per Mobile Device

<table>
<thead>
<tr>
<th>Device</th>
<th>2017 MBs per Month</th>
<th>2022 MBs per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-smartphone</td>
<td>50</td>
<td>224</td>
</tr>
<tr>
<td>M2M Module</td>
<td>216</td>
<td>448</td>
</tr>
<tr>
<td>Smartphone</td>
<td>2,336</td>
<td>10,697</td>
</tr>
<tr>
<td>Tablet</td>
<td>3,023</td>
<td>6,777</td>
</tr>
<tr>
<td>Laptop/PC</td>
<td>3,648</td>
<td>6,904</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Average Cellular Traffic Per Mobile Device

<table>
<thead>
<tr>
<th>Device Type</th>
<th>2017 MBs per Month</th>
<th>2022 MBs per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-smartphone</td>
<td>59</td>
<td>206</td>
</tr>
<tr>
<td>M2M Module</td>
<td>252</td>
<td>386</td>
</tr>
<tr>
<td>Smartphone</td>
<td>3,760</td>
<td>14,400</td>
</tr>
<tr>
<td>Tablet</td>
<td>3,460</td>
<td>8,310</td>
</tr>
<tr>
<td>Laptop/PC</td>
<td>4,130</td>
<td>7,560</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM Average Cellular Traffic Per Mobile Device

<table>
<thead>
<tr>
<th>Device</th>
<th>2017 MBs per Month</th>
<th>2022 MBs per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-smartphone</td>
<td>17</td>
<td>51</td>
</tr>
<tr>
<td>M2M Module</td>
<td>175</td>
<td>484</td>
</tr>
<tr>
<td>Smartphone</td>
<td>1,590</td>
<td>6,440</td>
</tr>
<tr>
<td>Tablet</td>
<td>3,170</td>
<td>6,440</td>
</tr>
<tr>
<td>Laptop/PC</td>
<td>3,990</td>
<td>8,580</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
## WE Average Cellular Traffic Per Mobile Device

<table>
<thead>
<tr>
<th>Device</th>
<th>2017 (MBs per Month)</th>
<th>2022 (MBs per Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-smartphone</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>M2M Module</td>
<td>273</td>
<td>505</td>
</tr>
<tr>
<td>Smartphone</td>
<td>2,310</td>
<td>9,790</td>
</tr>
<tr>
<td>Tablet</td>
<td>2,170</td>
<td>6,050</td>
</tr>
<tr>
<td>Laptop/PC</td>
<td>2,930</td>
<td>5,480</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Traffic Growth by Device
By 2022, smartphones will exceed 90% share of total mobile data traffic

46% CAGR
2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2017, 2022 traffic share
North America Mobile Traffic Growth by Device
By 2022, smartphones will exceed 85% share of total mobile data traffic

36% CAGR
2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM Mobile Traffic Growth by Device
By 2022, smartphones will reach nearly 90% share of total mobile data traffic

43% CAGR
2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2017, 2022 traffic share
Western Europe Mobile Traffic Growth by Device

By 2022, smartphones will exceed 85% share of total mobile data traffic

38% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2017, 2022 traffic share
Globally, in 2017, a smart device generated 10 times more traffic than a non-smart device.

* Smart devices have advanced multimedia/computing capabilities and a minimum of 3G connectivity

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, 94% of mobile smartphones and tablets will be IPv6-capable.
NA IPv6-Capable Smartphones and Tablets
By 2022, 99% of mobile smartphones and tablets will be IPv6-capable

7% CAGR
2017–2022

Millions of Devices

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM IPv6-Capable Smartphones and Tablets

By 2022, 93% of mobile smartphones and tablets will be IPv6-capable

13% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE IPv6–Capable Smartphones and Tablets
By 2022, 99% of mobile smartphones and tablets will be IPv6–capable

7% CAGR
2017–2022

Millions of Devices

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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Global IPv6-Capable Mobile Devices/Connections
By 2022, 76% of all mobile devices/connections will be IPv6-capable

18% CAGR
2017–2022

Billions of Devices

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
NA IPv6–Capable Mobile Devices/Connections

By 2022, 92% of all mobile devices/connections will be IPv6–capable

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

20% CAGR
2017–2022

Billions of Devices

<table>
<thead>
<tr>
<th>Year</th>
<th>Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>0.4</td>
</tr>
<tr>
<td>2018</td>
<td>0.5</td>
</tr>
<tr>
<td>2019</td>
<td>0.6</td>
</tr>
<tr>
<td>2020</td>
<td>0.7</td>
</tr>
<tr>
<td>2021</td>
<td>0.9</td>
</tr>
<tr>
<td>2022</td>
<td>1.1</td>
</tr>
</tbody>
</table>
LATAM IPv6-Capable Mobile Devices/Connections
By 2022, 83% of all mobile devices/connections will be IPv6-capable

16% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE IPv6-Capable Mobile Devices/Connections
By 2022, 81% of all mobile devices/connections will be IPv6-capable

15% CAGR 2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global IPv6 Mobile Data Traffic
By 2022, IPv6 mobile traffic will generate 57% of the total mobile data traffic

92% CAGR
2017–2022

Exabytes per month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
NA IPv6 Mobile Data Traffic
By 2022, IPv6 mobile traffic will generate 62% of the total mobile data traffic

73% CAGR
2017–2022

Exabytes per month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM IPv6 Mobile Data Traffic
By 2022, IPv6 mobile traffic will generate 55% of the total mobile data traffic

85% CAGR
2017–2022

Exabytes per month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE IPv6 Mobile Data Traffic
By 2022, IPv6 mobile traffic will generate 60% of the total mobile data traffic

76% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
VNI Mobile Forecast Update, 2017–2022
Top Mobile Networking Trends

1. Evolving Toward Smarter Multimedia Mobile Devices
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6. Analyzing the Expanding Role and Coverage of Wi–Fi
7. Reviewing Tiered Pricing—Unlimited Data and Shared Plans

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Connections by Network Type

By 2022, 5G impact starts to emerge

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

Note: This view includes M2M. LPWA includes cellular LPWA (e.g., NB-IOT) and non-cellular LPWA (e.g., LORA)

* Figures (n) refer to 2017, 2022 network connection type share
North America Mobile Connections by Network Type
By 2022, 5G impact starts to emerge

Note: This view includes M2M. LPWA includes cellular LPWA (e.g., NB-IOT) and non-cellular LPWA (e.g., LORA)

* Figures (n) refer to 2017, 2022 network connection type share

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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LATAM Mobile Connections by Network Type

By 2022, 5G impact still nascent

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

Note: This view includes M2M. LPWA includes cellular LPWA (e.g., NB-IOT) and non-cellular LPWA (e.g., LORA)

* Figures (n) refer to 2017, 2022 network connection type share
WE Mobile Connections by Network Type
By 2022, 5G impact starts to emerge

![Graph showing mobile connections by network type from 2017 to 2022]

- **Billions of Devices or Connections**
- **Source:** Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

**Note:** This view includes M2M. LPWA includes cellular LPWA (e.g., NB-IOT) and non-cellular LPWA (e.g., LORA)

*Figures (n) refer to 2017, 2022 network connection type share*
## LPWA vs. 5G: Comparative IoT Capabilities

<table>
<thead>
<tr>
<th>LPWA</th>
<th>5G</th>
</tr>
</thead>
<tbody>
<tr>
<td>A highly efficient narrowband solution, purpose-built for low-end IoT</td>
<td>A highly flexible broadband solution, suitable for low- and high-end IoT</td>
</tr>
<tr>
<td>• Power efficient</td>
<td>• Power efficient</td>
</tr>
<tr>
<td>• Low device cost</td>
<td>• Cost optimized</td>
</tr>
<tr>
<td>• Small, intermittent amounts of data over long distances</td>
<td>• Massive IoT connection density</td>
</tr>
<tr>
<td>• Latency tolerant</td>
<td>• High bandwidth &amp; ultra-low latency</td>
</tr>
<tr>
<td>• Dynamic resource allocation per app</td>
<td></td>
</tr>
</tbody>
</table>

*Note: LPWA includes cellular LPWA (e.g., NB-IoT) and non-cellular LPWA (e.g., LORA)*

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
5G IoT Applications by Category
Diverse scale, network requirements, experience and business value

- Critical Communications
  - Autonomous Vehicles
  - Smart Grid
  - Factory Automation

- Enhanced Mobile
  - Broadband
  - Immersive Video
  - Augmented Reality
  - 3D Video

- Massive IoT
  - Smart Cities
  - Smart Grid
  - Smart Metering

Source: GSMA
## Mobile Connections by Network Type
### 2022 - Regional share

<table>
<thead>
<tr>
<th>% Share</th>
<th>2G</th>
<th>3G</th>
<th>4G</th>
<th>5G</th>
<th>LPWA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GLOBAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td>8</td>
<td>20</td>
<td>54</td>
<td>3.4</td>
<td>14</td>
</tr>
<tr>
<td><strong>BY REGION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North America</td>
<td>0</td>
<td>2</td>
<td>51</td>
<td>8.9</td>
<td>37</td>
</tr>
<tr>
<td>Western Europe</td>
<td>3</td>
<td>5</td>
<td>58</td>
<td>6.4</td>
<td>27</td>
</tr>
<tr>
<td>Central and Eastern Europe</td>
<td>3</td>
<td>18</td>
<td>63</td>
<td>0.5</td>
<td>16</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>9</td>
<td>15</td>
<td>61</td>
<td>3.6</td>
<td>11</td>
</tr>
<tr>
<td>Latin America</td>
<td>8</td>
<td>27</td>
<td>58</td>
<td>1.0</td>
<td>6</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td>20</td>
<td>54</td>
<td>23</td>
<td>0.2</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Traffic by Network Type
By 2022, 5G will carry 12% of mobile data traffic

* Figures (n) refer to 2017, 2022 network type share of traffic
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Mobile Traffic by Network Type

By 2022, 5G will carry nearly 40% of mobile data traffic

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

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM Mobile Traffic by Network Type
By 2022, 5G will carry nearly 4% of mobile data traffic

* Figures (n) refer to 2017, 2022 network type share of traffic
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE Mobile Traffic by Network Type
By 2022, 5G will carry over 20% of mobile data traffic

Exabytes per Month

<table>
<thead>
<tr>
<th>Year</th>
<th>2G (2%,0%)</th>
<th>3G (24%,3%)</th>
<th>4G (74%,74%)</th>
<th>5G (0%,23%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>0.0</td>
<td>0.3</td>
<td>4.4</td>
<td>0.0</td>
</tr>
<tr>
<td>2018</td>
<td>0.0</td>
<td>0.3</td>
<td>4.6</td>
<td>0.1</td>
</tr>
<tr>
<td>2019</td>
<td>0.0</td>
<td>0.3</td>
<td>4.8</td>
<td>0.2</td>
</tr>
<tr>
<td>2020</td>
<td>0.0</td>
<td>0.3</td>
<td>5.0</td>
<td>0.3</td>
</tr>
<tr>
<td>2021</td>
<td>0.0</td>
<td>0.3</td>
<td>5.3</td>
<td>0.4</td>
</tr>
<tr>
<td>2022</td>
<td>0.0</td>
<td>0.3</td>
<td>5.6</td>
<td>0.5</td>
</tr>
</tbody>
</table>

* Figures (n) refer to 2017, 2022 network type share of traffic
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, **5G connections and devices** will be 3% of global mobile devices and connections and will account for **12% (9.2 EBs/month)** of mobile data traffic.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Globally, in 2017, a 4G connection generated 2.8 GB/month, nearly 3X more than a 3G connection (949 MB/month).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, a 5G connection will generate 22 GB/mo, nearly 3X more than a 4G connection (8.2 GB/month).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
VNI Mobile Forecast Update, 2017–2022
Top Mobile Networking Trends

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5. Comparing Mobile Network Speed Improvements
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7. Reviewing Tiered Pricing—Unlimited Data and Shared Plans

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global M2M Connections Growth
M2M Connections will grow 4-fold from 2017 to 2022

32% CAGR
2017–2022

Billions of Connections

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America M2M Connections Growth
M2M Connections will grow 5-fold from 2017 to 2022

36% CAGR
2017–2022

Millions of Connections

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM M2M Connections Growth
M2M Connections will grow 3-fold from 2017 to 2022

28% CAGR
2017–2022

Millions of Connections

<table>
<thead>
<tr>
<th>Year</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>68</td>
</tr>
<tr>
<td>2018</td>
<td>89</td>
</tr>
<tr>
<td>2019</td>
<td>114</td>
</tr>
<tr>
<td>2020</td>
<td>145</td>
</tr>
<tr>
<td>2021</td>
<td>185</td>
</tr>
<tr>
<td>2022</td>
<td>234</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE M2M Connections Growth
M2M Connections will grow 4-fold from 2017 to 2022

31% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile M2M Connections Growth
North America has the highest growth rate (36%) from 2017 to 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile M2M Traffic Growth

M2M traffic will grow 8-fold from 2017 to 2022
Central & Eastern Europe will have the highest growth (10-fold)

52% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, **M2M modules** will be 31% of total global mobile devices and connections and will account for 2% (1.7 EBs/month) of mobile data traffic.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, M2M modules will be 63% of total North America mobile devices and connections and will account for 5% (279 PBs/month) of mobile data traffic.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, **M2M modules** will be 24% of total Latin America mobile devices and connections and will account for 3% (113 PBs/month) of mobile data traffic.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, M2M modules will be 55% of total Western Europe mobile devices and connections and will account for 6% (324 PBs/month) of mobile data traffic.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
<table>
<thead>
<tr>
<th>Connected Home</th>
<th>Connected Work</th>
<th>Connected Car</th>
<th>Connected Cities</th>
<th>Retail</th>
<th>Other</th>
</tr>
</thead>
</table>
| • Home automation  
  • Building security  
  • Network equipment – printers +  
  • Network infrastructure – routers +  
  • White goods  
  • Tracking applications  
  • Household information devices | • Office building automation  
  • Building security  
  • Office equipment – printers +  
  • Routers +  
  • Commercial appliances | • Fleet management  
  • In-vehicle entertainment systems, emergency calling, Internet  
  • Vehicle diagnostics, navigation  
  • Stolen vehicle recovery  
  • Lease, rental, insurance management | • Environment and public safety – closed-circuit TV, street lighting, waste removal, information +  
  • Public space advertising  
  • Public transport  
  • Road traffic management | • Retail goods monitoring and payment  
  • Retail venue access and control  
  • Slot machines, vending machines | • Agriculture – livestock, soil monitoring, water and resource conservation, temperature control for milk tanks +  
  • Construction: Site and equipment monitoring  
  • Emergency services and national security |
| Connected Health | Manufacturing & Supply Chain | Energy | | | |
| • Health monitors  
  • Assisted living – medicine dispensers +  
  • Clinical trials  
  • First responder connectivity  
  • Telemedicine | • Mining and extraction  
  • Manufacturing and processing  
  • Supply chain  
  • Warehousing and storage | • 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 | | | |
Global Mobile M2M / IoT Growth by Vertical

By 2022, connected home largest, connected health fastest growth

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Mobile M2M / IoT Growth by Vertical
By 2022, connected home most connections, connected cities fastest growth

36% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM Mobile M2M / IoT Growth by Vertical
By 2022, connected home most connections, manufacturing & supply chain fastest growth

28% CAGR
2017–2022

Millions of M2M Connections

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE Mobile M2M / IoT Growth by Vertical

By 2022, connected home most connections, connected health fastest growth

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Connected Wearable Devices
Global connected wearables will grow 2-fold from 2017–2022; By 2022, nearly 10% of wearables will have embedded cellular connectivity

16% CAGR
2017–2022

% with Embedded Cellular Connectivity

Millions of Connected Wearables

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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North America Connected Wearable Devices

NA connected wearables will grow 2-fold from 2017–2022; By 2022, nearly 9% of wearables will have embedded cellular connectivity

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
LATAM Connected Wearable Devices
LATAM connected wearables will grow nearly 3-fold from 2017–2022; By 2022, over 13% of wearables will have embedded cellular connectivity

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
WE Connected Wearable Devices

WE connected wearables will grow 2-fold from 2017–2022; By 2022, over 9% of wearables will have embedded cellular connectivity

17% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Regional Connected Wearables
North America will maintain the largest share

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16% CAGR
2017–2022

Billions of Connections

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, 10% of total wearables globally will have embedded cellular connectivity.

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
VNI Mobile Forecast Update, 2017–2022
Top Mobile Networking Trends

1. Evolving Toward Smarter Multimedia Mobile Devices
3. Measuring Mobile IoT Adoption—M2M and Emerging Wearables
4. Identifying New Mobile Applications and Requirements
5. Comparing Mobile Network Speed Improvements
6. Analyzing the Expanding Role and Coverage of Wi-Fi
7. Reviewing Tiered Pricing—Unlimited Data and Shared Plans

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Data Traffic Growth / Apps
By 2022, mobile video will be 79% of mobile data traffic

46% CAGR
2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2017 and 2022 mobile data traffic shares

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North America Mobile Data Traffic Growth / Apps

By 2022, mobile video will be 80% of mobile data traffic

36% CAGR 2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2016 and 2021 mobile data traffic shares
LATAM Mobile Data Traffic Growth / Apps

By 2022, mobile video will be 79% of mobile data traffic

43% CAGR
2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2016 and 2021 mobile data traffic shares

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WE Mobile Data Traffic Growth / Apps
By 2022, mobile video will be 80% of mobile data traffic

By 2022, mobile video will be 80% of mobile data traffic.

38% CAGR
2017–2022

Mobile Video (61%, 80%)
Mobile Non-video (39%, 20%)

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

* Figures (n) refer to 2016 and 2021 mobile data traffic shares
Global Augmented and Virtual Reality Mobile Traffic

63% CAGR
2017–2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
VNI Mobile Forecast Update, 2017–2022
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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
## Global Average Cellular Speeds
Mobile/Cellular speeds will more than triple from 2017–2022

<table>
<thead>
<tr>
<th>Region</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GLOBAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td>8.7</td>
<td>28.5</td>
</tr>
<tr>
<td><strong>BY REGION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>10.6</td>
<td>28.8</td>
</tr>
<tr>
<td>Latin America</td>
<td>4.9</td>
<td>17.7</td>
</tr>
<tr>
<td>North America</td>
<td>16.3</td>
<td>42.0</td>
</tr>
<tr>
<td>Western Europe</td>
<td>16.0</td>
<td>50.5</td>
</tr>
<tr>
<td>Central and Eastern Europe</td>
<td>10.1</td>
<td>26.2</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td>4.4</td>
<td>15.3</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Average Wi-Fi Speeds
Wi-Fi speeds will more than double from 2017–2022

<table>
<thead>
<tr>
<th>Region</th>
<th>In Mbps</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GLOBAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global</td>
<td></td>
<td>24.4</td>
<td>54.2</td>
</tr>
<tr>
<td><strong>BY REGION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia Pacific</td>
<td></td>
<td>26.7</td>
<td>63.3</td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
<td>9.0</td>
<td>16.8</td>
</tr>
<tr>
<td>North America</td>
<td></td>
<td>37.1</td>
<td>83.8</td>
</tr>
<tr>
<td>Western Europe</td>
<td></td>
<td>25.0</td>
<td>49.5</td>
</tr>
<tr>
<td>Central and Eastern Europe</td>
<td></td>
<td>19.5</td>
<td>32.8</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td></td>
<td>6.2</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Average Speeds by Device Type
Tablet mobile speeds will be twice as fast as the average mobile speed by 2022.
Smartphone mobile speeds will be faster than average by 2022 (due to 5G).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Mobile Average Speeds by Device Type

Tablet mobile speeds twice as fast as the average mobile speed by 2022.
Smartphone mobile speeds will be faster than average by 2022 (due to 5G).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Latin America Mobile Average Speeds by Device Type
Tablet mobile speeds faster than average mobile speed by 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Western Europe Mobile Average Speeds by Device Type

Tablet mobile speeds nearly twice as fast as the average mobile speed by 2022

Smartphone mobile speeds will be faster than average by 2022 (due to 5G)

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Average Speeds by Network Type

5G speeds will reach 170 Mbps by 2022
4G speeds will be 1.5X higher than average by 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America Mobile Average Speeds by Network Type

5G speeds will reach 178 Mbps by 2022
4G speeds will be 1.7X higher than average by 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Latin America Mobile Average Speeds by Network Type

5G speeds will reach 86 Mbps by 2022
4G speeds will be 1.5X higher than average by 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Western Europe Mobile Average Speeds by Network Type

5G speeds will reach 177 Mbps by 2022
4G speeds similar to average by 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
In North America, Canada will have the highest 5G speeds by 2022 (187 Mbps*).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017-2022

* Based on 24 VNI countries
In Latin America, **Chile** will have the highest 5G speeds by 2022 (74 Mbps*).

*Based on 24 VNI countries

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
In Western Europe, **Sweden** will have the highest 5G speeds by 2022 (211 Mbps*).

*Based on 24 VNI countries*

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Mobile Speeds and Technology Evolution
New technology generations occur around every decade with more capabilities


Launch

1G (14.4 Kbps)

Voice calls
Analog
9 years

Texting
10 years

Emails
Low-Res Video
9 years

Mobile Broadband
10 years

2G (300 Kbps)

3G (42 Mbps)

4G (100+ Mbps)

5G (>1 Gbps)

IoT
Smart Cities
Connected Car
Telemedicine
VR/AR
AI/ML
Cloud Gaming

Today

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
VNI Mobile Forecast Update, 2017–2022
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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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Global IP Traffic by Local Access Technology
By 2022, 48% of total IP traffic will be driven by mobile*

* Mobile driven traffic includes mobile/cellular traffic and Wi-Fi offload from mobile

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
North America IP Traffic by Local Access Technology
By 2022, 54% of total IP traffic will be driven by mobile*

* Mobile driven traffic includes mobile/cellular traffic and Wi-Fi offload from mobile

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Latin America IP Traffic by Local Access Technology

By 2022, 75% of total IP traffic will be driven by mobile*

* Mobile driven traffic includes mobile/cellular traffic and Wi-Fi offload from mobile

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Mobile Data Traffic Offload to Wi-Fi*

59% of mobile traffic will be offloaded by 2022
54% of mobile traffic was offloaded in 2017

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022

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

76% of mobile traffic will be offloaded by 2022
67% of mobile traffic was offloaded in 2017

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

45% CAGR 2017–2022

Exabytes per Month

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Latin America Mobile Data Traffic Offload to Wi-Fi*

54% of mobile traffic will be offloaded by 2022
48% of mobile traffic was offloaded in 2017

*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, 2017–2022
Global Mobile Data Traffic and Offload Traffic, 2022

4G and 5G devices offload more traffic than 3G and 2G

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, the amount of mobile traffic offloaded to Wi-Fi networks will reach 59% (111 EBs/mo).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
## Global Wi-Fi Hotspot Coverage and Availability

<table>
<thead>
<tr>
<th>Existing</th>
<th>Growth</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pay-as-you-go</td>
<td>• Cellular offload (carrier driven)</td>
<td>• Wi-Fi Capacity trading</td>
</tr>
<tr>
<td>• Free access promoting other services (Retail free Wi-Fi)</td>
<td>• Community Wi-Fi/ homespots</td>
<td>• Transaction platform</td>
</tr>
<tr>
<td>• Managed services (venues and outdoor)</td>
<td>• Carrier-grade VoWiFi</td>
<td>• Internet of things</td>
</tr>
<tr>
<td>• Cellular offload (user promoted)</td>
<td>• TV everywhere</td>
<td>• Context awareness</td>
</tr>
<tr>
<td>• Added value for broadband subscription</td>
<td>• Large events</td>
<td>• HetNet Wi-Fi + mobile</td>
</tr>
<tr>
<td>• Advertising &amp; sponsorship</td>
<td>• Big data analytics</td>
<td>• Connected car (in-car Wi-Fi)</td>
</tr>
</tbody>
</table>

### Total Public WLAN + Community Hotspots

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>124 M</td>
<td>549 M</td>
</tr>
</tbody>
</table>

### Total Incremental Hotspots

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Global Public Wi-Fi Hotspots
Asia Pacific leads with 261 million (47%) hotspots by 2022

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
By 2022, China will have 34% of global hotspots, the most in the world (185 million).

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
The United States will have **93%** of NA hotspots, the most in the region, **77 million** by 2022.

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

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
VNI Mobile Forecast Update, 2017–2022
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Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Top Mobile User Profiles

Top 1% of mobile users generated 6% of mobile traffic in August 2018.

* Study based on North American Tier 1 and Tier 2 operators.

Top Mobile User Profiles
Top 20% users consume majority (62%) of monthly traffic

* Study based on North American Tier 1 and Tier 2 operators
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Top Mobile User Profiles
Top 20% users consume nearly 33 gigabytes per month*

* Study based on North American Tier 1 and Tier 2 operators
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Top Mobile User Profiles

31% of mobile users consume 10 GB per month
77% of mobile users consume over 2 GB per month *

Percentag e of Users (Aug 2018)

Greater than 20 GB: 15%
Greater than 10 GB: 31%
Greater than 5 GB: 53%
Greater than 2 GB: 77%
Greater than 200 MB: 97%
Greater than 20 MB: 100%

* Study based on North American Tier 1 and Tier 2 operators
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Unlimited plans continue to lead in data consumption, 4-fold higher *

* Study based on data from North American Tier 1 and Tier 2 operators

Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Data Consumption by Number of Lines per Plan/Subscription*
Average mobile data consumption per line consistent whether on shared or individual plan

* Study based on North American Tier 1 and Tier 2 operators
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Mobile Shared Data Plans Average Data Usage
Number of mobile shared data plans now a majority (76%)

Number of Lines per Plan

* Study based on to North American Tier 1 and Tier 2 operators
Source: Cisco VNI Global Mobile Data Traffic Forecast, 2017–2022
Conclusion
Cisco VNI Mobile Forecast: 2017–2022
Use our tools & resources @ www.cisco.com/go/vni

Mobile Visual Networking Index (VNI) Forecast

In February 2019, we released the Cisco Mobile VNI Forecast, 2017–2022. Highlights from the updated study include:
the following projections for 2022:

- **5.7B** Global mobile users
  - White paper: Mobile VNI Forecast and Trends, 2017-2022

- **12.3B** Mobile-ready devices and connections
  - Infographic: Mobile VNI Forecast, 2017-2022

- **930 EB** Annual run rate of mobile data traffic (in exabytes) / EB
  - Online: Mobile VNI Highlights Tool

Submit questions/comments via our public VNI community page: