Cisco Global Cloud Index
2014–2019

2015 Update

Cisco Knowledge Network (CKN) Session
Presented by: SP Thought Leadership Team / traffic-inquiries@cisco.com
November 2015
Global Cloud Index Forecast Methodology
Projecting Data Center and Cloud Traffic Growth

The methodology begins with the installed base of workloads categorized by workload type and implementation and then applies the volume of bytes per workload per month to obtain the traffic for current and future years.

Detailed methodology description and specific analyst sources included in complete GCI report
Cisco VNI and Global Cloud Index

Visual Networking Index (VNI)

A + B = 2.0 ZBs

A. Non-Data Center Traffic
   NOT included in GCI

B. Data Center-to-User Traffic
   This is the overlap between VNI and GCI

Global Cloud Index (GCI)

B + C + D = 10.4 ZBs

B. Data Center-to-User Traffic (18%)
   This is the overlap between VNI and GCI

C. Data Center-to-Data Center Traffic (9%)
   Traffic that flows from data center to data center

D. Within Data Center (73%)
   Traffic that remains within the data center

D = 7.6 ZBs
C = 0.9 ZBs
B = 1.9 ZBs
A = 0.1 ZBs
Global Data Center and Cloud Drivers

By 2019, there will be 24.4B global devices/connections (3.2 devices/connections per capita)

By 2019, data generated by IoE apps (507 ZB) will be 49X higher than total data center traffic (10.4 ZB)

By 2019, 55% of consumer Internet population (>2B users) will use cloud storage

Today, 47% of cloud sensitive data loss incidents involve confidential data

In 2015, 81 countries met the single advanced app criteria for mobile networks (21 in 2014)

In 2015, 119 countries met the single advanced app criteria for fixed networks (109 in 2014)

From 2014 –2019, total data center workloads will grow 2.5X; cloud workloads will grow 3.3X

By 2019, workload density for cloud data centers will grow to 8.4 workloads/server; compared to 3.2 for traditional data centers
# GCI Forecast Update, 2014–2019

## Top 5 Data Center/Cloud Trends

<table>
<thead>
<tr>
<th></th>
<th><strong>Growth of Global Data Center Relevance and Traffic</strong></th>
<th><strong>Continued Global Data Center / Cloud Virtualization</strong></th>
<th><strong>Cloud Service Delivery Models (IaaS, PaaS, SaaS)</strong></th>
<th><strong>Global Digitization—IoE and Big Data</strong></th>
<th><strong>Global Cloud Readiness</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Data center by traffic by destination</td>
<td>• Traditional DC vs. Cloud DC virtualization</td>
<td>• Regional* Service delivery workload analysis for Total Cloud</td>
<td>• M2M impact*</td>
<td>• Internet ubiquity</td>
</tr>
<tr>
<td></td>
<td>• Data center and cloud IP traffic growth</td>
<td>• Public vs. private cloud workloads</td>
<td>• Regional* Service delivery workload analysis for Private Cloud</td>
<td>• Potential impact of “Big Data” on global data centers</td>
<td>• Network speeds and latency analysis</td>
</tr>
<tr>
<td></td>
<td>• SDN/NFV architecture impact – wild card*</td>
<td></td>
<td>• Regional* Service delivery workload analysis for Public Cloud</td>
<td>• Data center and cloud storage analysis</td>
<td>• Security analysis*</td>
</tr>
</tbody>
</table>

*New for 2014–2019 Forecast*
Global Data Center Traffic Growth
Data Center Traffic Triples from 2014 to 2019

Global traffic increased from 3.4 zettabytes per year in 2014 to 10.4 zettabytes per year in 2019 with a compound annual growth rate (CAGR) of 25% from 2014 to 2019.

Source: Cisco Global Cloud Index, 2014–2019
Global Data Center Traffic by Region

North America to Have Highest Traffic Volume by 2019
MEA to Experience Highest Traffic Growth

<table>
<thead>
<tr>
<th>Region</th>
<th>2014 Traffic</th>
<th>2019 Traffic</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>1.5 Zettabytes</td>
<td>4.5 Zettabytes</td>
<td>25%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>648 Exabytes</td>
<td>1.9 Zettabytes</td>
<td>23%</td>
</tr>
<tr>
<td>Central &amp; Eastern Europe</td>
<td>149 Exabytes</td>
<td>523 Exabytes</td>
<td>29%</td>
</tr>
<tr>
<td>Latin America</td>
<td>163 Exabytes</td>
<td>460 Exabytes</td>
<td>23%</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td>82 Exabytes</td>
<td>328 Exabytes</td>
<td>32%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>915 Exabytes</td>
<td>2.7 Zettabytes</td>
<td>24%</td>
</tr>
</tbody>
</table>

Source: Cisco Global Cloud Index, 2014–2019
Global Data Center Traffic by Destination, 2014
Most Data Center Events/Content Stays Within the Data Center

- **Data Center to User**: 17.8%
- **Within Data Center**: 75.4%
- **Data Center to Data Center**: 6.8%

**A** Within Data Center (75.4%)
- Storage, production and development data, authentication

**B** Data Center to Data Center (6.8%)
- Replication, CDN, intercloud links

**C** Data Center to User (17.8%)
- Web, email, internal VoD, WebEx…
Global Data Center Traffic by Destination, 2019
Most Data Center Events/Content Stays Within the Data Center

- **Within Data Center (73.1%)**
  - Storage, production and development data, authentication

- **Data Center to Data Center (8.7%)**
  - Replication, CDN, intercloud links

- **Data Center to User (18.2%)**
  - Web, email, internal VoD, WebEx…
Data Center Infrastructure and Data Volumes —2019, *Current Architecture*

* Currently forecasted as 2019 total data center traffic.
** Currently not captured in the forecast.

Source: Cisco Global Cloud Index, 2014–2019
Within two years, over 80% of companies expect to implement SDN, and 69% of those plan to implement SDN in the data center, compared to 47% and 31% for WAN and LAN.

-- Current Analysis 2015 Global SDN Buyer Study

Source: Cisco Global Cloud Index, 2014–2019
Cloud Definition by NIST

- Measured Service
- On Demand/ Self Service
- Rapid Elasticity
- Broad Network Access
- Resource Pooling

Cloud
Workload Definition

A server workload is defined as a virtual or physical set of computer resources, including storage, assigned to run a specific application or provide computing services for one or many users.

<table>
<thead>
<tr>
<th>No Virtualization Scenario</th>
<th>Virtualization Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Workload = 1 Physical Server</td>
<td>1 Workload = Virtual Machine (VM) / Container</td>
</tr>
</tbody>
</table>
| Physical Server | VM1 / Container  
| | VM2 / Container  
| | VM3 / Container  

Definition developed and applied for the purpose of the GCI forecast
Global Cloud Workloads Surpass Traditional Workloads

86% of All Workloads Will Be in Cloud by 2019

- **Installed Workload in Millions**
  - Traditional Data Center (-1% CAGR)
  - Cloud Data Center (27% CAGR)

Source: Cisco Global Cloud Index, 2014–2019
# Global Cloud Workload Distribution

Asia Pacific Workloads Grow 4.5-Fold from 2014 to 2019
North America Will Maintain Largest Share of Cloud Workloads by 2019

<table>
<thead>
<tr>
<th>Region</th>
<th>2014</th>
<th>2019</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North America</strong></td>
<td>37.2M</td>
<td>106.2M</td>
<td>23.3%</td>
</tr>
<tr>
<td><strong>Western Europe</strong></td>
<td>18.0M</td>
<td>49.4M</td>
<td>22.4%</td>
</tr>
<tr>
<td><strong>Central &amp; Eastern Europe</strong></td>
<td>2.4M</td>
<td>7.9M</td>
<td>27.5%</td>
</tr>
<tr>
<td><strong>Latin America</strong></td>
<td>3.0M</td>
<td>10.3M</td>
<td>28.3%</td>
</tr>
<tr>
<td><strong>Middle East &amp; Africa</strong></td>
<td>2.1M</td>
<td>7.3M</td>
<td>28.2%</td>
</tr>
<tr>
<td><strong>Asia Pacific</strong></td>
<td>20.9M</td>
<td>94.0M</td>
<td>35.1%</td>
</tr>
</tbody>
</table>

Source: Cisco Global Cloud Index, 2014–2019
## Global Traditional Workload Distribution

### Global Decline of Traditional Workloads

<table>
<thead>
<tr>
<th>Region</th>
<th>2014</th>
<th>2019</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>22.0 Million</td>
<td>20.1 Million</td>
<td>-1.8%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>10.3 Million</td>
<td>9.0 Million</td>
<td>-2.5%</td>
</tr>
<tr>
<td>Central &amp; Eastern Europe</td>
<td>1.3 Million</td>
<td>1.1 Million</td>
<td>-4.3%</td>
</tr>
<tr>
<td>Latin America</td>
<td>1.5 Million</td>
<td>1.2 Million</td>
<td>-4.1%</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td>1.1 Million</td>
<td>1.0 Million</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>9.9 Million</td>
<td>12.2 Million</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

Source: Cisco Global Cloud Index, 2014–2019

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Workload Density
Cloud Will Outpace Traditional Data Center by More Than 2.5-Fold

Average Workload Density

Source: Cisco Global Cloud Index, 2014–2019
Global Cloud Traffic Growth
Cloud Traffic Will Quadruple from 2014 to 2019

Source: Cisco Global Cloud Index, 2014–2019
Global Cloud Traffic by Region
North America to Have Highest Traffic Volume by 2019
MEA to Experience Highest Traffic Growth

<table>
<thead>
<tr>
<th>Region</th>
<th>2014 Traffic</th>
<th>2019 Traffic</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>888 Exabytes</td>
<td>3.6 Zettabytes</td>
<td>33%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>390 Exabytes</td>
<td>1.5 Zettabytes</td>
<td>31%</td>
</tr>
<tr>
<td>Central &amp; Eastern Europe</td>
<td>90 Exabytes</td>
<td>447 Exabytes</td>
<td>38%</td>
</tr>
<tr>
<td>Latin America</td>
<td>103 Exabytes</td>
<td>399 Exabytes</td>
<td>31%</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td>50 Exabytes</td>
<td>280 Exabytes</td>
<td>41%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>588 Exabytes</td>
<td>2.3 Zettabytes</td>
<td>32%</td>
</tr>
</tbody>
</table>

Source: Cisco Global Cloud Index, 2014–2019
Global Data Center Traffic: Traditional vs. Cloud
Cloud Accounts for More Than 80% of Traffic by 2019

Cloud Accounts for More Than 80% of Traffic by 2019

Source: Cisco Global Cloud Index, 2014–2019
Private vs. Public Cloud
Hybrid Cloud is a Combination of Private and Public Clouds

Enterprise Network

Service Provider Network

Private Cloud

Hybrid Cloud

Public Cloud

Cisco Cloud owned and managed by Cisco for its own employees, customers and partners.

AT&T, Verizon, Amazon AWS, Microsoft Azure, Salesforce, Google.

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Private Cloud vs. Public Cloud
By 2018 Public Cloud will Surpass Private Cloud

Installed Workloads in Millions

<table>
<thead>
<tr>
<th>Year</th>
<th>Public Cloud Data Center (44% CAGR)</th>
<th>Private Cloud Data Center (16% CAGR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>2015</td>
<td>48%</td>
<td>52%</td>
</tr>
<tr>
<td>2016</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>2017</td>
<td>56%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Source: Cisco Global Cloud Index, 2014–2019

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Workload Density
Private Cloud Will Outpace Traditional Data Center by More Than 3-Fold

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Data Center</th>
<th>Public Cloud Data Center</th>
<th>Private Cloud Data Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>2.0</td>
<td>3.2</td>
<td>6.9</td>
</tr>
<tr>
<td>2015</td>
<td>3.2</td>
<td>7.5</td>
<td>10.1</td>
</tr>
<tr>
<td>2016</td>
<td>4.0</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>5.0</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>6.0</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>7.0</td>
<td>11.9</td>
<td></td>
</tr>
</tbody>
</table>

Source: Cisco Global Cloud Index, 2014–2019
Cloud Service Models

- **Software as a Service (SaaS)**
  - Applications
  - Data
  - Middleware
  - Operating System
  - Virtualization
  - Servers
  - Storage
  - Networking

- **Platform as a Service (PaaS)**
  - Applications
  - Data
  - Middleware
  - Operating System
  - Virtualization
  - Servers
  - Storage
  - Networking

- **Infrastructure as a Service (IaaS)**
  - Applications
  - Data
  - Middleware
  - Operating System
  - Virtualization
  - Servers
  - Storage
  - Networking

- **Cloud Customer Manages**
- **Cloud Provider Manages**
Global Cloud Workloads

SaaS Most Popular Cloud Service Model Through 2019

SaaS (34% CAGR)
IaaS (19% CAGR)
PaaS (21% CAGR)

Source: Cisco Global Cloud Index, 2014–2019
Global Private Cloud Workloads
SaaS Most Adopted Cloud Service Model by 2019; Grows the Fastest

SaaS (31% CAGR)

PaaS (3% CAGR)

IaaS (-6% CAGR)

Installed Workloads in Millions

--- | --- | --- | --- | --- | ---
15% | 45% | 41% | 8% | 16% | 76%

Source: Cisco Global Cloud Index, 2014–2019
Global Public Cloud Workloads
SaaS Most Popular Cloud Service Model Through 2019; IaaS Grows Fastest

Installed Workloads in Millions

Source: Cisco Global Cloud Index, 2014–2019

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SaaS Example
Collaboration in the Cloud—An Internal Analysis

A Typical Business Day at Cisco using WebEx

~ 50K MEETINGS | ~ 140K HOURS | ~ 180K ATTENDEES

From August 2014 to August 2015

• 17% increase in monthly meetings
• 18% increase in monthly meeting minutes
• 17% increase in monthly attendees

Mobile attendees using WebEx are 5% and growing

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**SaaS Example**

**Collaboration in the Cloud—An External Analysis**

<table>
<thead>
<tr>
<th>A Typical Business Day at New York using WebEx</th>
<th>A Typical Business Day at Kansas City using WebEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ 50K Meetings</td>
<td>~ 11K Meetings</td>
</tr>
<tr>
<td>~ 111K Hours</td>
<td>~ 25K Hours</td>
</tr>
<tr>
<td>~ 175K Attendees</td>
<td>~ 40K Attendees</td>
</tr>
</tbody>
</table>

End-User Traffic: 48 TB  
Data Center Traffic: 111 TB

End-User Traffic: 11 TB  
Data Center Traffic: 25 TB

**Traffic Across Different Verticals**

<table>
<thead>
<tr>
<th>Vertical</th>
<th>End-User Traffic*</th>
<th>Data Center Traffic*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare</td>
<td>1.4 TB</td>
<td>3.2 TB</td>
</tr>
<tr>
<td>Engineering</td>
<td>1 TB</td>
<td>2.4 TB</td>
</tr>
<tr>
<td>Education</td>
<td>0.4 TB</td>
<td>0.9 TB</td>
</tr>
<tr>
<td>Banking</td>
<td>0.6 TB</td>
<td>1.3 TB</td>
</tr>
</tbody>
</table>

* Data includes US specific information on a per day basis

Sources: Cisco Tahoe Call Detail Records and Netflow data, Cisco Global Cloud Index 2014–2019
Applications/ Workload Diversity
Growth in M2M Connections Drive New Data Analytics Need

*Size of the bubble represents total M2M connections for each application

Source: Cisco Global Cloud Index, 2014–2019; Machina Research
Growth in Residential Internet Use Drives Personal Cloud Storage

Source: Cisco Global Cloud Index, 2014–2019

* Size of the bubble represents region’s personal cloud storage penetration as a % of its residential internet population
Global Personal Cloud Storage
Majority, 55%, of Residential Internet Users Will Use Cloud Storage by 2019

Consumers in Millions

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumers in Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>1,136</td>
</tr>
<tr>
<td>2015</td>
<td>1,355</td>
</tr>
<tr>
<td>2016</td>
<td>1,571</td>
</tr>
<tr>
<td>2017</td>
<td>1,740</td>
</tr>
<tr>
<td>2018</td>
<td>1,898</td>
</tr>
<tr>
<td>2019</td>
<td>2,045</td>
</tr>
</tbody>
</table>

12% CAGR 2014–2019

Source: Cisco Global Cloud Index, 2014–2019; Juniper Research
Global Personal Cloud Storage Traffic*

Exabytes per Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Exabytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>14</td>
</tr>
<tr>
<td>2015</td>
<td>17</td>
</tr>
<tr>
<td>2016</td>
<td>21</td>
</tr>
<tr>
<td>2017</td>
<td>26</td>
</tr>
<tr>
<td>2018</td>
<td>33</td>
</tr>
<tr>
<td>2019</td>
<td>39</td>
</tr>
</tbody>
</table>

*Personal cloud storage traffic includes personal content lockers, cloud back-up etc., and does not include cloud DVR

Source: Cisco Global Cloud Index, 2014–2019

23% CAGR 2014–2019
The Universe of Data is High Volume, High Velocity, and Distributed

Total data generated by all people, machines and things: (projected snapshot for 2019)
43 Zettabytes per Month
507 Zettabytes per Year

Total business/personal data stored in any location: (projected snapshot for 2019)
3.5 Zettabytes (Less than 1%)
What Makes a Smart City?  
Multiple Applications Create Big Data

A city of one million will generate 180 million gigabytes of data per day by 2019

- **Connected Plane**: 40 TB per day (0.1% transmitted)
- **Connected Factory**: 1 PB per day (0.2% transmitted)
- **Public Safety**: 50 PB per day (<0.1% transmitted)
- **Weather Sensors**: 10 MB per day (5% transmitted)
- **Intelligent Building**: 250 GB per day (1% transmitted)
- **Smart Hospital**: 3 TB per day (0.1% transmitted)
- **Smart Car**: 50 GB per day (0.1% transmitted)
- **Smart Grid**: 5 GB per day (1% transmitted)

Source: Cisco Global Cloud Index, 2014–2019
Total Stored Data

The volume of all data stored will more than double by 2019 from 1.4 ZB to 3.5 ZB. Most data is stored on client devices, but more moves to the data center over time.

- **Data at Rest (Stored)**
  - 2014: 73%
  - 2019: 49%

- **Data in Motion (Traffic)**
  - 2014: 27%
  - 2019: 51%

- Stored data on M2M modules grows the fastest at 89% CAGR

- **PCs**
- **Smartphones**
- **Tablets**
- **M2M**
- **External Storage**
- **Other**

- **2014**
  - 88% Client Devices or M2M
  - 12% DC
  - 1.4 ZB

- **2019**
  - 82% Client Devices or M2M
  - 18% DC
  - 3.5 ZB

Traffic 39% higher than stored in 2019, 71% in 2014
Storage Constraints Drive Cloud
Smartphone Traffic Exceeds Data Stored on Smartphones by 2016

Exabytes per Year


Smartphone Storage Capacity (28% CAGR)
Smartphone Traffic (62% CAGR)

The Necessity of the Cloud

Source: Cisco Global Cloud Index, 2014–2019

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Cloud Readiness
Security
Internet Ubiquity
Network Speeds and Latency Analysis
# Cloud Data Security

<table>
<thead>
<tr>
<th>IaaS</th>
<th>PaaS</th>
<th>SaaS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role of Cloud Provider:</strong></td>
<td><strong>Role of Cloud Provider:</strong></td>
<td><strong>Role of Cloud Provider:</strong></td>
</tr>
<tr>
<td>• Manage virtual machines</td>
<td>• Protecting data</td>
<td>• Managing access to applications, data, middleware, storage, networking</td>
</tr>
<tr>
<td>• Ensure fail over services</td>
<td>• Ensure fail over services</td>
<td></td>
</tr>
<tr>
<td>• Regulatory compliance</td>
<td>• Regulatory compliance</td>
<td></td>
</tr>
<tr>
<td>• Manage multiple copies of software platforms on single piece of hardware</td>
<td>• Provide secure development tools</td>
<td></td>
</tr>
<tr>
<td><strong>Security action:</strong></td>
<td><strong>Security action:</strong></td>
<td><strong>Security action:</strong></td>
</tr>
<tr>
<td>• Governance framework on how VMs are used</td>
<td>• Data transfer and encryption of user managed data</td>
<td>• Focus on establishing controls regarding users access to application</td>
</tr>
<tr>
<td>• Trusting the virtual machine image</td>
<td>• Managing application keys</td>
<td>• Protect API keys</td>
</tr>
<tr>
<td>• Hardening hosts</td>
<td>• Additional requirements for handling of sensitive information</td>
<td>• Avoid single sign on, use strong passwords, certificates</td>
</tr>
<tr>
<td>• Securing inter-host communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Managing application keys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Audit trail of VMs and management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Profiling Cloud Security Breaches
47% of Cloud Sensitive Data Loss Incidents Involve Confidential Data

Source: SkyHigh Cloud Adoption & Risk Report (Q3 2015)
Enabling Authentication and Secure Internet
Percentage of Secure Internet Servers to All Web Facing Servers

- Western Europe: 50%
- Asia Pacific: 23%
- Central and Eastern Europe: 29%
- North America: 27%
- Middle East and Africa: 10%
- Latin America: 13%
Regional Internet Access Ubiquity (2014)

Mobile Internet Penetration

Fixed Internet Penetration

Source: Cisco Global Cloud Index, 2014–2019
Regional Internet Access Ubiquity (2019)

Normalized measures of both fixed and mobile Internet penetration as of 2019.

- **Fixed Internet Penetration**
- **Mobile Internet Penetration**

Legend:
- **MEA**
- **APAC**
- **CEE**
- **LATAM**

Source: Cisco Global Cloud Index, 2014–2019
Global Cloud Readiness
Business and Consumer Apps/Network Requirements

**Basic Cloud Apps**

**Network Requirements:**
- Download Speed: Up to 750 kbps
- Upload Speed: Up to 250 kbps
- Latency: Above 160 ms

**Intermediate Cloud Apps**

**Network Requirements:**
- Download Speed: 751–2,500 kbps
- Upload Speed: 251–1,000 kbps
- Latency: 159–100 ms

**Advanced Cloud Apps**

**Network Requirements:**
- Download Speed: Higher than 2,500 kbps
- Upload Speed: Higher than 1,000 kbps
- Latency: Less than 100 ms
In 2015, 119 countries met the advanced single application readiness criteria for fixed networks, compared to 109 countries last year.

* Non-Concurrent Apps
In 2015, 81 countries met the advanced single application readiness criteria for mobile networks, compared to 21 countries last year.

* Non-Concurrent Apps
Global Cloud Readiness
Business and Consumer Network Requirements for Concurrent Apps

Basic Cloud Apps
Concurrent Support

Network Requirements:
Download Speed: 1900 kbps
Upload Speed: 600 kbps
Latency: Above 160 ms

- Stream basic video/music
- Text communications
- VOIP
- Web browsing
- Web conferencing
- Cloud based learning management system

Intermediate Cloud Apps
Concurrent Support

Network Requirements:
Download Speed: 1901–20,999 kbps
Upload Speed: 601–8,999 kbps
Latency: 159–100 ms

- SD Video conferencing
- Personal content locker
- HD Video streaming
- Electronic health records
- ERP/CRM
- VoLTE

Advanced Cloud Apps
Concurrent Support

Network Requirements:
Download Speed: 21,000 kbps
Upload Speed: 9,000 kbps
Latency: Less than 100 ms

- Virtual office
- Connected medicine
- HD Video conferencing
- Stream ultra HD video
- High frequency stock trading
- Connected car safety applications

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Regional End-User Cloud Readiness (2015)
Supporting Business and Consumer Applications on Fixed Networks (Concurrent Apps)

Average Broadband Speed

- Basic Cloud Application Ready
- Intermediate Cloud Application Ready
- Advanced Cloud Application Ready

Latency

- High
- Low

Regions:
- APAC
- CEE
- NA
- WE
- LATAM
- MEA
- Sweden
- Norway
- Finland
- USA

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Regional End-User Cloud Readiness (2015)
Supporting Business and Consumer Applications on Mobile Networks (Concurrent Apps)

Average Broadband Speed

High

Low

Basic Cloud Application Ready

Intermediate Cloud Application Ready

Advanced Cloud Application Ready

Latency

High

Low

Singapore

South Korea

Japan

South

Korea

Netherlands

MEA

LATAM

APAC

CEE

NA

WE

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Latency Key for Cloud Applications: Asynchronous vs Synchronous Storage

Asynchronous Storage Latency

- Personal Content Locker
- Standard Backup
- Asynchronous Storage Latency: 100 ms

Synchronous Storage Latency

- Disaster Recovery Systems
- Data and Transaction Replication
- Synchronous Storage Latency: 5 ms
Fixed Overall Network Characteristics (2015)

North America
- 3rd Mean DL: 25.4 Mbps
- 3rd Mean UL: 8.8 Mbps
- 4th Mean DL: 22.8 Mbps
- 4th Mean UL: 8.8 Mbps

Western Europe
- 1st Mean DL: 28.3 Mbps
- 1st Mean UL: 20.9 Mbps
- 2nd Mean DL: 28.1 Mbps
- 2nd Mean UL: 19.2 Mbps

Central and Eastern Europe
- 5th Mean DL: 7.6 Mbps
- 5th Mean UL: 2.4 Mbps
- 6th Mean DL: 7.0 Mbps
- 6th Mean UL: 2.2 Mbps

Latin America
- 5th Mean DL: 4.8 Mbps
- 5th Mean UL: 0.9 Mbps
- 6th Mean DL: 4.5 Mbps
- 6th Mean UL: 0.9 Mbps

Middle East and Africa
- 2nd Mean DL: 28.1 Mbps
- 2nd Mean UL: 16.0 Mbps
- 1st Mean DL: 19.2 Mbps
- 1st Mean UL: 9.3 Mbps

Asian Pacific
- 5th Mean DL: 7.0 Mbps
- 5th Mean UL: 2.2 Mbps
- 6th Mean DL: 4.5 Mbps
- 6th Mean UL: 0.9 Mbps
Mobile Overall Network Characteristics (2015)

**North America**

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**Western Europe**

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**Central and Eastern Europe**

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**Middle East and Africa**

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**Asia Pacific**

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Cisco Global Cloud Index
Where to Find More Information / Direct Questions

www.cisco.com/go/cloudindex

• Media Release
• GCI White Paper
• Cloud Readiness Report
• GCI Q&A
• GCI Highlights Tool
• Cloud Readiness Tool

Please direct GCI questions to:
traffic-inquiries@cisco.com