Latin America (LATAM) Cisco Global Cloud Index 2013–2018
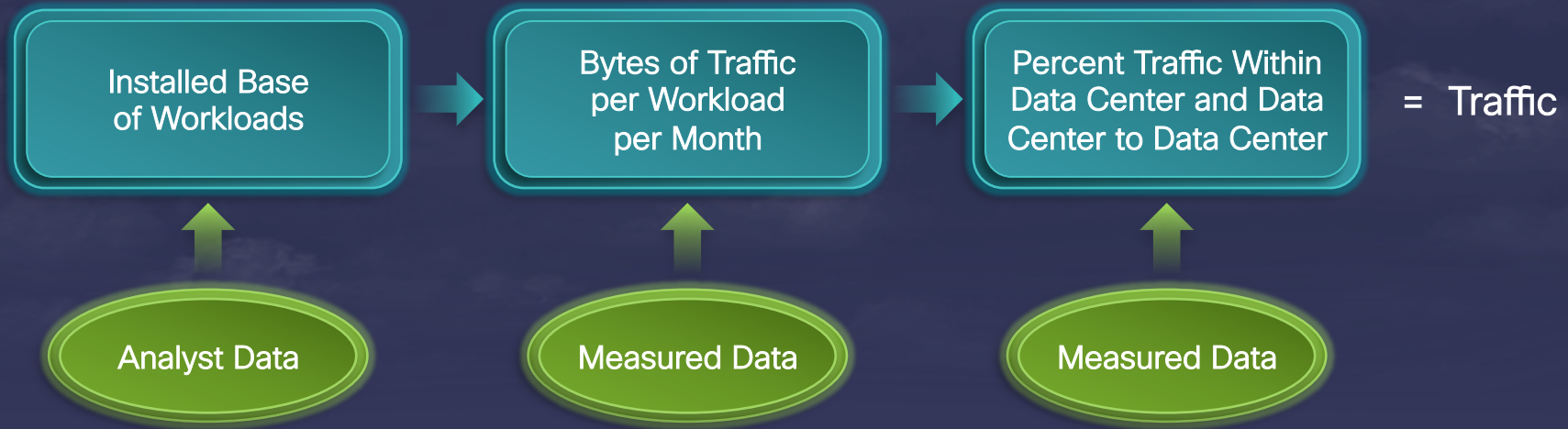
Rodolfo Molina

Sr. Director Cloud and Managed Services, Latam

November 5, 2014

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.

| Installed Base of Workloads | → | Bytes of Traffic per Workload per Month | → | Percent Traffic Within Data Center and Data Center to Data Center | = Traffic |

| Analyst Data | Measured Data | Measured Data |

Detailed methodology description and specific analyst sources included in complete GCI report

Cisco VNI and Global Cloud Index

Data Distinctions and Overlap of 2017 Traffic Forecasts

Visual Networking Index (VNI)

A + **B** = 1.6 ZBs

A Non-Data Center Traffic

NOT included in GCI

B Data Center-to-User Traffic

This is the overlap between VNI and GCI

D 6.4 ZBs

C 0.7 ZBs

B 1.5 ZBs

A 0.1 ZBs

Global Cloud Index (GCI)

B + **C** + **D** = 8.6 ZBs

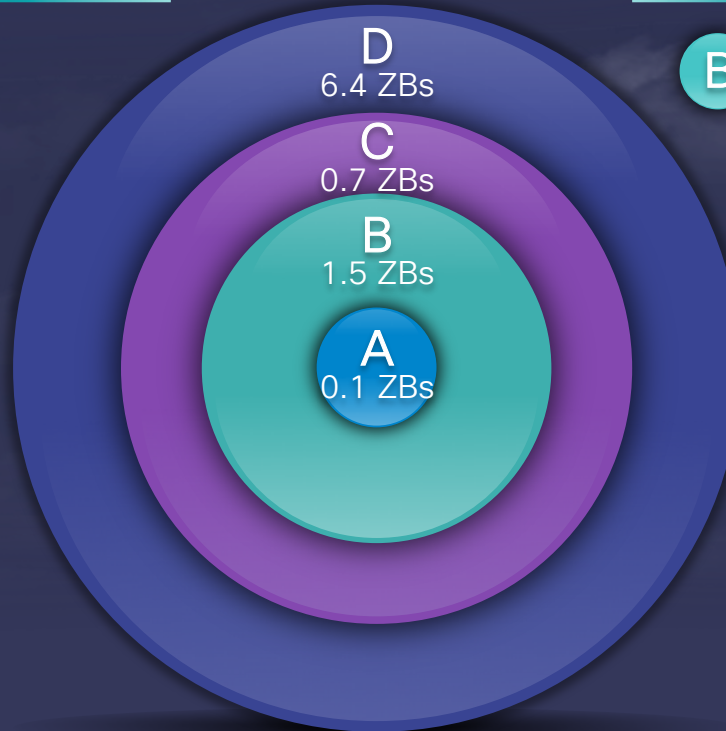**B** Data Center-to-User Traffic (17%)

This is the overlap between VNI and GCI

C Data Center-to-Data Center Traffic (8.5%)

Traffic that flows from data center to data center

D Within Data Center (74.5%)

Traffic that remains within the data center
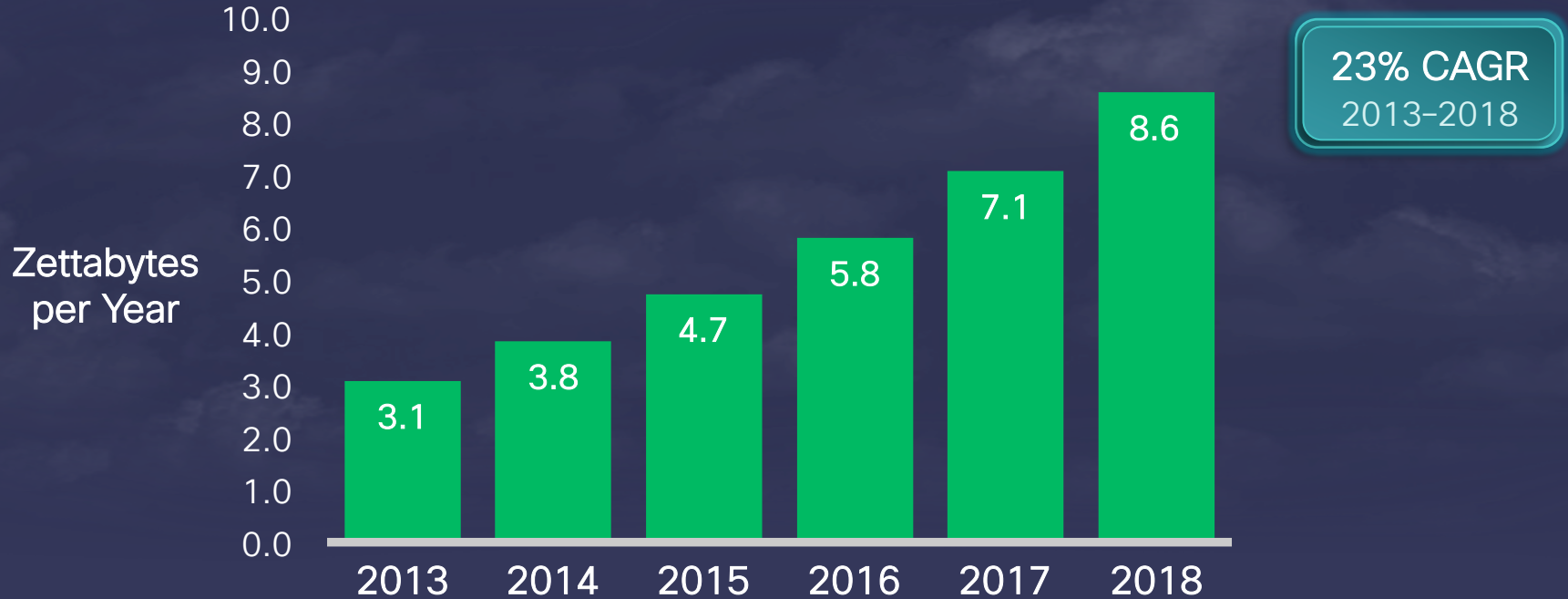
GCI Forecast Update, 2013–2018
Top 5 Data Center/ Cloud Trends

1	Growth of Global Data Center Relevance and Traffic	• Data center by traffic by destination • Data center and cloud IP traffic growth • Business vs. consumer cloud traffic
2	Continued Global Data Center / Cloud Virtualization	• Traditional DC vs. Cloud DC virtualization • Public vs. private cloud workloads*
3	Cloud Service Delivery Models (IaaS, PaaS, SaaS)	• Service delivery workload analysis for Total Cloud* • Service delivery workload analysis for Private Cloud* • Service delivery workload analysis for Public Cloud*
4	Internet of Everything (IoE)	• Potential impact of "Big Data" on global data centers* • Consumer cloud storage analysis* • Multi-device ownership & IPv6 adoption foster cloud growth
5	Global Cloud Readiness	• Internet ubiquity • Network speeds and latency analysis

New content for GCI 2013 – 2018 Forecast Update

Global Data Center Traffic Growth
Data Center Traffic Nearly Triples from 2013 to 2018

Zettabytes per Year

Year	Zettabytes
2013	3.1
2014	3.8
2015	4.7
2016	5.8
2017	7.1
2018	8.6

23% CAGR
2013–2018

Source: Cisco Global Cloud Index, 2013–2018

LATAM Data Center Traffic Growth
Data Center Traffic Nearly Triples from 2013 to 2018

Exabytes per Year

Year	Exabytes
2013	194
2014	248
2015	308
2016	377
2017	460
2018	553

23% CAGR
2013–2018

Global Data Center Traffic by Region

Asia Pacific to Have Highest Traffic Volume by 2018, Middle East & Africa to Experience Highest Traffic Growth

North America
2013: 1.1 Zettabytes
2018: 2.7 Zettabytes
CAGR 20%

Western Europe
2013: 516 Exabytes
2018: 1.3 Zettabytes
CAGR 20%

Central & Eastern Europe
2013: 190 Exabytes
2018: 640 Exabytes
CAGR 28%

Latin America
2013: 194 Exabytes
2018: 553 Exabytes
CAGR 23%

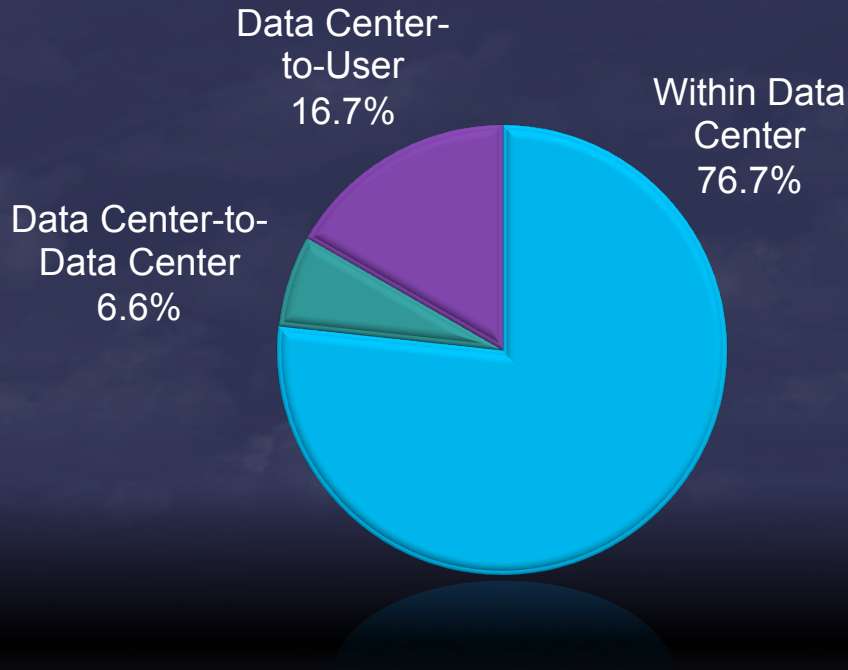| Middle East & Africa |
|---|
| 2013: 68 Exabytes |
| 2018: 366 Exabytes |
| CAGR 40% |

Asia Pacific
2013: 1.1 Zettabytes
2018: 3.1 Zettabytes
CAGR 24%

Source: Cisco Global Cloud Index, 2013–2018

Global Data Center Traffic by Destination, 2013
Most Data Center Events/Content Stays Within the Data Center

Data Center-to-User
16.7%

Data Center-to-Data Center
6.6%

Within Data Center
76.7%

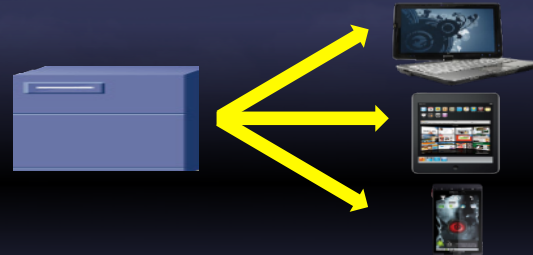**A** Within Data Center (76.7%)

Storage, production and development data, authentication

B Data Center-to- Data Center (6.6%)
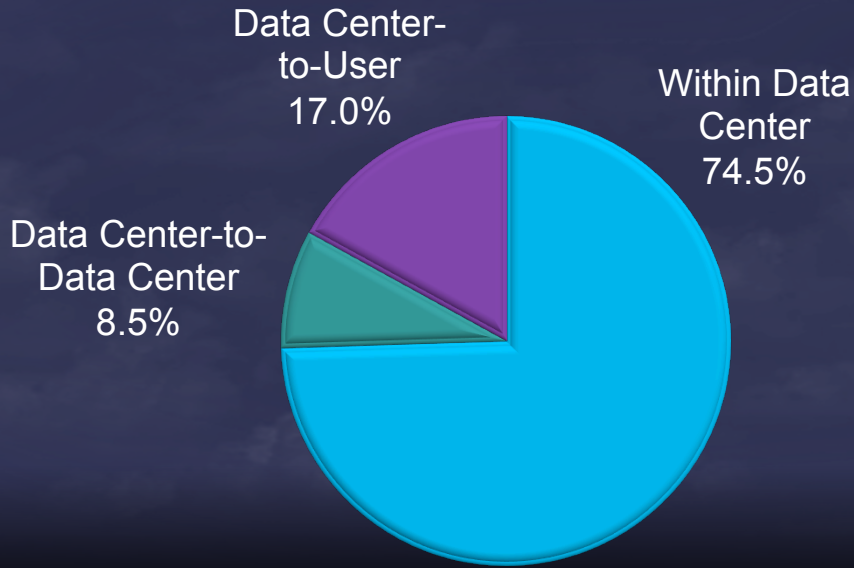
Replication, CDN, intercloud links

C Data Center-to-User (16.7%)

Web, email, internal VoD, WebEx, et al.

Global Data Center Traffic by Destination, 2018
Most Data Center Events/Content Stays Within the Data Center

Data Center-to-User 17.0%

Within Data Center 74.5%

Data Center-to-Data Center 8.5%
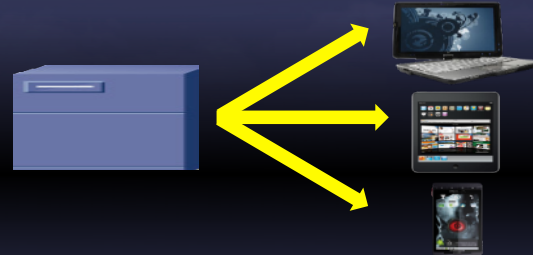
A Within Data Center (74.5%)

Storage, production and development data, authentication
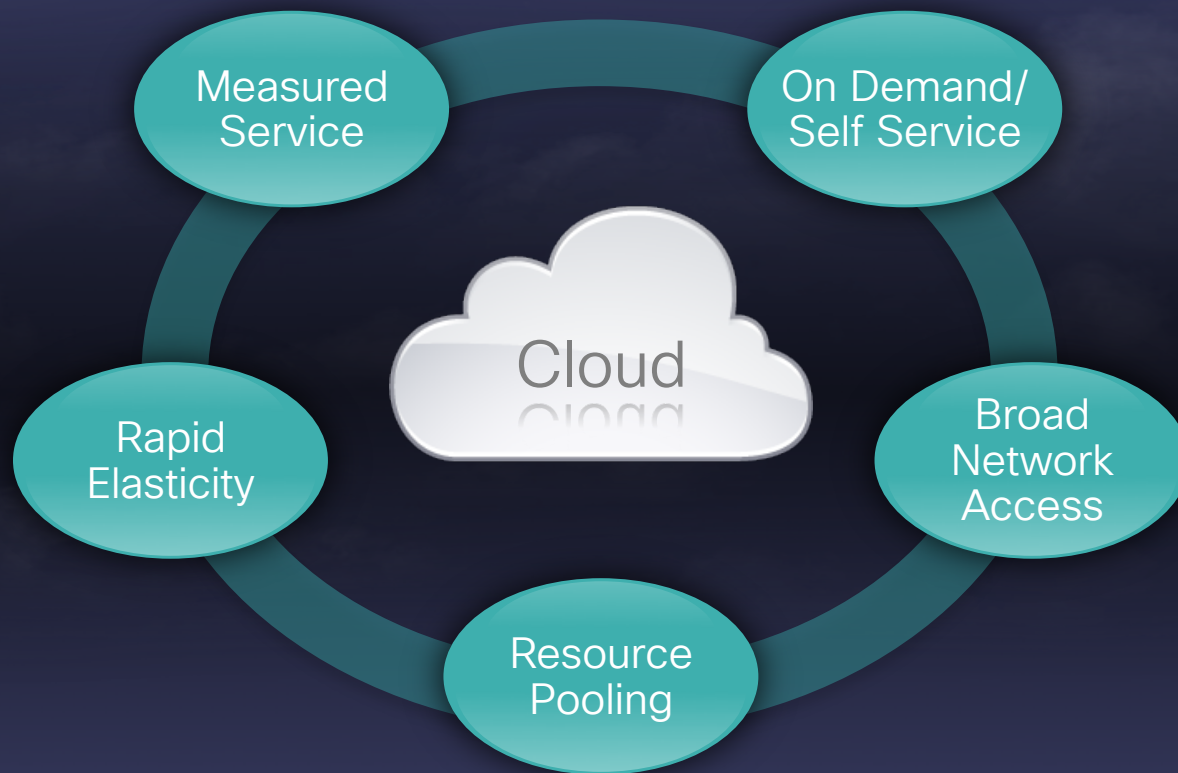
B Data Center-to- Data Center (8.5%)

Replication, CDN, intercloud links

C Data Center-to-User (17%)

Web, email, internal VoD, WebEx, et al.

Cloud Definition by ![NIST logo - National Institute of Standards and Technology]

- 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 assigned to run a specific application or provide computing services for one or many users.
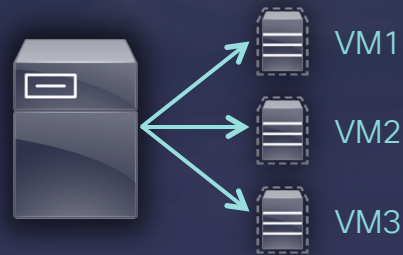
No Virtualization Scenario

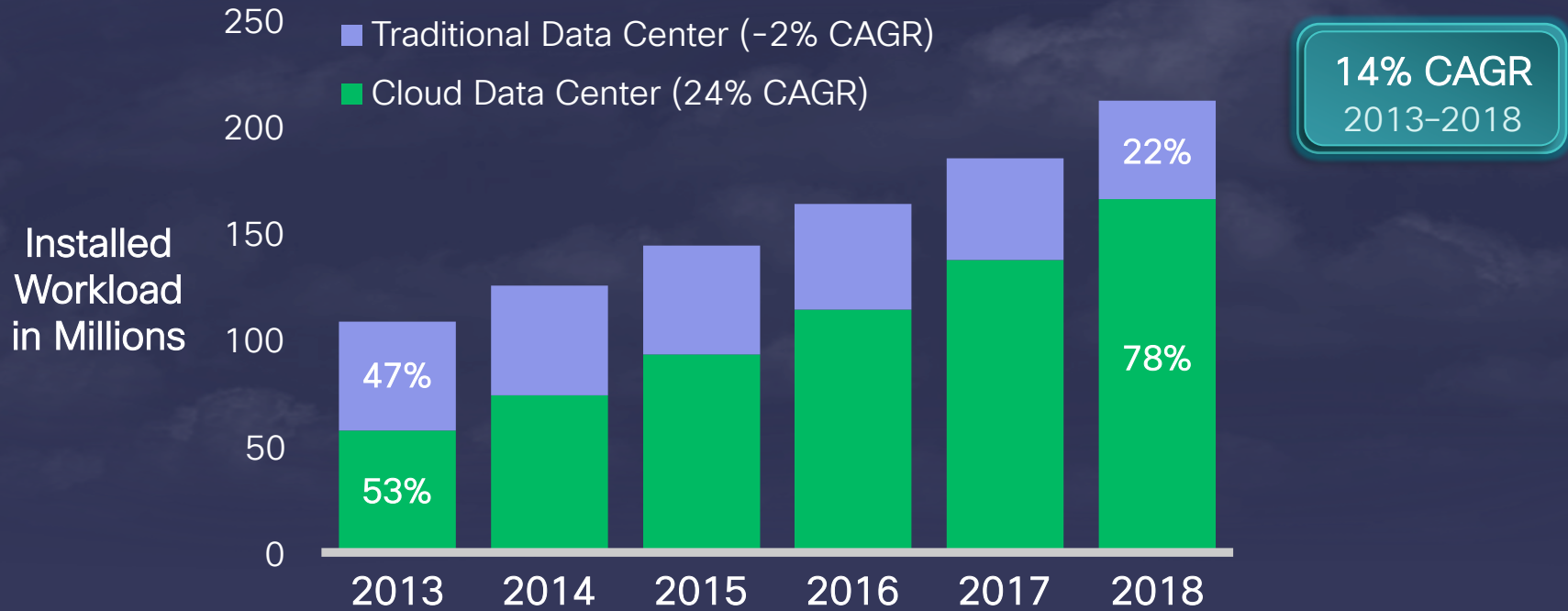1 Workload = 1 Physical Server

Physical Server

Virtualization Scenario

1 Workload = Virtual Machine (VM)

VM1

VM2

VM3

Definition developed and applied for the purpose of the GCI Forecast

Global Cloud Workloads Surpass Traditional Workloads
Over Three-Quarters (78%) of all workloads will be in Cloud by 2018

Installed Workload in Millions

- ■ Traditional Data Center (–2% CAGR)
- ■ Cloud Data Center (24% CAGR)

14% CAGR
2013–2018

Year	Cloud	Traditional
2013	53%	47%
2018	78%	22%

Source: Cisco Global Cloud Index, 2013–2018

LATAM Cloud Workloads Surpass Traditional Workloads
Over Three-Quarters (76%) of all workloads will be in Cloud by 2018

Installed Workload in Millions

Legend:
- ■ Traditional Data Center (3% CAGR)
- ■ Cloud Data Center (34% CAGR)

21% CAGR
2013–2018

Chart values:
- 2013: 45% Cloud, 55% Traditional
- 2014
- 2015
- 2016
- 2017
- 2018: 76% Cloud, 24% Traditional

Y-axis: 0 1 2 3 4 5 6 7 8
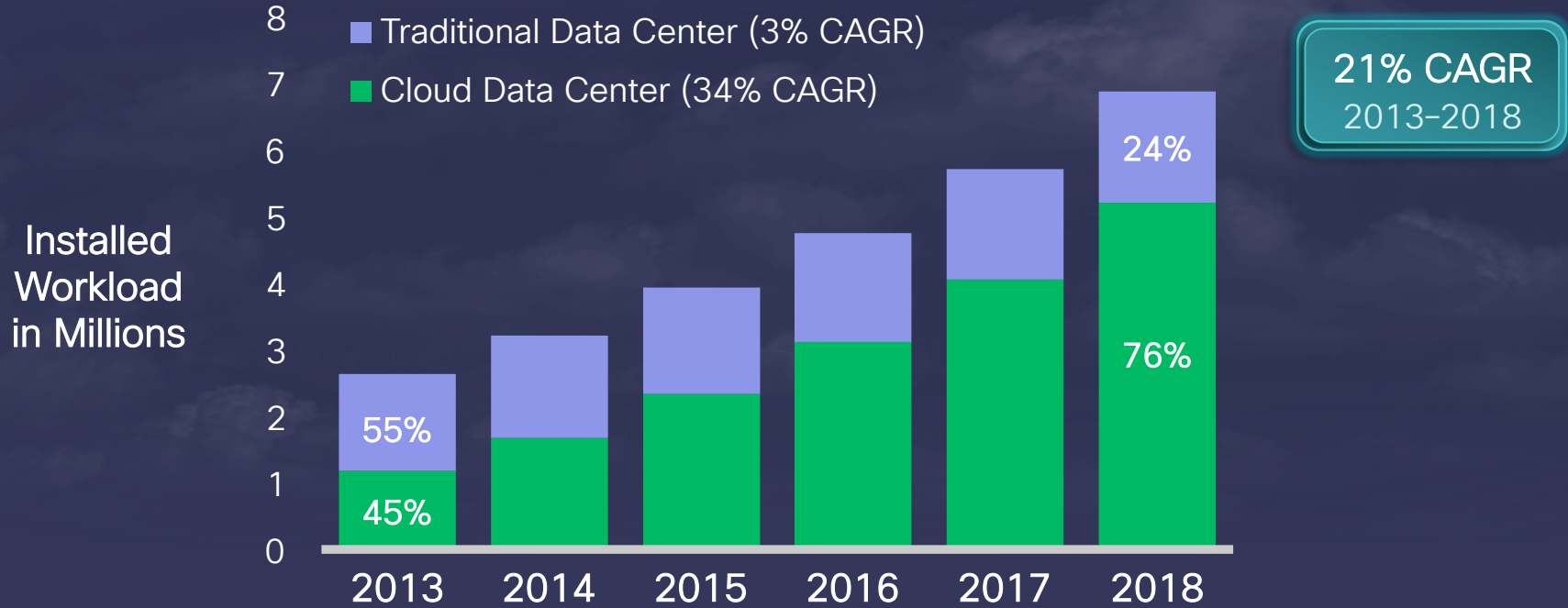
Source: Cisco Global Cloud Index, 2013–2018

Workload Density
Cloud Will Outpace Traditional Data Center by 3 Fold

Average Workload Density

- — Traditional Data Center
- — Cloud Data Center

8% CAGR

3X

2X

2% CAGR

2013 2014 2015 2016 2017 2018
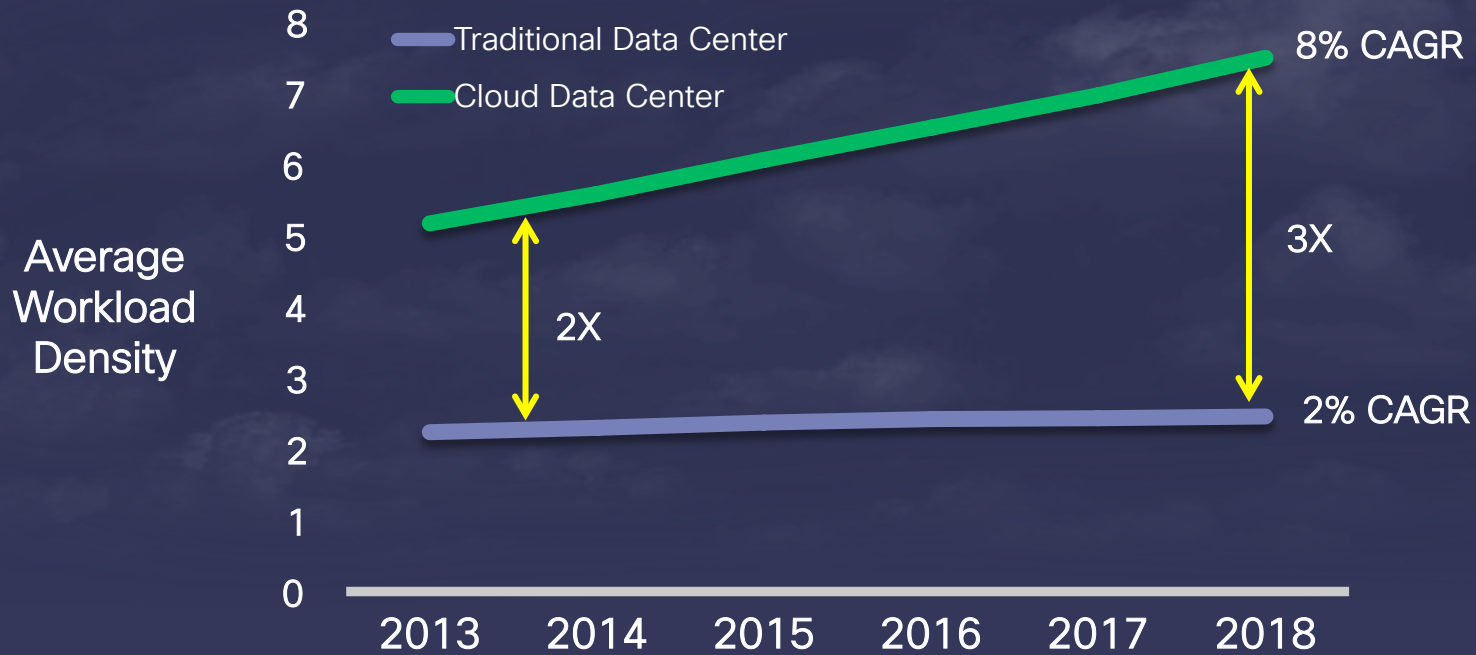
Global Cloud Traffic Growth
Cloud Traffic Will Nearly Quadruple from 2013 to 2018

Zettabytes per Year

Year	Zettabytes
2013	1.6
2014	2.3
2015	3.1
2016	4.0
2017	5.1
2018	6.5

32% CAGR
2013–2018
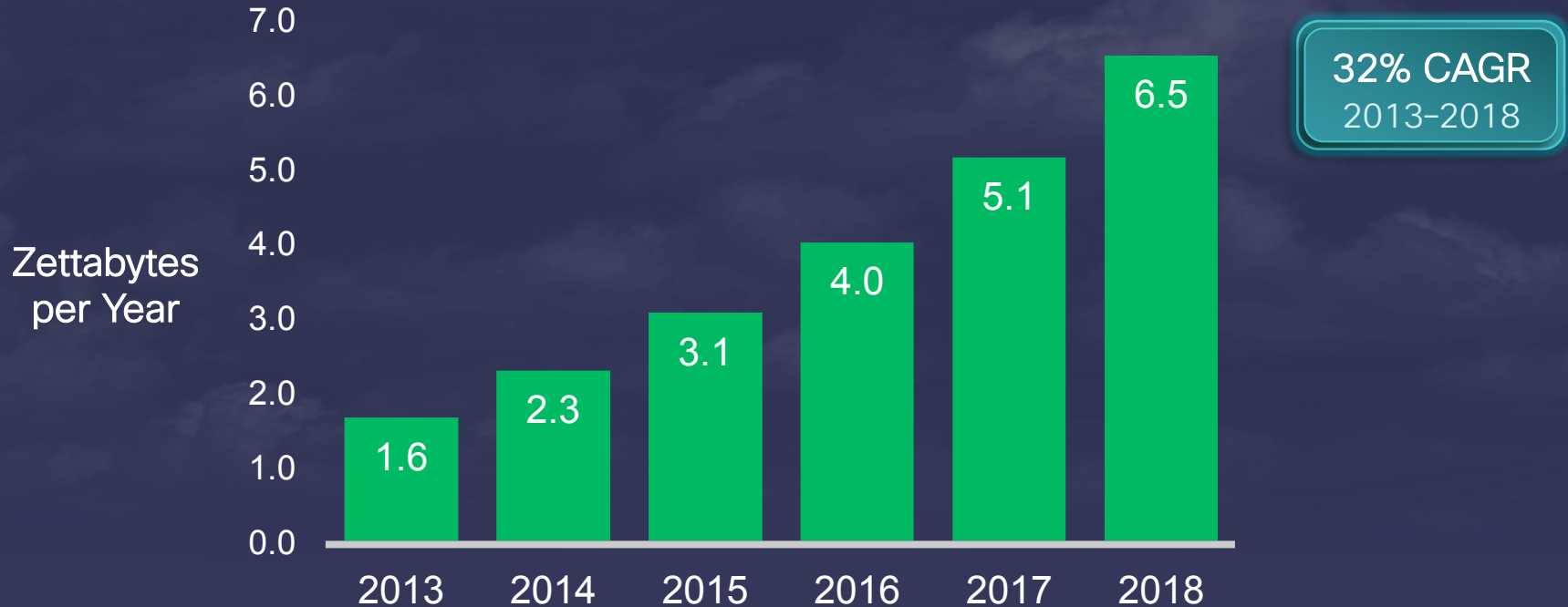
Source: Cisco Global Cloud Index, 2013–2018

Global Data Center Traffic: Traditional vs. Cloud
Cloud Accounts for Three-Quarters of Data Center Traffic by 2018

Legend:
- Traditional Data Center (8% CAGR)
- Cloud Data Center (32% CAGR)

Y-axis: Zettabytes per Year — 0.0, 2.0, 4.0, 6.0, 8.0, 10.0

X-axis: 2013, 2014, 2015, 2016, 2017, 2018

2013: 54% (Cloud), 46% (Traditional)
2018: 76% (Cloud), 24% (Traditional)
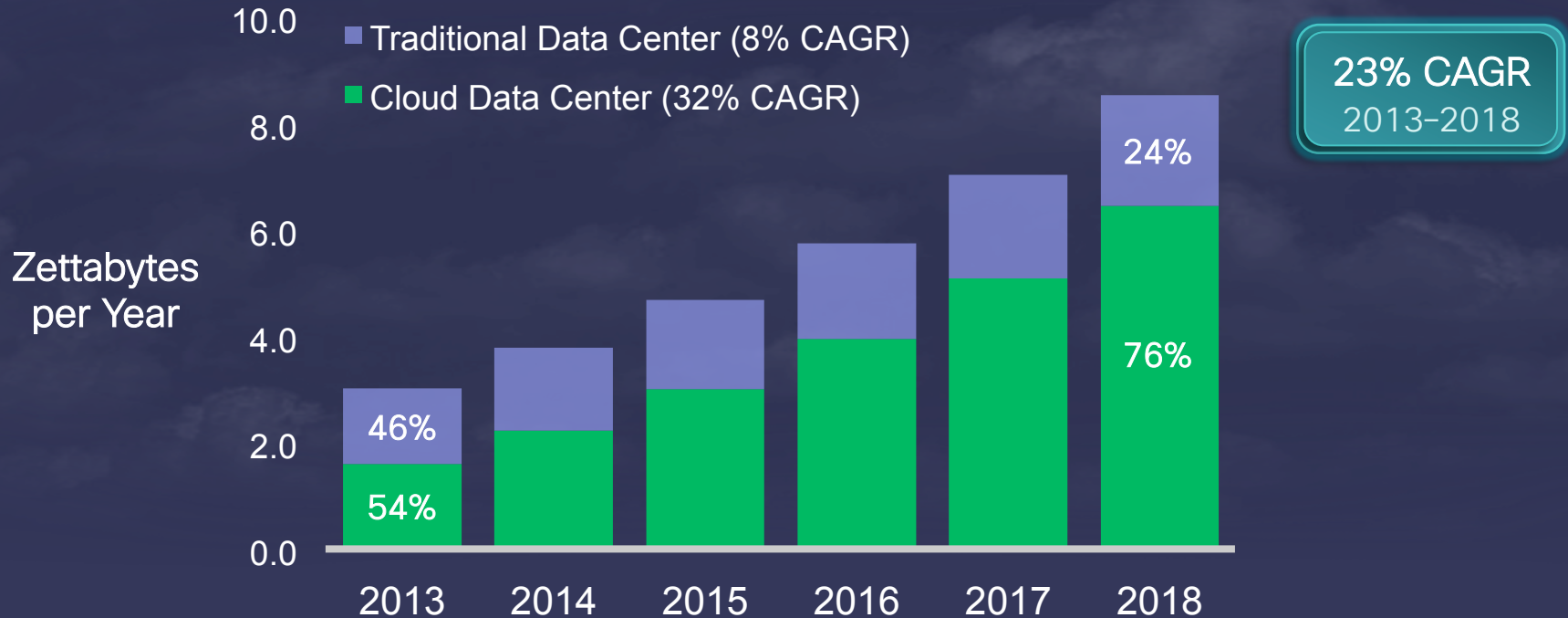
23% CAGR 2013–2018

Global Cloud Traffic by Region

Asia Pacific to Have Highest Traffic Volume by 2018, Middle East & Africa to Experience Highest Traffic Growth

North America

2013: 643 Exabytes
2018: 2.1 Zettabytes
CAGR 26%

Western Europe

2013: 311 Exabytes
2018: 988 Exabytes
CAGR 26%

Central & Eastern Europe

2013: 85 Exabytes
2018: 442 Exabytes
CAGR 39%

Latin America

2013: 89 Exabytes
2018: 394 Exabytes
CAGR 35%

Middle East & Africa

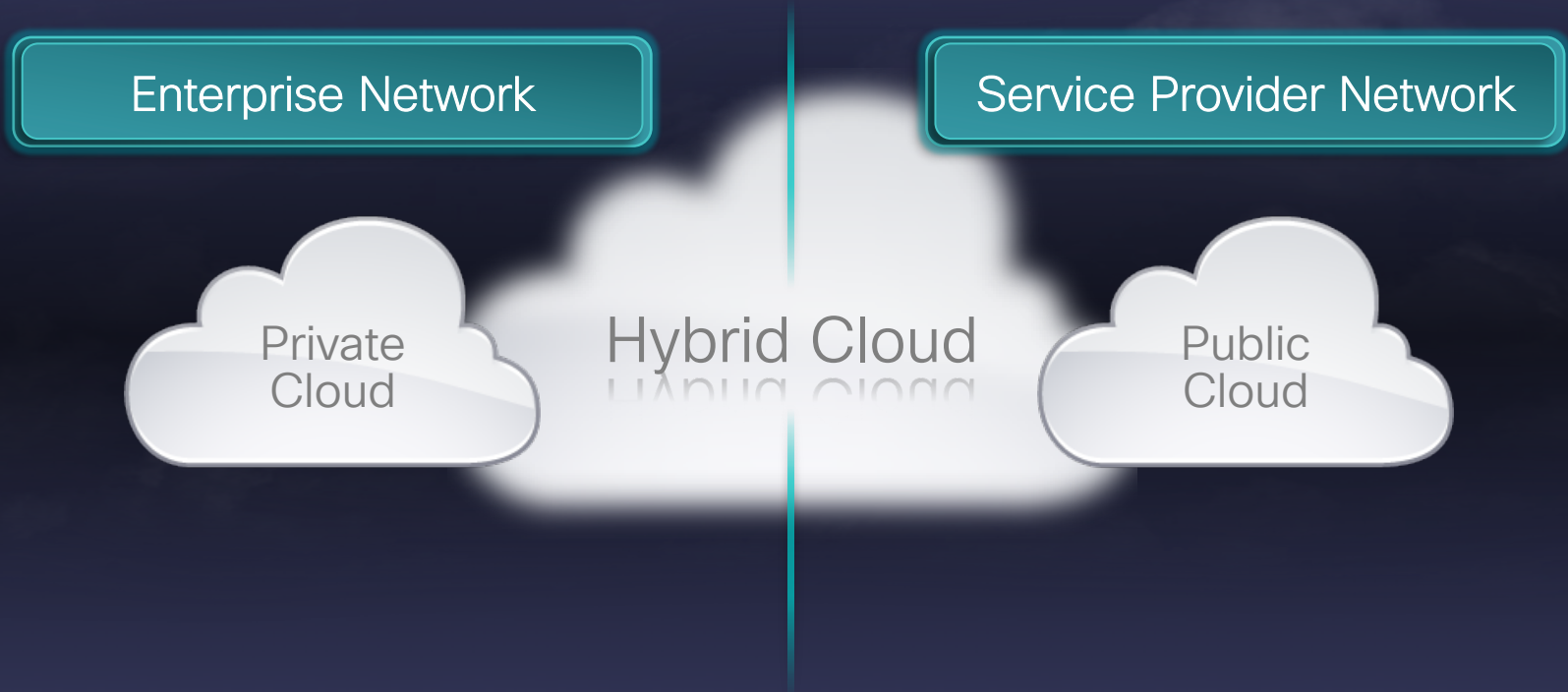2013: 31 Exabytes
2018: 262 Exabytes
CAGR 54%

Asia Pacific

2013: 489 Exabytes
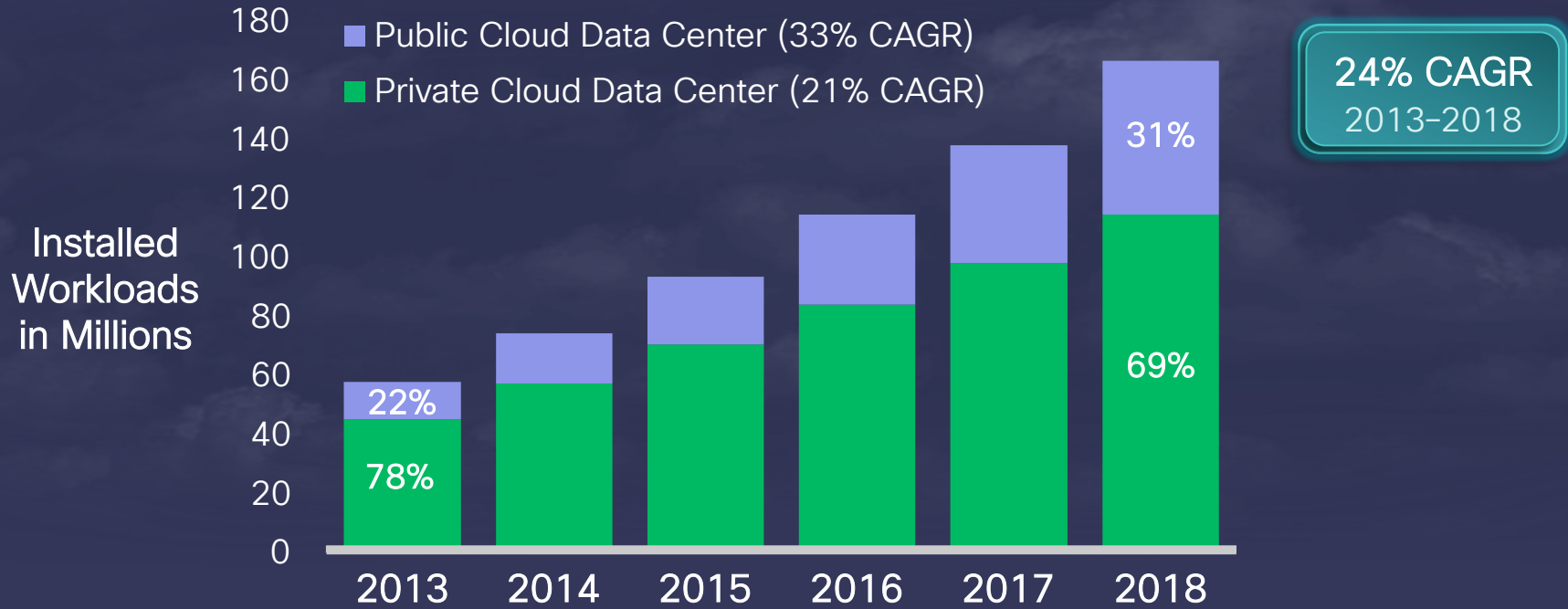2018: 2.3 Zettabytes
CAGR 37%

Source: Cisco Global Cloud Index, 2013–2018

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

Private Cloud Bigger Than Public Cloud
But Public Cloud is Growing Faster than Private Cloud

Installed Workloads in Millions

- Public Cloud Data Center (33% CAGR)
- Private Cloud Data Center (21% CAGR)

180
160
140
120
100
80
60
40
20
0

2013 — 22% / 78%
2018 — 31% / 69%

2013 2014 2015 2016 2017 2018

24% CAGR
2013–2018

Source: Cisco Global Cloud Index, 2013–2018

Workload Density
Private Cloud Will Outpace Traditional Data Center by 4.5 Fold

Average Workload Density

Legend:
- Traditional Data Center
- Public Cloud Data Center
- Private Cloud Data Center

7% CAGR

14% CAGR

2% CAGR

Y-axis: 0, 2, 4, 6, 8, 10, 12
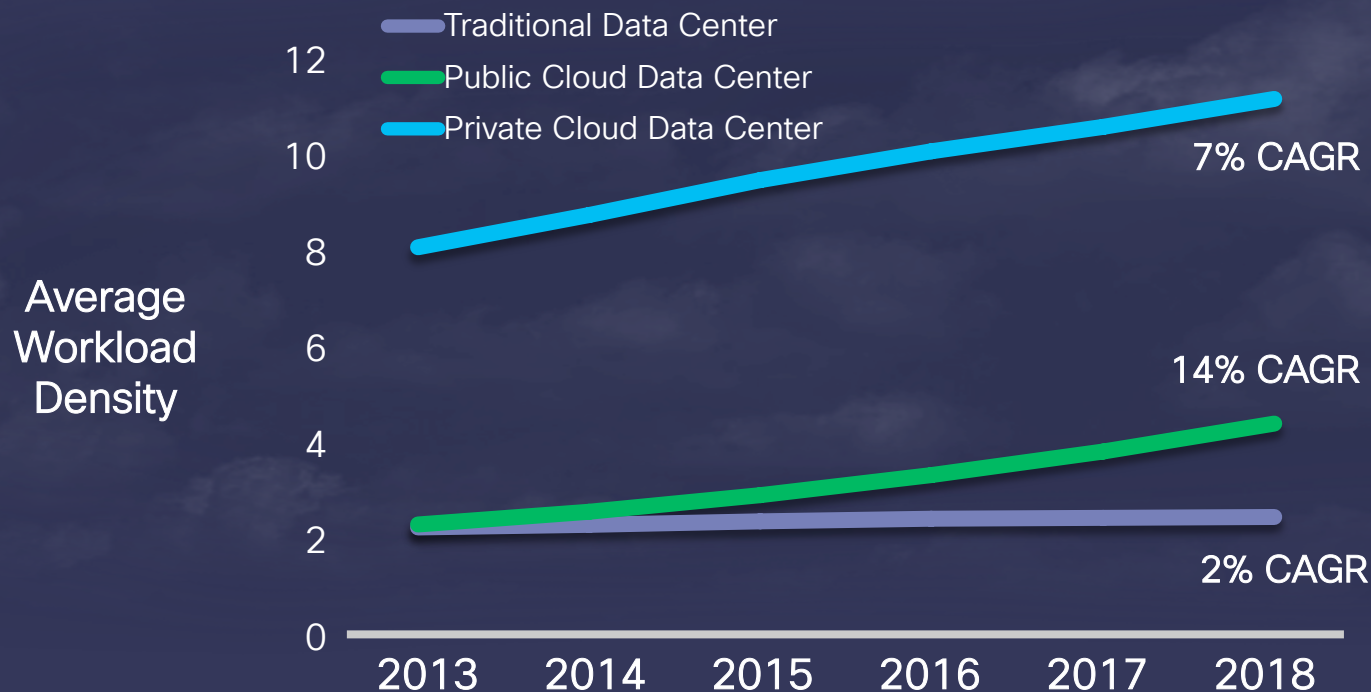
X-axis: 2013, 2014, 2015, 2016, 2017, 2018

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
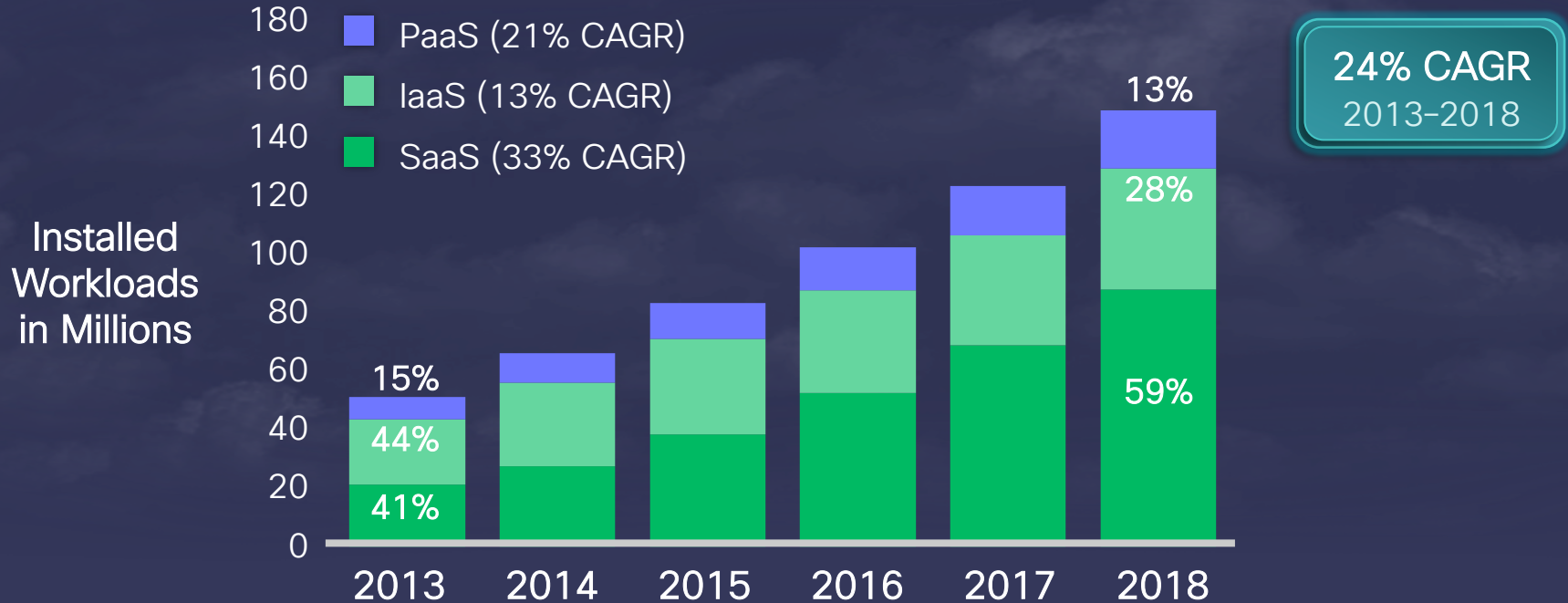
Cloud Customer Manages

Cloud Provider Manages

Global Cloud Workloads
SaaS Most Popular Cloud Service Model Through 2018

180
160
140
120
100
80
60
40
20
0

Installed Workloads in Millions

PaaS (21% CAGR)
IaaS (13% CAGR)
SaaS (33% CAGR)

2013 — 15%, 44%, 41%
2014
2015
2016
2017
2018 — 13%, 28%, 59%

24% CAGR
2013–2018

Source: Cisco Global Cloud Index, 2013–2018

Global Private Cloud Workloads
SaaS Most Adopted Cloud Service Model by 2018; Grows the Fastest

PaaS (16% CAGR)
IaaS (3% CAGR)
SaaS (37% CAGR)

Installed Workloads in Millions

2013: PaaS 16%, IaaS 49%, SaaS 35%
2018: PaaS 14%, IaaS 22%, SaaS 64%
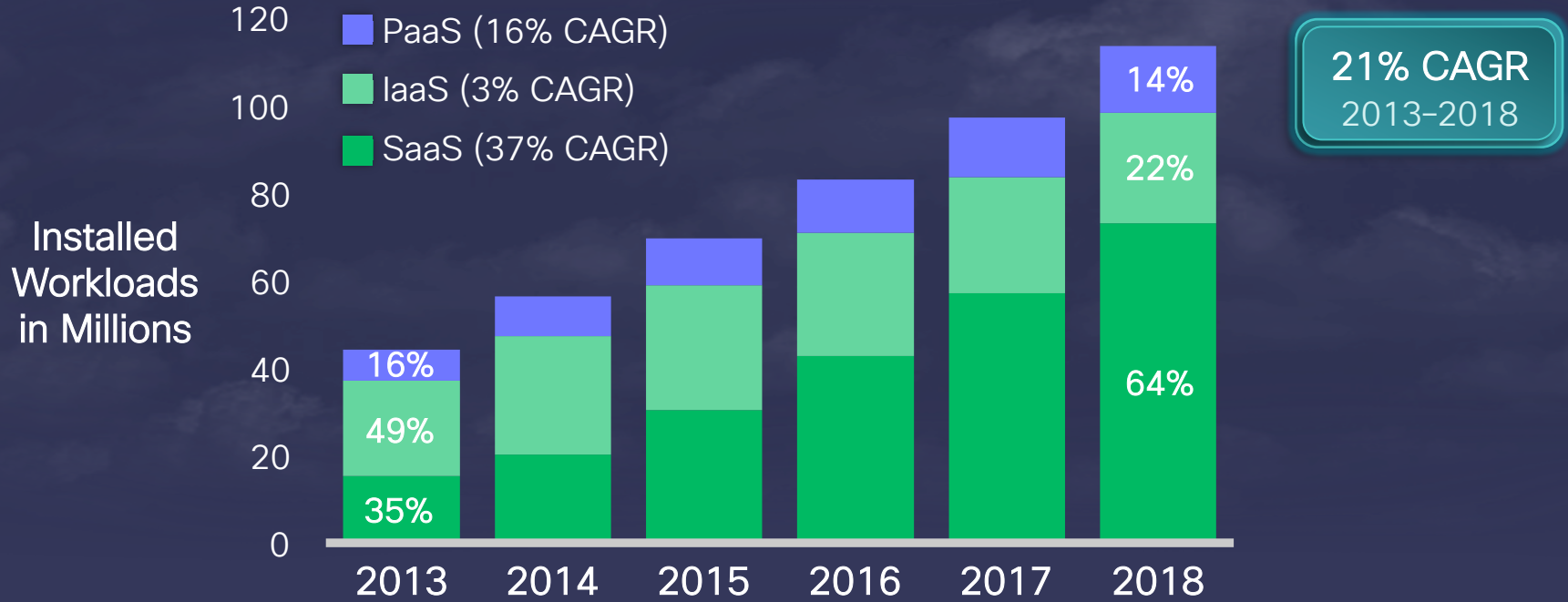
21% CAGR
2013–2018

Global Public Cloud Workloads
SaaS Most Popular Cloud Service Model Through 2018; IaaS Grows Fastest

Installed Workloads in Millions

Legend:
- PaaS (40% CAGR)
- IaaS (46% CAGR)
- SaaS (24% CAGR)

33% CAGR
2013–2018

2013: 10% / 25% / 65%
2018: 13% / 40% / 47%

Years: 2013, 2014, 2015, 2016, 2017, 2018

Y-axis: 0, 10, 20, 30, 40, 50, 60
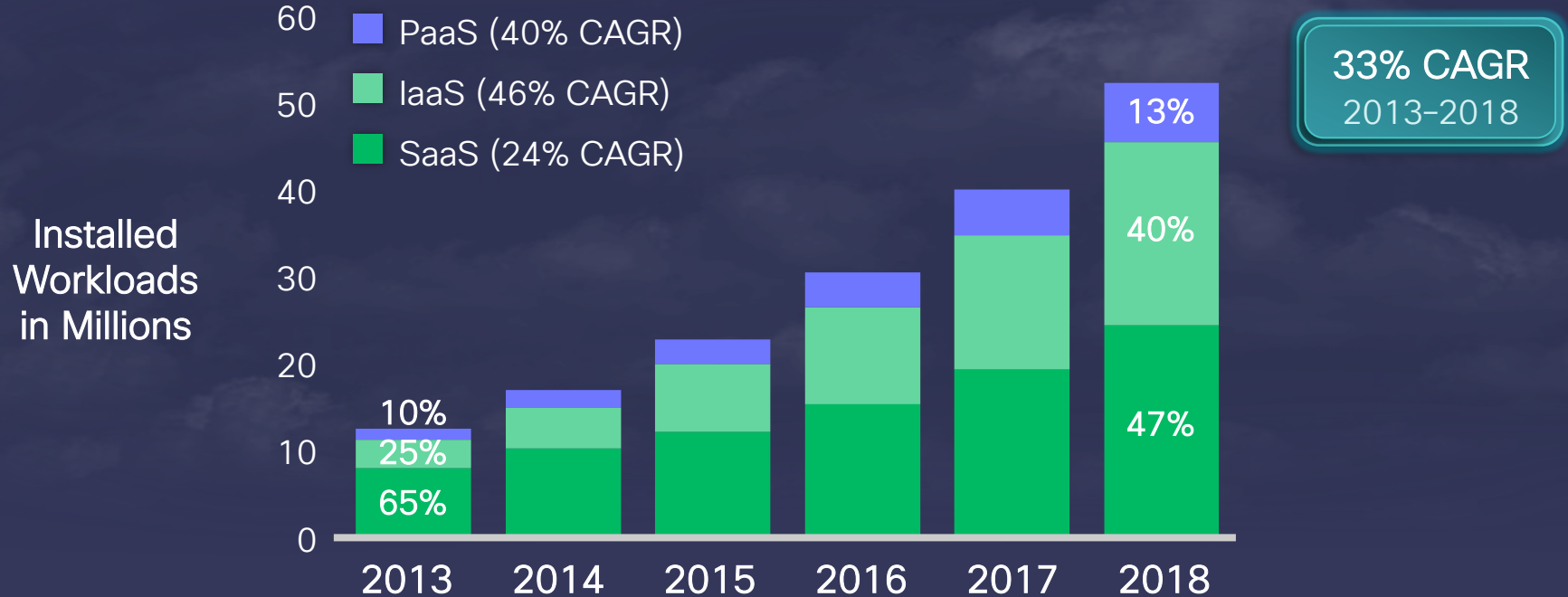
Source: Cisco Global Cloud Index, 2013–2018

Internet of Everything (IoE) Data Generation Comparison

Data generated by IoE apps will reach **400 ZBs** per year by 2018.

That's **276 times higher** than traffic projected to go from data centers to end users by 2018.

(1.5 ZBs)

Big Data Examples (2014)

	GB per Hour
Hubble Telescope	1
Smart Building	10
Retail Branch	10
Car*	15
Oil Well	92
Hospital	130
Manufacturing Facility	1,000
Self-Driving Car	2,700
Train*	5,000
Airplane*	40,000
Particle Accelerator	60,000,000

* These represent the latest models

2014 Big Data Example: Aviation—Boeing 787

Produced on Board:	Transmitted to Data Center:	1.25% of Data Transmitted, Local Data is
40 TB per hour	0.5 TB per hour	80x Higher

2014
Big Data
Example:
Healthcare—
Hospital
Patient

Produced in
Hospital
per Patient:

**10 GB
per year**

Transmitted to
Data Center:

**80 MB
per year**

0.8% of Data
Transmitted,
Local Data is
125x Higher

Big Data Example: Smart Building

Produced in Building:	Transmitted to Data Center:	1% of Data Transmitted, Local Data is
10 GB per hour	100 MB per hour	100x Higher

Will Data Created Exceed Data Consumed?

Average Traffic Per User

Potential Medical Data Per User

2013

2018

180 GB per Year

360 GB per Year

480 GB

Average Medical Data File Sizes

Routine Health Monitoring Partial		=	150 MB/day
In-Hospital Patient Monitoring All Vitals		=	2 GB/day
Genome Sequencing Complete Human Genome		=	100 GB
Newborn Baby xxxx		=	?

Smart Car

Streaming Audio

Web Browsing

Streaming
Long-form Video

Navigation (LBS)

Streaming
Short-form Video
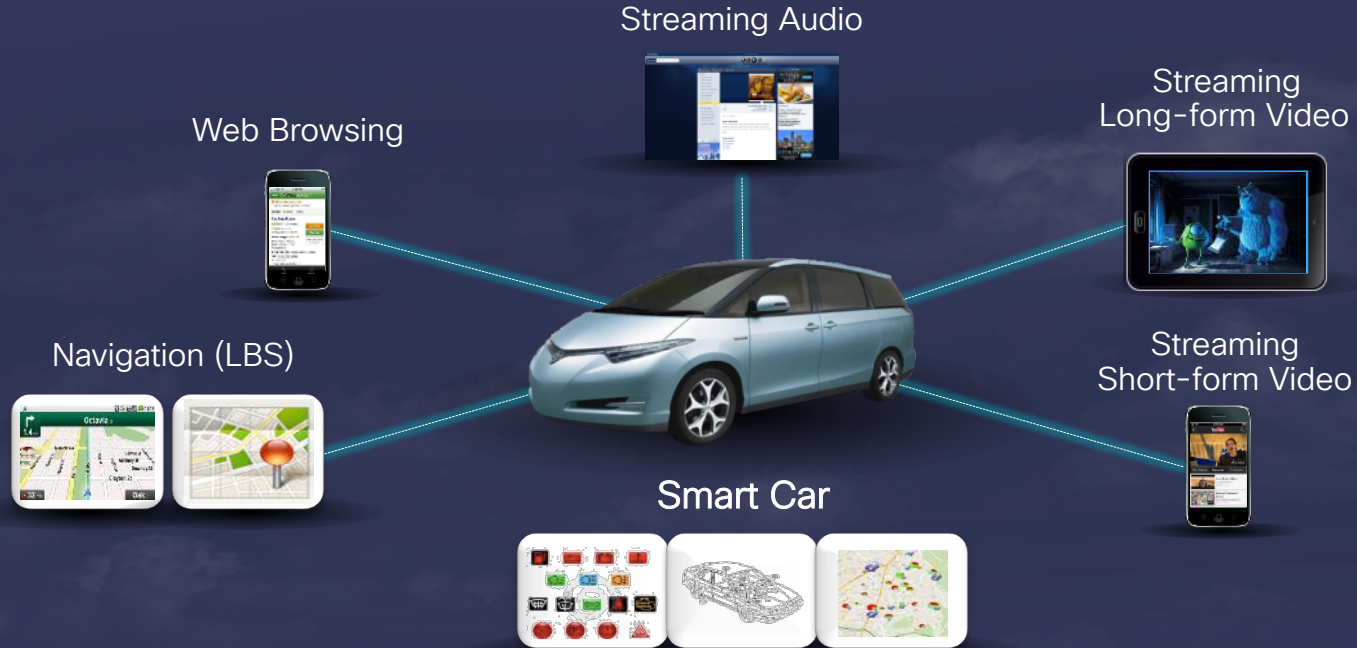
Smart Car

Smart Car (Self Driving Car) Traffic : 1GB / Second; 2 PB / Year
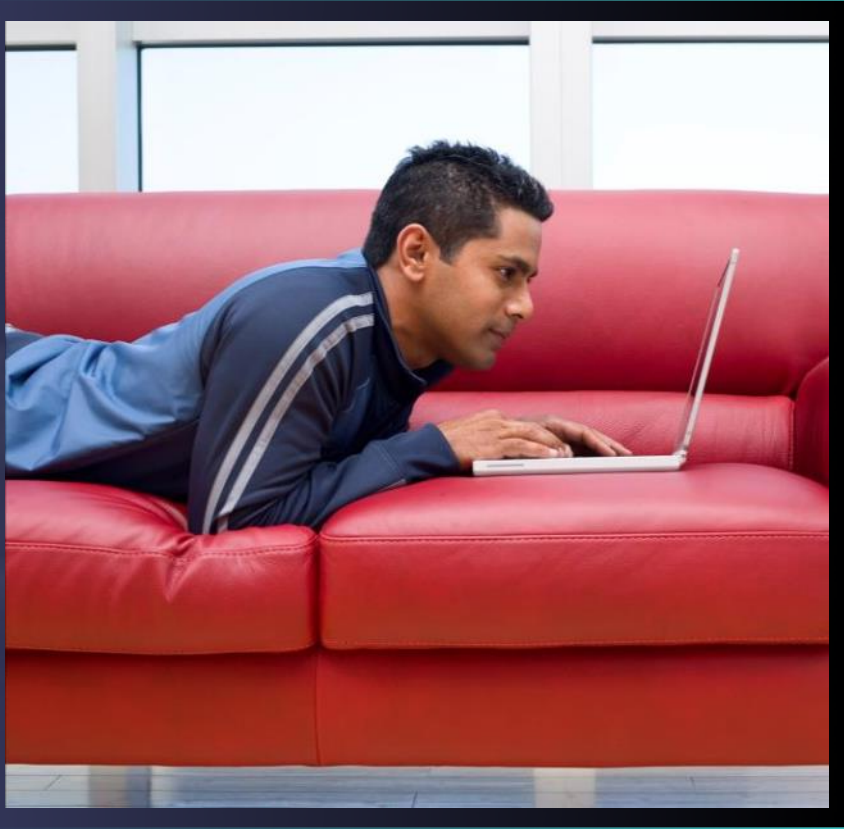
By 2018, half of the world's population (50%) will have residential Internet access.

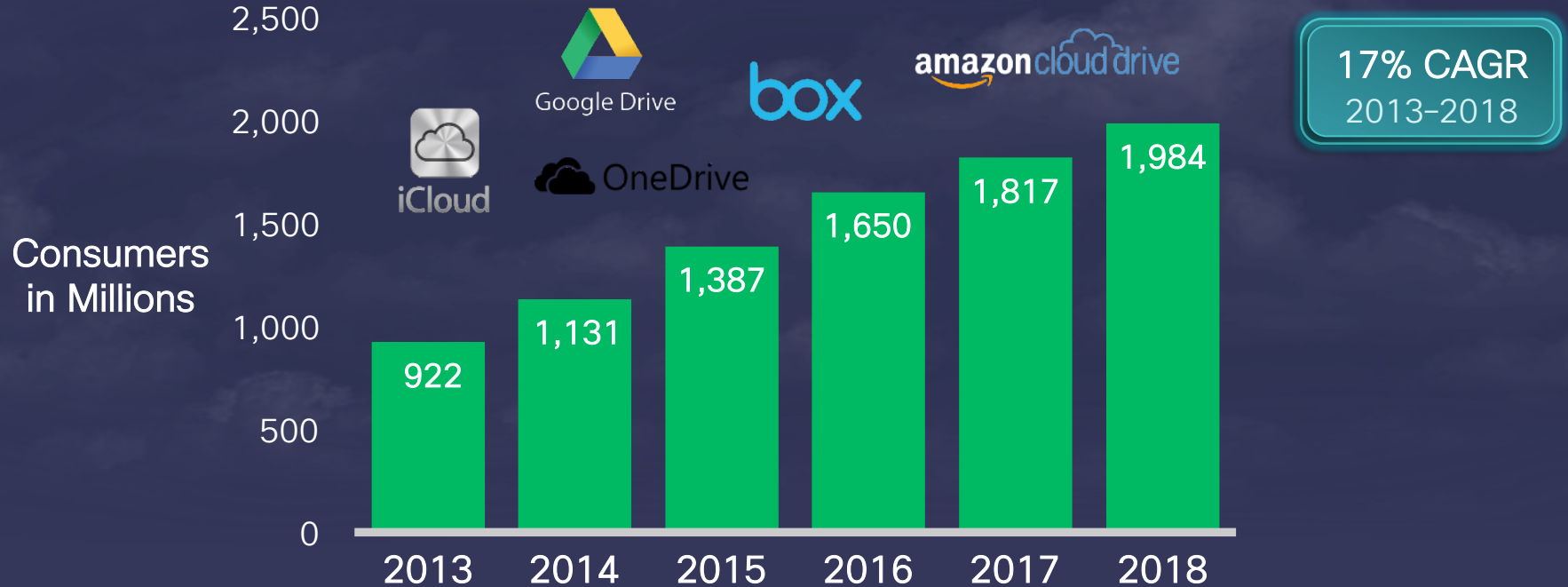By 2018, there will be 4.5 device/connections per residential internet user.

By 2018, 53% of all residential Internet Users will use Personal Cloud Storage.

Source: Cisco Global Cloud Index, 2013–2018

Global Personal Cloud Storage
Majority (53%) of Consumer Internet Users Will Use Cloud Storage by 2018

Consumers in Millions

Year	Consumers in Millions
2013	922
2014	1,131
2015	1,387
2016	1,650
2017	1,817
2018	1,984

17% CAGR
2013–2018

Source: Cisco Global Cloud Index, 2013–2018 ; Juniper Research

LATAM Personal Cloud Storage
Nearly One-Third (31%) of Consumer Internet Users Will Use Cloud Storage by 2018

Consumers in Millions

Google Drive

box

amazon cloud drive

iCloud

OneDrive

17% CAGR
2013–2018

Year	Consumers in Millions
2013	49
2014	55
2015	63
2016	73
2017	86
2018	109
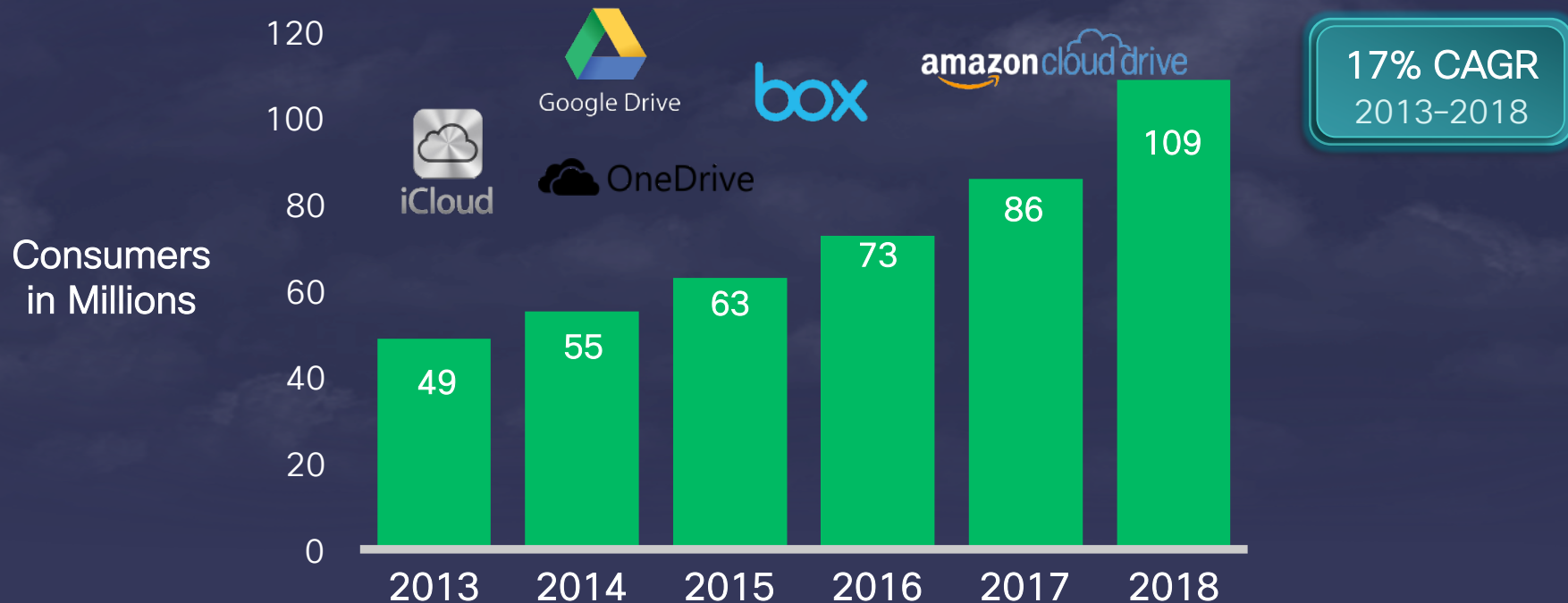
Source: Cisco Global Cloud Index, 2013–2018 ; Juniper Research

Global Personal Cloud Storage
Growing Internet Access & Multi-Device Ownership (Fixed/Mobile) Drives Cloud Storage Adoption

100%

Residential Internet Users as a % of Population

CEE

60%

LATAM

APAC

WE

NA

MEA

20%

2   3   4   5   6   7   8   9   10

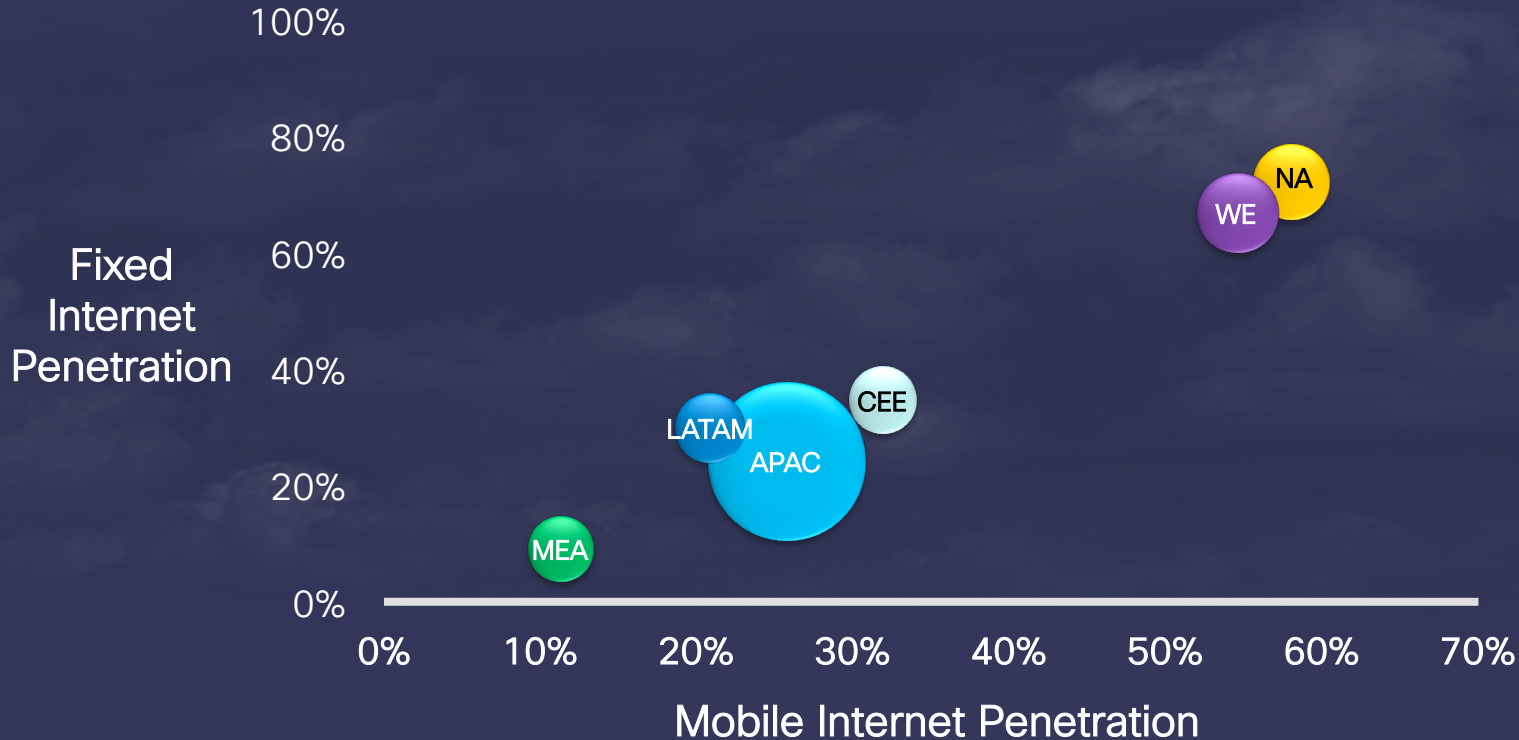**Average Number of Devices and Connections Per Internet User**
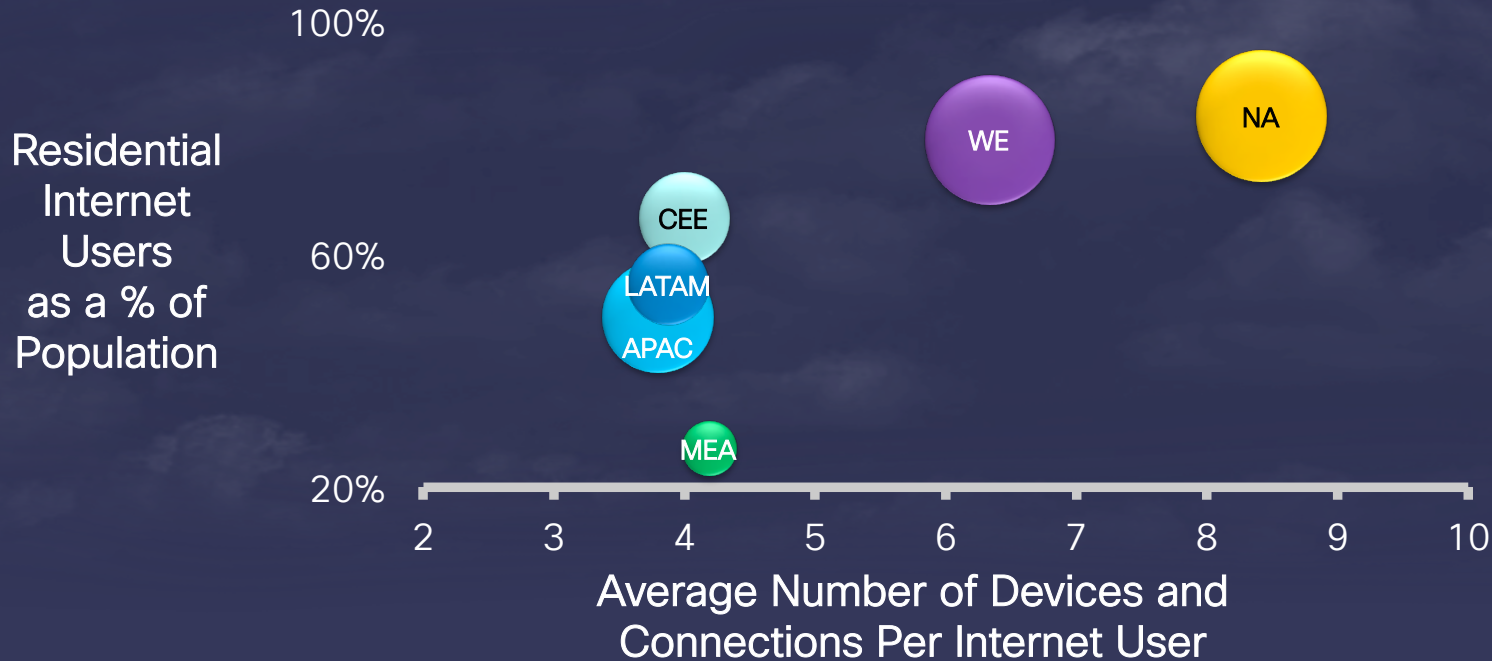
Source: Cisco Global Cloud Index, 2013–2018

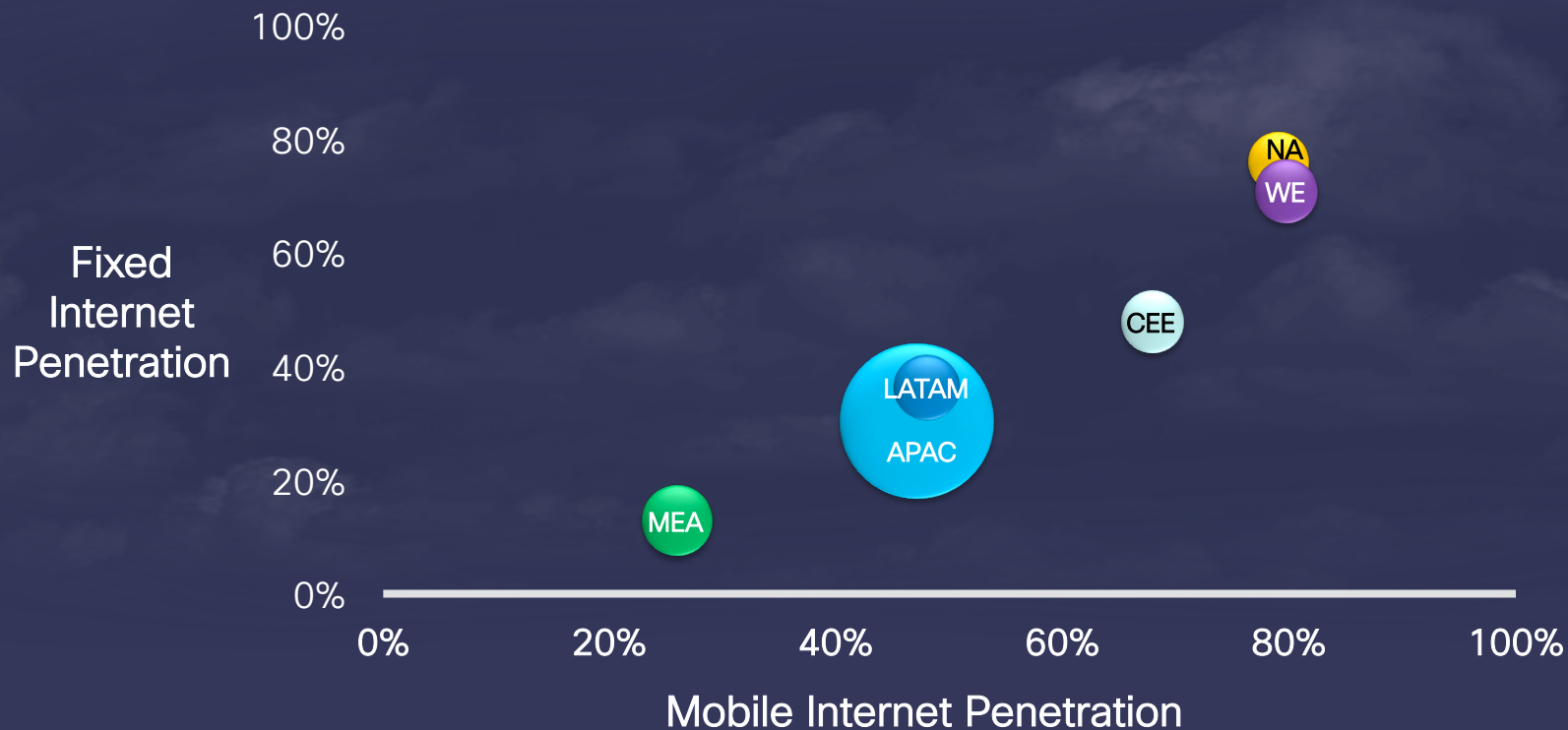# Cloud Readiness
- Internet Ubiquity
- Network Speeds and Latency Analysis

Regional Internet Access Ubiquity (2013)

Chart: Fixed Internet Penetration (y-axis, 0% to 100%) vs Mobile Internet Penetration (x-axis, 0% to 70%)

- MEA: ~11% mobile, ~9% fixed
- LATAM: ~20% mobile, ~30% fixed
- APAC: ~28% mobile, ~20% fixed
- CEE: ~33% mobile, ~35% fixed
- WE: ~55% mobile, ~67% fixed
- NA: ~58% mobile, ~72% fixed

Regional Internet Access Ubiquity (2018)

Fixed Internet Penetration (y-axis): 0% to 100%

Mobile Internet Penetration (x-axis): 0% to 100%

- MEA
- APAC / LATAM
- CEE
- NA / WE

Global Cloud Readiness
Business & Consumer Apps/Network Requirements

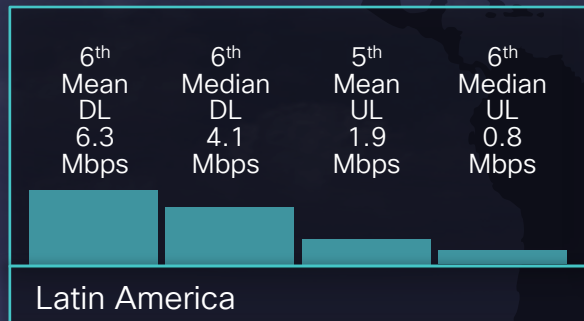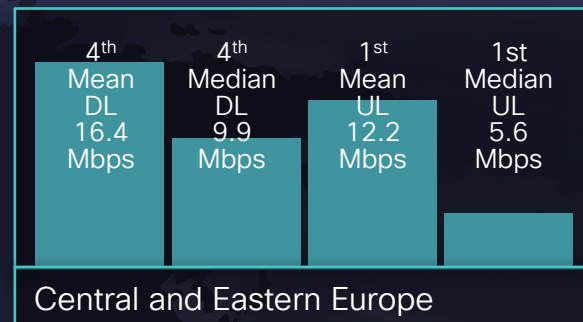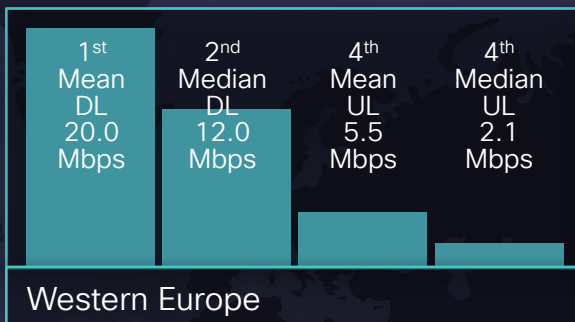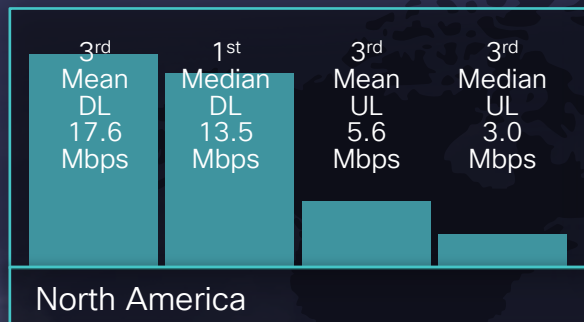| Basic Cloud Apps	Intermediate Cloud Apps	Advanced Cloud Apps
Network Requirements:	**Network Requirements:**	**Network Requirements:**
Download Speed: Up to 750 kbps	Download Speed: 751–2,500 kbps	Download Speed: Higher than 2,500 kbps
Upload Speed: Up to 250 kbps	Upload Speed: 251–1,000 kbps	Upload Speed: Higher than 1,000 kbps
Latency: Above 160 ms	Latency: 159–100 ms	Latency: Less than 100 ms

LATAM Highlight – Mexico DL Speeds

Fixed Overall Network Characteristics (2014)

North America
3rd Mean DL 17.6 Mbps	1st Median DL 13.5 Mbps	3rd Mean UL 5.6 Mbps	3rd Median UL 3.0 Mbps

Western Europe
1st Mean DL 20.0 Mbps	2nd Median DL 12.0 Mbps	4th Mean UL 5.5 Mbps	4th Median UL 2.1 Mbps

Central and Eastern Europe
4th Mean DL 16.4 Mbps	4th Median DL 9.9 Mbps	1st Mean UL 12.2 Mbps	1st Median UL 5.6 Mbps

Latin America
6th Mean DL 6.3 Mbps	6th Median DL 4.1 Mbps	5th Mean UL 1.9 Mbps	6th Median UL 0.8 Mbps

Middle East and Africa
5th Mean DL 6.4 Mbps	5th Median DL 4.7 Mbps	6th Mean UL 1.8 Mbps	5th Median UL 0.8 Mbps

Asia Pacific
2nd Mean DL 18.8 Mbps	3rd Median DL 11.8 Mbps	2nd Mean UL 12.1 Mbps	2nd Median UL 5.0 Mbps

Mobile Overall Network Characteristics (2014)

North America

| 1st Mean DL 10.1 Mbps | 1st Median DL 6.9 Mbps | 2nd Mean UL 4.3 Mbps | 1st Median UL 2.4 Mbps |

North America

Western Europe

| 2nd Mean DL 9.5 Mbps | 2nd Median DL 6.6 Mbps | 3rd Mean UL 3.4 Mbps | 2nd Median UL 1.7 Mbps |

Western Europe

Central and Eastern Europe

| 4th Mean DL 7.0 Mbps | 4th Median DL 3.0 Mbps | 1st Mean UL 4.9 Mbps | 4th Median UL 0.9 Mbps |

Central and Eastern Europe

Latin America

| 5th Mean DL 3.8 Mbps | 6th Median DL 1.5 Mbps | 5th Mean UL 1.4 Mbps | 6th Median UL 0.5 Mbps |

Latin America

Middle East and Africa

| 6th Mean DL 2.5 Mbps | 5th Median DL 1.7 Mbps | 6th Mean UL 1.0 Mbps | 5th Median UL 0.5 Mbps |

Middle East and Africa

Asia Pacific

| 3rd Mean DL 7.1 Mbps | 3rd Median DL 6.2 Mbps | 4th Mean UL 2.6 Mbps | 3rd Median UL 1.6 Mbps |

Asia Pacific

Globally IPv6 User Projections are Nearly 24% by 2018

Zoom: 1d 5d 1m 3m 6m 1y Max   • World Wide 4.74 • Projection 23.46 | January 09, 2018
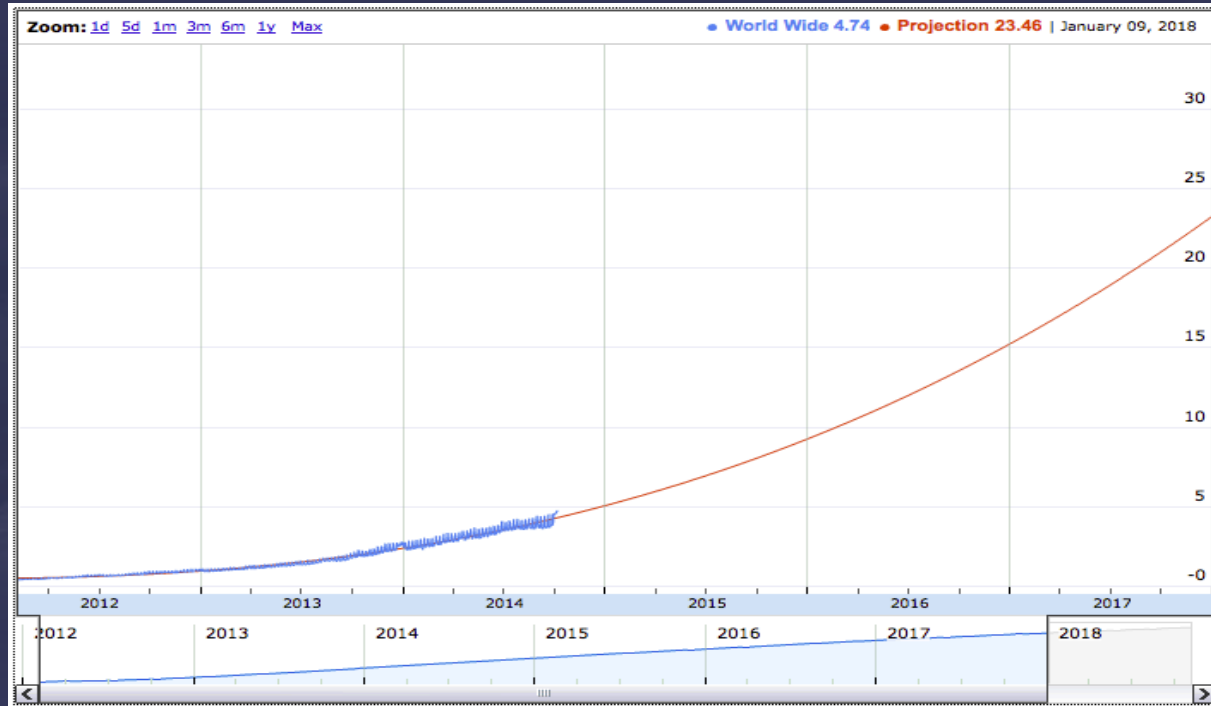
Source: Forecast Simulation Tool at 6lab.cisco.com

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

Public URL: 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

Thank you.