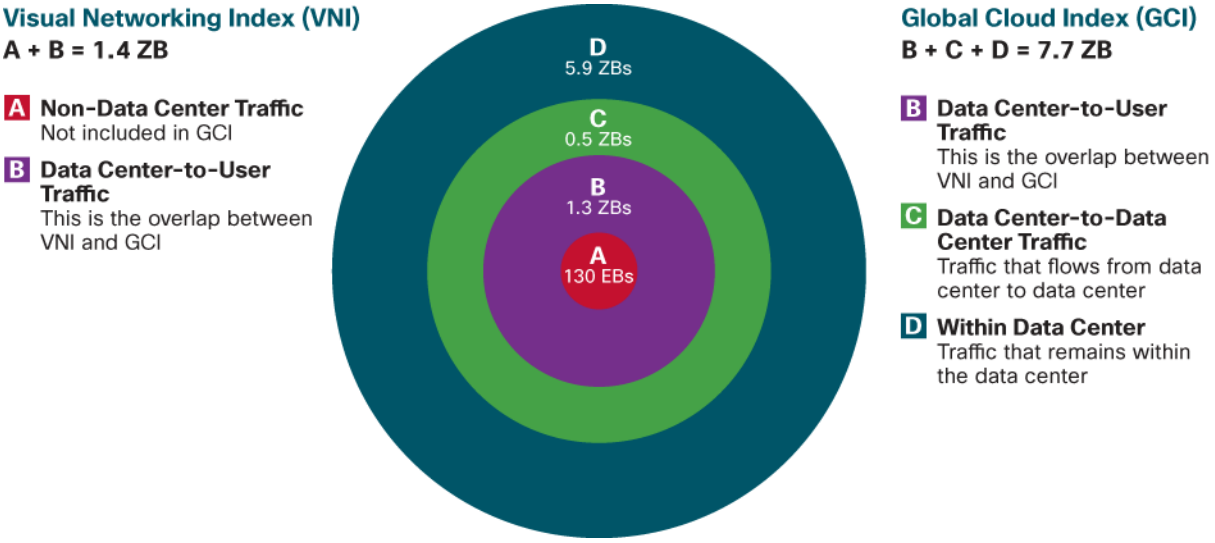
Cisco Global Cloud Index

Q. What is the Cisco® Global Cloud Index (GCI) and how is it different from other Cisco IP traffic forecasts?

A. Data center virtualization and cloud computing are evolving as essential elements of business, education, government, and home communications and networking. Cisco conducts this study as an industry resource to provide IT professionals with new data to help them address increasingly complex data center operations and service delivery requirements. Understanding macro-level data center and cloud traffic trends can help organizations make strategic networking and business decisions. The Cisco GCI also delves into measuring and forecasting private network traffic—investigating what is going on within data centers, between data centers, and what ultimately travels from data centers to end users.

While the Cisco GCI and the other Cisco IP network traffic forecast (the Cisco Visual Networking Index [VNI]) are distinct forecasts, there is some overlap (Figure 1). The Cisco VNI forecasts the amount of traffic crossing the Internet and IP WAN networks, while the Cisco GCI forecasts traffic within the data center, from data center to data center, and from data center to user. The Cisco VNI forecast consists of data center-to-user traffic, along with non-data center traffic not included in the Cisco GCI (various types of peer-to-peer traffic). The Cisco GCI includes data center-to-user traffic (this is the overlap with the Cisco VNI), data center-to-data center traffic, and traffic within the data center. For more details on the Cisco VNI, please see the Cisco Visual Networking Index: Forecast and Methodology, 2012–2017.

Figure 1. Cisco GCI and VNI



Q. How is “Cloud” defined in the Cisco Global Cloud Index?

A. The Cisco GCI aligns with the industry-standard cloud computing definition from the National Institute of Technology (NIST). The NIST definition lists five essential characteristics of cloud computing: on-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service. Deployment models include private, public, and hybrid clouds (or a combination of these). These distinct forms of cloud computing enable a variety of software, platform, and infrastructure services. Cloud data centers can be operated by service providers as well as private enterprises.

Q. What is the methodology behind the Cisco Global Cloud Index?

A. The Cisco GCI incorporates a bottom-up and top-down approach to derive global and regional results. The methodology begins with the installed base of workloads 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 within the forecast period. For traffic modeling and verification of data center traffic types and volumes, network data was collected from 10 enterprise and Internet data centers (more than 40 terabytes per month for 12 months). A global cloud traffic forecast is provided, as well as six regional forecasts (Asia Pacific, Central and Eastern Europe, Western Europe, Middle East and Africa, North America, and Latin America). For specific details of our forecast methodology, please see the Cisco Global Cloud Index: Forecast and Methodology, 2012–2017.

Q. What is the difference between a traditional data center and a cloud data center?

A. The main differences are in levels of virtualization, standardization, automation, and security. Cloud data centers offer increased performance, higher capacity, and greater ease of management compared with traditional data centers. Virtualization serves as a catalyst for hardware and software consolidation, greater automation, and an integrated security approach.

Q. How does the Cisco Global Cloud Index differentiate between cloud traffic and non-cloud traffic?

A. Cloud traffic is generated as a result of cloud services—easily deployed services that are accessible through the Internet, have elastic and scalable provisioning and usage-based pricing, and can be delivered on demand. Cloud traffic is measured and then subtracted from total data center traffic to obtain non-cloud traffic estimates.

Q. What is a "workload," and why is this important to understanding data-center and cloud traffic?

A. A workload is the amount of processing a computer or a server undertakes to run an application and support a number of users interacting with the application. The increasing migration of workloads from end-user devices to remotely located servers, and from premises-based networks to cloud networks, creates new network requirements for operators of both traditional and cloud data center environments.

Traditionally, one server carried one workload. However, with increasing server computing capacity and virtualization, multiple workloads per physical server are common. Cloud economics includes server costs, resiliency, scalability, and product lifespan. These considerations often lead organizations to move from traditional data centers to cloud data centers. This allows the migration of workloads across servers, both inside the data center and across data centers (even centers in different geographic areas). Often an end-user application is supported by several workloads distributed across multiple servers. This distributed architecture creates multiple streams of traffic within and between data centers in addition to traffic to and from the end user.

Q. What is meant by "cloud readiness" and what characteristics are used to assess regions' ability to support cloud services?

A. The cloud readiness segment of the Cisco GCI study offers regional and some country-level views of the fundamental performance factors required for broadband and mobile networks to deliver next-generation cloud services. The enhancements and reliability of these performance factors will support the increased adoption of business-grade and consumer-grade cloud computing. For instance, it is important for consumers to be able to download music and videos on the road as well as for business users to have continuous access to videoconferencing and mission-critical customer relationship management (CRM) and enterprise resource planning (ERP) systems. Download and upload speeds as well as latencies are vital measures to assess network capabilities of cloud readiness.

Over 90 million records from Ookla, Cisco's GIST application, and the International Telecommunication Union (ITU) were analyzed from 150 countries. Regional cloud readiness values (calculated as an average of country-level values within a particular region) are included in the primary Cisco GCI report. Individual countries may have slightly or significantly higher or lower averages compared to the regional averages for download speed, upload speed, and network latency. For country-level data, please refer to the Cisco GCI Supplement: Cloud Readiness Regional Details. The major cloud readiness broadband characteristics and performance factors included in this study are as follows.

- **Broadband ubiquity**: This indicator measures fixed and mobile broadband penetration while considering population demographics to assess the pervasiveness and expected connectivity in various regions.
- **Download speed**: With increased adoption of mobile and fixed bandwidth-intensive applications, end user download speed is an important characteristic. This indicator will continue to be critical for the quality of service delivered to virtual machines, CRM and ERP cloud platforms for businesses, and video download and content retrieval cloud services for consumers.

- **Upload speed**: With the increased adoption of virtual machines, tablets, and videoconferencing in enterprises, as well as by consumers on both fixed and mobile networks, upload speeds are especially critical for delivery of content to the cloud.
- **Network latency**: Delays experienced with voice over IP (VoIP), viewing and uploading videos, online banking on mobile broadband, or viewing hospital records in a healthcare setting are due to high latencies (usually reported in milliseconds). Reducing delay in delivering packets to and from the cloud is crucial to delivering today's advanced services.

The study has traditionally focused on average or mean download, upload, and latency characteristics. However, to better understand the distribution of speeds within a country, the median download speed, median upload speed, and median latency are being introduced to the study. In most countries median speeds are lower than mean or average speeds. This is due to the higher occurrence of lower speeds in the lower 50th percentile, compared to the longer tail of distribution of the higher speeds.

For any set of numbers, the median is the midpoint, where half the numbers are lower and half the numbers are higher. The average of a set of numbers is the total of all the numbers in the set, divided by the number of items in that set. For further details, please see the sample speed distribution curve in Cisco GCI Supplement: Cloud Readiness Regional Details.

Q. Are there any other factors besides the ones listed above that might impact the end-user cloud experience?

A. Yes, besides the upload and download speeds and latency of the ISP network, the location of the content providers' servers or content distribution network (CDN) and their distance from the Internet service provider (ISP) network are factors. It is estimated that latency increases by 1 millisecond for every additional 150 miles travelled by a video stream.

Q. May I or my organization or company use or publish Cisco Global Cloud Index forecast data?

A. Yes. Cisco welcomes and encourages press, analysts, service providers, and other interested industry parties (business, regulatory, or academic) to use or publish the data. We do require that proper Cisco attribution be given for any and all Cisco Global Cloud Index data that is published or shared in private or public, print and electronic forms (for example, "Source: Cisco Global Cloud Index [or GCI], 2012–2017"). No further signatures or consent are required to reference our publicly available white papers and reports. We are always interested in the context in which our data is used and would appreciate it if parties that use our content would share copies of their completed work containing Cisco GCI insertions. Please send these to traffic-inquiries@cisco.com.

Q. Can you share the data center and cloud data you used to construct the Cisco GCI traffic projections?

A. We are not able to share the specific source data that serves as a primary input to our forecast methodology.

Q. Where can I direct questions about the Cisco Global Cloud Index?

A. Please send questions about the Cisco GCI study to traffic-inquiries@cisco.com.

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Printed in USA

FLGD 11289 10/13