

Introduction—Understanding Data Center Interconnect

To meet insatiable demand for video, data, and cloud-based content and services, Data Center Interconnect (DCI) technologies have evolved to enable ultra-high capacity, massive scalability, power efficiency, and management simplicity.

As the name suggests, DCI is the technology that connects two or more data centers together over short, medium, or long distances using high-speed packet-optical connectivity. It connects routers and servers to each other or to multi-tenant data centers, so end-users and data can connect to storage and compute resources, cloud applications, and cloud services. It's a broad concept that comprises connectivity solutions across different layers of the network. DCI can be built from the optical layer, with packet-optical technology, or the packet layer, with switches and routers. It can be part of a managed service provided by an operator, or it can be a solution enterprises build for themselves. Networks sit at the heart of DCI, providing the connectivity to meet evolving requirements for operational simplicity, scalability, and automated performance. Leveraging advanced DCI technologies, organizations can speed the delivery of new services, reduce operating costs, and improve flexibility and efficiency.

DCI connects two or more data centers together, so end-users and data can connect to the right cloud applications and services.

By interconnecting data centers, users can consume content on demand, and gain access to information and entertainment anywhere, at any time. The recent growth of DCI has been fueled by content and cloud service providers, such as Google, Amazon, Netflix, and Facebook. These companies have evolved how data centers are built and interconnected to provide content delivery to billions of users. Additionally, DCI helps hospitals meet rigorous business and clinical needs, seamlessly share data among providers, safely back up and store millions of records, and prepare for growth. It provides the networking infrastructure banks need to support a full range of digital products, from digital money transfers to real-time payments, and open banking via APIs. In the education arena, campus IT networks rely on DCI to access and deliver digital

content between data centers and between campus facilities and the data center.

Many enterprises are moving IT resources to multi-tenant data centers and public clouds. In 2018, companies connected to roughly five public and private clouds on average, and 66 percent of cloud users planned to grow their cloud spending by 20 percent or more¹. As this trend accelerates, connectivity from enterprise data centers and between cloud data centers is expected to grow in lockstep. As the migration to cloud services continues, even standalone enterprise data centers do not exist in isolation. Enterprise data centers must talk to each other—sharing data and content, providing backups, and enabling greater resiliency. With the right combination of solutions, enterprises can ensure the smooth transport of critical assets across any distance and among any number of data centers. With speedy and reliable connections in place, geographically separate data centers can easily share resources and balance workloads.

Rise of the data center and DCI

A data center is a facility used to store, manage, and process data. It typically occupies anywhere from an entire floor of a building (such as a basement or dedicated floor) to a specially built facility with stringent access controls or even underground tornado-proof fortifications. The number of data centers is growing to match the widespread use of cloud services and virtualization—and these trends are only expected to grow. By 2021, interconnection bandwidth will grow to over 8,200 Tb/s, which outpaces Internet traffic by almost two times the growth rate¹. These interconnections are shaping and scaling the global digital economy, enabling the rapid growth of multi-cloud services, giving rise to new ecosystems such as the Internet of Things (IoT), and propelling digital business to outgrow the overall global economy by three times.

Multiple trends are driving the need for more data centers. Due to rising content demands, some organizations are moving data centers closer to users, while others choose to locate data centers where power and/or real estate costs are lower. The growth of 'hyperscale' data centers that leverage shared resources and cloud computing, along with stringent security protections, are poised for explosive growth, replacing traditional enterprise Web server farms with cloud services that deliver far greater automation. Hyperscale data center growth is poised to expand, from nearly \$87 billion in 2016 to an estimated \$360 billion in 2023,^{2,3} and hyperscale data

¹ RightScale 2018 State of the Cloud Report summary, <https://www.rightscale.com/p/state-of-the-cloud>

² Equinix Global Interconnection Index, Vol. 2, 2018, p8 <https://www.equinix.com/resources/whitepapers/global-interconnection-index/>

³ Hyperscale Data Centers: Market Strategies and Forecasts, Worldwide, 2017-2023, January 2017, Wintergreen Research, Inc. <https://www.researchandmarkets.com/reports/4033103/hyperscale-data-centers-market-strategies-and#rela0>