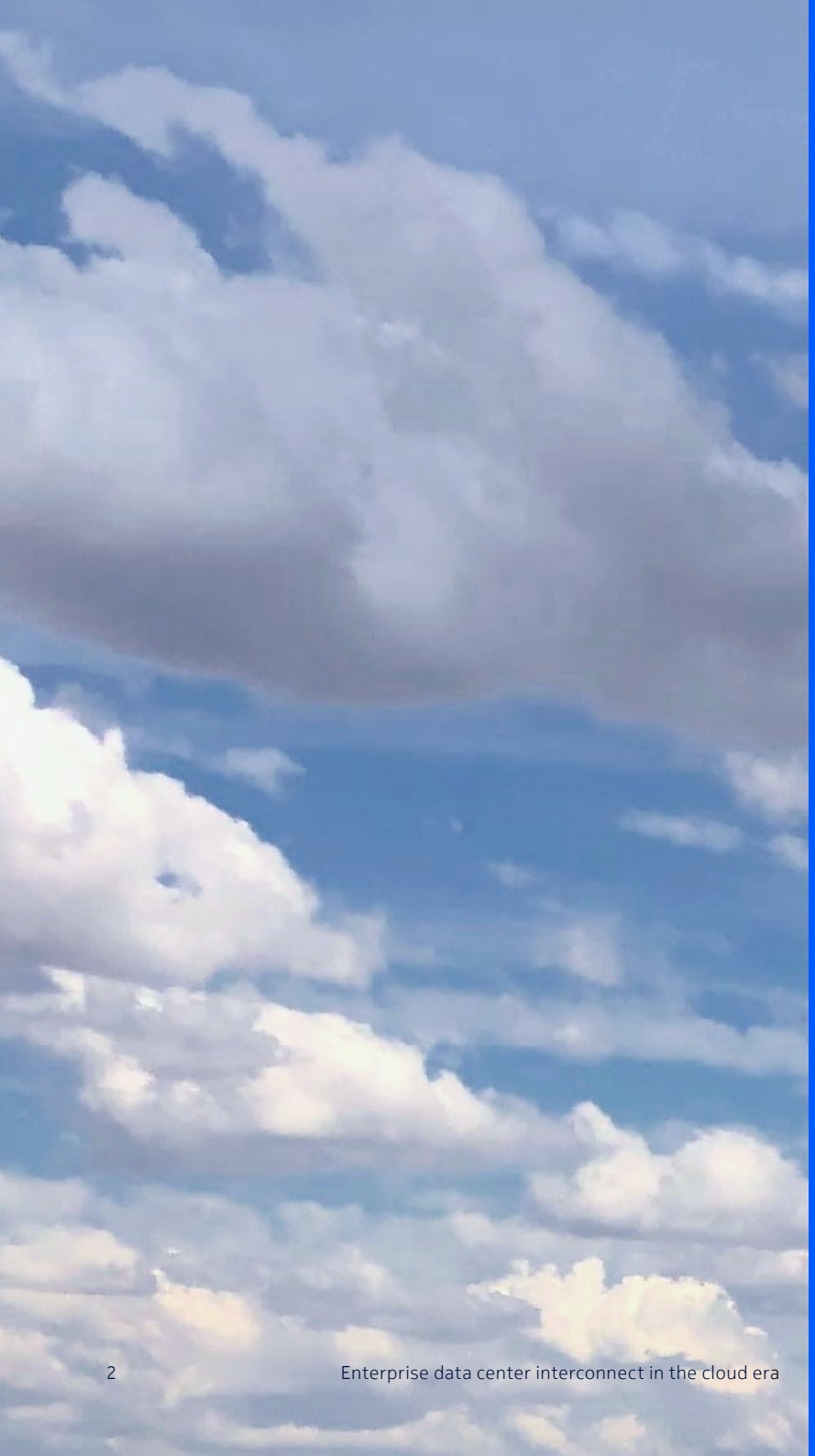
Enterprise data center interconnect in the cloud era

NOKIA



Enterprises face a tidal wave of data: massive amounts of information generated by increasingly digitalized operations. Government, financial institutions, healthcare providers, manufacturers, utilities—every enterprise needs to consider how their data centers match their operational needs. Constructing data center interconnect (DCI) networks must to be part of a strategic plan that maps present needs to future growth plans.

The cloud has long been touted as a solution for enterprises seeking to embrace digitalization while controlling capital expenses. Virtual data centers, the cloud, offers the advantages of a big corporate-owned facility without the big price tag and long-term commitment.

But what are the best cloud solutions?

Nokia and our partners are ready to help you.

All enterprises need the cloud

On-line commerce. Remote employees. Virtual meetings. These have all become commonplace as digitalization trends accelerated over the past few years. While these trends were adopted earlier by large corporations, medium and smaller enterprises are also now compelled to embrace technology to remain competitive. At the same time, traditional needs persist, such as protecting data, ensuring business continuity and disaster recovery.

In 2019 CIO Magazine reported that smaller corporations spend almost 7% of their revenue on IT, compared to 3% spent by large corporations. Increasingly, these expenditures are on cloud-based storage and computing capacity. It's the best way for any enterprise to scale their IT needs in-step with the changing business landscape. Cloud virtualization preserves enterprise cash, reduces debt and offers flexibility for the enterprise to shape their IT expenditures to match their business plans.

- **IDC reported global cloud services spend increased 29% to 406B in 2021**
- **TechCrunch reports Q1 2023 global cloud infrastructure revenue at $63B, showing enterprises continue to invest even while facing economic uncertainties**
- **Gartner predicts that public cloud end user services spend to exceed $600B**

Which cloud model?

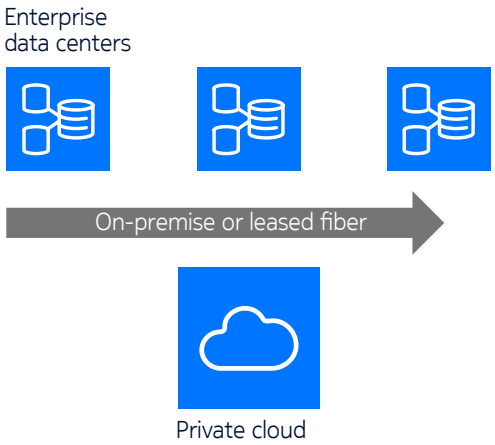
The cloud concept has evolved over the past few years as a result of several market and technology factors. Optical fiber in many metro markets continues to be installed, driven by demand for 5G wireless, broadband and other telecom services; fiber capacity is increasingly available for lease by enterprise use. This makes DCI affordable. At the same time, co-location data centers continue to become available in most markets, offering enterprises the ability to lease remote storage and compute capacity or remotely operate their own assets. Many of these centers also act as access points for internet exchange points, allowing direct access to public cloud services.

These trends imply several cloud models: private, virtual private and hybrid cloud.

Private cloud

Most cloud ecosystems start with some form of private cloud. With a private cloud, on premise and off-premise data center resources and the DCI network interconnecting them are dedicated to and controlled by the enterprise. Private clouds are ideal for business-critical applications and information because they provide strong security and control and low levels of risk.

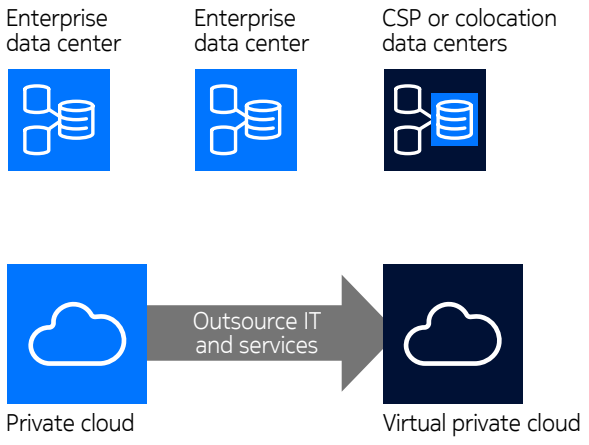
Private cloud DCI may be as simple as in-building cabling between servers or, now more commonly, leasing dark fiber to connect remote facilities or data centers using enterprise-owned transport equipment.



Virtual private cloud

For less critical applications, many organizations seek to take advantage of a virtual private cloud. With this approach, the private network is easily and cost-effectively extended to include IT assets and resources owned and hosted off-premises, for example, in a third-party data center such as a communications service provider (CSP) multi-tenant data center or carrier-neutral provider (CNP) colocation data center.

Virtual private cloud DCI extends the concept of leased dark fiber to optionally include other services such as network operation and equipment maintenance. The enterprise data center and remote assets connected over secured leased managed services or dedicated dark fiber form an enterprise private cloud, with some assets located physically outside enterprise ownership.



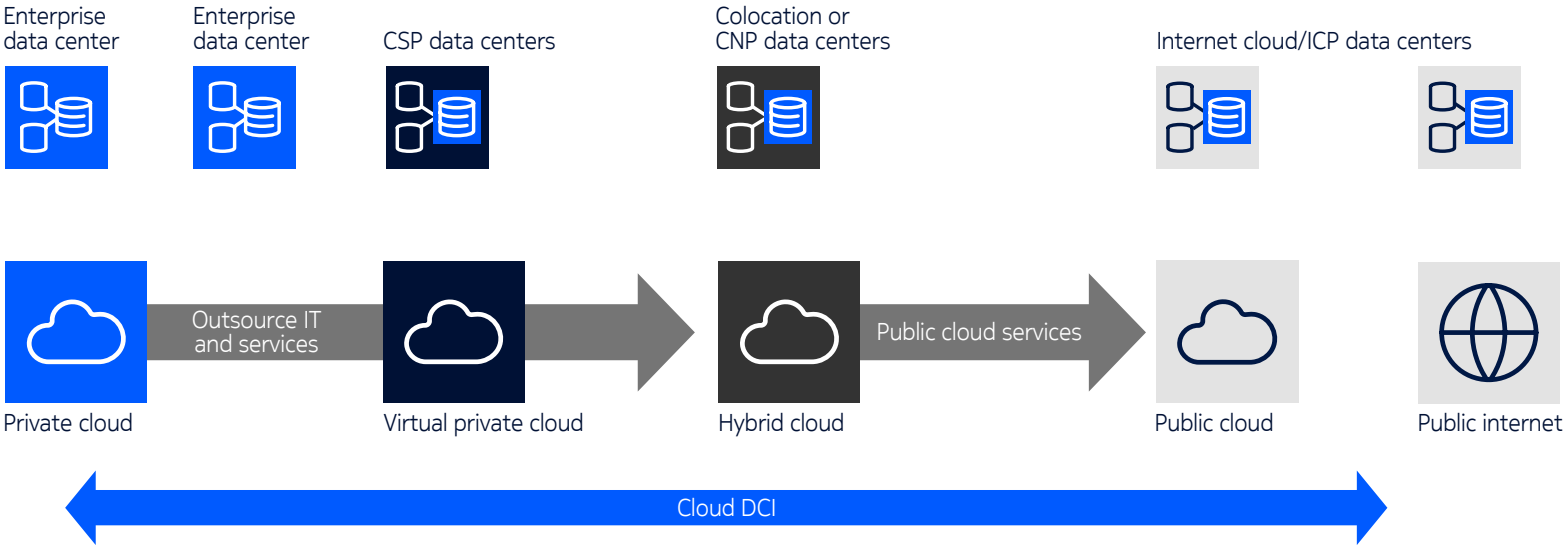
Hybrid cloud

Organizations that maintain private or virtual private clouds can also capitalize on the flexibility, agility and affordability of public cloud services offered by internet content providers (ICPs). By creating a hybrid cloud, they can securely access public cloud services when, where and for as long as they're needed.

For example, some organizations may choose to run less-critical workloads using pay-as-you-go public cloud services, reducing CAPEX in favor of OPEX.

Hybrid cloud DCI allocates resources and balances workloads across the private and public clouds to match expenses to business needs. Data moves easily between clouds, and resources can expand or contract seamlessly to meet changing workloads. Organizations can use a secure internet connection or dedicated cloud interconnect to reach public cloud services.

Read more:
Cloud DCI for enterprise white paper



DCI for the cloud

Data center consolidation, virtualization, and cloud computing are all helping enterprises get a handle on their data while keeping IT costs under control. But they're also raising new questions:

- How do we extend virtualization across multiple data centers and cloud types, especially if they're owned and operated by different entities?
- How do we connect our private cloud to public cloud services when we need more agility and capacity?
- How do we do all of this and still have the same high-speed, low-latency, secure interconnections we need?

The answer in all three cases is a DCI approach designed specifically for the cloud. That means having the agility and efficiency to interconnect data centers and IT resources across private, virtual private, hybrid and public clouds—without compromising scalability, control, reliability or security.

Cloud DCI can be as simple as leasing dark fiber and purchasing transport equipment so that the enterprise connects to its server assets. As workloads become more complex and capacity increases, most enterprises will favor solutions that make use of outside systems integrators, service providers and co-location providers that help them form an appropriate virtual private or hybrid cloud.

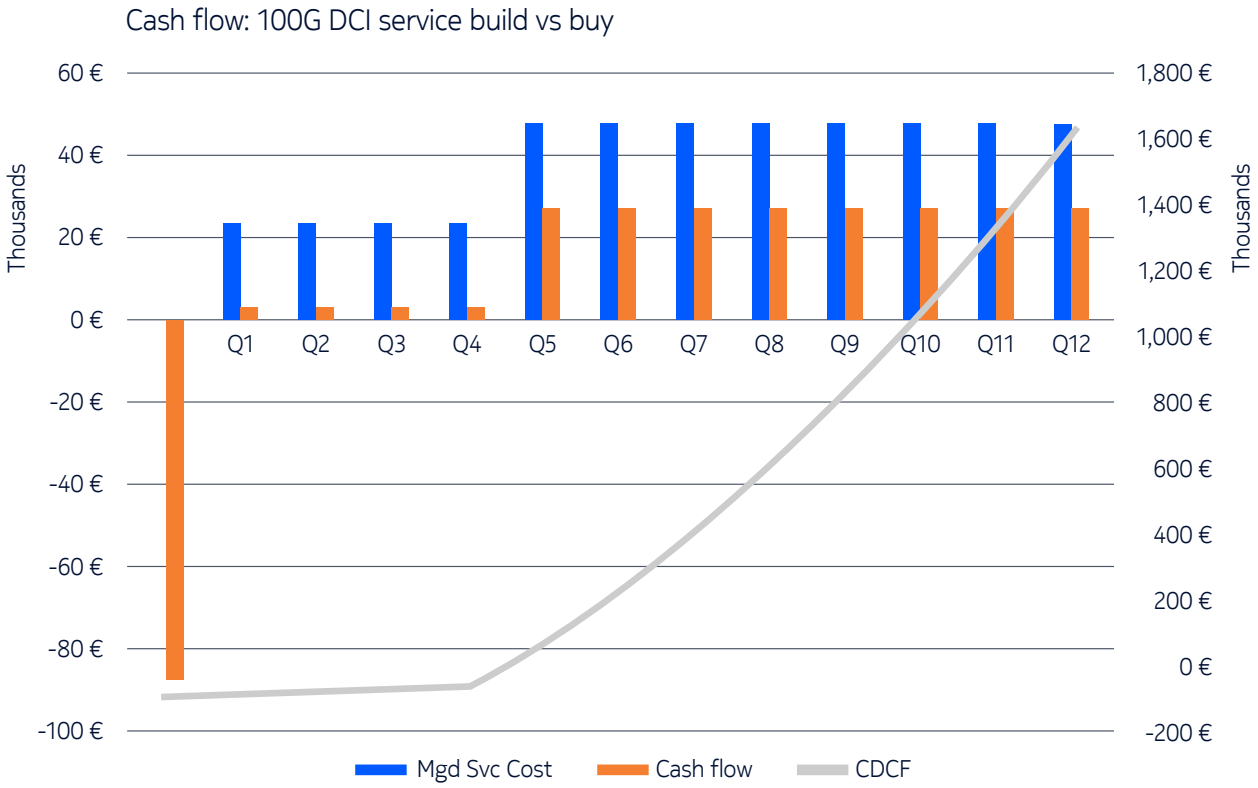
The case for 100G private build

Enterprises consolidating data centers or connecting remote assets may find it beneficial to construct their own DCI. For example, consider an enterprise in the Paris metro connecting two data centers roughly 12 kilometers apart. They need protected 100 Gb/s service now and expect to add a second wavelength. Utilizing readily available dark fiber and optical transport equipment, they can turn up their network today and reach pay-back as the second wave is deployed. Better still, there is enormous additional capacity ready for future growth.

Read more:
DCI build or buy white paper

100G private DCI build versus 100G managed DCI service

Example of a typical large enterprise consolidating data centers



Source: Ghent University. Surfnet dark fiber study.

Connecting 2 large data centers in Paris metro:

- 12 km route distance
- 100G redundant connection in 1st year
- Second 100G service added at Q4

100G private DCI has lower MRC for modest CAPEX investment with favorable payback:

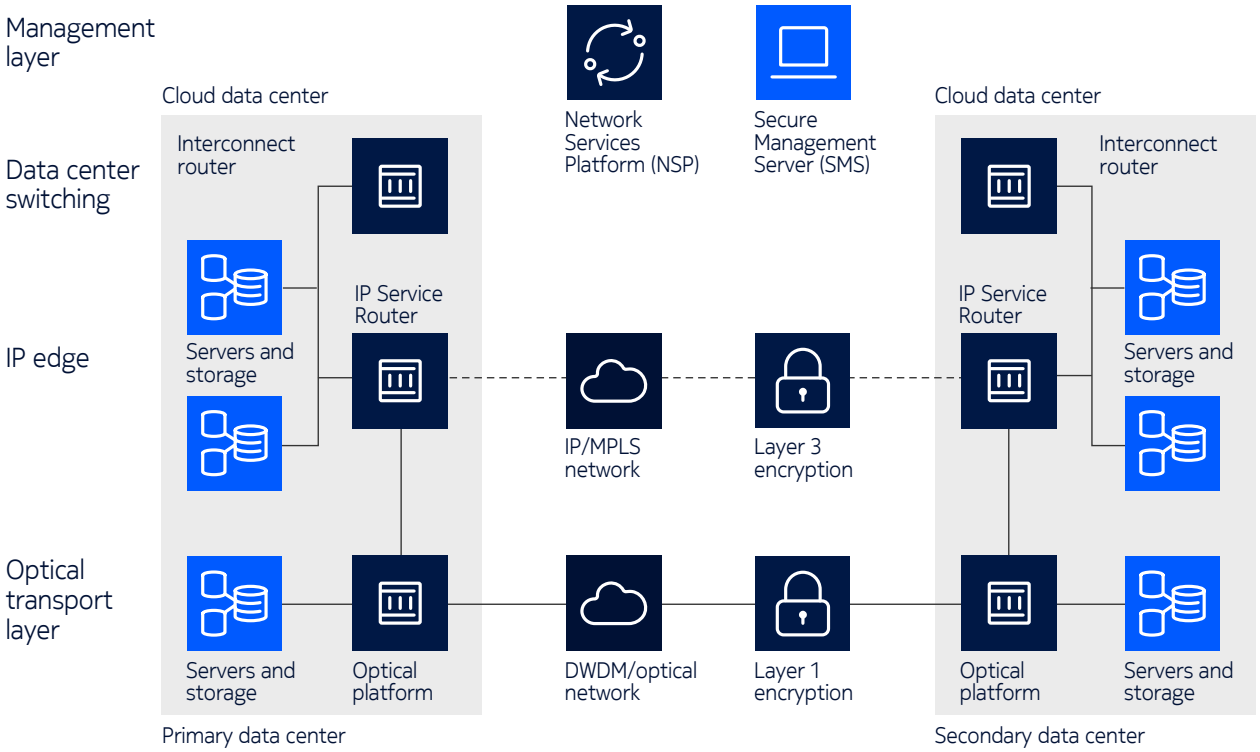
- CDCF (breakeven) during 4th quarter after deployment

Nokia solutions for enterprise cloud DCI

Nokia offers a choice of DCI solutions that provide the flexibility, scalability and security to support current needs—along with the capacity, performance and agility needed to support cloud interconnect across different cloud types. Nokia DCI solutions provide a multi-layer architecture that includes packet optical transport, IP/MPLS routing and SDN solutions for both the data center and the WAN. Data is secured through quantum-safe AES-256 encryption with symmetric, centralized key management controlled by the Nokia 1830 Security Management Server (SMS).

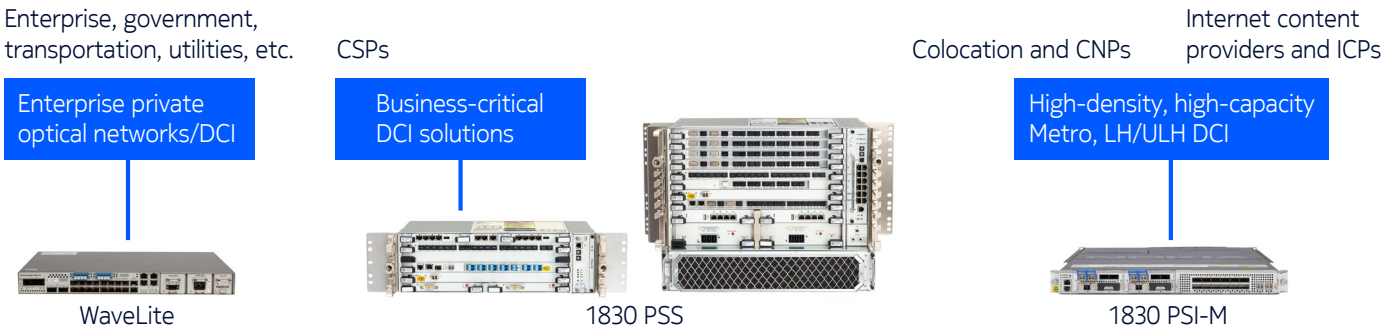
Nokia Cloud DCI solution

Integraged IP/optical architecture



- IP, Ethernet and wavelength services
- Scalable bandwidth beyond 400G
- Quantum-safe secure transport: AES 256 encryption w/symmetric key management
- IP/optical integration with common management
- Seamless interworking between IP and data center switching fabric
- Network automation and optimization with NSP

At the optical transport layer, Nokia's optical transport portfolio provides the foundation for cloud interconnect with flexible, scalable, secure and low-latency optical transport between geographically diverse data centers. The Nokia 1830 Photonic Service Switch (PSS) forms a powerful business-critical DCI solution with a modular architecture and chassis selection that can be matched to specific network needs. Nokia WaveLite offers an enterprise DCI solution optimized for simple DCI in a medium-sized enterprise. Nokia 1830 PSI-M is a compact, modular transport solution offering webscale capacity in a powerful, data center-oriented design.



Read more:
Explore Nokia optical DCI solutions

Nokia Business-critical DCI solutions brochure

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As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.