

# All Fibers Lead to Data Centers

With the recent explosive growth of video streaming, social media, and cloud-based services, a large portion of Internet traffic either comes from data centers or goes to them. In fact, in the same way an earlier civilization produced the adage “all roads lead to Rome,” in the broadband world we might well say “all fibers lead to data centers.”

## Data Center Architectures

Three networks are associated with data center solutions:

- The access network
- The inter-data center network, sometimes referred to as Data Center Interconnect (DCI)
- The intra-data center network

Numerous services are required to support these data center architectures. Figure 1 depicts a high-level view of a data center solution.

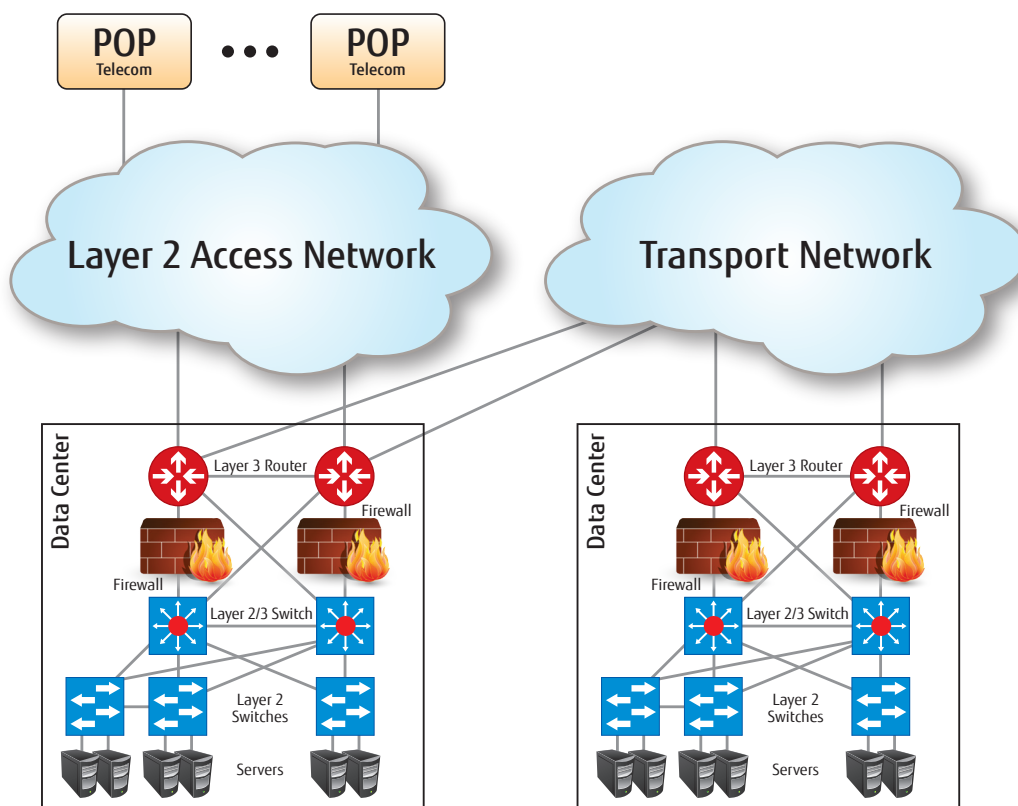


Figure 1: Data center solution

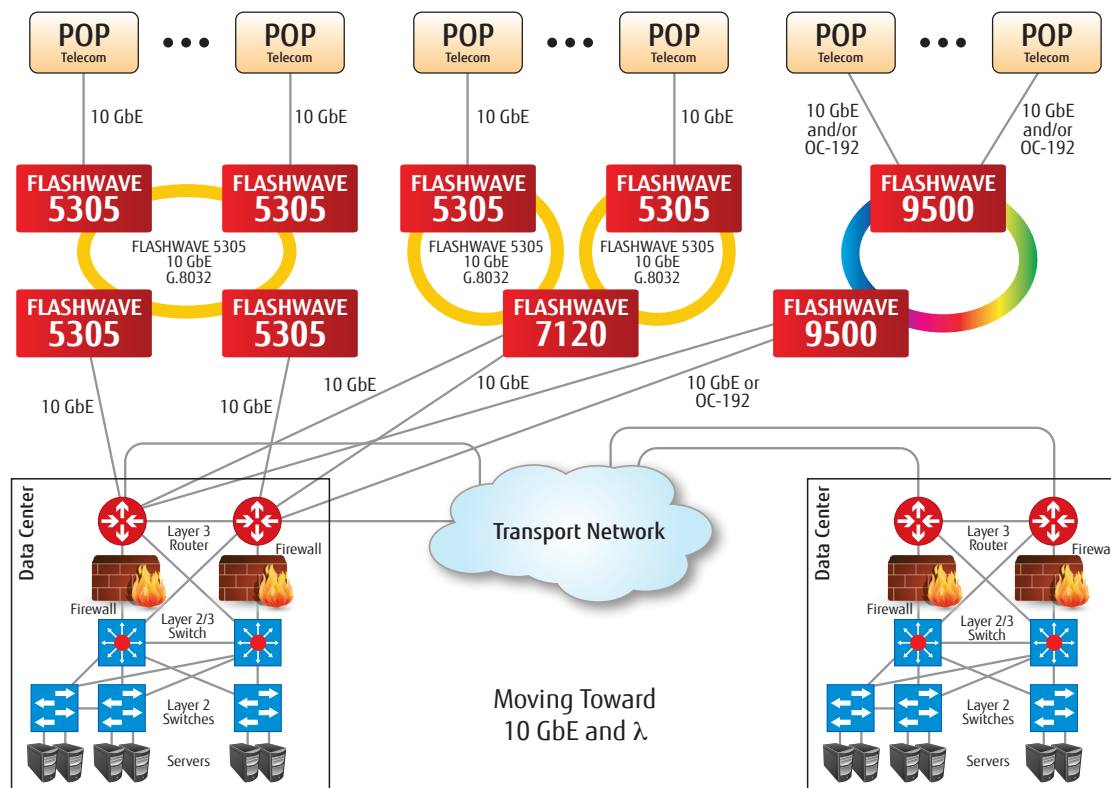
### Access and Data Center Interconnect Component

Fujitsu supplies solutions for all three data center architectures: access solutions, DCI solutions, and intra-data center solutions.

For internet content providers, the access and DCI networks are separate and distinct. For carriers, the access and DCI networks often are the same.

For years, many carriers have provided access and interconnect on Fujitsu metro optical networks, and they continue to do so.

Figure 2 shows several Fujitsu access solutions.



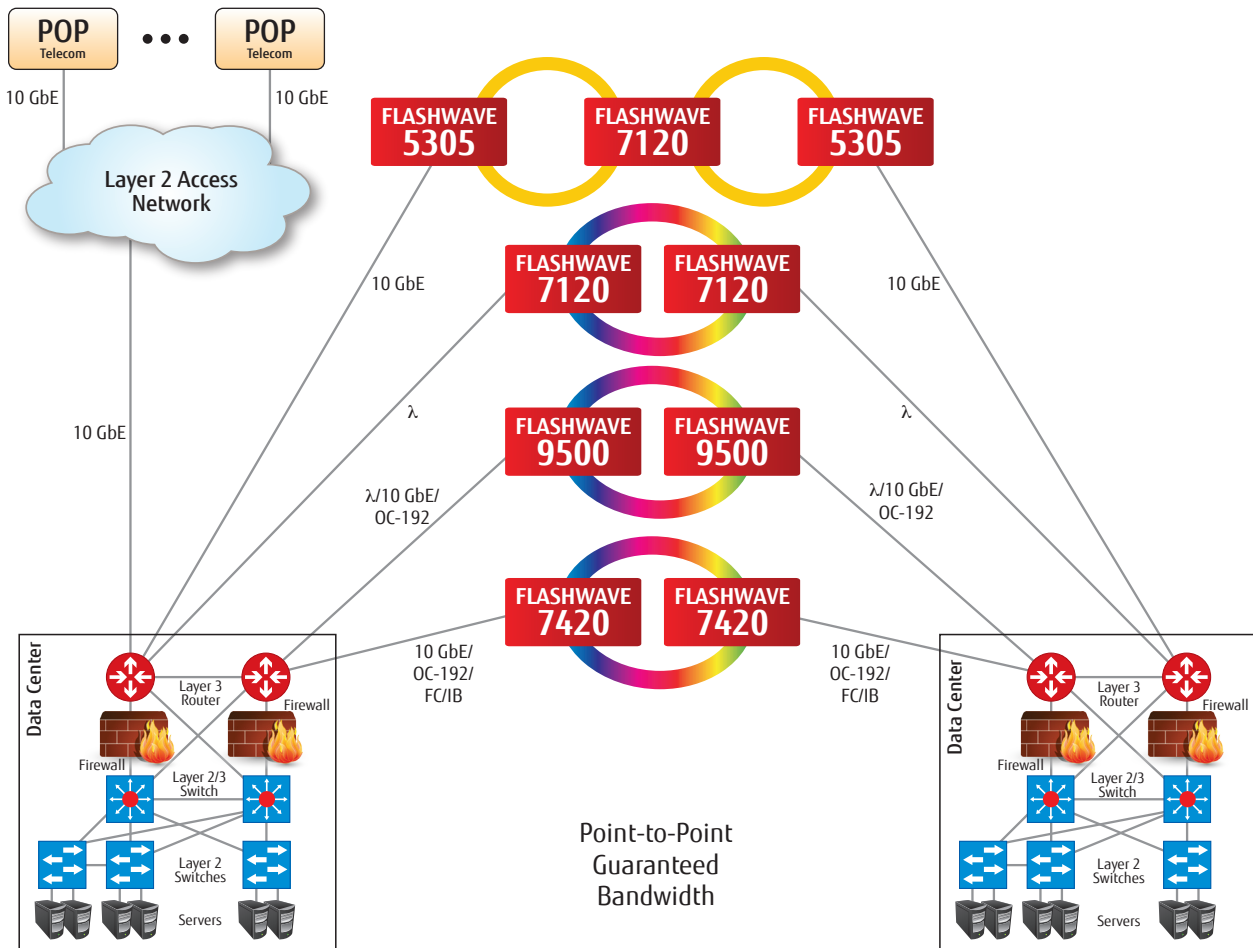
**Figure 2: Data center access solutions**

For Ethernet-focused applications with low bandwidth requirements, a FLASHWAVE® 5305 device may be appropriate.

For Ethernet-focused applications that have higher bandwidth requirements, a network based on a FLASHWAVE 5300-family device and a FLASHWAVE 7120 Micro Packet Optical Networking Platform may be suitable.

For applications with even higher bandwidth requirements and other needs, say TDM or optical services, a network based on a FLASHWAVE 9500 Packet Optical Networking Platform may be the best choice.

Figure 3 depicts several Fujitsu DCI solutions.



**Figure 3: Data center interconnect solutions**

Fujitsu access and transport solutions deliver multiple benefits:

- For financial applications providing 10 GbE, lambda, and specialized Fibre Channel or InfiniBand services, consider the FLASHWAVE 7420 Metro/Enterprise WDM Platform.
- For networks providing lambda, 10 GbE, and OC-192 services along with OTN switching that offers dynamic bandwidth connections, the FLASHWAVE 9500 platform is the best solution.
- For networks focused on lambda services, the FLASHWAVE 7120 platform may be most appropriate.
- For 10 GbE-based networks that need grooming between the 10 GbE interfaces, a solution that combines a FLASHWAVE 5300-family device and the FLASHWAVE 7120 platform might be the best fit.

### Intra-Data Center Component

Of the many intra-data center architectures that are available, the 3-tier design is most common today.

Fujitsu has partnered with Juniper Networks to provide robust, scalable, efficient intra-data center solutions.

Figure 4 depicts a legacy 3-tier intra-data center design that comprises access, aggregation, and core services.

The Juniper products typically used to implement this architecture are the EX4300 in the access layer, the EX8200 in the aggregation, and the EX8200 or EX9200 in the core. The MX, a Layer 3 router, handles northbound routing at the edge.

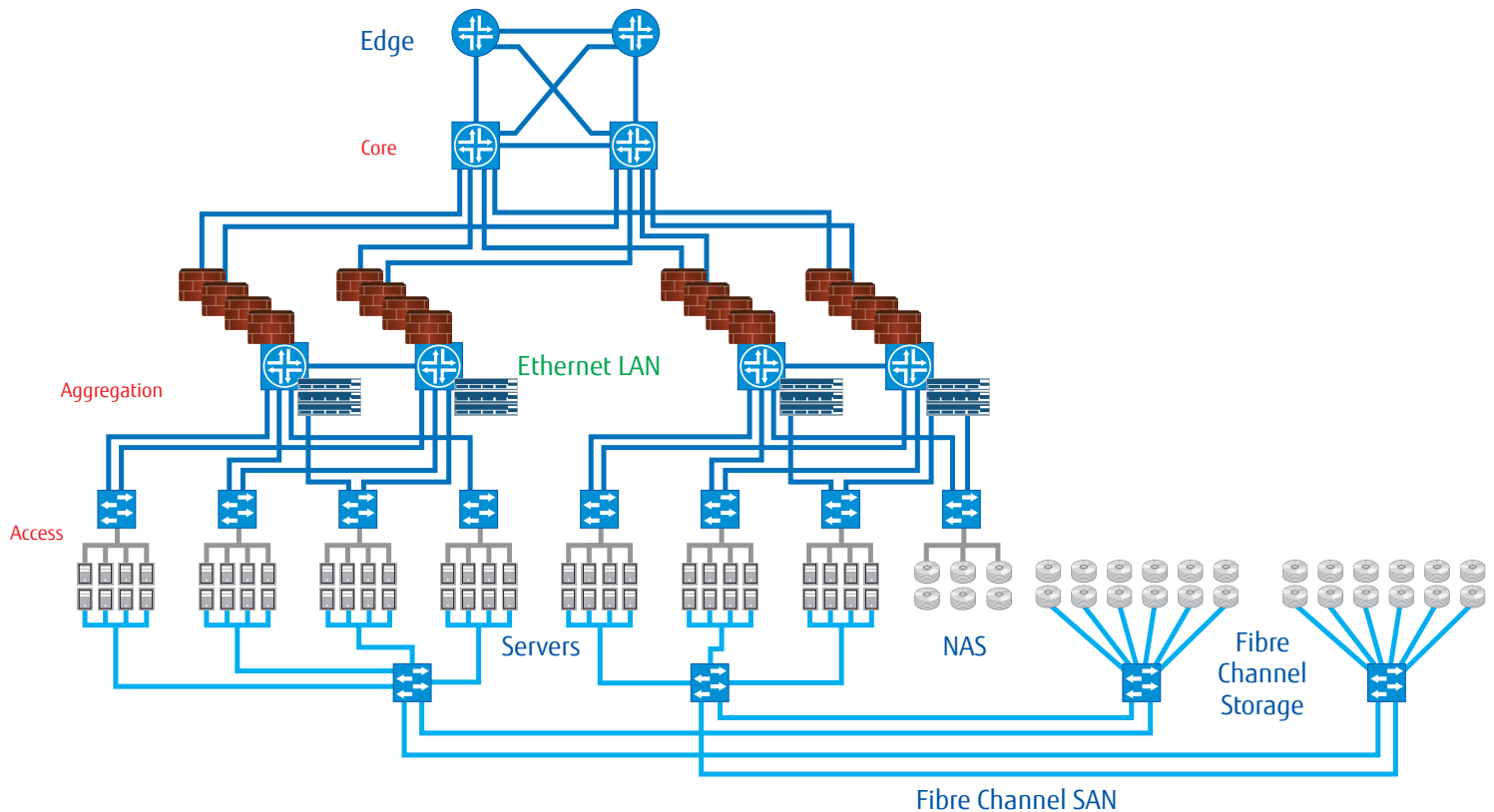


Figure 4: Legacy 3-tier data center network

Collapsing the three tiers to two tiers essentially combines the aggregation and core layers, resulting in a more economical and efficient network. Figure 5 depicts a 2-tier Juniper data center network with Virtual Chassis technology and the same EX4300 and EX8200 switches. With Virtual Chassis functionality, individual switches can be clustered to simplify connectivity.

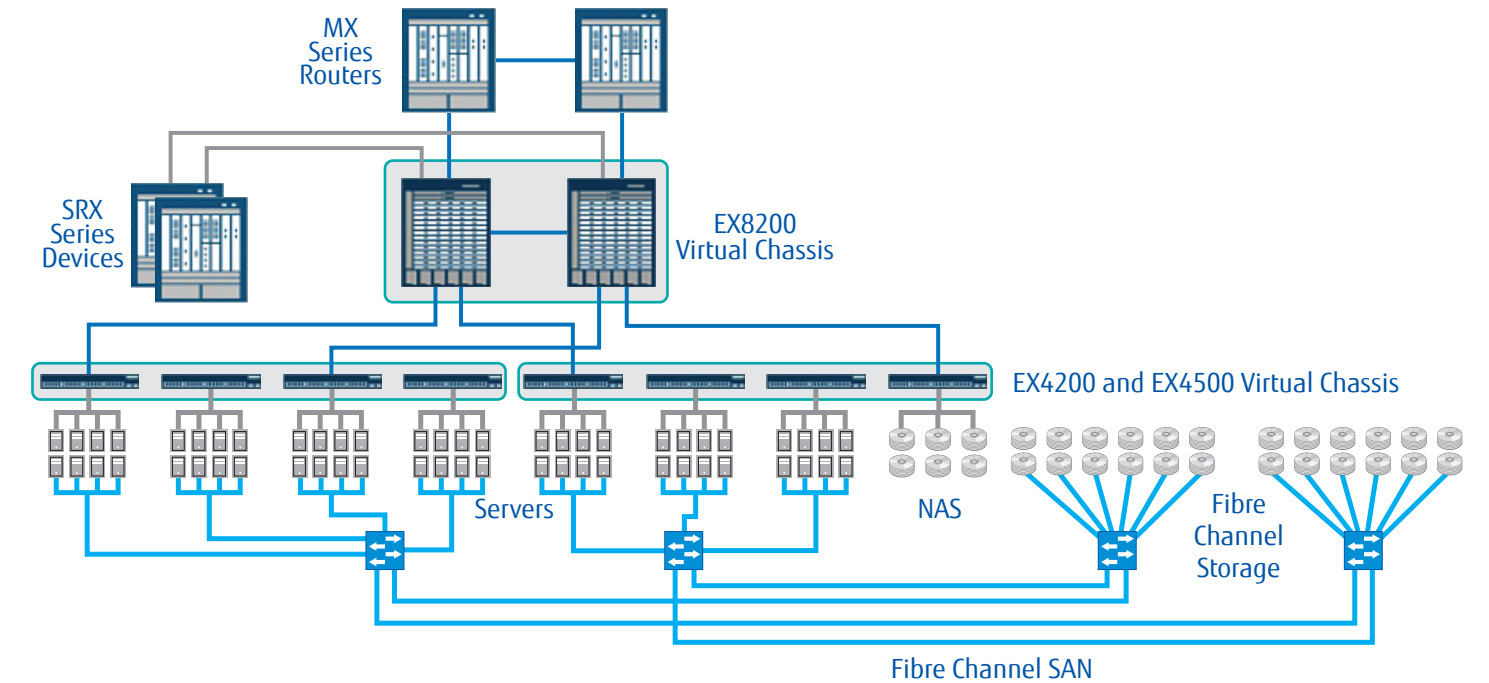


Figure 5: 2-tier data center network

Collapsing to a single tier can further improve capex and efficiency. Figure 6 depicts a single-tier data center network using Juniper QFabric products: the QFX3500, QFX3600, and QFX5100 along with QFabric core components.

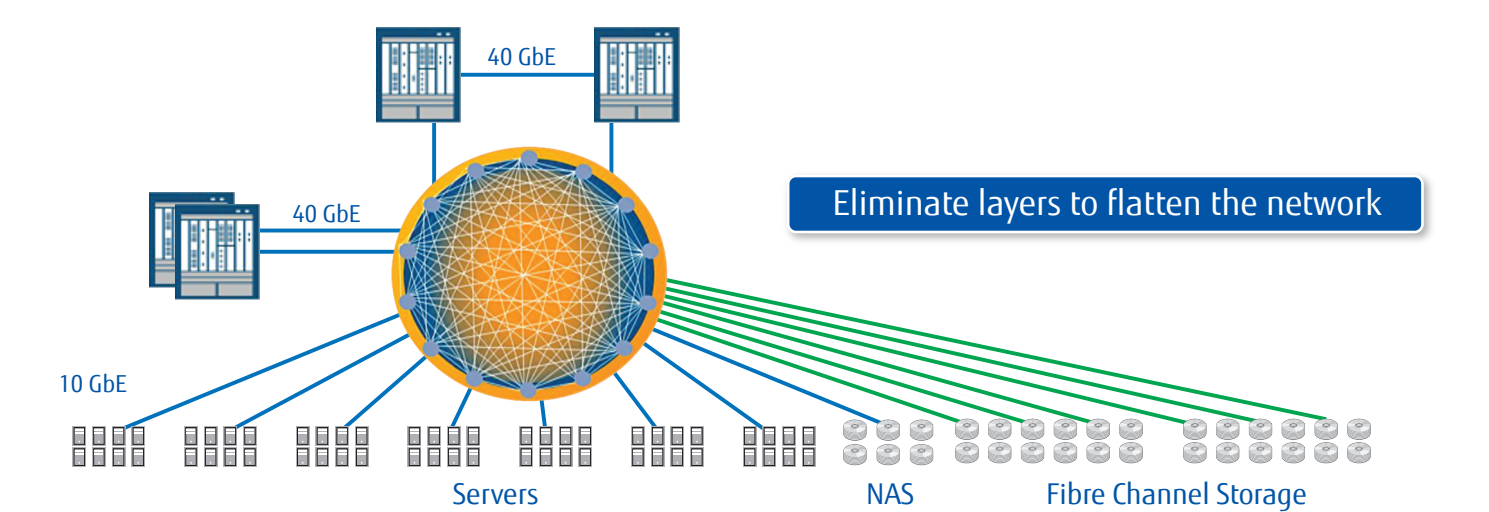


Figure 6: Single-tier data center network

An alternative to QFabric is Junos Fusion, a more open spine-and-leaf fabric. This design incorporates the newest Juniper switch, the QFX10000, as well as the EX4300 and the QFX5100 workhorses shown in previous examples.

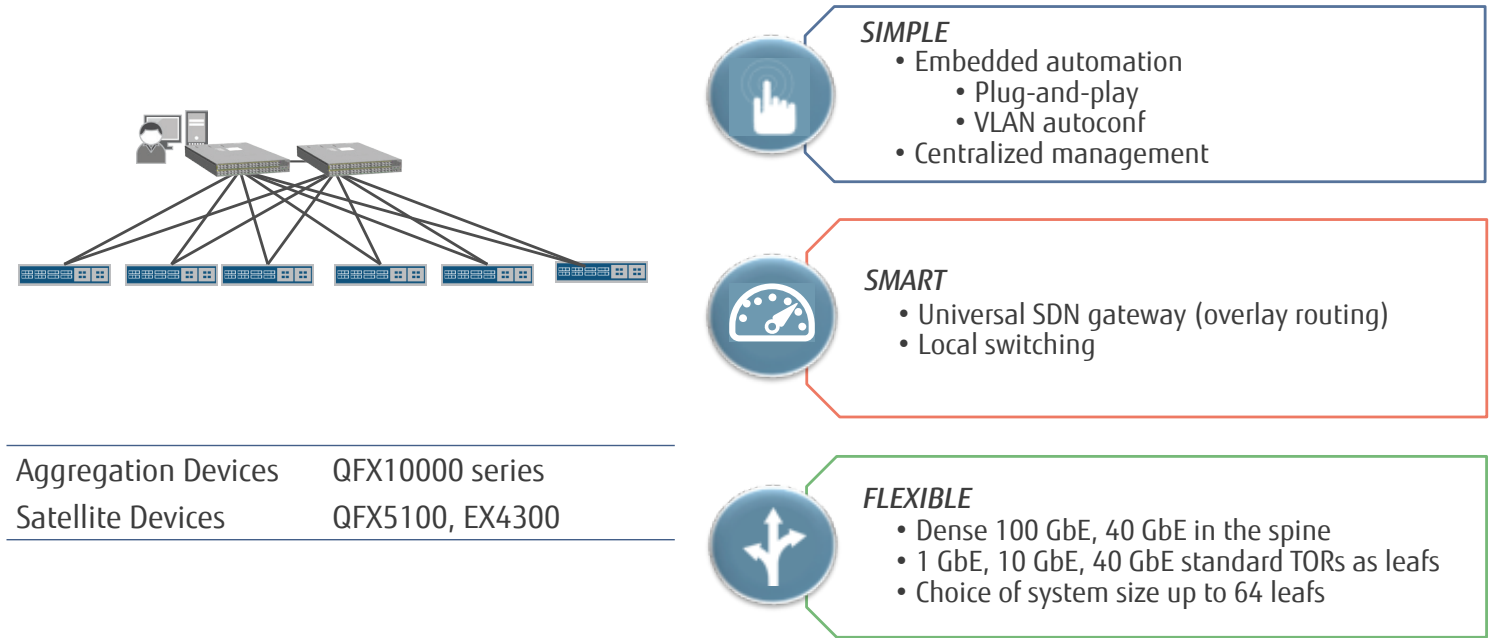


Figure 7: Junos Fusion is an alternative to QFabric

A Wide Range of Services

Fujitsu supports the interconnected networks between data centers to maximize flexibility and cost efficiency, designing transport bandwidth networks that meet the demands you face today and tomorrow.

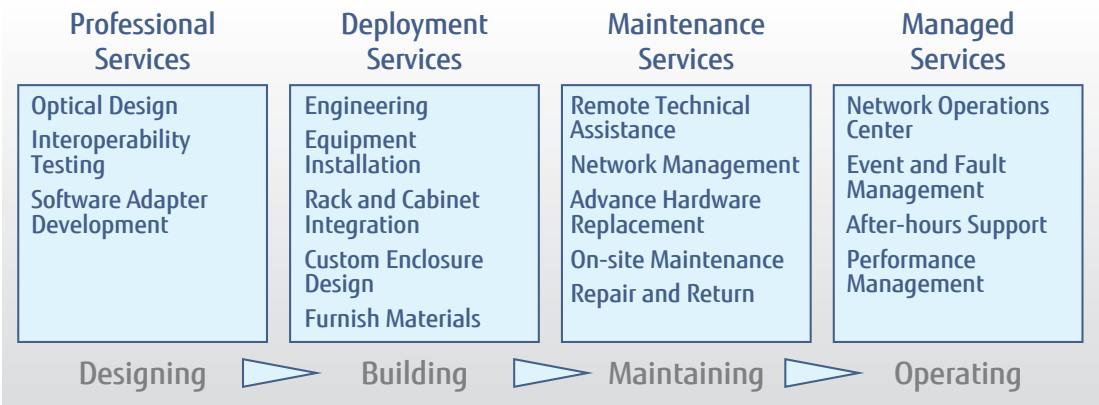


Figure 8: Fujitsu provides a wide range of services

### Designing

Fujitsu combines experienced consultants with state-of-the-art design tools to design optimal transport networks between data centers. The design stage can also include interoperability testing of multivendor equipment that adds another level of service assurance before deployment. Fujitsu can develop software adapters as required.

### Building

Fujitsu provides traditional, on-site installation and provisioning. In engagements with standardized configurations, Fujitsu can install equipment in racks, test it, and provision it before shipping. These services save time and money, and they guarantee greater quality than traditional stick-built facilities.

### Maintaining

A properly supported network will consistently deliver the quality of service contracted by end users. Failures are always possible, but Fujitsu minimizes service interruptions assigning only skilled technical-assistance engineers to support your network. Through Fujitsu Maintenance Support Plans, Fujitsu reduces the impact of outages by providing on-demand spare parts, repair services, and remote and local knowledge.

### Operating

Fujitsu provides proactive programs to help your network function smoothly. Our Network Operations Center (NOC) is available around the clock, providing real-time fault and event management. If you operate a NOC, Fujitsu can provide after-hours support services. Other services provide predictive analytics that proactively identify bandwidth needs and network faults.

### Summary

Fujitsu provides multiple solutions—comprising hardware, software, and services—for data center applications:

- The access network
- The inter-data center network, sometimes referred to as Data Center Interconnect (DCI)
- The intra-data center network

Let Fujitsu help you identify requirements and key considerations, then provide the best solution and optimize it for you.

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