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1FINITY

Optical Networking for Digital Transformation

Staying Connected through a Time of Change

It is an understatement to call 2020 a time of historic transformation. Almost overnight, millions of employees have become teleworkers; millions of students are now distance learners; and almost every human activity is unexpectedly virtualized. Never before has there been such immense and unexpected rise in demand for online services, because connectivity is critical to solve the challenge of this profound upheaval. Digital transformation—enabled by trusted network infrastructure—is now a key driver of societal transformation.

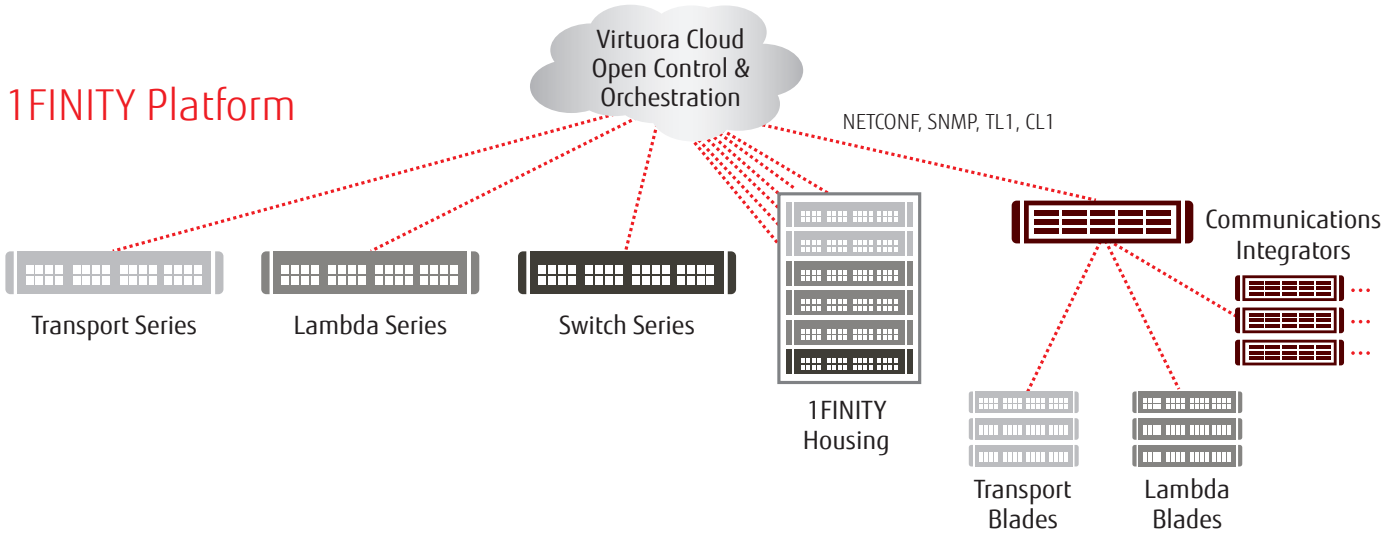
One Size No Longer Fits All

In the midst of seismic change, there is growth potential for the communications network industry—even though it's hard to forecast precisely what will be needed, when, and where. Economic instability adds a level of pressure and uncertainty, requiring service providers to adopt more flexible and agile business models. That's why the right network architecture and equipment selection are critical, together with the capabilities needed to support responsive growth, new service offerings, and continuous innovation. Service providers need a menu of options to keep costs down by starting small and maintaining the flexibility to grow along with business opportunities. In sum, one size no longer fits all.

What's Driving Traffic Demand?

Multiple factors drive growing demand for high-quality bandwidth. New online services, such as live-streaming and virtual reality, are only the beginning. Under-the-hood technology advancements are also bandwidth-intensive, but they are key enablers that make it possible to build and operate the kind of networks needed to power our online future and deliver the services needed to keep the world connected.

Open, Compact, Modular– and Flexible



Fujitsu developed the 1FINITY™ optical networking platform to meet the industry's long-term needs and its anticipated evolution with a platform that, above all, would withstand the tests of time and continuous change. We realized that over-engineered, restrictive chassis-based systems would not easily adapt, and that a new, simpler, more agile approach was needed. So we developed 1FINITY for the network digital transformation era.

1FINITY is an open platform intended to be physically modular and disaggregated while being brought together, or "logically aggregated," under software control. This autonomous, programmable architecture enables the network to meet business needs first and foremost, rather than constraining network operators with restrictive, proprietary or outdated technology.

1FINITY comprises three series of highly flexible communications network equipment: Transport, Lambda, and Switching. These compact, modular, stackable blades can be deployed in various combinations to provide exactly the capabilities and functions needed–in contrast to traditional converged platforms.

Why 1FINITY Transforms Optical Networks

1FINITY is **Disaggregated**

- Compact
- Modular
- Pluggable

1FINITY is **Open**

- Merchant optics
- Open APIs
- Standards-based

1FINITY is **Flexible**

- Customizable
- Right-sized
- Interoperable

1FINITY is **Programmable**

- Simple management
- SDN-ready
- Automated

1FINITY is **Economical**

- Spectrally efficient
- Pay-as-you-grow
- Space-efficient

How 1FINITY Solves Real Business Challenges

1FINITY makes full use of resources and bandwidth.
1FINITY combines fast, simple deployment with a wide range of options for right-sizing capacity. As a result the platform offers the agility to scale precisely in response to current and future needs and respond quickly to unexpected demand. With 1FINITY, you deploy exactly what you need with no over-engineering, empty rack slots, wasted bandwidth, or stranded investments.

1FINITY helps keep costs low.
1FINITY offers multiple features that help reduce both capital and operational costs. Its future-proof, blade-based hardware is designed to last through years of technology evolution, because it can scale on three levels: optics, plug-in units, and blades. This extends the life of equipment overall and cuts down the cost of upgrades or migrations. Simplified operations, intelligent performance management features, and fast, easy installation procedures bring further reductions in total cost of ownership.

1FINITY is simple and efficient to operate and maintain.
The operational advantages of 1FINITY begin with its simplified deployment process and extend through the life of the equipment. Transitions, upgrades and technology evolution can proceed without service interruption. 1FINITY's network automation tools and unified software control and management, together with its ease of integration into existing OSS, also reduce operations workload and simplify operations procedures.

1FINITY supports high performance, reliability, and quality of service.
As digital transformation gathers momentum and networks evolve from "dumb pipes" to become more autonomous and automated, reliability and service quality are more important than ever. 1FINITY's open architecture integrates seamlessly with standards-based SDN control and management systems, as well as with existing back-office support systems. 1FINITY blades incorporate multiple onboard features that increase quality of service, including protection switching and low-latency technology.

1FINITY helps stimulate revenue and business growth
1FINITY's features and benefits come together to support new opportunities and to encourage long-term business growth. Rapid deployment and ease of upgrades, for instance, reduce time to revenue for new services. High reliability and low latency support SLA compliance and enable delivery of high-value business and enterprise services. The platform's operational simplicity results in effective network management with fewer resources.

The 1FINITY Platform

APPLICATIONS

- Metro, regional and long-haul transport
- Point-to-point data center interconnect
- Alien wavelength

VALUE HIGHLIGHTS

- Interoperable with third-party line systems
- Spectrally efficient
- Meets requirements of telecom and data center deployments

T-Series (Transport)

Variable Muxponders, Transponders and Aggregators

The 1FINITY Transport series is a range of transponder and muxponder blades purpose-built for various optical transport applications. In addition to the targeted application, the selection of T-series blade depends on the capacity, reach and performance requirements of the transport network or between individual transport network segments. All T-series blades feature a compact, modular physical design with coherent optics, native software, and field-swappable components. These blades deliver client services ranging from 10GbE to 400GbE over optical line rates that are variable and spectrally efficient.

Some T-Series blades (T300, T310, T700*) are NEBS Level 3- compliant, DC-powered, and mountable in two-post racks common in telecommunications environments. As blade counts multiply, 1FINITY housing enclosures can be used to streamline DC power needs. Other T-Series blades (T100, T600) have AC/DC power and should be mounted in the four-post cabinets common in data center environments. These blades also possess advanced automation features such as Layer 1 encryption, zero-touch provisioning, and streaming telemetry.

The 1FINITY T400 blade is a Layer 1 aggregator that can be deployed with T-series transponder blades to provide 10 GbE to 100 GbE aggregation wherever 10 GbE/OTU2/OC-192 client interfaces are not available (applies to all blades except the T310).

1FINITY Transport Series Blades

Feature	T100	T300	T310	T600	T700-D	T700-P (2021)
Function	Xponder	Transponder	Muxponder	Xponder	Xponder	Xponder
Maximum Capacity	800G	1T	200G	2.4T	1.6T	1.6T
Client Optics	8 × QSFP28	10 × QSFP28	20 × SFP+	24 × QSFP28	16 × QSFP28 4 × QSFP56-DD	16 × QSFP28 4 × QSFP56-DD
Client Signal Type	100 GbE	100 GbE/OTU4	10 GbE/OTU2/ OC192	100 GbE	100 GbE/OTU4 400 GbE	100 GbE/OTU4 400 GbE
Line Optics	4 × CFP2-ACO	5 × CFP2-ACO	2 × CFP2-ACO	4 × discrete DCO	4 × discrete DCO	4 × pluggable CFP2-DCO[1]
Modulation	QPSK/16QAM	QPSK/16QAM	QPSK/16QAM	16QAM/6B4D-2A8PSK/ 32QAM/ 64QAM	QPSK/6b4D-2A8PSK/ 16QAM/ 32QAM	QPSK/8QAM/ 16QAM/32QAM
Line Rates	100G/200G	100G/200G	100G/200G	200G/300G 400G/500G/600G	200G/300G/400G	100G/200G/ 300G/400G
Transmission Band	C	C	C	C	C or L	C
Grid	Fixed	Fixed	Fixed	Flex	Flex	Flex
Power Options	AC/DC	DC	DC	AC/DC	DC	DC
NEBS-Compliant	No	Yes	Yes	No	Yes*	Yes*
Open ROADM Compliant	No	Yes	Yes	No	No	Yes
1FINITY Housing Compatible	No	Yes	Yes	No	Yes	Yes

* NEBS testing in process

[1] Includes options for 400ZR, OpenZR+ and Open ROADM.

APPLICATIONS

- Metro/regional ROADM or FOADM
- Open line system
- Mesh data center interconnect

VALUE HIGHLIGHTS

- Largest port count WSS-based ROADM-on-a-blade
- Cost-effective passive add/drop complex

L-Series (Lambda)

Dynamic ROADM and Open Line Systems

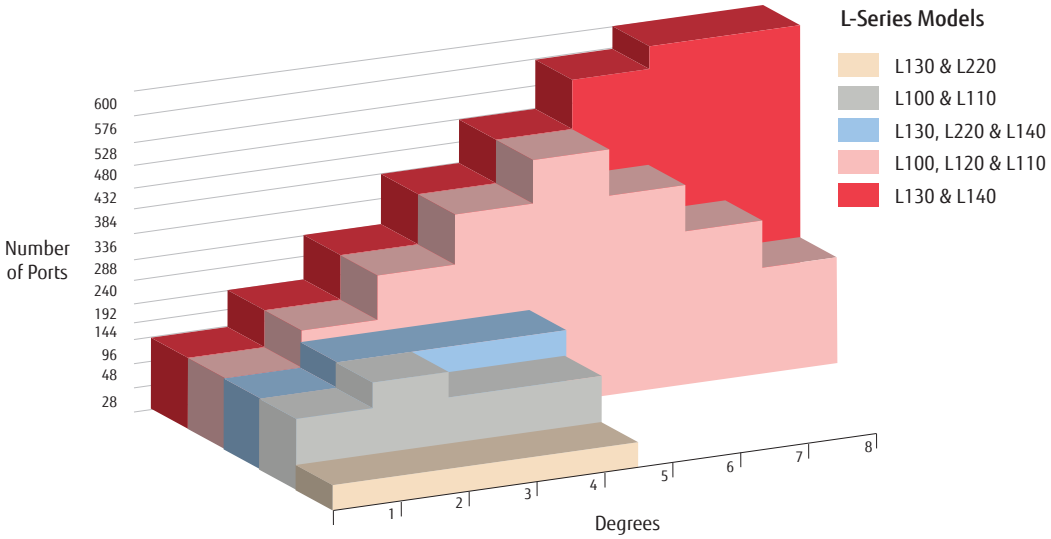
The 1FINITY Lambda series is designed to serve next-generation ROADM applications with the latest route-and-select architecture and flexible grid (also known as flex-grid or gridless) operation. With enhanced topology flexibility and operational efficiencies, L-Series blades provide a scalable ROADM solution that meets requirements ranging from the simplest, small-scale deployments to the most demanding multi-degree networks. Integrated universal amplifiers improve performance and simplifies configuration, while reducing rack space needs, power consumption, and transmission loss in comparison to conventional ROADMs.

Available in either the more economical CD (colorless, directionless) or more flexible CDC (colorless, directionless, contentionless) systems, the L-Series comprises numerous interoperable, functional blades: WSS-based ROADM-on-a-blade, channel add/drop complex, expansion add/drop and amplifiers.

The 1FINITY CD ROADM system (L100, L110, L120) provides integrated management and configuration support up to eight degrees with 480 client drops. CD ROADMs are ideal for the majority of ring and spur sites where it is important to keep costs down by supporting low-traffic service with lower-cost equipment. The CDC ROADM system (L130, L220, L140) is optimized for 400G+ transmission and provides integrated ports for OTDR support, C+L band configuration, and forward Raman amplifier upgrades. Expandable up to eight degrees with 600 client drops, CDC solutions are ideal for hub sites where maximum flexibility and functionality is critical.

The 1FINITY CD and CDC ROADM systems support interoperation at a degree level with each other as well as the FLASHWAVE® 9500 ROADM platform. 1FINITY inline amplifiers (L200) and backward Raman amplifiers (L160) are available to boost the performance and reach of the ROADM nodes.

1FINITY Line System Configurations



L-series blades can be deployed in multiple combinations to get the desired add/drop port counts per degree. This table assumes a 50 GHz channel.

S-Series (Switch)

Versatile Aggregation and Switching

The 1FINITY Switch series performs high-density packet aggregation, switching, and transport, with total switch capacity from 120 Gbps to 1.2 Tbps. The modular S100 Ethernet switch provides 1.2 Tbps bidirectional switching and is ideal for networks that require 1 or 10 GbE to 100 GbE aggregation for MEF-compliant E-Line, E-LAN and E-Tree services. With customizable service port modules, this Layer 2 switch provides enhanced flexibility, including an optional narrowband optic that can connect directly into a ROADM node, thus avoiding the need for transponders. The S100 simplifies operations with per-service performance monitoring and sub-50 ms linear and ring Ethernet protection switching. When loaded with cloud-based routing software, the 1FINITY S100 converts to a Layer 3 MPLS router for ultra-scalable segment routing and network slicing in a 1RU form factor.

The 1FINITY S150 MPLS router performs the same functions as the S100 Layer 3 router, but in a temperature-hardened 2RU form factor with up to 900 Gbps switching capacity. The S900 is a cell-site or enterprise switch that provides demarcation and simple Ethernet aggregation in a fixed 1RU form factor.

APPLICATIONS

- 10G to 100G aggregation
- Midhaul and backhaul transport
- Cloud-based routing
- Layer 2 Ethernet
- Layer 3 MPLS

VALUE HIGHLIGHTS

- Narrowband optics for direct connect to ROADMs
- Can change from switch to router function under software control

C-Series Communications Integrator and 1FINITY Housing

Simplified Deployment and Operations

The 1FINITY Communications Integrator (C200 Series) is an optional set of aggregation blades that improves efficiency by unifying multiple 1FINITY T-series and L-series blades and presenting them as a single node. This consolidated blade connection presents a single IP address to the SDN controller over a single DCN interconnect port. Individual C200 Series blades can connect up to 35 T-Series blades and up to 22 L-Series blades. This consolidation simplifies site pre-planning, supports plug-and-play operations, and improves operational efficiency.

The 1FINITY Housing is an optional power bridging frame designed to accommodate up to six co-located 1FINITY blades. Power bridging reduces capital and operating expenses by identifying economies of scale when two or more 1FINITY blades are installed at a site. An integrated power distribution unit (PDU) reduces installation costs by distributing DC power to the blade positions, thereby avoiding the need for individual power wiring to each blade. The six-slot 8RU Housing unit for -48 V DC input can be mounted into a NEBS-compliant 19" or 23" telecom rack (2-post) or a 19" data center server rack (4-post).

Meet the Challenge of Digital Transformation

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Open Control and Orchestration

1FINITY is engineered to open standards, and is therefore compatible with any vendor's SDN/NFV control or orchestration software that also employs these open standards. Fujitsu's Virtuora® Cloud software makes the most of 1FINITY's native features and can be deployed in combination with other network operations and support systems.

Native Software

Ease of integration and foundational support for the open-source frameworks used in network automation are quickly becoming a necessity. When implemented on 1FINITY blades, 1FINITY's native software simplifies IT automation by supporting multiple user interface options (e.g., CLI, NETCONF, SNMP), Python scripting, zero-touch provisioning (ZTP), and streaming telemetry, among other features.

The Virtuora Cloud Platform

Fujitsu's Virtuora Cloud provides software-driven open control and orchestration. As communications services are increasingly delivered over a complex mesh of cloud and programmable networks, Virtuora Cloud provides an extensible network automation solution for digital infrastructure, including orchestration and control, monitoring and assurance, analytics & actions, and self-healing network services powered by artificial intelligence.

Realize Your Network Vision

Fujitsu leveraged new network technologies and over three decades of commercial hardware and software expertise to build the 1FINITY network platform for the digital transformation era.

But while 1FINITY is the basis for a network architecture that meets operators' business challenges, it is our expertise that makes this architecture a reality. Extensive long-term involvement and experience in open source communities puts Fujitsu's expert integration teams in a unique position to equip networks for digital transformation.

With a network based on the open, modular 1FINITY platform, service providers benefit from an ultra-scalable network architecture able to rapidly meet even the most unpredictable demand and quickly grow even the smallest networks.

1FINITY provides economy, efficiency and operational velocity throughout the entire network life cycle, supporting long-term value and sustainable growth–not to mention future evolution and innovation. For a network that will deliver cost-effective performance as well as adapt, evolve, and meet the great challenge of digital transformation, Fujitsu's 1FINITY, and Fujitsu's expertise, are the right choices.

Want to know more?
Get in touch.

Call us on **(888) 362-7763** to book an appointment.

» Learn more about the 1FINITY Platform