FUJITSU

Solution Brief
New Optical Networks

A greenfield vision for a brownfield world

Solution Benefits

- Modular, pay-as-you-grow expansion
- Software control and management
- Economical and resource-efficient
- Simplified installation

Functional Elements

CD ROADM Nodes
- 1FINITY™ L100 Series Lambda blade R 2.4

Inline Amplifier (ILA) Nodes
- 1FINITY L200 ILA blade R 1.1

Transport Nodes
- 1FINITY T100 Transport blade R 2.3
- 1FINITY T200 Transport blade R 1.2
- 1FINITY T300 Transport blade R 1.2
- 1FINITY T310 Transport blade R 1.2

SDN Controller
- Virtuora® Network Controller (NC) R 5.0

Introduction

In theory, greenfield network deployment is a relatively worry-free endeavor that follows a smooth execution path without the baggage of legacy equipment. In practice, this is rarely how projects play out.

Most "greenfield" deployments involve finding space for new equipment in an existing facility, squeezing new assets into limited space alongside previously populated legacy equipment, and drawing power from existing plant (assuming the power facilities can accommodate the new load without modernization).

Planning for Unknown Demands

Network deployments, migrations and upgrades happen for clearly understood reasons, such as to add capacity, boost operational efficiency, or open up revenue opportunities via new features and functionality.

However, while the reasons and objectives may be known, other aspects are impossible to predict. Networks must scale to meet capacity and functionality needs, but it may not be apparent at the outset exactly what services and how much capacity will be needed. A common concern in recent years is that traffic growth frequently exceeds planning estimates; even recently installed systems can rapidly become exhausted.

Anticipating these unknown future needs is difficult, but not impossible. Fujitsu offers a solution for greenfield deployments that reduces risk and

still enables adaptive network evolution to meet challenges as they arise.

Our priority is ensuring that service providers can meet known bandwidth needs, while providing the assurance that it is possible to add capacity at any time, in-service, to address unexpected demands.

Reducing Operational and Practical Complexity

Additional challenges come from the practicalities of new deployments in existing sites. Space and power may be at a premium, for example. There may be operational complexities to overcome, difficulties with back-office systems integration, or a simple need to cut down on complex procedures and scripts for tasks such as service turn-up or expansion into new areas. Greenfield network solutions must offer remedies for obstacles in these areas as well as providing ample bandwidth and growth room.

Flexible Approaches to Growth

The Fujitsu New Optical Networks Solution

Today's networking platforms are complex and tend to be tightly coupled and vertically integrated. Fujitsu open architecture has physically separated these complex components and logically re-aggregated them with intelligent software. The Fujitsu New Optical Networks solution is based on the combined power of the 1FINITY hardware platform and the Virtuora software suite.

1FINITY Hardware

The modular, flexible nature of Fujitsu 1FINITY blades promotes pay-as-you-grow architecture and provides ample capacity for both current and future demands.

The 1FINITY Lambda (ROADM) platform provides flexible spectrum support to safeguard future growth potential via future services like 400G/600G/1T. Optical degrees can be added at any time, in-service if needed. New services can also be added without regard to optical infrastructure or shelf type. The 1FINITY L100 and L110 Lambda blades are deployed to form CD ROADM nodes that can be expanded incrementally up to four ROADM degrees and 128 add/drop channel capacity. With the 1FINITY L200 Inline Amplifier blade, the distance between ROADM nodes can be increased via 35 dB spans.

The 1FINITY Transport platforms scale past 100G per wavelength and can accommodate 200G wavelengths on the same transport blade via simple provisioning changes, rather than requiring replacement hardware to meet this need as might have been the case in the past. The 1FINITY T100. T200, T300, and T310 Transport blades are transponder/muxponders with different client and line interfaces that can be configured in two ways (for DP-QPSK or DP-16QAM network modulation), depending on the capacity and reach requirements.

Virtuora Software

Operationally, Virtuora Network Controller (NC) provides SDN/NFV-based network management and service delivery. Virtuora NC interacts directly with network devices through southbound interfaces using standards-based protocols, while operators and northbound software systems interact indirectly with the network through Virtuora NC using REST APIs. This solution uses the Virtuora Network Management suite for element, fault and performance management, as well as network analytics. Other applications for resource discovery, service activation and path computation are provided by the Virtuora WDM Control suite.

Integration Services

The Fujitsu Network Integration team works as a trusted partner helping operators meet the challenges of modernizing and deploying next-generation networks. Our expert project managers and engineers ensure efficient, timely communication and coordination with vendors, ensure the project is planned and executed on time, help minimize financial and other risks, and resolve issues that arise.

Network integration services include:
- Consulting
- Design and planning
- Systems integration
- Installation, test and turn-up
- Maintenance and support

Functional Summary
The following functionality is supported in this release:
- 1-, 2-, 3-, and 4-degree CD-ROADMs supporting in-service additions of ROADM degrees.
- Inline amplification to extend the distance between individual ROADM nodes
- Automatic optical power balancing
- DWDM line rates of 100G or 200G with DP-QPSK or DP-16QAM modulation schemes
- Flexible client services of 100 GbE, 10 GbE, OTU2 and OC-192

Solution Benefits

Modular, Pay-as-You-Grow Expansion

The 1FINITY disaggregated platform's modular approach results in low initial investment and efficient scalability. It is possible to deploy just what is needed hen it is needed, knowing that future capacity needs can be met with pay-as-you-grow expansion. Until now, the only option has been to "predict" traffic growth and deploy to match the prediction, while hoping you are correct. In this kind of scenario, outcome variability is a problem, given the cost and disruption of substituting a larger shelf after the fact, not to mention the cost of wasteful over-deployment. The flexible New Optical Transport solution minimizes risk, enabling the network to grow responsively 1RU blade at a time.

Software Control and Management

Managing and maintaining a network deployed as a modular solution is greatly simplified via SDN/NFV. One of the core tenets of SDN/NFV is openness, particularly the ability to control networks that span multiple layers and incorporate different vendors' equipment. This openness enables, disaggregated equipment such as 1FINITY to easily integrate into a system or network view. Dynamic software control also promotes ease of use and reduces mistakes in provisioning, which reduces operational costs.

With the Virtuora software platform, operations such as turning up a new service become quick point-and-click tasks, since Virtuora automates provisioning across the network. At a time of pressure to reduce operational costs and human-error potential, this is an example of the multiple ways Virtuora employs automation to reduce errors, speed up operations, and simplify laborious, time-consuming tasks.

Economical and Resource-Efficient

Instead of reserving half a bay for a converged packet optical platform, which you may never fill, you can now utilize space in 1RU increments. There is no need to find contiguous space, since blades can be distributed wherever there is space, including in different racks.

Simplified Installation

The modularity of a blade-based system may seem deceptively complex compared to shelf-based systems. But chassis-based systems still require front-plane fiber connections between optical ROADM components and service modules. There may also be slot placement restrictions, or modules that are incompatible with certain shelf types.

A 1FINITY solution has the same front-plane fiber connections, but is unrestrictive in deployment with regard to slot placement and usage. A

Adaptive Network Evolution

disaggregated solution allows equipment to be placed where there is space, which ensures full use of available rack capacity, and reduces the need to consume time and resources looking for or installing new bays to obtain enough contiguous space for a large converged shelf.

Developing the Right Planning Strategy

Network planners are challenged to develop a strategy for immediate and near-term needs for the network based on accurate assumptions of growth and anticipated service roll-out. The modularity of the 1FINITY New Optical Networks solution allows for pay–as-you-grow architecture that addresses these needs over a typical 12- to 24-month timeframe and also has the scalability to support unknown needs beyond that.

Some network operators became "trapped" with a 10G-based network when 100G began to enter volume deployment. In numerous cases, special design rules or network changes were needed to add the new 100G services. 1FINITY provides an open optical system that supports flexible spectrum, which enables faster adoption of future services, such as 400G and 1T, without disruption to of the optical layer.
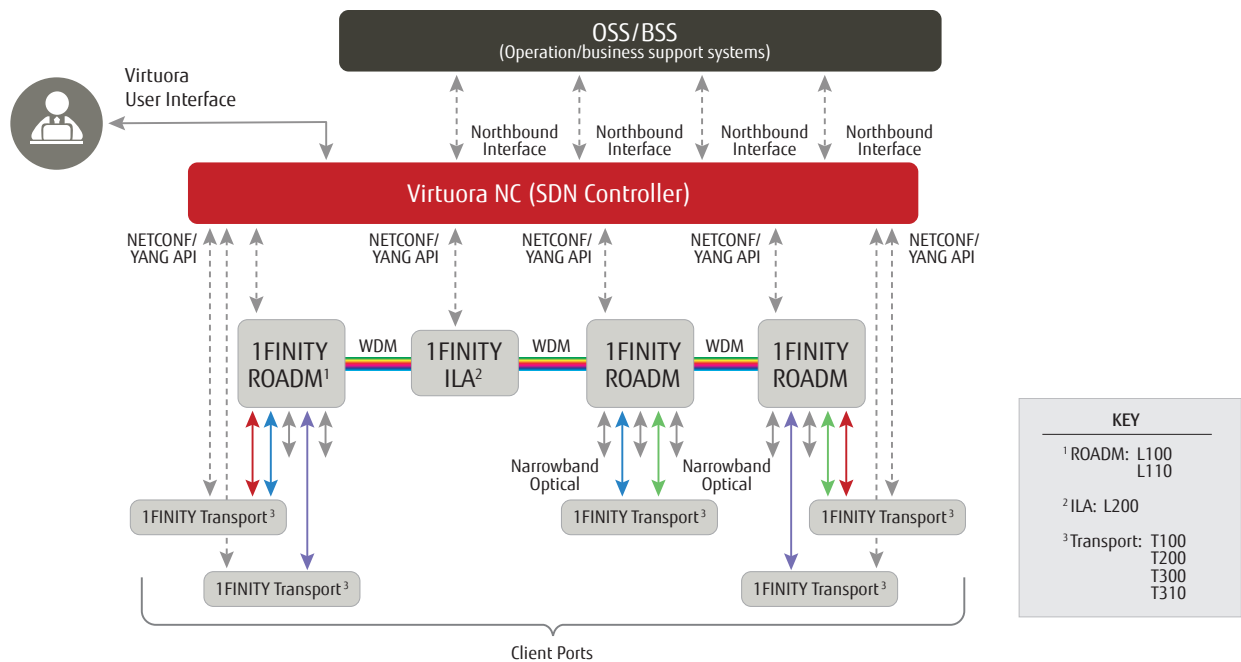
Conclusion

In today's competitive environment, providers must deploy larger amounts of bandwidth faster, with a high level of service assurance. However, delivering the needed capacity presents many challenges. Service providers need a ROADM solution that reduces expense and risk, yet enables adaptive evolution and embraces software-defined management and control.

With the demand for new services including DOCSIS 3.1, SD-WAN, 5G and other OTT requirements, careful investment and planning is essential to a seamless outcome that fulfills the promises of these new services.

The Fujitsu New Optical Networks solution, based on modular blades and SDN-based management, provides a network that meets service providers' current requirements, reduces space and power consumption, and speeds introduction of new services. The solution brings together open, modular, scalable, programmable hardware and software platforms. Interoperable ROADM and transport blades can be deployed incrementally to match evolving requirements in a pay-as-you-grow fashion. Thus, service providers can reduce the risk of expansion; simplify installation, management and maintenance; and speed adoption of future services.

New Optical Transport Network Solution Architecture

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