RESPONDING TO MOBILE CAPACITY CHALLENGES WITH PACKET OPTICAL MOBILE BACKHAUL

ALCATEL-LUCENT 1830 PSS DELIVERS SIMPLICITY, RELIABILITY AND VERSATILITY

APPLICATION NOTE

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ABSTRACT

Demand for mobile services continues to increase at a phenomenal rate, both in terms of the number of subscribers and the bandwidth per subscriber. To remain competitive and reduce the potential for churn, mobile operators need to be able to grow their networks' capacity in line with the growth in demand. However, they also need to manage the TCO of their networks to ensure service delivery costs are in line with revenues. A key factor contributing to their overall success is the efficiency of their mobile backhaul networks. The Alcatel-Lucent 1830 Photonic Service Switch is a key element of Alcatel-Lucent's end-to-end mobile backhaul offer, and is purpose-built to provide the scalability, reliability and versatility operators need to meet the challenges of heterogeneous network build-outs and a 4G/LTE world.

INTRODUCTION

Mobile and fixed/mobile operators need to address burgeoning mobile data traffic growth while reducing and controlling costs. They need solutions for mobile backhaul that will enable them to cost-effectively support the build-out of complex, multi-technology or heterogeneous networks and the transition to 4G/LTE-driven mobile traffic growth between cell/hub sites and the controller sites. At the same time, these solutions must support an evolution from circuit-switching/TDM to packet-based backhaul connections.

To date, operators have responded to these challenges with a rapid and largely complete adoption of Ethernet/packet-based transport in mobile backhaul networks. They have also drastically cut spending on (and decommissioned) their TDM-based infrastructures. Packet-optical transport platforms play a key role in aggregating mobile traffic and handling the mix of circuit/TDM and IP/Ethernet traffic transport while enabling a smooth transition to an all-IP infrastructure.

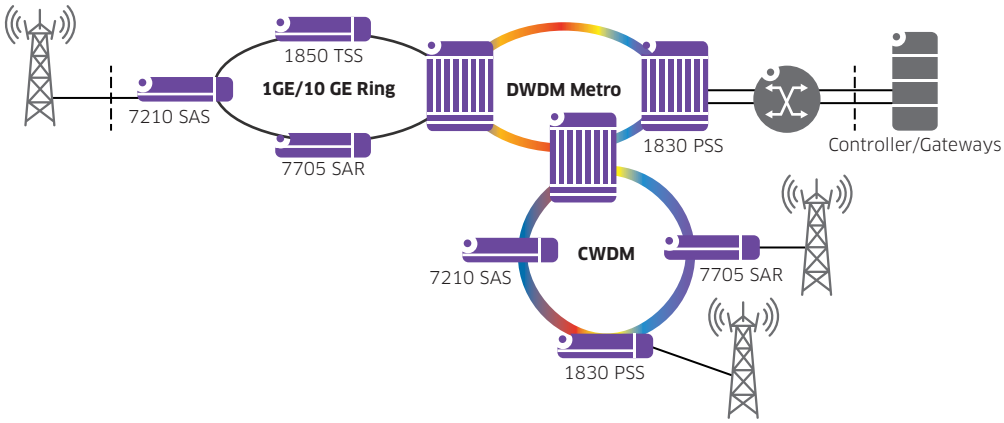
As the shift to all packet continues, operators are now focused on optimizing the performance of mobile backhaul networks, so they can continue to meet customers' varied and stringent SLA commitments. Solutions must provide standard and robust network management/OAM tools that are operationally consistent and can be leveraged across the network. As mobile/data traffic growth has also spurred a convergence of fixed and mobile networks for improved overall network efficiency, management systems must be able to provide services across technologies.

To meet the challenges of heterogeneous networks in a 4G/LTE world, operators need a solution that is purpose-built for scalability with a range of system form factors and connectivity options. The solution must be able to interwork effectively and efficiently in a complete end-to-end, multilayer Ethernet and IP mobile/broadband service backhaul network. Operators are looking for a simple, reliable and versatile solution that spans access to aggregation to core.

A mobile backhaul solution for today's challenges: Alcatel-Lucent 1830 PSS

The Alcatel-Lucent 1830 Photonic Service Switch (PSS) is a highly scalable packet and wavelength solution for packet optical mobile backhaul that addresses operators' scaling needs today and into the future. Today, mobile network operators, from incumbents to wholesalers to fixed/mobile operators, are using the 1830 PSS to achieve improved TCO with optimal efficiency and ease of use.

Figure 1. Alcatel-Lucent Packet-Optimized WDM Solution for Ethernet/IP Mobile Backhaul



Operational efficiency, scalability and network optimization

As a highly integrated packet-optimized WDM solution, the Alcatel-Lucent 1830 PSS simplifies the network by consolidating or reducing the number of multiple function-specific or traditional MSPP network elements. This reduces the need to interwork and manage numerous elements. The 1830 PSS also aggregates packet traffic from multiple access/cell sites and efficiently packs wavelengths to offer massive scalability and networking efficiency. The 1830 PSS provides cell site aggregation for pure-packet mobile backhaul. The combined consolidation and aggregation delivers significant capital and operational savings. The 1830 PSS is part of the Alcatel-Lucent Mobile Backhaul solution, which leverages a unified Alcatel-Lucent 5620 Service Aware Manager network management platform across IP and Optics for further operational simplification and efficiency.

Mobile traffic growth is accommodated by:

- Expanding the number of cell sites and coverage
- Adding bandwidth capacity per cell site with scalable, high-density access platforms

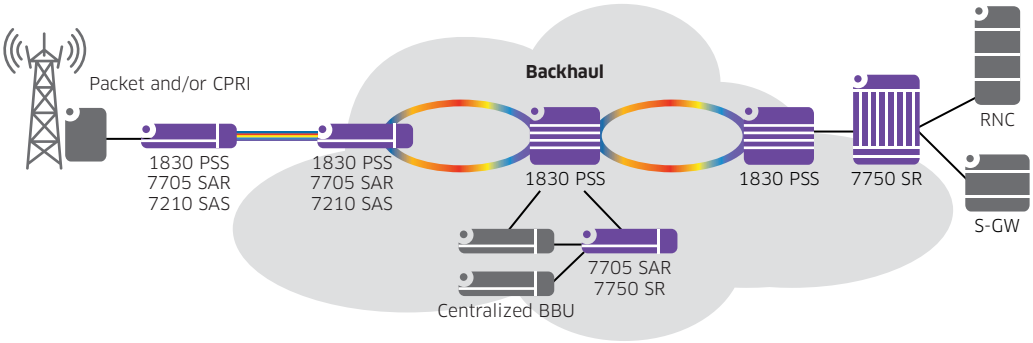
For multiple-operator sites, growth is accommodated in terms of:

- Capacity allocated per operator
- Number of backhaul connections per cell site
- Support for Carrier Ethenet VPNs
- The ability to support the bandwidth and connection scale required

In early LTE rollouts, sites are equipped with 50-100 Mb/s per operator at sites and much of the equipment is provisioned with 10 GE ports to allow for growth beyond typical 1 GE uplinks. While operators cannot predict LTE's impact on capacity requirements, they do foresee the need to support not only smartphone traffic but also mobile

broadband, which will overcome fixed broadband by 2015[1]. These dynamics, along with the increasing number of sites being "fiber-ized", indicates a strong need for the scalability, flexibility and performance of packet-optimized WDM – from the mobile backhaul aggregation site to the access network. Additionally, new centralized base band unit architectures, with remote radio heads using Common Public Radio Interface (CPRI) backhaul over fiber, place yet higher demands on wavelength capacity and performance criteria like delay and jitter.

Figure 2. Alcatel-Lucent 1830 PSS in a CPRI infrastructure



WDM enables operators to cost-effectively scale their services. It also gives them the ability to maximize fiber utilization and performance. The scalable 1830 PSS multi-reach WDM portfolio offers right-sized platforms designed to efficiently meet traffic capacity and diversity needs ranging from access to metro/aggregation and core backbone applications. The Alcatel-Lucent solution also provides a scalable end-to-end 100G/400G solution across IP and Optics.

Reliable, carrier ethernet backhaul services with advanced networking features

With the shift to all-IP well under way using trusted Ethernet-based solutions, the focus has turned to optimizing the performance of Carrier Ethernet backhaul networks to meet SLAs. Operators need real-time network performance reporting to verify SLA commitments. This is especially critical for wholesalers who must meet SLAs for multiple operators. To get this information, operators must be able to rely on standards-based, carrier-grade OAM and synchronization techniques and tools.

The packet-optimized Alcatel-Lucent 1830 PSS reliably transports high availability packet services using advanced carrier-grade networking features, including advanced QoS support, Ethernet OAM, Performance Monitoring and 50 ms protection. Flexible configuration capabilities enable operators to deliver cost-optimized service levels and to increase network availability. For example, operators can rely on the ITU-T Y.1731 "pro-active" and "on-demand" tools for fault localization and performance monitoring to manage the network using standard-based carrier-class OAM. The ITU-T G.8032 Ethernet Ring Protection capability assures multipoint protected services. MEF-certified platform minimizes deployment risks.

[1] Infonetics Research, 'Mobile Backhaul Equipment and Services', March 26, 2012

The Alcatel-Lucent solution includes a smart, compact Ethernet demarcation (NID) option for remote configuration and management by the 1830 PSS. This passively-powered unit saves space and power while providing Ethernet Connectivity Fault Management and full alarming for increased reliability.

A unified management solution provides a comprehensive set of applications, bundled according to the transport network solutions being managed. In continued support of migration from TDM to packet, the solution also addresses challenges such as high resiliency/availability, clock sync distribution, and end-to-end OAM management. It does so by supporting traditional and packet-based clock sync approaches like Synchronous Ethernet and IEEE 1588v2 to provide both frequency and phase synchronization. Additionally, the solution provides advanced troubleshooting and SLA monitoring tools to ensure service/network performance metrics are met, with visibility across packet microwave, optical, and IP portfolios. Backed by Alcatel-Lucent's professional services, the solution enables operators to reduce the time to market and improve time to revenue, at an acceptable cost and risk.

Optical versatility with a scalable, multi-reach carrier ethernet / WDM platform

Today's mobile backhaul transport solutions must support a wide range of standard interconnection options from the cell site to the aggregation layer. The Alcatel-Lucent 1830 PSS supports multiple aggregation applications with a full range of Ethernet packet cards and interconnection options.

Offering exceptional Carrier Ethernet backhaul feature richness, the Alcatel-Lucent 1830 PSS enables operators to offer differentiated granular services including FE/1GE, N x 1GE, and 10 GE. The platform meets the MEF-9 and MEF-14 standards, supporting E-Line, E-LAN and E-Tree services. Synchronization support includes SyncE (frequency) and IEEE 1588v2 (phase/time). The 1830 PSS has the highest 10 GE port density in its class.

The 1830 PSS platform has many attributes that make it ideal for mobile backhaul:

- Carrier-grade Ethernet transport, switching and networking plus OTN aggregation in a scalable WDM platform
- Enables differentiated point-to-point and multipoint services in a converged solution, ideal for both access and metro networks
- Scalable product size variants from access to core
- Tunable and Reconfigurable OADM configurations and WDM mesh
- OTN switching at 1, 2 and 4 Tb/s capacity evolving to 8 Tb/s
- Single carrier 40G/100G coherent optics, with ability to scale to 400G wavelength networking
- High performing restoration with GMPLS control plane
- Common network management
- Wavelength Tracker monitors and traces each wavelength for superior OAM
- Common cards across the product portfolio

CONCLUSION

The Alcatel-Lucent 1830 PSS is ideal for packet optical mobile backhaul, and will help operators scale the networks to meet the growing demand for mobile services — at a cost that their businesses can sustain. Its features and capabilities provide the flexibility operators need as they evolve to address increasing mobile services bandwidth demands. Its comprehensive management capabilities help operators to continue to deliver the level of service their customers expect, within an environment of continual growth and demand.

The 1830 PSS is a key component in Alcatel-Lucent's comprehensive, end-to-end Mobile Backhaul solution. This solution enables operators to leverage a unified network management platform across packet microwave, IP and optics, for further operational simplification and efficiency. The Alcatel-Lucent Mobile Backhaul solution is specifically designed to enable operators to maximize the mobile subscribers' experience while minimizing the TCO of the mobile backhaul network.

GLOSSARY

CPRI	Common Public Radio Interface
CWDM	Coarse Wavelength Division Multiplexing
DWDM	Dense Wavelength Division Multiplexing
FE	Fast Ethernet
GE	Gigabit Ethernet
GMPLS	Generalized Multiprotocol Label Switching
GSM	Global System for Mobile Communications
LTE	Long Term Evolution
MEF	Metro Ethernet Forum
MPLS-TP	Multiprotocol Label Switching – Transport Profile
MSC	Mobile switching center
MSPP	Multiservice provisioning platform
NID	Network interface device
OADM	optical add/drop multiplexer
OAM	Operations, administration and maintenance
OS	operating system
OTN	optical transport network
PSS	(Alcatel-Lucent 1830) Photonic Service Switch
QoE	quality of experience
QoS	quality of service
RAN	radio access network
SAM	(Alcatel-Lucent 5620) Service Aware Manager
SAR	(Alcatel-Lucent 7705) Service Aggregation Router
SAS	(Alcatel-Lucent 7210) Service Access Switch
TCO	total cost of ownership
WDM	Wavelength Division Multiplexing

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