Alcatel-Lucent
9500 Microwave Packet Radio
(ETSI Markets)

Alcatel·Lucent

The Alcatel-Lucent 9500 Microwave Packet Radio (MPR) provides cost-effective IP transformation for seamless microwave transport of TDM, ATM, IP and Ethernet traffic over a Carrier Ethernet infrastructure.

The steady increase of data services in backhaul networks results in high capacity and costs if addressed with traditional TDM or hybrid microwave systems. The Alcatel-Lucent 9500 Microwave Packet Radio (MPR) packet-based platform is a multiservice aggregation platform that uses Circuit Emulation Service (CES) (MEF 8) and Pseudowire (PWE3) to seamlessly transport TDM and ATM with no radio-performance degradation, providing a Carrier Ethernet microwave-transport infrastructure and introducing the required flexibility to carry more capacity with lower costs.

It is recognized that circuit-based transport will still be used for some time, and the transition to packet-based transport cannot happen overnight. To solve this issue, the Alcatel-Lucent 9500 MPR operates as a hybrid microwave fully interworking with the existing installed base with comparable performance, while enabling IP transformation at the pace of the network with the same hardware. The operator is now free to maintain its current mode of operation using a TDM/hybrid model and to start migrating to packet as data traffic grows, boosted by IP-3G nodeBs and HSPA where needed.

# Meeting a key backhaul challenge: the rapid growth of multimedia traffic

The mobile market is changing, and to remain competitive, mobile service providers must deliver new profitable services and reduce their backhaul costs. Mobile user demand continues to move beyond basic data services such as Instant Messaging (IM) and e-mail to more delay-sensitive applications such as media streaming and real-time multimedia. In response, broadband wireless technologies — including HSPA, Evolution-Data Optimized (EV-DO) and ultimately Long Term Evolution (LTE) — are evolving to enable higher transmission speeds and packet interfaces. Backhaul networks must evolve to meet these new bandwidth demands and new technology requirements at an acceptable cost.

Packet transport can help mobile providers transform their networks to better manage the increasing traffic demands of broadband services. To satisfy the need for new packet backhaul solutions, Alcatel-Lucent offers an innovative way of natively transporting packets. With this new approach, the Alcatel-Lucent 9500 MPR can ensure the Quality of Service (QoS) required for each traffic type, dramatically reduce operating expenditures (OPEX), and improve the connectivity of Ethernet and existing TDM- or ATM-based E1 base stations. As a result, your network can absorb rapid growth in multimedia traffic easily and efficiently, maximizing the existing infrastructure while enabling smooth migration to IP.

Figure 1. Alcatel-Lucent 9500 MPR addresses all microwave applications
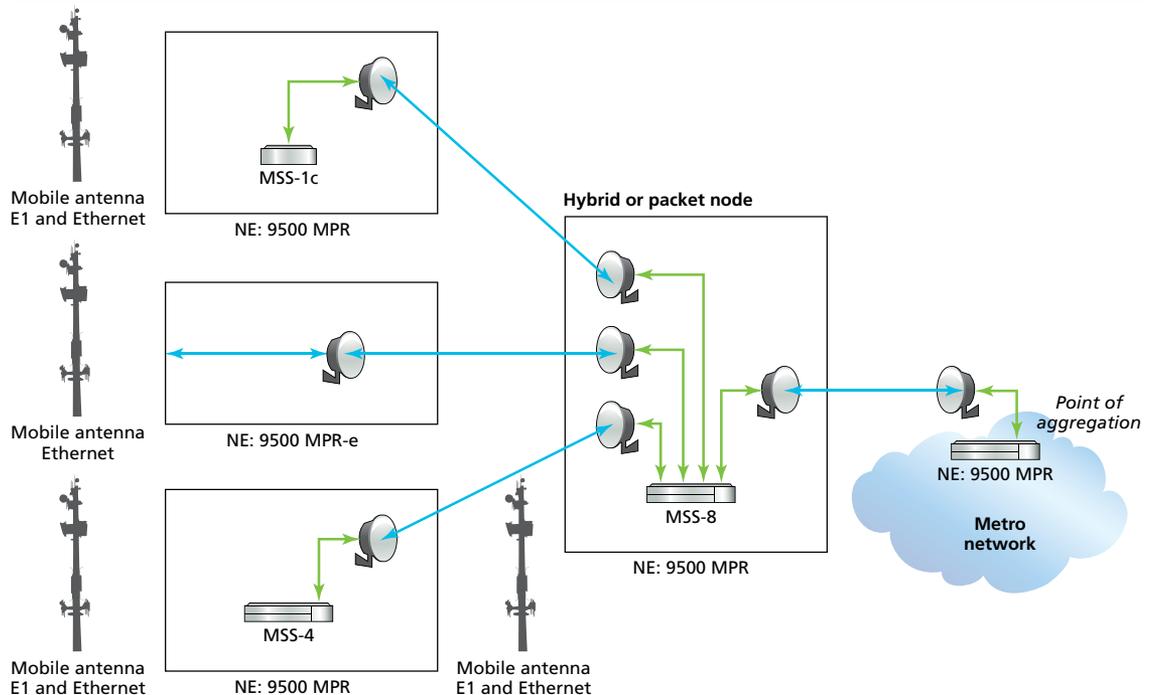
The need for IP transformation

The increasing demand for new broadband services requires more connectivity and additional ports at cell sites. Packet-traffic growth from these services is driving bandwidth requirements: up to 20 Mb/s to 30 Mb/s per cell site for 3G HSDPA and up to 100 Mb/s for LTE. This increase is driven by packet traffic that includes a variety of services such as voice and broadband. QoS and service discrimination are becoming fundamental for next-generation backhaul transport networks.

As mobile-network infrastructure evolves, IP-native base stations will have Ethernet interfaces instead of E1 or T1 interfaces. This change in physical interfaces brings new challenges to backhaul networks, such as synchronization delivery. Because the transition will happen gradually, backhaul networks must migrate gracefully while supporting a mixed payload of legacy TDM/ATM and increasing packet traffic.

The evolution of microwave radio from TDM to packet technologies enables data-aware transport, which can support new high-bandwidth services while leveraging existing technologies. IP transformation typically seeks to achieve four major goals:

- Gradual transformation of the network — Focus on areas where compelling events force investment in new solutions as well as maintenance of backward compatibility with the existing infrastructure

- Return on these investments in less than two years as a result of OPEX savings

- Minimized OPEX, despite capacity increases — Optimized use of scarce resources and aggregation of all services over a single pipe, with no overlays

- Use of a multivendor model — Standard protocols and no proprietary equipment

Maintaining a simple approach becomes fundamental to avoid the multiplication of deployed equipment and increased capital expenditures (CAPEX) and OPEX.

Data traffic is growing fast, but revenues are not increasing at the same pace, as shown in Figure 2. More efficient ways are needed to transport the packet traffic generated by broadband services.

IP TRANSFORMATION DRIVERS

→ The need for additional connectivity (ports) to introduce new broadband technologies and services (HSDPA, EV-DO, Wi-Fi® hotspots, WiMAX®, LTE)

→ Increased bandwidth requirements for new packet-based services (20 Mb/s to 30 Mb/s per cell site)

→ Physical interface changes (Ethernet base stations) to avoid the need for separate overlay networks to support Ethernet connectivity

Figure 2. Traffic and revenue evolution with a massive introduction of broadband services
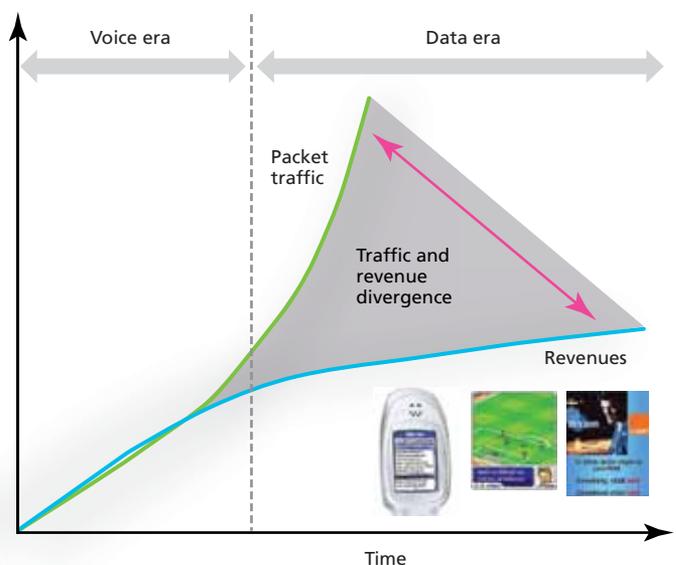
An innovative, truly packet product

The Alcatel-Lucent 9500 MPR guarantees TDM-like performance for all types of backhaul technologies and enables the smooth evolution of TDM/ATM-based networks to all-IP. High performance and low latency for each service and synchronization of these services is achieved along the entire backhaul network using Synchronous Ethernet (SyncE) when transporting all traffic aggregated over packet, operating in packet mode. Alternatively, synchronization is delivered using E1 or sync-out port and SyncE when operating in hybrid mode.

Service-aware transport

The Alcatel-Lucent 9500 MPR supports service-driven adaptive modulation for exceptional use of the radio-frequency (RF) spectrum and significantly improved broadband-traffic transmission. The Service-Awareness feature directly maps all traffic — guaranteed and broadband — over the radio frame. The Service-Awareness feature recognizes the traffic types in incoming packets and automatically adapts to varying microwave link conditions. For example, priority traffic, such as video and voice, is assigned to the most available packets across the radio link while less time-dependent applications, such as Internet browsing and broadband in general, are given access based on availability (see Figure 3).

Service-driven adaptive modulation provides "hitless" operation for high-priority traffic, guaranteeing no degradation or synchronization/frame loss during modulation changes to respect stringent transport requirements, as on TDM infrastructure.

Simplified growth

The Alcatel-Lucent 9500 MPR enables a dramatic increase in the number of broadband users: up to 100 times that of E1- or T1-based TDM solutions, as shown in Figure 4.

Extending MPLS from the core to the cell site

The Alcatel-Lucent 9500 MPR is part of an integrated, end-to-end remote-access network and core solution for complete IP transformation. Comprehensive, end-to-end monitoring of the entire IP remote-access network helps ensure effective MPLS-TP and/or IP/MPLS management, therefore reducing complexity.

Figure 3. Service Driven Adaptive Modulation

Figure 4. Number of active multimedia and voice users with TDM and packet-radio solutions
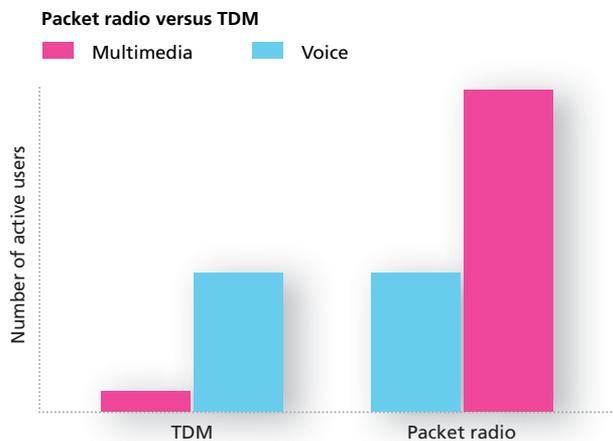
Microwave Service Switch-8 (MSS-8)

MSS-4

MSS-1c

Microwave Packet Transport (MPT):
Multipurpose Outdoor Unit (ODU)

Microwave Service Switch

The Microwave Service Switch (MSS) is a multiservice aggregation switch in which TDM traffic is circuit-emulated according to MEF 8. Inverse Multiplexing over ATM (IMA) is terminated, aggregated natively, then converted into packet using PWE3 (IETF RFC 4717).

The MSS can provide native E1, ATM IMA and Ethernet connectivity for point to point and nodal configurations (hybrid mode), as well as aggregated over converged ethernet traffic (packet mode).

All traffic is statistically multiplexed with IP/Ethernet traffic and transported over a single Ethernet connection. Different services can be dynamically managed, depending on radio performance levels at any given time — particularly in the case of fading conditions, in which services are always managed according to their quality and service priorities.

Microwave Packet Transport Unit

The Microwave Packet Transport (MPT) Unit is a multipurpose Outdoor Unit (ODU) that is available for the whole product family. The MPT Unit addresses all microwave applications, such as standalone full outdoor, split-mount and nodal configurations, providing an unparalleled level of flexibility. The MPT covers from 6 GHz to 38 GHz and 70/80 GHz frequency band.

The Alcatel-Lucent 9500 MPR is backward-compatible with previous generations of Alcatel-Lucent hybrid microwave-system ODUs, protecting already made investments, allowing network migration with the lowest CAPEX and OPEX during the installation and commissioning process as well as fully reusing existing equipment material.

Single packet-node characteristics

- Multiservice-switching capacity greater than 16 Gb/s
- Total radio throughput greater than 4 Gb/s
- Termination of 192 x E1
- Full redundancy with no single point of failure
- Embedded synchronization distribution even in full Ethernet infrastructure
- Nodal software configuration with a single packet matrix switching both Ethernet and TDM
- Standalone full outdoor solution
- Up to 12 microwave radios connected to a single MSS in hybrid or packet-node configuration

Support services

Alcatel-Lucent offers a full range of support services for streamlined, cost-effective IP transformation, including:

- Network design and planning
- Hotline
- Express repair and return, swap and repair, and spare-parts management
- On-site visits, urgent interventions and technical assistance
- Training
- Bundled services during warranty period and warranty extensions

┅➔ Key features and benefits

FEATURE	BENEFIT
The Multiservice Aggregation-Layer feature aggregates and carries TDM 2G, ATM 3G and IP/Ethernet over a common packet layer. This allows sharing of a common packet-transmission infrastructure, regardless of the nature of the traffic carried. Mapping of different access technologies over Ethernet is achieved with standardized protocols.	A single transmission pipe is used for all services and access technologies on cell sites. Radio bandwidth is utilized at 100 percent. In contrast, TDM radio stacks multiple data streams (E1, Ethernet) over the radio channel and underutilizes a large portion of the bandwidth. Moreover, hybrid platforms do not provide circuit emulation or ATM pseudowire.
With the Service-Awareness feature, different services are treated according to their QoS requirements.	Operators achieve end-user satisfaction even while using services other than voice, using the minimum necessary bandwidth. In contrast, with TDM products there is no possibility of differentiating services: all are treated as top-priority, with no differentiation between voice and best-effort broadband.
The Alcatel-Lucent 9500 MPR operates as hybrid or packet-node on a single packet matrix with high switching capacity (greater than 16 Gb/s).	The Alcatel-Lucent 9500 MPR can switch, aggregate and handle many incoming traffic types with almost no capacity limits (greater than 16 Gb/s) and without additional external switches. In addition, the Alcatel-Lucent 9500 MPR is able to deliver synchronization in packet networks using SyncE, E1 or sync-out ports.
The Service-Driven Adaptive Modulation feature allows full exploitation of the entire air bandwidth by changing modulation schemes according to propagation conditions and by associating different service qualities to the available transport capacity.	Scarce spectrum resources are used efficiently in all conditions and at a lower cost than renting. High-priority traffic is transported in all conditions with no degradation in performance, thanks to a "hitless" modulation switch.

The Alcatel-Lucent advantage

- Alcatel-Lucent is a leader in IP transformation and migration to fully packet-based mobile backhaul networks. Our innovative wireless-transmission solution provides the next-generation backhauling capabilities needed to compete in today's marketplace.

- Alcatel-Lucent is a leading vendor in micro-wave, IP and optical networks, including Carrier Ethernet.

- The Alcatel-Lucent 9500 MPR is part of the Alcatel-Lucent High Leverage Network™ architecture for converged aggregation and metro networks.

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