# Tellabs® Mobile Backhaul Solutions Support Cost-effective, Scalable and Reliable Network Growth

This Tellabs Mobile Backhaul Solutions business case demonstrates the potential for up to 93% savings in the long-term evolution of mobile networks — more than €120 million ($153 million USD) over three years for a large multinational operator.

As mobile phones become more like personal computers, users expect the same level of multimedia experience they enjoy via fixed-line networks, including feature-rich graphical interfaces to access their favorite applications, fast and predictable download times, and reliable transactions. Security of data is of paramount importance to users, especially for newer mobile applications like mobile payment systems and online financial transactions.

For mobile operators offering data services over their 2G or 3G networks, the major challenge is how to leverage existing investments and offer new 3G data services while minimizing Operating Expenditures (OpEx) and Capital Expenditure (CapEx). Mobile operators need to determine the best and quickest way to deliver new services to capitalize on consumer demand without compromising the reliability and security that users expect.

Using simplified operator examples, this business case demonstrates how Tellabs Mobile Backhaul Solutions can help mobile operators accelerate new revenue streams without incurring major increases in CapEx/OpEx. With potential savings of up to 93% in certain instances, both small and large operators worldwide can realize scalable, reliable and secure long-term network growth. For one large multinational operator, Tellabs demonstrated potential savings of more than €120 million ($153 million USD) over three years by implementing a mix of the Tellabs Mobile Backhaul Solutions covered in this paper.

## Challenges for Mobile Operators

Most existing mobile networks were designed to handle voice traffic and require relatively low bandwidth capabilities. The statistical predictability required to provision a voice circuit is fairly straightforward, using Time Division Multiplexing (TDM) and Asynchronous Transfer Mode (ATM) circuits to handle the anticipated load based on the number of subscribers estimated to be using the service at any one time.

However, once data services are introduced, the last-mile access network can become a major bottleneck in the mobile network. The main points of congestion in the Radio Access Network (RAN) are between the cell sites and the Radio Network Controller (RNC), as shown in Figure 1.

Mobile operators face three main challenges when using TDM or ATM technology in the RAN:

- **Microwave Congestion**

  Every E1 added at a base station needs to be provisioned hop-by-hop throughout the microwave infrastructure. This takes a long time to install and often requires costly site visits. Along a microwave daisy chain, the tail E1s add up and will eventually exceed the microwave capacity limit, forcing costly and sometimes hard-to-engineer microwave upgrades.

- **Data Congestion**

  The introduction of 2.5G and 3G data services, such as High Speed Downlink Packet Access (HSDPA), requires large amounts of bandwidth to handle the increased activity of end users. This increased load adds to existing circuit congestion, requiring new timeslots to handle peak usage in addition to the regular voice traffic.

- **Network Scalability and Evolution**

  As new applications like mobile web browsing and payment systems are introduced, networks must be able to scale and evolve to meet end users' expectations for quality and reliability. Long-term evolution to an all-IP network in order to support the deployment of bandwidth-intensive applications close to the access edge will place further demands on the access network. Today's TDM/ATM technology lacks the scalability and flexibility to cope with these demands.

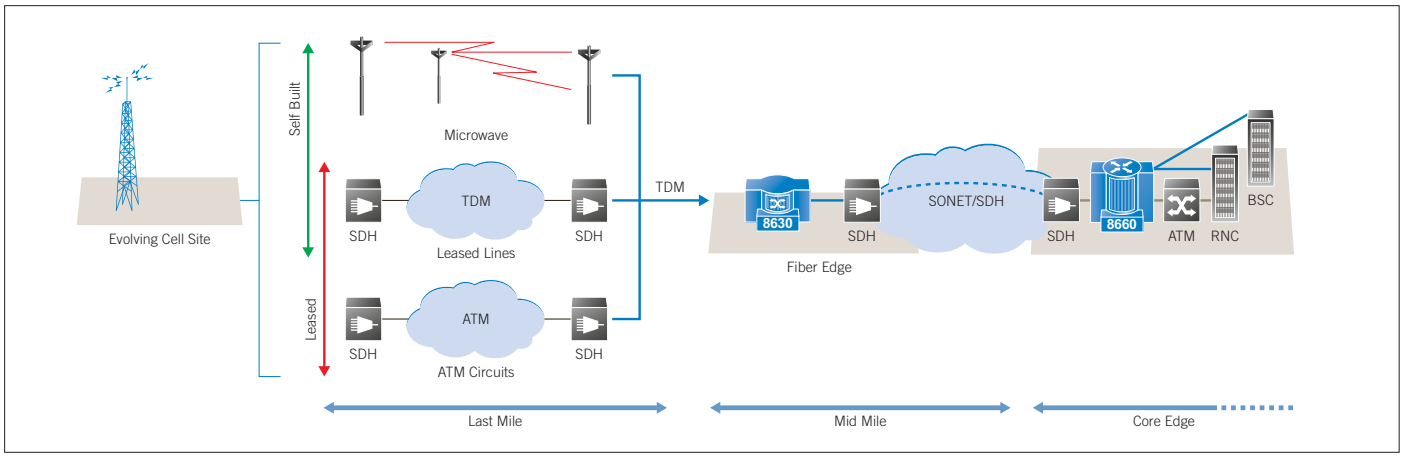


Figure 1. Radio Access Network

## How Tellabs Mobile Backhaul Solutions Address These Challenges

Tellabs Mobile Backhaul Solutions provide a smooth and cost-effective proven migration path that supports the evolution of mobile networks by leveraging existing network deployments without forklift upgrades or major service interruptions. With the scalability, reliability and flexibility that mobile operators need to offer new mobile data services, Tellabs Mobile Backhaul Solutions use advanced Ethernet Pseudowire and IP/MPLS technologies to provide a seamless migration from 2G to 3G and beyond with reduced CapEx/OpEx, quicker time-to-market and accelerated time-to-revenue.

Tellabs Mobile Backhaul Solutions extend the packet-based network further out toward the access edge, which can result in significant cost savings and return on investment for both small and large mobile operators worldwide. In the case of one large multinational operator, the OpEx and CapEx savings could be in excess of €120 million ($153 million USD) over three years. The following hypothetical operator examples demonstrate how Tellabs Mobile Backhaul Solutions address the three primary challenges in the RAN, leading to considerable savings in each scenario.

## Microwave Congestion

### SOLUTION:

TDM exhaustion can be alleviated by introducing packet-based routing in the access network. The Tellabs® 8600 Managed Edge System uses IP/MPLS technology to support both existing TDM and ATM circuits while allowing new Ethernet-based connectionless packet networks to support new data services. All of these technologies (TDM, ATM and Ethernet) can now traverse the same network using Pseudowires. In Figure 2, the packet network can be deployed parallel to the circuit network and new services can be provisioned over the packet network without impacting existing services.

As the network evolves, existing voice services can also be migrated to the packet-based network, reducing OpEx (including reduced frequency costs and support agreements costs) incurred by leasing TDM links from other network operators. CapEx can be reduced by deploying more cost-effective Ethernet end-points, thus reducing the number of microwave spans required compared to the more expensive TDM and ATM equivalents.

### COSTS AND SAVINGS:

In this first example, a mobile operator wants to prolong the life of its existing Microwave access network while providing significant capacity for growth. In particular, the operator wants to initiate aggressive marketing campaigns when launching new services and needs the bandwidth capability in the access network in order to do this.

We assume that the addition of 60 new radio base stations requires an extra 10 x STM-1 (150 Mbps) circuits in the microwave network. Each STM-1 circuit costs €25,000 ($32,000 USD)to install and €2,500 ($3,200 USD) per year to operate. Due to the statistical multiplexing gains obtained by a Tellabs IP/MPLS solution, only 4 x STM-1 circuits are required for the equivalent number of base stations. This gives a CapEx saving of 60% and an annual OpEx saving of 60%, as shown in Table 1. Due to the varying size and nature of individual operator networks, equipment costs have been excluded. Contact a Tellabs representative to discuss your unique network requirements.

| Case | STM-1 circuits required | CapEx Cost | OpEx Cost |
|---|---|---|---|
| SDH | 10 | €250,000 ($320,000 USD) | €25,000 ($32,000 USD) |
| IP/MPLS | 4 | €100,000 ($128,000 USD) | €10,000 ($12,800 USD) |
| **Savings for 60 new cell sites** | | **€150,000 ($192,000 USD) = 60%** | **€15,000 ($19,200 USD) = 60%** |

Table 1. IP/MPLS network savings

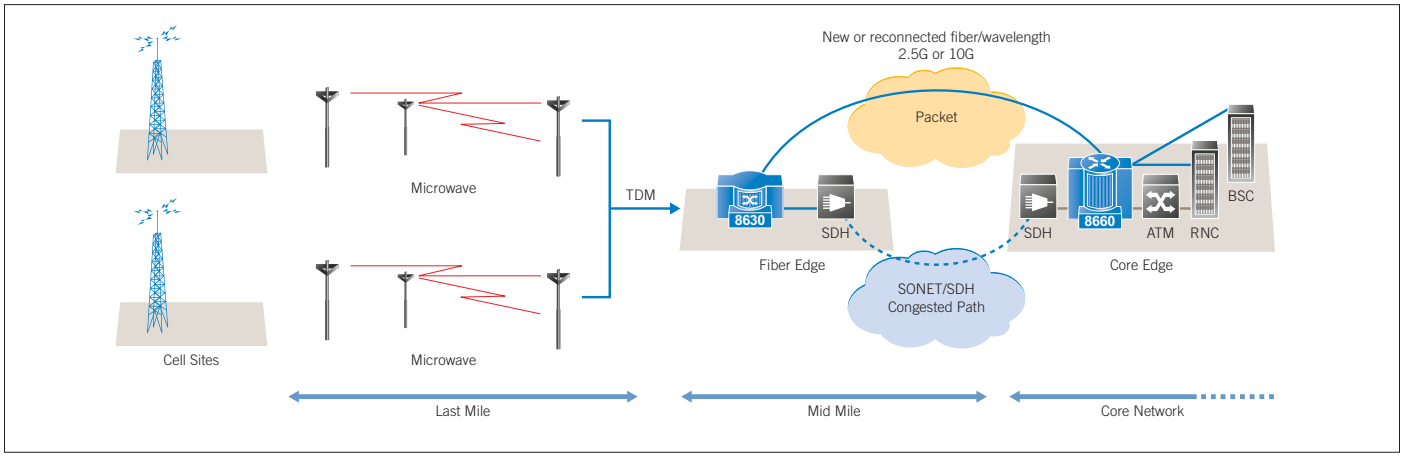


Figure 2. Alleviating microwave congestion with a Tellabs IP/MPLS solution.

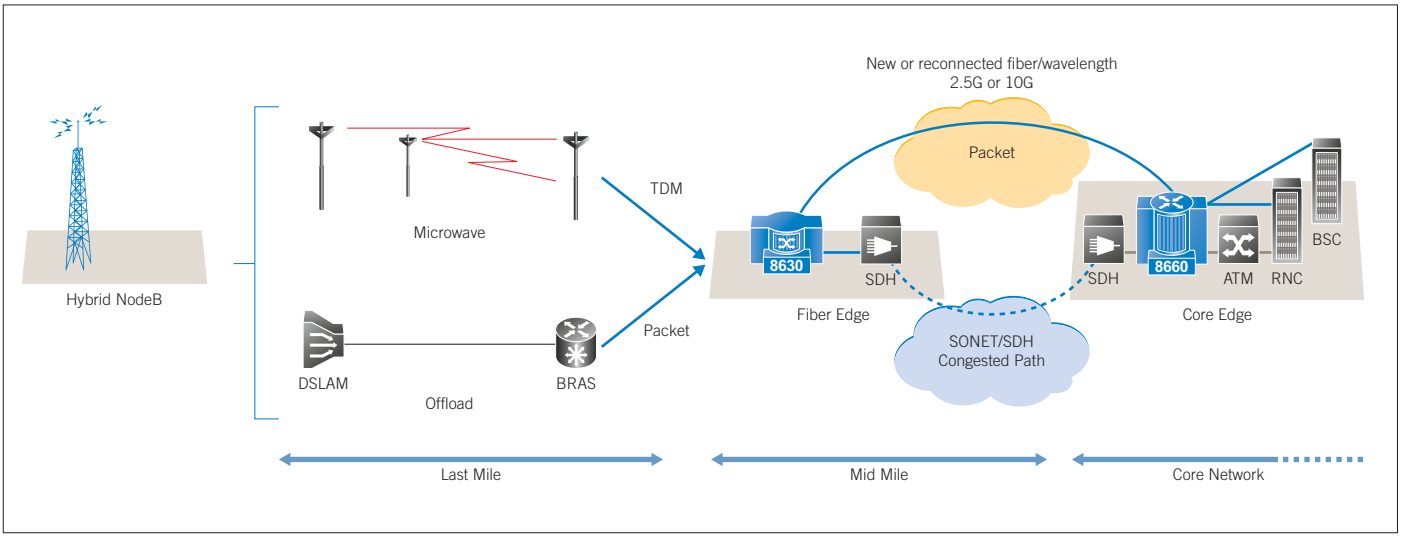


Figure 3. Offloading HSDPA traffic via broadband links to DSL to alleviate data congestion.

## Data Congestion

### SOLUTION:

The unpredictable nature of data traffic causes problems for capacity planners in the access network. It would not be economical to provision the network to be able to handle the maximum capacity possible, so a compromise is always sought.

Operators can benefit from the statistical multiplexing provided by a packet-based network, but a short-term solution can be to offload the HSDPA data traffic to local broadband circuits at the cell site as shown in Figure 3.

This can significantly reduce capital expenses by alleviating the need for adding capacity to either the TDM or packet network. It also reduces operating expenses by using lower-priced DSL circuits instead of higher-priced leased-line circuits.

### COSTS AND SAVINGS:

In this case a mobile operator introduces new 3G data services that place a large strain on the existing Microwave network and SDH backhaul infrastructure. Using the Tellabs® 8600 system, the HSDPA traffic is offloaded over broadband links and this traffic is transported as encapsulated Ethernet or ATM packets over a Tellabs® 8660 Edge Switch-enabled IP/MPLS network.

Major savings can be made by addressing the existing E1 leased-line circuits that provides the necessary capacity. As an alternative to E1 leased lines, the HSDPA traffic is offloaded to DSL circuits leased from a local broadband operator.

Here the mobile operator found that, on average, each cell-site offering data services required on average 3 x E1 circuits for backhaul. An equivalent DSL link could provide the equivalent capacity. The annual cost of an E1 circuit is €5,500 ($7,000 USD) while a DSL circuit is €1,200 ($1,600 USD). This resulted in an average annual saving of 93% in operating expenditure, as shown in Table 2.

| Case | Expense per base station | Cost |
|---|---|---|
| Without HSDPA offload | Annual Leasing of 3 E1 circuits | €16,500 ($21,000 USD) |
| With HSDPA offload | Annual cost of 1 x DSL circuits | €1,200 ($1,600 USD) |
| **Annual savings per base station** | | **€15,300 ($19,400 USD) = 93%** |

Table 2. HSDPA offload savings

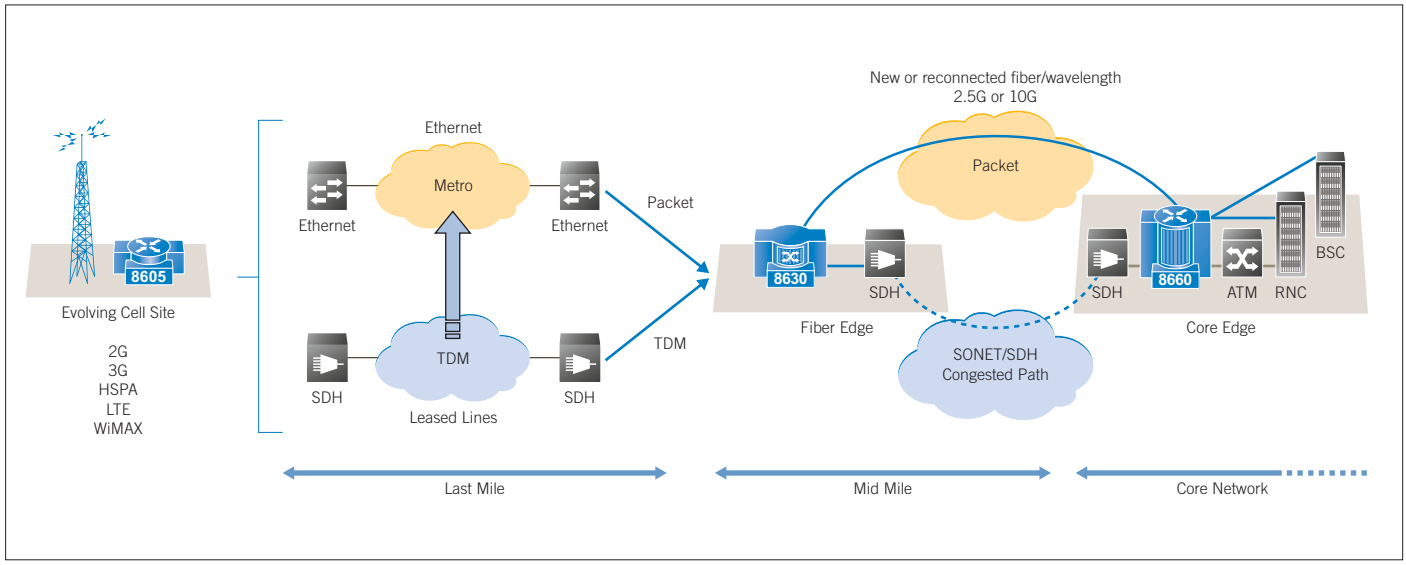


Figure 4. Extending the packet network to the access edge over leased Ethernet lines supports network scalability and evolution.

## Network Scalability and Evolution

### SOLUTION:

As the mobile network evolves and data services mature, even more strain will be placed on the access network to handle the enormous growth of data services predicted. At this point, it becomes cost-effective and wise to move the packet network out to the access edge to benefit from the statistical multiplexing, scalability and redundancy provided by the underlying IP/MPLS based network. The Tellabs 8600 system includes edge devices such as the Tellabs® 8605 Access Switch, which can be used to switch traffic directly into the IP/MPLS network while assigning the appropriate QoS parameters to optimize delivery of voice, data and video traffic.

As shown in Figure 4, Metro Ethernet services can be used in the last mile network to cost-effectively handle the unpredictability of data services while providing the scalability for the introduction of new services. These new services can be layered onto the Ethernet-based packet network for fast time-to-revenue. Existing TDM-based services can be migrated over to the packet network to reduce the operating costs incurred by the maintenance of the obsolete TDM or ATM equipment and the monthly line rental costs normally associated with leasing from national carriers providing wholesale services. Further savings can be made by using competitively priced Metro Ethernet services instead of the more expensive TDM-based services used in the past.

### COSTS AND SAVINGS:

A mobile operator needs to add major capacity to its network for the migration and evolution to 3G services and beyond. The operator relies on other carriers for lease of backhaul circuits, but the costs of TDM circuits are prohibitive and lack scalability given the uncertainty of service take-up by consumers. The goal is to be ready for any new service while being independent of its radio vendors.

By making use of leased 100 Mbps Ethernet services available from a national carrier, the operator could dramatically reduce the operating costs compared to the equivalent TDM circuits. Each cell site requires on average 5 x E1 circuits to connect to the access network. These can gradually be replaced by Ethernet services and the data forwarded over the single circuit using IP/MPLS. As shown in Table 3, the operator could realize savings of just over 70% in CapEx (including associated start-up and connection fees) and just under 50% in OpEx in the first year alone.

| Case | Expense | CapEx Cost | OpEx Cost |
|---|---|---|---|
| SDH | 5 x E1 circuits | €30,000 ($39,000 USD) | €15,000 ($20,000 USD) |
| IP/MPLS | 1 x 100 Mbps Ethernet circuits | €8,640 ($11,000 USD) | €8,000 ($11,000 USD) |
| **Savings** | | **€21,360 ($28,000 USD) = 71%** | **€7,000 ($9,000 USD) = 47%** |

Table 3. Leased Ethernet savings

Tellabs is working worldwide to supply mobile operators with solid platforms that provide predictable and scalable mobile backhaul service solutions.

## Substantial Return on Investment

In order to give an idea of the potential savings in each of these examples, it has been necessary to simplify the assumptions and look at individual sites or groups of sites. Obviously, for large multi-national mobile operators there are many other factors such as scaling factors, traffic patterns, geographic constraints and local operating conditions that will affect the calculations, and so results may differ.

However, for one such large multi-national mobile operator, Tellabs was able to show that by implementing solutions like the ones outlined in this business case within its subsidiary companies, the operator would be able to save in excess of €120 million ($153 million USD) in CapEx and OpEx over three years.

## Conclusion

Tellabs is working worldwide to supply mobile operators with solid platforms that provide predictable and scalable Tellabs Mobile Backhaul Solutions. The end result is a smoother and more cost-effective evolution from 2G and 3G networks to the long-term evolution of all-IP converged networks.

If you would like to investigate the potential savings for your particular network configuration, please contact your local Tellabs sales representative who is equipped with the financial modeling tools to analyze your network requirements.

## Additional Benefits

By implementing the Tellabs 8600 system to overlay an IP/MPLS packet-based network over the leased Ethernet services, mobile operators benefit from the flexibility, reliability and scalability that high-bandwidth Ethernet-based services can provide. In addition to financial savings, operators benefit from:

- Reduction in the amount of legacy ATM and SDH equipment ***saves more money***
- Simplified operational procedures ***save time***
- Less cabling and easier upgrades with Ethernet devices ***save installation and maintenance costs***
- Faster service roll out ***decreases time-to-revenue***
- End-to-end service-level management ***streamlines and simplifies network management***
- Seamless migration to all-IP and LTE networks ***brings the newest technologies to operator networks***

***NOTE:*** *All U.S. Dollar amounts in this document were converted from the original Euro figures using the 1 Euro = $1.2724 USD exchange rate in effect on December 2, 2008. E1 leased line costs quoted are from a BT Price List generated in October 2008.*

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