



# Traffic Management for Mobile Backhaul

## Streamlining Mobile Backhaul Planning and Service Delivery

With the advent of 3G and 4G wireless technology and the millions of multimedia smartphones, tablets, and other devices attached to them, high-bandwidth graphics and video applications now dominate wireless networks. This surge in traffic growth leaves mobile backhaul networks struggling with the weight of subscriber traffic transiting from broadband radio access networks (RANs) onto operators' core networks (Figure 1).

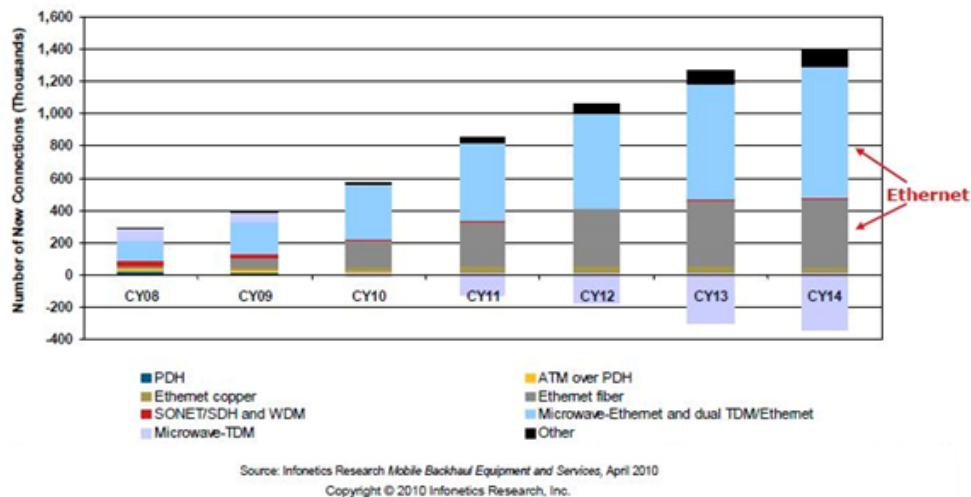


Figure 1: Number of New Mobile Backhaul Connections by Technology

This mobile traffic is quickly filling up the T1/E1 and microwave backhaul links that are transporting it from cell towers to aggregation points at the edge of mobile operators' core networks. Consequently, many operators are upsizing the capacity of these backhaul networks to relieve congestion, maintain customer satisfaction, and ultimately remain competitive. Others outsource this backhaul requirement to the traditional network service providers who, in turn, need to deliver the traffic cost effectively while maintaining the service quality that this type of traffic requires. Many network operators are looking to carrier Ethernet and Multiprotocol Label Switching (MPLS) to do the job since legacy TDM circuits have become uneconomical or are simply not available.

## Mobile Backhaul Requirements

In building a successful backhaul solution, it is vital to understand the IP/Ethernet RAN transport requirements. In addition to having the right physical network infrastructure, there are other important factors to consider, including planning, engineering, and operating procedures.

**Timely (30-Day) Provisioning**—Standard provisioning times have dropped significantly from what was typically 90 days to just 30, although rapidly deploying resilient circuits across multivendor networks still requires careful planning. To remain competitive and keep pace with accelerating traffic demands, automation and intelligent tools are essential.

**Maintaining Service Levels Cost Effectively**—The fact that minimizing costs while maintaining manageability and visibility of traffic is critical to your success is a given. Likewise is the negative public criticism that is inevitable when quality of service is not delivered. In this social-media driven world, your customers, particularly your mobile backhaul customers, are not settling for anything less (Figure 2).

Just as the potential for revenue per customer is large, so is the potential for loss of revenue. So while meeting the demands for greater aggregate capacity, delivering reliability is paramount. The increasing use of multiservice networks means that each class of service (CoS) reserved across the network must be managed to maximize use of the network resources assigned to it. Traffic within each class must perform consistently and as expected during traffic reroutes, unanticipated high traffic periods, and during both planned and unplanned downtime.

**Easing Shifts from ATM/TDM to IP/Ethernet**—As a mobile backhaul provider you are likely accustomed to ATM with its sophisticated CoS capabilities and the predictability of static permanent virtual circuits (PVCs). It is similarly critical to gain the same level of control over your IP-based backhaul networks as you merge voice, video, and data onto those networks.

Service	Impact
Internet	Minimal
Voice	Garbled or dropped call
Video	Pixelation, buffering, or blank screen
Mobile Backhaul	Newspaper headlines, lost revenue stream

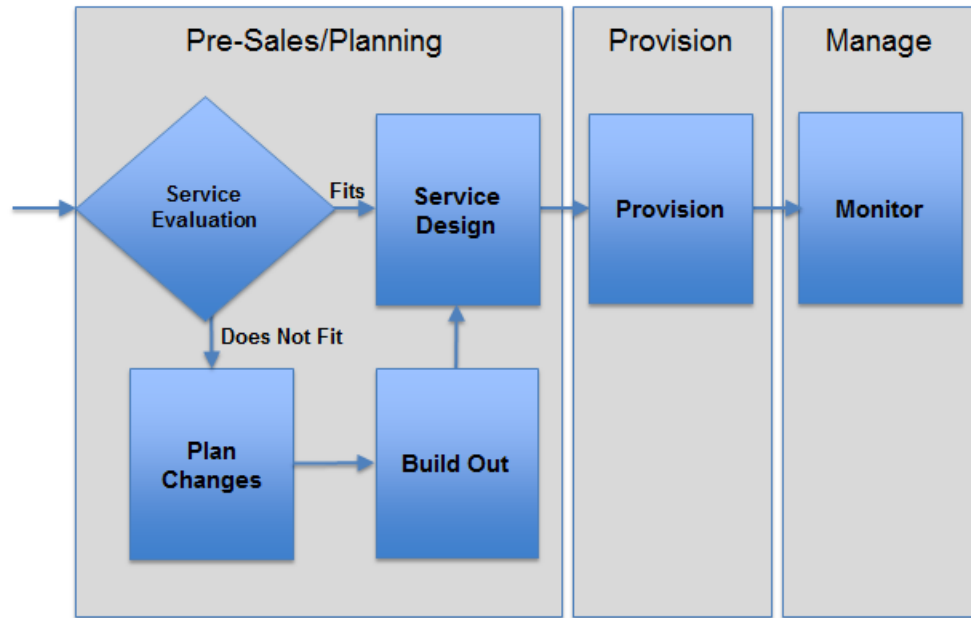
Figure 2: Impact of Packet Drops on Quality of Service Delivered

## The Cariden MATE Solution

Cariden MATE™ software delivers the visibility and control required to sustain network performance, including within CoS levels, while automating as much of the traffic management procedures as is viable. With the MATE solution, your network designers can efficiently plan new customer circuits or capacity upgrades for mobile backhaul services. You can easily discover the existing network topology, configuration, and traffic flows as baseline input for your designs and plans.

### MATE Software and the Mobile Backhaul Lifecycle

Whether running your own aggregation access network or offering mobile backhaul services to customers, the MATE solution offers a common process for planning to ensure you can meet the demands for backhaul capacity (Figure 3).



**Figure 3: Service Admission and Control Process for New Mobile Backhaul Circuits**

### **Service Evaluation**

When the group responsible for providing a new circuit gets a request for capacity, they can use a MATE-based system to see where the circuit could be routed. Their modeling checks that the intended path provides resilience in the event of failures in the Layer 3 network and the Layer 1 network on which it is running. They can also check whether the network can support the expected traffic flows in the requested circuits without causing congestion leading to service outages. If the proposed routing for a new circuit does not fit well on the current infrastructure, the routing of existing traffic flows can be optimized to see if there is a better way to meet traffic demands without increasing capacity.

### **Service Accommodation**

If the required circuits do not fit into the existing network efficiently, you can use MATE software to plan the most effective changes for accommodating these requests and any forecasted growth over any given period. By integrating these planning and forecasting capabilities with knowledge of the assets already deployed, a full bill of materials and build out plans can be produced for the required network build out.

### **Service Design**

Once the network is capable of supporting the required circuits, you can utilize MATE functionality to design the most efficient routing of traffic. The calculated path layouts identify optimized bandwidth utilization and how to minimize exposure to the risk of network failure through resiliency analysis that considers both Layer 1 and Layer 3 topologies.

### **Service Provisioning**

Since most network operators run multivendor networks with a variety of platforms, most vendor-specific management tools cannot provide a complete solution for the network. Using the network-wide, traffic-based approach of a MATE solution provides you with vendor-neutral, network design expertise based on the reality of what is happening on your network. Once the overall service design has been completed using the MATE system, your preferred provisioning tools, driven by this design, can provision the circuits.

### Service Monitoring

Once circuits are provisioned and activated, the MATE-based solution continues to be useful for monitoring the traffic. It is also used to ensure changes in traffic flows, failures within the network, or topology changes do not negatively impact services.

Increasingly, MATE-based systems are also used where mobile backhaul services are being run across multiservice IP/MPLS networks. In these cases, it is essential to be able to predict and understand the impact that the backhaul traffic can have on other services, as well as ensuring it can be delivered efficiently. The mobile industry is seeing considerable consolidation of operators and the networks they use to transport traffic. The MATE solution enables you to identify the impact of moving traffic onto an existing network, showing the effect of the changes before they are implemented, and avoiding the risk of a negative impact to the your business.

### Benefits of a MATE-Based System

Concisely, Cariden MATE software takes the guesswork out of adding new backhaul services to the network or making changes to existing ones.

MATE Features	Benefits
<b>Network Topology Discovery and Visualization</b>	Collects data from the network devices of all the major router vendors, including Alcatel-Lucent, Cisco, Juniper Networks, and Huawei. It also allows you to visualize the underlying physical topology of the network, as well as run simulations based on it.
<b>Modeling and Simulation of Existing and Forecasted Traffic</b>	Identifies whether the network can maintain required performance under both normal operation and failure conditions. Traffic forecasts can be input as growth to the existing traffic matrix as a whole, by traffic flows, or as external growth projections, in anticipation of new service requests or special events and campaigns.
<b>Modeling Service Class and Interface Queue Traffic</b>	Demonstrates how topology changes, such as adding or removing equipment or rerouting certain traffic flows, affect network performance and CoS delivery.
<b>Online and Offline Traffic Engineering</b>	Helps route traffic to make best use of all network resources and mitigate network congestion.

### A Single Platform for Planning, Engineering, and Operations

The three primary groups involved in managing mobile backhaul networks are planning, engineering, and operations, with each performing complementary traffic management roles across a different time horizon. Traditionally, their activities have been isolated from each other with each group using a distinct set of tools. This disjointed approach has made it challenging to maintain consistency of methodology, traffic data, and baseline network models. Additionally, this limitation has led to suboptimal network engineering decisions based on incomplete understanding of the network as designed and as operated.

Using MATE software, all three groups have a single traffic management platform that is industry-renowned for its flexible user and programmatic interfaces. Planners and engineers appreciate the easy-to-use graphical interface and ability to maintain up-to-date network models. Operationally, MATE software offers extensive support for automated workflows using its programmatic interfaces. Such support means that MATE functionality can be built into bigger automated systems that require no human interaction for day-to-day operation.

Network planners use MATE tools to estimate and design required capacity for backhaul networks. Engineers leverage the same tools to specify efficient and economical network routes that are resilient to failures and to route around planned maintenance. Operational staffs rely on MATE tools to mitigate congestion issues that were not caught by the other groups or that are caused by network failures.

Having a common platform allows cross-department communications when making traffic management decisions, with each group having a full understanding of the network, both as it was designed and as it is currently operating. This integration under a common system is the most effective way to ensure that mobile backhaul networks remain uncongested and CoS resources perform optimally. Having a single, unified platform is also a highly economical approach from a capital investment and training standpoint when compared to making separate investments for each group.

## Proven Results

Today many network operators use MATE software for managing their mobile backhaul infrastructures. One such carrier bought MATE software as a result of experiencing a major outage of its mobile voice services due to a device failure in its network. The failure resulted in rerouted traffic causing network congestion within a class of service carrying voice traffic. The congestion led to packet drops which, in turn, caused calls to be dropped entirely. Without good visibility into what was happening on their network, the carrier spent several uncomfortable days being unable to provide services reliably, which resulted in national media coverage and significant negative publicity.

By deploying the MATE solution, that customer now plans for and controls what is happening on their network. They can predict service-impacting problems before they happen and take mitigating action before their customers experience performance degradation and start complaining.

## About Cariden

Cariden Technologies, Inc. is a software company serving telecommunications providers worldwide. Founded in 2001, the company has maintained steady growth and profitability with its industry standard software for IP/MPLS capacity planning and traffic engineering. Networks serving 85% of the U.S. broadband customers have adopted Cariden software, as have 7 of the 11 global Tier 1 ISPs. Cariden's success is fueled by its technical innovations in delivering visibility, efficiency, and automation to networks.

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