Q: Why are service providers starting to make greater use of MPLS-TE?
A: Quite simply, services providers need to offer their customers better service quality while also reducing network capacity costs.

MPLS Traffic Engineering (MPLS-TE) brings more control and greater certainty to the operation of IP/MPLS networks. Essentially, MPLS-TE allows routes between two end points (or multiple end points in some cases) to be optimally designed, rather than simply being left to dynamic routing by the network’s IGP protocol. MPLS-TE also supports a number of protection options for rapidly responding to link and router outages.

The ability to design optimal routes and offer resiliency to faults ultimately means MPLS-TE is able to offer higher-value services to the service provider’s customers while making more efficient use of network resources.

Q: MPLS-TE has been available for some time. How is its use changing?
A: Rolling out MPLS-TE brings a number of challenges compared with designing an IP network. The benefit of being able to design and optimise MPLS-TE routes means that the service provider needs to have a clear picture of their network and traffic, and some means of analysing this to actually determine the optimal design of an MSPL-TE route.

Many service providers started by using MPLS-TE as an ‘architectural’ tool, to design tunnels between IP routers to optimise the IGP network. This has benefits in that it allows more flexibility when designing and optimising the IP network,
but ultimately it’s still operating an IP network and delivering IP services to customers.

To achieve the goal of greater service quality and network efficiency, service providers are increasingly using MPLS-TE for service delivery. One or more LSP (Label Switched Paths) are being designed for each customer’s connection. This means the MPLS-TE design moves from an occasional, strategic activity to a service-fulfilment and operational activity.

My company, Aria Networks, provides software solutions for the design, build planning and operation of IP/MPLS networks. We frequently encounter two business concerns about the adoption of MPLS-TE as a service delivery technology: Building the business case for investment in MPLS-TE by identifying the benefits; Implementing the capacity management processes necessary to operate the network, realising these benefits.

Q: Is MPLS-TE the right approach for everyone?
A: Every service provider is different, with different business objectives, economics and customers. So, there is no one-size-fits-all. Some generalisation can be made. For example, MPLS-TE is certainly worth investigating if you run a large, meshed IP network as is typical of many fixed-line service providers, large ISPs and the international core networks of the largest mobile service providers. It is less likely to be beneficial if your network is a point-to-point, tree, or hub-and-spoke topology, such as a mobile backhaul network or smaller, but high capacity, international network. In the latter cases, carrier Ethernet over optical may be more cost-effective and simpler to operate, for example.

But even if you think your network is a candidate to benefit from MPLS-TE, ‘probably’ is not a business case. You need to determine where MPLS-TE will offer the biggest efficiencies, and where it will most quickly enable new revenue generating services.

Q: What sort of benefits of MPLS-TE are you identifying?
A: A recent project with a tier-1 carrier focused on the predictability of the network under failure conditions as the main performance indicator. In IP networks you often have to overbuild capacity, by as much as 100%, to ensure there is sufficient capacity to deal with all possible network faults. The service provider wanted to minimise traffic spikes and hot spots while still maximising utilisation of resources under normal operational conditions. Our analysis compared IP with as many as six LSP paths for each service, and LSP with fast reroute (FRR) enabled in the network. Using only IP, we showed that in the event of faults that some links would be prone to spikes of up to 300% of normal utilisation. The results also established that the network could be run with a high level of reliability by employing FRR and providing just two or three LSPs per service. Using LSPs gave better ‘load balancing’ of utilisation under normal operation and predictable rerouting under failure conditions. The challenge Aria Networks met was determining where to route the LSPs to achieve these benefits.

On-going benefits, from better capacity management and more efficient use of resources can save up to 20% in network capacity costs, year on year. This is achieved thanks to the greater potential efficiency of LSP routing compared to IP routing, and the improvements to the capacity management accuracy from the MPLS-TE planning process.

Q: How is Aria Networks able to evaluate the benefits of MPLS-TE? What is different about your approach?
A: At Aria Networks, our approach it to look at the business objectives (as a set of KPIs), the costs, capacities and capabilities of the current and proposed networks. Our capacity management software solution models the network, optimises LSP design according to quality, resiliency and cost priorities, and automates the analysis of many alternative scenarios.

Unlike a spreadsheet or an IP/MPLS engineering tool, Aria Networks’ solution is able to ‘goal seek’ the best scenario, removing the need to manually model and test each alternative. This is achieved by setting an objective and then letting the analysis work on the best way to achieve that objective. ‘Best’ will be meeting a KPI that takes into account both technical and non-technical constraints.

When we help a service provider compare their current IP network with an MPLS-TE alternative, we consider:

- How well the IP network manages under failure conditions, by running ‘worst case failure’ analysis. This models the impact on the network for the failure of each link, router and shared-risk group. The results identify hot spots in the network and also resources that are under-utilised both in failure and normal operational states. This is a good indicator of the efficiency and reliability of the IP network.
- Where, and how many, LSPs would be needed to carry IP routes across the network, optimising each for cost, quality, resiliency and load-balancing across available resources. This analysis considers primary and secondary (or more) end-to-end paths, fast reroute protection, and shared risks such as two LSPs sharing the same fibre.
- Both the IP and MPLS-TE networks can then analysed for their ability to meet forecast growth in traffic over any time period, typically 1-3 years. The initial cost of migration to MPLS-TE may not be realised immediately, but the relative cost of upgrading the IP capacity compared to operating a more efficiently routed MPLS-TE network can result in medium or long-term savings.
If MPLS-TE is right for the service provider, the results of the analysis will show reduced hot-spots, better utilisation of existing resources, and lower costs going forward due to more efficient use of capacity.

Q: Presumably designing the MPLS-TE architecture is just the first step in realising the benefits of MPLS-TE?
A: Absolutely. Planning for MPLS-TE is not a one-off, ‘yes or no’, design decision. Once you’ve determined how MPLS-TE can benefit the business, and perhaps this is only for certain regions or service types, then your capacity planning, service delivery and service assurance processes need to implement this strategy.

At Aria Networks we talk about capacity management as a design-build-operate process. The design phase establishes the best architecture, technology and vendor choices to meet business objectives, and sets policies for both the network capacity build and operational practices. Network build planning ensures there is enough capacity, of the right type, in the right place, to enable just-in-time capacity management; And the operational phase ensures services are being delivered while meeting cost and quality requirements, on a network that responds in a reliable, predictable way to unplanned outages.

Much of the analysis carried out when evaluating and designing an MPLS-TE network can be used for build and operational planning. ‘Worst case failure’ analysis can be used daily to ensure the network is able to support observed (rather than estimated) traffic volumes. LSP optimisation can be used to assist in delivery of customer services, and to ensure the whole network is still being used efficiently. And by using the same platform for operational and strategic planning, the service provider can feed-back observation to make better long term plans. For example, if usage patterns are seen to change, this can be used to refine the build planning to ensure capacity is deployed in the right place at the right time according to the latest information rather than a year-old estimate.

Q: Is the emergence of SDN enabling service providers to further improve their IP network efficiency?
A: Software Defined Networking offers service providers the ability to programmatically control how routers forward data packets allowing sophisticated traffic routing and service delivery without the need to implement multiple, complex standards and protocols.

Much like MPLS-TE, SDN will likely first be used in a few key locations in the service providers’ network to apply service policies and implement relatively simple traffic engineering in the IP layer.

Wider deployment of SDN enabled routers will eventually raise the exciting prospect of designing new network architectures and services with greater flexibility than any ‘official’ protocol like MPLS-TE could offer. More flexibility means more scope for optimisation, service differentiation, and efficient use of network capacity.

To fully benefit from SDN, capacity management will need to go beyond design, build, and operate to also support real-time optimisation and service assurance. Rather than designing an optimal service and periodically re-optimising services, as you would for LSPs, SDN enables real-time control of packet flow. Capacity management then becomes closely coupled to the SDN controller to provide the intelligence needed to ensure the right services are routed along the right path as traffic demand varies minute by minute. This is where service providers will see the greatest efficiency gains. But the biggest benefit is likely to be the ability to seamlessly react to sudden, unpredictable events including network faults but also localised traffic bursts from customers.

Whether SDN is adopted, or more use is made of their existing IP/MPLS infrastructure, Aria Networks puts capacity management at the heart of service providers’ operations. We believe that the way service providers are operating their networks today requires a capacity management solution that is fundamentally different from the planning tools that emerged 10-20 years ago. Uniquely, Aria Networks’ solution automates critical operational tasks, and provides the option to extend this platform to ensure the organization is also designing and building networks that meet strategic business objectives, market demands, and economic constraints.

For more information visit:
www.aria-networks.com