Pipeline Knowledge is Power.

The Trick To High Availability Services
By Basil Alwan

In the face of relentless competition and constant technology innovation, the drive for profitability is changing the way service providers conduct business like never before. Major transformation projects, including SBC's Lightspeed, BT 21st Century Network and China Telecom ChinaNet2, are underway throughout the world. The magnitude of these projects and the accelerated pace of service deployment are visible examples of the new business environment. So too are the types of services delivered – services like voice, video, and business VPNs - whose "always on" expectations are firmly entrenched in the minds of their users.

Transformation, however, is not without its challenges, especially operational challenges hidden in the details: rolling-out and provisioning services faster than ever to millions of subscribers is one thing, doing so, while increasing the reliability of the IP infrastructure to deliver high availability services is another. Together they are compelling service providers to re-think their strategies and long-term plans for a converged IP service deliver architecture. One area of focus, is placing more emphasis on the service-orientation of IP platforms and the tools to quickly provision and repair multiple services with multiple levels of service quality. Another is the reliability of routers and routing protocols to ensure traffic is always forward using up-to-date information – even during node failures. Addressing both gives service providers an infrastructure they can bank on.

Always-on delivery of multiple services to consumers and business, while having a simple goal, has many aspects that amount to a highly complex undertaking. Individual network elements must be combined on a scale that enables millions of end users to enjoy voice, video, Internet and VPN services as a predictable and reliable service in everyday life. While IP technology affords a large degree of flexibility and features to create differentiated service behavior, the drawback is that the resulting complexity and scale of IP management tasks can result in relatively high OPEX, or worse, poor service quality and consistency.

The degree of router misconfiguration has been heavily influenced by the use of legacy, CLI-based management tools. A plethora of disparate tools are available, many as "freeware," and different devices often speak different CLI dialects. Several management systems often access the IP devices in parallel, making it hard to verify if the aggregate result of these various device configuration changes is taking effect at network and service levels in a consistent, coherent, and predictable manner.

A better solution is an IP management system that understands the hierarchy of an end-
to-end service construction including intimate knowledge of the component technologies that comprise it. This "service awareness" allows the management

system to react to individual nodal and composite service events and present correlated, relational information to the operator, allowing faster service provisioning, verification, and restoration. Specifically, service aware templates are created which understand not just the individual services and elements that might be affected by the provisioning of a new service, but also the connection points between technologies that comprise the composite service as it traverses the network. For example, when a service is turned up at an edge port, the service aware manager knows how to construct and enable it, including paths, priorities, and other attributes. This creates an "auto-instantiating infrastructure" where the network builds itself through an over-arching understanding of the composite-service hierarchy. This simplifies and accelerates manual or OSS-driven provisioning and allows the integration of OAM policies with provisioning for automated turn up testing.

The challenge of increasing IP service availability is in maintaining a stable, accurate routing environment. Routers make forwarding decisions for customer traffic based on network topology information each node continually updates and maintains. This is a very dynamic and complex function requiring constant exchange of information amongst routers. The challenge is maintaining this information when a router switches between primary and backup control processors. The established norm for Internet routers, however, is for routing protocols to stop and restart.

Euphemistically called Graceful Restart, the affected router enters a recovery mode during which its routing protocols reconverge their understanding of the network topology. During this process, forwarding decisions for customer traffic is based on information that may no longer be valid, leading to service outages. Convergence of always-on services over IP demands more, and for this challenge, there is Non-Stop Routing. As its name implies, it is a technology whereby routing protocols remain fully operational during control plane switchovers, greatly reducing the amount of time topology changes are not able to be updated and reflected in forwarding decisions.

Another consideration is the impact routing protocol failures have on network reliability. The upside of dynamic routing protocols is that their interaction between network elements reduces operational cost. The downside, however, is that a problem in one network element can spread to a much larger population of elements, and this has been observed in both packet routing and TDM voice-switching networks. Non-Stop Routing greatly diminishes this possibility by isolating the corrective actions following a control plane processing failure to within the system where the failure occurred. This is particularly important in networks that have a mix of legacy and next generation routers where additional load on neighbor routers could have unintended consequences.

Massive, rapid deployment of value-added, “always-on” consumer and enterprise services has become a "do or die" imperative for operators. New converged IP service deliver architectures built with service aware management and Non-Stop Routing will

unshackle operators from IP’s service complexity and "best effort" service heritage. And that’s something service providers can bank on to deliver high speed rollouts of always-on services.