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Self-organizing Networks and the Shifting MNO Battleground

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Mobile network operators (MNOs) have recently seen a significant increase in network traffic as a result of subscribers' dependence on mobile data services, presenting a considerable barrier to sustaining MNOs' bottom lines. In fact, according to Nielsen, 2011 saw an 89 percent increase in mobile data consumption. Mobile traffic is expected to grow even more over the next year, further expanding the amount of network congestion that MNOs must proactively manage.

Although not a recent development, this growth has forced MNOs to increase their network capacity by migrating their TDM backhaul to Ethernet. However, while attention was focused on gaining backhaul capacity efficiency, the bottleneck of mobile data traffic has shifted to the radio access network (RAN). As consumers come to expect and demand better mobile service performance, migrating RAN to LTE is seen as an obvious and straightforward solution.

For RAN operations and engineering teams, the arrival of LTE is further extending the RAN's challenge of achieving KPIs. These new infrastructures introduce new network elements and thousands of parameters that RAN organizations need to configure, monitor, assure, and optimize parallel to legacy activities like mobilizing management entities, serving gateways and packet data network gateways. New technologies also mean new equipment vendors in the network, leading to more management systems, proprietary parameters and interfaces. It's no surprise that RAN organizations need more efficient ways to: sense the performance and quality of the network, detect and compensate for service outages, optimize coverage, capacity and performance and find an effective way to mitigate traffic load.

Furthermore, because LTE will take years to be completely rolled out and configured in all markets, MNOs must face their current RAN optimization issues head-on or risk degrading customers' quality of experience (QoE). At the same time, MNOs are struggling to manage their growing arsenal of networks (2G, 3G and now 4G) with existing resources, and are in desperate need of an easier and more cost-effective strategy to simultaneously augment current network capacity and assure customer experience.

Self-organizing networks (SON), which are steadily growing in recognition and popularity, optimize the management of all RAN operational phases. Despite initial push back from engineers concerned about their job security, SON is a natural – if not necessary – performance management solution to monitor and manage RAN complexity; it automatically configures RAN systems, increases capacity, maximizes performance and remediates network glitches and degradation as they occur. How SON works

While network performance and capacity have historically been optimized by network operations center (NOC) engineers, the concept of allowing a network to organize and optimize itself was first introduced in the RAN a few years ago. SON technology, at the most basic level, automates the

maintenance and management of MNOs' networks, including the configuration of cells and network parameters, replacing the constant attention from RAN engineers that has historically been required. This innovation was initially met with industry-wide fear that engineers would be replaced by computers. However, SON is now becoming more widely accepted, as it allows RAN engineers to more effectively grow and improve the reliability and capacity of complex networks while maintaining a tight budget. As such, SON helps contain OPEX by increasing employee efficiency while also contributing to revenue growth. Today, it is clear that SON will be a mandatory tool for any MNO that wants to maintain a competitive edge.

Paving the road to self-optimized RAN

To be clear, SON is not just one solution, but incorporates multiple use cases to configure, optimize and maintain network performance. Because there are many aspects to a complete SON solution, MNOs should implement their optimization framework based on best-of-breed technology solutions for precise use cases – likely from a variety of vendors. In addition, as product managers must achieve short time-to-market and maintain a competitive edge, industry standards, such as those defined by the Next Generation Mobile Network Alliance (NGMN), are now a key requirement for every SON solution.To deploy a SON solution that guarantees a quick return on investment (ROI), MNOs need to be able to easily identify the areas of optimization that would provide the maximum benefit. This can be achieved by leveraging network analytics and reporting engines to proactively identify the most promising spots for optimization gains ("SON hotspots").

When these conditions are met, an MNO can benefit from the use of SON technology in the following ways:

- **Maintaining and improving the customer experience** – SON is able to offer a more consistent, high-quality user experience by monitoring the causes of network degradation and actively preventing recurring network issues.

- **Maximizing service usage** – Dynamic load balancing and hotspot mitigation help identify recurring network congestion and suggest configuration templates that can be automatically applied in a proactive and recurring manner to help limit performance degradation, thus improving quality of service (QoS) and reducing the number of recurring problems.

- **Delaying massive capital expenditure** – Rather than spending millions to extend their spectrum, MNOs can save money and time by maximizing the capacity of their current 2G and 3G networks to delay their LTE rollout in all markets until this technology is more cost-effective.

- **Allowing green network power savings** – SON automatically turns off under-used systems whenever possible to save energy and money.

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Realizing these benefits require a step-by-step approach to fine-tune existing processes, it is critical that MNOs' SON framework offers four key principles. As described earlier, SON should be able to detect where optimization will have the widest impact. Second, SON technology should leverage algorithms to suggest the optimum configuration for a given network. Next, CSPs should make sure their SON framework is capable of working in an open or closed loop system. And finally, SON should provide access to before and after dashboards to demonstrate the benefits of the optimization process and fine-tune future optimizations.

The Need for Open Scripting SON Frameworks

Some MNOs aspire to develop proprietary SON algorithms and workflows while existing commercial off-the-shelf (COTS) SON solutions focus on specific use cases. In addition to fully packaged use cases, an open SON scripting framework would allow network management teams to develop customized solutions driven by their unique operational needs. Even when equipped with SON hotspots identification mechanisms and sophisticated SON algorithms, operations teams need the flexibility to build their own business logics and script routines to automate simple yet time-consuming recurring tasks such as parameter audits and bulk parameter updates (e.g. what are the current RET settings for all cells in a certain market?). In a more sophisticated example, operators would source near real-time KPI analytics within their own scripts to automatically respond to network events that would otherwise have been remediated manually. This requires cell locking mechanisms, script priority management and manual override capabilities that compose the building blocks of a SON development framework.

What this means for the future

According to Yankee Group, approximately 26 percent of MNOs' operational expenditures (OPEX) is spent on network operations. To put this in perspective, a leading U.S. tier 1 MNO is spending as much as $9 billion USD annually to operate, manage and optimize its network. Overall, the organization of RAN practices around the concepts of SON is proving to be a necessary solution for MNOs looking to manage multiple networks in a cost-effective manner. With the ability to plan, configure, operate and optimize multiple networks, SON eliminates congestion in a given network, offering high QoE and improving an MNO's business model. Though the amount of networks currently being managed by each MNO may seem daunting, SON simplifies RAN capacity optimization and can help operators become more competitive in the communications market.

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