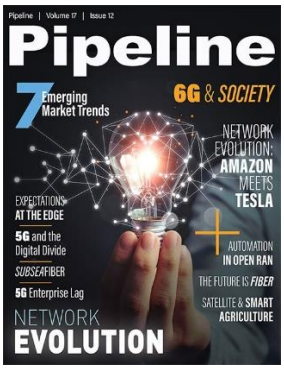

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The Power of Automation in Open RAN Networks

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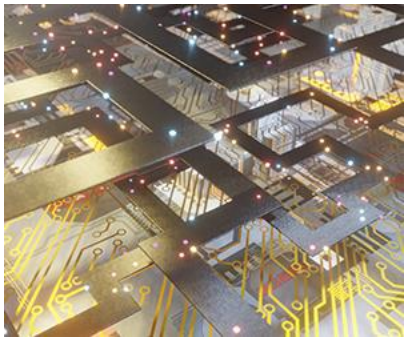

The telecom industry is going through a dramatic change that can only be compared to the change that data centers went through in the 2000s, all driven by Moore's Law. Internet of Things (IoT), digital health, e-learning, e-banking, artificial intelligence (AI), and Industry 4.0 are just a few of the many applications that are driving mobile traffic. Mobile network operators (MNOs) across the globe are presented with new revenue opportunities and must scale their networks to keep up with this demand.

Open RAN is the movement in wireless telecommunications to disaggregate hardware and software, and to open interfaces and reduce costs. With Open RAN and the virtualization it brings, operators are enabled to run software-based network functions on standard commercial-off-the-shelf (COTS) servers. With non-proprietary, open interfaces, MNOs can use one supplier's radios with another's processors—something previously not possible.

Open RAN follows the enterprise disaggregation path as seen with data centers. Once hardware and software were disaggregated in the enterprise sector in the 2000s, two similar challenges needed to be addressed:

1. How to Integrate software and hardware from different vendors.

2. How to automate the upgrades to that software.

This is where cloudification, ZTP (zero-touch provisioning), AI (artificial intelligence), and ML (machine learning) coupled with analytics come in to enable automation in Open RAN. Today these elements are becoming increasingly important to mobile operators. See Figure 1 below.

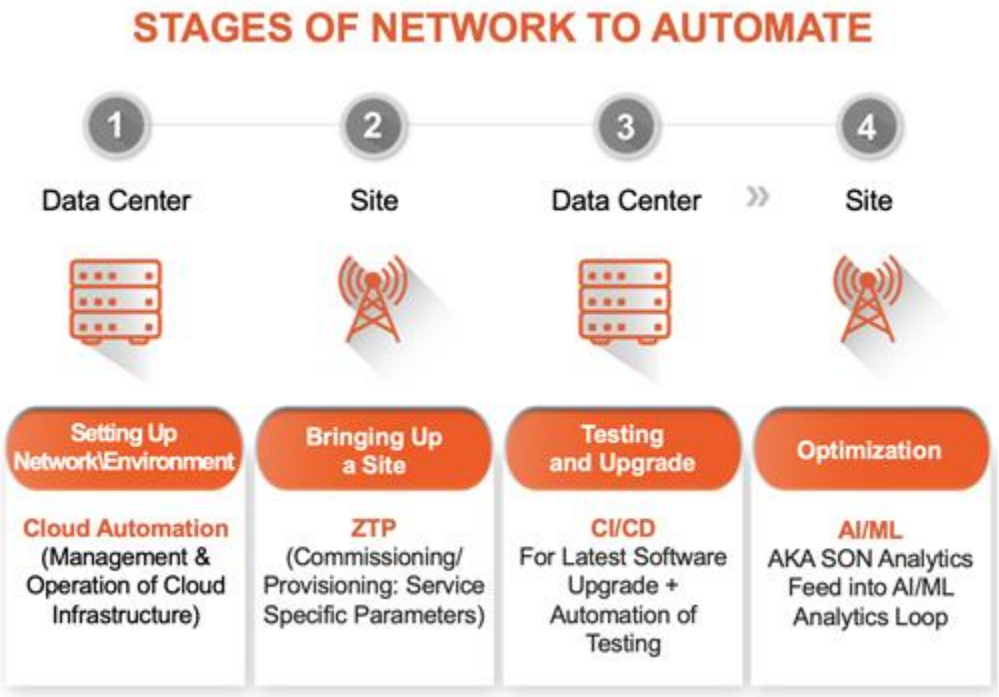

Figure 1: Stages of network automation
click to enlarge

Stages of the network to automate

Automation is enabled by four capabilities across all the stages of network deployment. Automation tools include ZTP, CI/CD, AI/ML and analytics. Automation is a key enabler for software-based cloud-native networks. Updates are deployedautomatically without disrupting the network or end-user experience. Automation is used for scaling, testing, and allocating software and underlying hardware resources.

ZTP stands for zero-touch provisioning, meaning a mobile operator does not have to perform any manual tasks to configure the cell sites. Sites are configured quickly and automatically. Once sites are configured, continuous integration and continuous development (CI/CD) is utilized to automate updates and reduce any manual labor involved on site or in the data center. By reducing or eliminating the need to send engineers on-site, the ongoing maintenance costs will be reduced for mobile operators.

ZTP will be critical for dense 5G deployments when hundreds of sites will need to be configured.

CI/CD frameworks have been used in IT and enterprise spaces for years. There are two important factors to keep in mind as CI/CD is adopted for Open RAN. The first factor is the disaggregation

itself, as hardware and software components are coming from different vendors. The second consideration is around physical components (servers, radios) in the RAN.

These components power different functions across the network. When applying CI/CD models to RAN upgrades, they need to holistically feed into the overall CI/CD strategy across all network segments, such as RAN, transport, and core. So, in addition to creating a cohesive RAN CI/CD strategy, a mobile operator needs to create an overall network CI/CD strategy.

DevOps requires a mindset shift, as traditionally separated departments within an organization now need to work very closely together. They will need to implement a set of new automation tools to be used across the group for monitoring and testing the application and keeping it secure.

DevOps and CI/CD enable fast changes to software to deliver on and meet business and end-user needs. The updates delivered to sites can be monitored to evaluate how they impact end users, and whether they are achieving the pre-determined business goals.

The integration, software upgrades, and lifecycle management of these disaggregated software components running on COTS hardware are enabling a new testing model in which software from the different groups within an organization is not tested in silos, but rather under an overall CI/CD umbrella. As a result, CI/CD will significantly reduce development time from hours to minutes of effort, eliminating most of the manual tasks.

This approach will help with creating CI/CD blueprints for future deployments in several ways.

Creating an interconnected ecosystem

By implementing CI/CD, mobile operators embrace greater collaboration between different ecosystem members, which fosters innovation. It supports multi-vendor, cloud-native network function onboarding and lifecycle management. This approach minimizes risk through frequent delivery of new features and new optimizations while increasing efficiency via automation that leads to the faster introduction of new services to keep end users happy.

The mobile operator’s maintenance team can be enabled with these open automation tools, which enable access to vendor-neutral sets of applications.

Combining the power of containers and CI/CD

Agile DevOps simplifies automation by providing validated stack templates for containers to host microservices. These upgrades will be automated with CI/CD. The combination of software being pushed via CI/CD to containers allows MNOs to easily define their own architecture and make Open RAN easier and more cost-effective to deploy and maintain. The main benefit will be in sites running as a service with software updates being pushed to hundreds of sites automatically instead ofscheduling them for upgrades when a crew is available to go on site and upgrade manually.

Automation of testing and upgrades

implementing a CI/CD model in the telecoms industry helps to migrate the testing, integration, software release, and actual software deployment of the RAN from manual fieldwork to automated and remote deployment. Manual on-site upgrades are subject to mistakes, and the maintenance window is short. With automation, mistakes are eliminated, and the time window gets expanded.

With CI/CD the fast delivery cycle makes it easier for developers to work as the business requires. Kubernetes makes finding faulty code easier, meaning it can be reverted or fixed much faster without impacting the business. If there is an issue with infrastructure, automation will enable moving the application to another data center, edge or centralized, depending on the application. Rollbacks for application or container failing are automated, so the latest stable version is always available, minimizing downtime and any impact on the end user.

Artificial intelligence (AI) and machine learning (ML)

In a recent Omdia survey, 80 percent of mobile operator responders stated that they plan to use AI to automate network operations starting in 2021 and beyond. AI coupled with ML will be the main tools to guarantee the quality of network performance and the quality of the resulting end-user experience across ALL Gs.

AI will be responsible for analyzing data and using ML algorithms to adjust network conditions, provide proper load balancing, ICIC, and managing handoffs seamlessly—all to ensure the subscriber gets the best experience possible.

All data sources, as in big data, will need to be considered to first classify the data, then second to recognize the pattern or abnormality, then third to predict the behavior. As time progresses, ML algorithms will evolve and become better at predicting and helping AI to make real-time network decisions. This will be critical for 5G when humans and things will be connected.

Any AI can only be as good as the data that goes into it. The data will need to cover different use cases, which need to be supported and include data from different vendors across not only all components of the RAN, but also the overall network. This is where openness will play a critical role and where the ecosystem must be created.

Analytics

Analytics is a tool to see and understand what's going on in the network and how those changes affect the subscriber experience. Analytics will provide a visual representation of patterns or abnormalities and will help a mobile operator to understand what needs to be corrected to improve network performance for a better subscriber experience. It's an opportunity to review the AI data and see reports on how ML is improving the network.

Analytics will be deployed as rAPPs as part of the Non-real time RIC and will utilize big data to provide an overall view of the network conditions. There will be a need for better openness and better APIs between vendors that enable that data mining.

Conclusion

A clear automation strategy and defined processes across CI/CD, ZTP, AI/ML, and analytics will help mobile operators to move into a fully automated RAN world, which is key when RAN components come from different vendors as with Open RAN.

The scope of work is the same as with legacy RAN; what is different is the number of vendors that will be a part of the Open RAN ecosystem. With automation of configuration with ZTP and automation of ongoing maintenance with CI/CD, AI/ ML will help mobile operators to realize the promise of Open RAN to avoid vendor lock-in while Increasing efficiency, providing better resource utilization, and driving down overall TCO.