



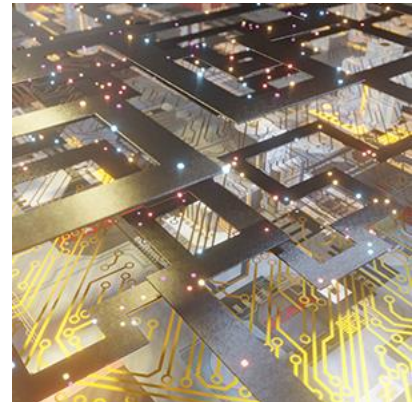
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Three Keys to 5G Network Agility

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As the rollout of 5G networks accelerates, the pressure to meet customer expectations has reached an all-time high. Whether it's enhanced mobile broadband, AR or VR use cases or HD video streaming, meeting customer expectations for quality of service and quality of experience amid the fast pace of change requires maintaining an agile network. This article examines why automation, continuous integration/continuous delivery (CI/CD) pipelines, and advanced testing and monitoring are necessary for every agile network to manage ultra-complex, fast-paced scenarios and minimize the risk of failure.



Orchestrating 5G success

The COVID-19 pandemic certainly made the telecom industry, along with everyone on the planet, hyper-aware of the staggering demand for reliable connectivity. In the first quarter of the pandemic, broadband consumption increased in the United States by 47 percent, according to [OpenVault](#), a provider of broadband consumption patterns. In fact, in a single day, Americans streamed 50,000 years' worth of content, there were 2.7 billion Microsoft Teams meeting minutes recorded, and 3,800 years of Google Meet sessions, according to [Infinera](#), a provider of open optical networking solutions. For the most part, telecom networks were able to meet the growing demand. But for operators to achieve success and remain relevant in the future 5G world, telecom networks are going to need to orchestrate seamless, smooth, and uninterrupted services across the board. The challenge that operators are facing is the labyrinth of new and legacy technology generations, entangled with a multitude of devices and protocols, all running in parallel.

Operators will need to continue to meet the demands and expectations of customers and businesses while optimizing their platforms to make the network puzzle come together. Furthermore, a host of aggressive competitors, armed with both promises and concrete deliverables, are always on the lookout to grab their piece of the market. We have far surpassed the time where customer satisfaction was considered “nice to have.”

It has become imperative to guarantee quality of service and quality of experience in a complex scenario, while fostering innovation and keeping costs in check. This is where the three keys of network agility come in: automation, CI/CD pipelines, and advanced testing and monitoring.

Accelerating service assurance through automation

With the fast pace of service and software rollouts that are taking over today’s next-generation networks, supporting methods and processes also need to be introduced. Frankly, the labor-intensive and error-prone manual processes associated with legacy solutions have become exorbitantly expensive and operationally impossible. This is because they are no longer able to adequately address the complexities of network design, technology integration, deployment, operation, and maintenance. To handle these ultra-complex and fast-paced scenarios and minimize the threats of failure that can lead to customer churn and revenue loss, enhanced testing strategies and automated processes become vital.

The introduction of automation and testing can reduce the challenges operators face, providing a set of tools that enables them to automate cumbersome manual testing and monitoring processes. It can be used at all stages of the network lifecycle, from design to deployment and operations.

By implementing an automation framework, operators can accelerate innovation, improve customer experience, and reduce operational costs using tools that will enhance automated testing and automate various processes, such as methods of procedure (MOPs), acceptance test processes (ATP), and regression, allowing software to take over the more repetitive tasks and freeing engineers up to focus on innovation and the end user’s overall experience. In addition, using the automation framework at all phases of the network lifecycle, operators supercharge end-to-end active test data with input from third-party tools or various network functions, allowing for much faster troubleshooting of multi-vendor networks and complex service issues.

The essential role of CI/CD

CI/CD and automation processes are making their way into network operations and service deployment. When planning an automated testing strategy, it is crucial to determine whether it is a standalone solution or if it must be integrated into larger automation processes, such as continuous integration/continuous delivery (CI/CD) pipelines. Such pipelines will be critical in ensuring that 5G achieves its full potential. Unlike previous generations of mobile networks, the 5G core is designed on a modular architecture. It employs cloud-native technologies to serve a

wide range of use cases, where slices lodge network functions composed of a range of microservices running in a common shared data environment. See Figure 1, below.

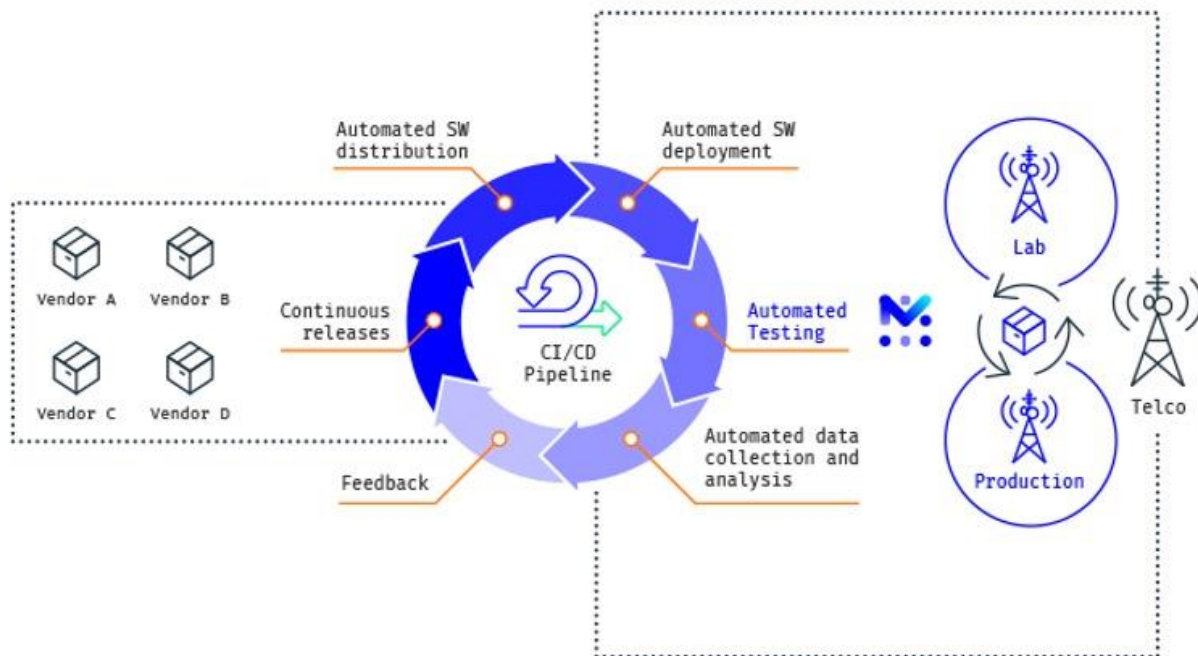


Figure 1: Integration into larger automation processes
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As 5G networks transform over the course of time, operators will need to develop, deploy, and upgrade new network functions in an agile, predictable, and reliable manner. CI/CD will allow 5G operators to make very granular changes rapidly and repeatably, with automatic scaling in and scaling out, as well as the ability to decommission a previous slice while using the new version in their environment.

Selecting an adaptable automation framework is fundamental to an operator’s environment, as it renders the capacity to orchestrate and interoperate with CI/CD tools such as Jenkins, CircleCI, AWS CodeBuild, Azure DevOps, analytics, or data feed tools like Splunk or Kafka, and even communication tools like Slack. Moreover, an automation framework that uses RESTful API adds a continuous testing component, which allows users to automate the system and extract data generated from periodic tests and automation tasks, ensuring that tasks are not broken whenever new changes are incorporated, for instance after a software upgrade.

Advanced testing and monitoring

Expectations are that 5G networks are going to rapidly expand over the next five years, accounting for up to 1.4 billion connections by 2025, according to the [GSMA](#). This is going to pave the way for faster speeds and innovative new services and usecases while at the same time

raising customer expectations. Best-effort service is a thing of the past. To meet and monetize the potential of 5G and the wide range of use cases it enables, operators will need a strategic approach to testing and monitoring that blends established testing methodologies for 5G smartphones, radio access, and core network with the new automation processes that are making their way into 5G network design, launch, and operation.

As 5G is rolled out and new services are enabled, it will be essential for operators to test, monitor, and benchmark 5G QoS for their NSA and SA deployments, as well as check throughput, latency, and the performance of EPS fallback for services as they move from 5G NR to LTE. Furthermore, as they transition to SA deployments, they will need to manage a more complex virtualized network core, create and monitor SLAs for multiple network slices, and meet the performance requirements of consumers, IoT and industry.

Another advantage of implementing an automation framework is the freedom it provides in developing automation scenarios. This is accomplished by supplying low-level building blocks that may be used to create a variety of automation jobs using simple keyword-driven scripting. Users may construct manageable, scalable, and reusable code by linking keywords to specific actions or features.

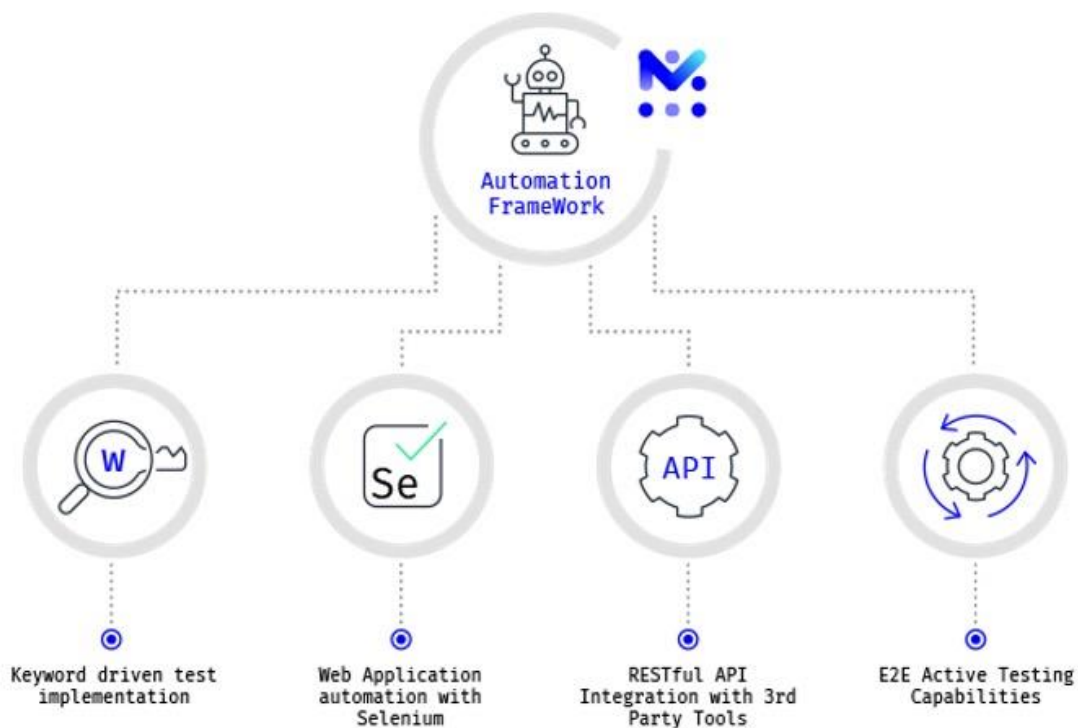


Figure 2: Automation framework
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It will be imperative for operators to understand the end-to-end service, from the core network, radio access, and down to the device. An active, end-to-end testing suite that tests, monitors, troubleshoots, and benchmarks all these services 24/7 with scalability in mind will ensure an operator successfully evolves as 5G technology progresses.

[GSMA Intelligence](#) estimates that carriers will make 5G investments worth more than \$1 trillion worldwide between 2018 and 2025. Key to monetizing and achieving their ROI is ensuring that they deliver the quality of experience and service that will take 5G from a “nice to have” to a mission-critical service. This is only possible with an agile network that can scale up and down as required, spin up new services and network slices quickly, and is in tune with how services and applications are performing. To achieve this, automation—underpinning functions such as testing and monitoring and in the form of CI/CD frameworks—must be a key consideration for carriers when determining their quality assurance approach. The complexity of the network and the demands and expectations of your customers mean that this will become the norm, but carriers can take advantage of the benefits today.