NETSCOUT

AUTOMATE YOUR WAY OUT OF COMPLEXITY. AND BENEFIT FROM IT

By Monica Paolini, Senza Fili.

Wireless networks are getting more complex. There is no way around it. Improvements in performance and quality of service don't come for free. Most of the new technologies entail an increase in complexity, even when they are designed to be easy to deploy and use.

For instance, moving from a single antenna to a massive MIMO (mMIMO) inevitably makes it more complex to manage the access network, because multiple mMIMO antennas have to be managed jointly – and this may require setting and updating in real time more than 1,000 parameters, which interact with each other.

With virtualization, 5G, edge computing and slicing, operators can extract more value – or achieve a higher utilization – out of their networks, but these technologies make operators work harder to run their networks because of the increased complexity they bring to their networks.

Is Complexity a Bad Thing?

Not really. Despite its reputation, complexity can improve the return on investment and enable differentiation. As networks become virtualized and include 5G, the increase in complexity is the result of more options, more flexibility and more tools that operators can use to optimize their networks by customizing them to meet their needs – in each location in their footprint, and at different times. I discussed these topics in more depth in an interview with NETSCOUT's Bruce Kelley.

Because use and demand are highly variable across time and place, operators need to move to real-time and location-aware network management. The penalty for operators who do not make this move is high: they cannot extract the expected benefits of their newly deployed network infrastructure, in terms of return on investment and in terms of performance.

This more dynamic approach to network management also gives operators the opportunity to differentiate their network from their competitors' networks, by focusing on specific performance targets they want to achieve (e.g., very low latency) or on specific services they want to support (e.g., high-performance mobile gaming).

The question is not how to set complexity aside, but how to embrace it and harness it to the operator's advantage. This is where automation comes in: it offers a way to deal with complexity without hiding it. As networks become more complex, manual or script-based network optimization is no longer sufficient – or feasible.

Not only it is too expensive and inefficient to hire more people to keep up with the increased complexity, we humans are not good at repeatedly tweaking a high number of parameters and monitoring performance variability to spot underlying problems. We get bored and our brains are not designed to concurrently process a large number of variables that interact with each other. Human short-term memory is limited to 4-8 items – this is how many parameters we can keep track of at the same time. As the number of parameters grows, we become unreliable or simply incapable of finding the best solution to a multi-dimension problem such as network optimization, where many KPIs and parameters interact with each other, without some external computational assistance.

In the mMIMO example, not only do the interactions among parameters affect the performance of a single antenna, but also the settings for one antenna have an impact on the performance of other antennas. A human does not have the ability to optimize mMIMO in real time by turning knobs.

So Is Automation a Good Thing?

Not always. Automation makes it possible to tame complexity in wireless networks, but it does not deliver the expected performance or efficiency improvements unless it is grounded on reliable data and solid optimization processes.

Collecting and identifying the relevant data is the first challenge, not because it is difficult to collect the data, but because there is too much data that can be collected, and only a small portion of it is relevant. Learning to sift through data to pull out what matters – the smart data, as NETSCOUT® calls it – is not trivial, but it is necessary to move to the next step: identifying and addressing network problems and inefficiencies.

This second step requires initial learning to determine the best course of action for different scenarios, and to set appropriate and effective automation processes. But since we cannot predict all scenarios, we also need ongoing learning, to refine our ability to process the data collected to address new scenarios without direct human supervision.

This is where we need analytics as the foundation of automation, and machine learning and AI to learn how to address new scenarios based on the knowledge we gained from previous experience. Automation, in turn, provides the processing power that is needed to support this continuous and incremental closed-loop learning process.

As I discussed in a previous blog, knowledge about the network – and in fact the operators' knowledge that is specific to their networks – is the foundation to automation and hence to manage and benefit from complexity.

Side Effects: Control

Automation requires work, but it also eliminates or reduces the low-level direct control over the network – turning the knobs – and in some cases it may override the accepted wisdom of how to operate a network. Again, in the mMIMO example, humans do not need to set the values of the 1,000 parameters nor decide when to change these values. This makes the staff workload manageable but reduces their visibility into the network and their ability to control it.

To succeed with automation – and the attending management of complexity –, both staff and management have to learn to trust the automation processes and the knowledge of the network on which it rests. A gradual deployment of automation will help to get everybody on board, especially in environments where pay and career progression depend on network KPIs, and, as a result, people may resist venture away from what they know.

The cultural challenges that automation, real-time optimization and closed-loop learning bring to the forefront may be more difficult and require more time to address than technological ones.

Side Effects: Security

Complexity and automation create new security vulnerabilities and an environment in which it is more difficult to detect security breaches. This happens at a time when security concerns are on the rise with the increase in deployments of IoT applications, which are attractive targets of attacks and which are more difficult to secure because most terminals are unsupervised.

On one hand, operators have to adapt their security approach to address the more stringent requirements of the new automated and virtualized wireless networks. On the other hand, automation, with the support of analytics, machine learning and AI, can be deployed to identify security breaches and respond to them. But it is imperative to do so in conjunction to the initial automation deployment and to treat security as an integral part of service assurance, to avoid undue exposure to security threats early on.

As networks evolve to 5G, become more virtualized and more distributed, and serve a wider range of devices, complexity grows and presents new challenges. But it also offers opportunities to tailor networks to operators' needs with more granularity and to improve the return on the investment on their networks. Automation is the tool operators need to both meet the challenges and gain from the opportunities that complexity create. But automation must be deployed correctly and gradually to be effective and to preserve network security, as well as to be organically integrated into the operator's internal culture.

NETSCOUT

Corporate Headquarters
NETSCOUT Systems, Inc.
Westford, MA 01886-4105
Phone: +1 978-614-4000
www.netscout.com

Sales Information
Toll Free US: 800-309-4804
(International numbers below)

Product Support
Toll Free US: 888-357-7667
(International numbers below)

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SPA_008_EN-1901 07/2019