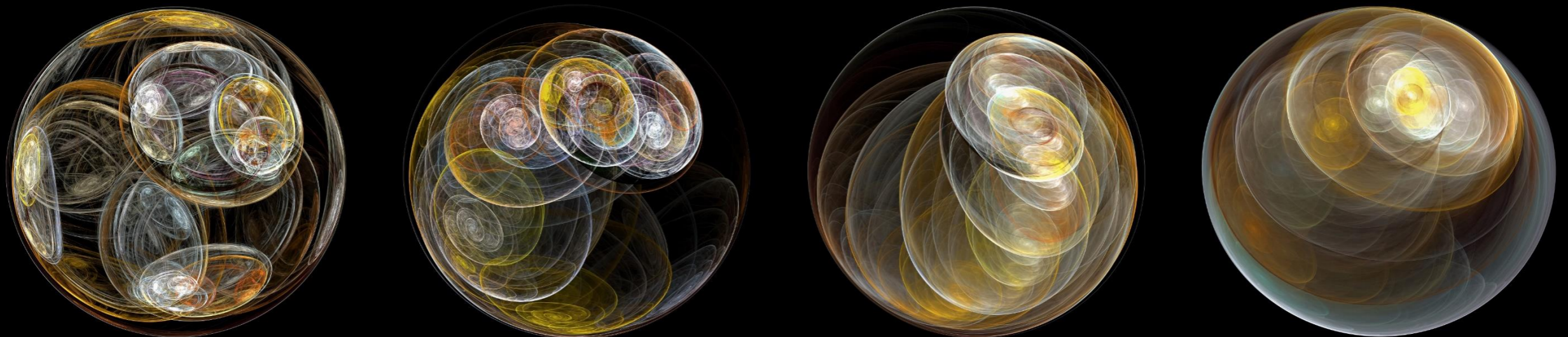


Why do we need visibility to innovate?

Know your wireless network to get the best out of it

Monica Paolini, Senza Fili



Why do we need visibility to innovate?

Know your wireless network to get the best out of it

What drives innovation is not only new technologies but, equally essential, the ability to use these new technologies to meet specific needs. We must know what those needs are so we can choose which technologies to adopt – and where and when. Visibility into wireless networks gives operators the knowledge they need to benefit from technological innovation, and to optimize network performance and efficiency to meet their unique targets.

5G gives mobile operators an innovative and powerful technology platform, but to extract all the benefits from its technological advances, they must choose wisely among many options. There is no single right or wrong choice that works for all operators. Each operator must look into its network and the services it supports to select its own path forward and fine tune the network through time. Visibility enables operators to maximize the impact of 5G innovation and the return on their investment in 5G.

Visibility becomes even more important as we move to 5G and networks become more complex. In this paper, we discuss how visibility can help mobile operators manage the increased complexity and extract all the benefits that 5G promises, and how other players – such as enterprises, fixed service providers, and cloud service providers – can gain from visibility too.

What is visibility?

Visibility gives service providers granular, real-time, actionable insight and understanding of their networks – across any service, any infrastructure, any technology, and any platform, from the end-to end network all the way down to the subscriber level.

Where does visibility matter?

- End-to-end public and private networks
- Private and public cloud, edge infrastructure
- Software-defined data centers (SDDCs), virtualized environments

Which functions benefit from visibility?

- Service assurance
- Security
- Open-loop and closed-loop automation
- Network optimization
- Technological innovation
- New service creation and revenue generation
- Support of mission-critical, latency-sensitive services (e.g., health care, assisted/autonomous driving)
- Complex multi-vendor, disaggregated and virtualized networks
- SLA compliance
- Perceived quality of service
- Evolution to intelligent and autonomous networks

Why do we need visibility?

Operators have always been able to collect huge amounts of detailed data on their network's performance, availability, reliability, or any other metric of interest. But the data can be overwhelming, and not tell operators how well the network is doing or how to improve its performance.

Visibility is the ability to harness this data to understand the performance of the network, identify its limitations, and figure out the best way to improve it. Visibility makes networks transparent, allowing operators to explore network behavior at different depths and different layers, and from very confined areas all the way to the end-to-end network.

Operators are no longer limited to key performance indicators (KPIs) to assess network performance. KPIs are useful high-level metrics, but they are not sufficient to guide operators in improving network performance and innovating their wireless infrastructure.

The ability to collect relevant data and use it for actionable insights is becoming crucial as we move to 5G networks, which are more complex and dynamic than previous generations. There is more to know, and there is more to do to optimize performance and increase efficiency.

Visibility gives operators the ability to peer into the complexity of their networks and pick the relevant data to make network operations simpler, more secure and more reliable. It leads operators to chart their path toward automated and autonomous networks, optimized user experience, and cost and spectrum efficiency.

How does visibility help?

Network planning

What is the most cost-effective way to upgrade a network?

Technological innovation

How do 5G, virtualization or new network topologies improve performance, efficiency, and support for new services?

Evolution strategy

What must be updated in the network and when?

Coexistence

What is the best way to add 5G to legacy networks?

Automation, AI/ML

How effective is automation and how can AI/ML expand its scope?

Control

How can service providers or private network providers assess and fine-tune network performance and ensure they meet their SLAs?

Performance

Does the network maximize the perceived quality of experience?

Visibility in 5G networks

It may seem a truism to say that visibility encourages innovation. Isn't visibility useful in 4G or even 3G or 2G networks? Most certainly it is. But in 5G, visibility is not just useful, it is necessary for charting an effective path

through the increased range of innovation options that 5G offers.

From a spectrum perspective, operators may use – in addition to licensed cellular bands – sub-1 GHz frequencies for IoT, unlicensed bands traditionally used exclusively by Wi-Fi, shared-access bands, and mmW bands. In the RAN, they can choose among different MIMO and beamforming options, and whether to use distributed and virtualized RAN topologies such as open RAN. The core is becoming virtualized and moving to distributed and service-oriented architectures with the combinations of edge computing and network slicing. 5G also encourages the evolution of the ecosystem toward network disaggregation and multi-vendor environments.

The evolutionary paths to 5G are part of a wider digital transformation and a deeper role of wireless connectivity with the fourth industrial revolution. Operators need visibility to navigate across the innovation paths that digital transformation opens, and pick those that best meet their needs.

Visibility is also valuable for operators to decide when it is the right time to move to 5G, and the pace of the evolution to 5G. Each operator has different network evolution needs and different timelines to meet them. Rushing to 5G may end up not delivering the desired cost and performance efficiency.

Visibility where it matters

In a visible network, operators can direct their attention and actions where they want. While it is important to have a high-level view of the overall network, they need to go deeper to understand what drives or hinders network performance and resource utilization, and what they can do to improve them.

There is no single depth that suffices. If you do not go deep enough, you may miss the detail necessary to provide concrete guidance. If you go too deep,

Drilling into visibility

Network layer

Understand where potential performance bottlenecks are and how to eliminate them, especially in virtualized distributed networks with a flexible topology and a wide scope for optimization.

Network slices

Manage traffic priorities of network slices to maximize use of network resources.

Time

Enable dynamic, real-time traffic and network management where traffic loads and application requirements change rapidly.

Facilitate the transition from reactive to predictive traffic management.

Application

Track and optimize performance of specific applications and services, depending on their priority, revenue contribution or other factors, as a function of demand and network capacity.

Assess the potential profitability and ability to support new applications.

excessive, data that is not relevant may be distracting and overwhelming, and may drive attention, for example, to instances of issues rather than to the issues' root causes. The table on the right lists different levels where visibility can contribute.

The operators' deep expertise is an essential complement to visibility: it guides the up and down shifts in focus that are necessary to understand how different parts and layers of the network interact with each other, and at what level innovation and optimization are most effective.

Visibility in the end-to-end network

In addition to the ability to leverage visibility at different depths, it is equally important to stand back and look at end-to-end network performance. Ultimately, optimizing the perceived user experience or IoT service performance is the main goal for service providers. This is what ultimately maximizes their return on their investment.

There are different ways to optimize performance, either for the entire network or for specific elements. Visibility into the end-to-end network helps service providers decide what their own optimization targets should be. Different service providers may have different targets depending on their service mix and network infrastructure. For some, lowering latency may take priority; for others it may be indoor coverage or capacity. And for most, these targets may depend on location, services and other factors. Once they have identified these priorities, operators can more effectively assess the tradeoffs and decide what actions to take at deeper levels.

End-to-end network visibility helps not only to improve main performance metrics such as latency and capacity, but also to track, set targets and innovate in areas such as security, virtualization, network topology, scalability, and cost efficiency. It can also help create a solid foundation for the adoption of analytics, AI and ML and the gradual transition to autonomous networks.

Who benefits from visibility?

Service providers are the most direct beneficiaries of visibility: it helps them manage, optimize, and expand their networks. But they are not the only ones to benefit from it.

Cloud providers have started to actively address the 5G connectivity needs of enterprises, directly or through partnerships with mobile operators. With visibility, cloud providers can reach deeper into the wireless infrastructure and tailor their services to improve connectivity. Visibility expands the scope of their collaboration with mobile operators and their ability to meet the needs of the enterprise.

Enterprises gain more control over private networks within their premises. Visibility makes it easier to optimize or expand their network performance, based on their needs. Network visibility is essential to managing industrial IoT (IIoT) and ultra-reliable low-latency communications (URLLC) applications with high security, safety and reliability requirements.

End users also benefit from visibility, because it gives operators the tools they need to ensure a more consistent, high-quality experience and to improve customer support when connectivity issues arise.

A new ecosystem built on visibility

The evolution to 5G and virtualization also enable the opening of wireless networks that operators need to reduce their dependence on vendors, lower their costs, and encourage innovation. Open networks foster the emergence of new ecosystems with a larger set of players.

The new multi-vendor, multi-technology, multi-cloud networks have much more challenging interoperability requirements and depend on reliable open APIs and open-source software. In turn, operators must be more vigilant over their networks to benefit from the independence, agility, sustainability, scalability and cost efficiency that open networks promise.

Opening wireless networks requires extensive visibility that makes it possible to coordinate, monitor and assess the interaction among different network functions and the parties – vendors, service providers, integrators, enterprises – that participate in the wireless ecosystem. Everybody eager to cooperate benefits from visibility: it establishes a trusted environment where each ecosystem player has the freedom and support to innovate.



From NETSCOUT

NETSCOUT® NETSCOUT SYSTEMS, INC. (NASDAQ: NTCT) assures digital business services against disruptions in availability, performance, and security. Our market and technology leadership stems from combining our patented smart data technology with smart analytics. We provide real-time, pervasive visibility, and insights customers need to accelerate, and secure their digital transformation. Our approach transforms the way organizations plan, deliver, integrate, test, and deploy services and applications. Our nGenius service assurance solutions provide real-time, contextual analysis of service, network, and application performance. Arbor security solutions protect against DDoS attacks that threaten availability, and advanced threats that infiltrate networks to steal critical business assets. To learn more about improving service, network, and application performance in physical or virtual data centers, or in the cloud, and how NETSCOUT's performance and security solutions, powered by service intelligence can help you move forward with confidence, visit www.netscout.com or follow @NETSCOUT and @ArborNetworks on Twitter, Facebook, or LinkedIn.

NETSCOUT and the NETSCOUT logo are registered trademarks of NETSCOUT SYSTEMS, INC. and/or its subsidiaries and/or affiliates in the USA and/or other countries.

About Senza Fili



Senza Fili provides advisory support on wireless technologies and services. At Senza Fili we have in-depth expertise in financial modeling, market forecasts and research, strategy, business plan support, and due diligence. Our client base is international and spans the entire value chain: clients include wireline, fixed wireless, and mobile operators, enterprises and other vertical players, vendors, system integrators, investors, regulators, and industry associations. We provide a bridge between technologies and services, helping our clients assess established and emerging technologies, use these technologies to support new or existing services, and build solid, profitable business models. Independent advice, a strong quantitative orientation, and an international perspective are the hallmarks of our work. For additional information, visit www.senzafili.com.

About Monica Paolini



Monica Paolini, PhD, founded Senza Fili in 2003. She is an expert in wireless technologies and has helped clients worldwide to understand technology and customer requirements, evaluate business plan opportunities, market their services and products, and estimate the market size and revenue opportunity of new and established wireless technologies. She frequently gives presentations at conferences, and she has written many reports and articles on wireless technologies and services. She has a PhD in cognitive science from the University of California, San Diego (US), an MBA from the University of Oxford (UK), and a BA/MA in philosophy from the University of Bologna (Italy).

© 2021 Senza Fili. All rights reserved. We thank NETSCOUT for supporting the preparation of this paper. The views and statements expressed in this report are those of Senza Fili, and they should not be inferred to reflect the position of NETSCOUT or other parties mentioned in this document. The document can be distributed only in its integral form and acknowledging the source. No selection of this material may be copied, photocopied, or duplicated in any form or by any means, or redistributed without express written permission from Senza Fili. While the document is based on information that we consider accurate and reliable, Senza Fili makes no warranty, express or implied, as to the accuracy of the information in this document. Senza Fili assumes no liability for any damage or loss arising from reliance on this information. Trademarks mentioned in this document are the property of their respective owners. Photos by Shutterstock.