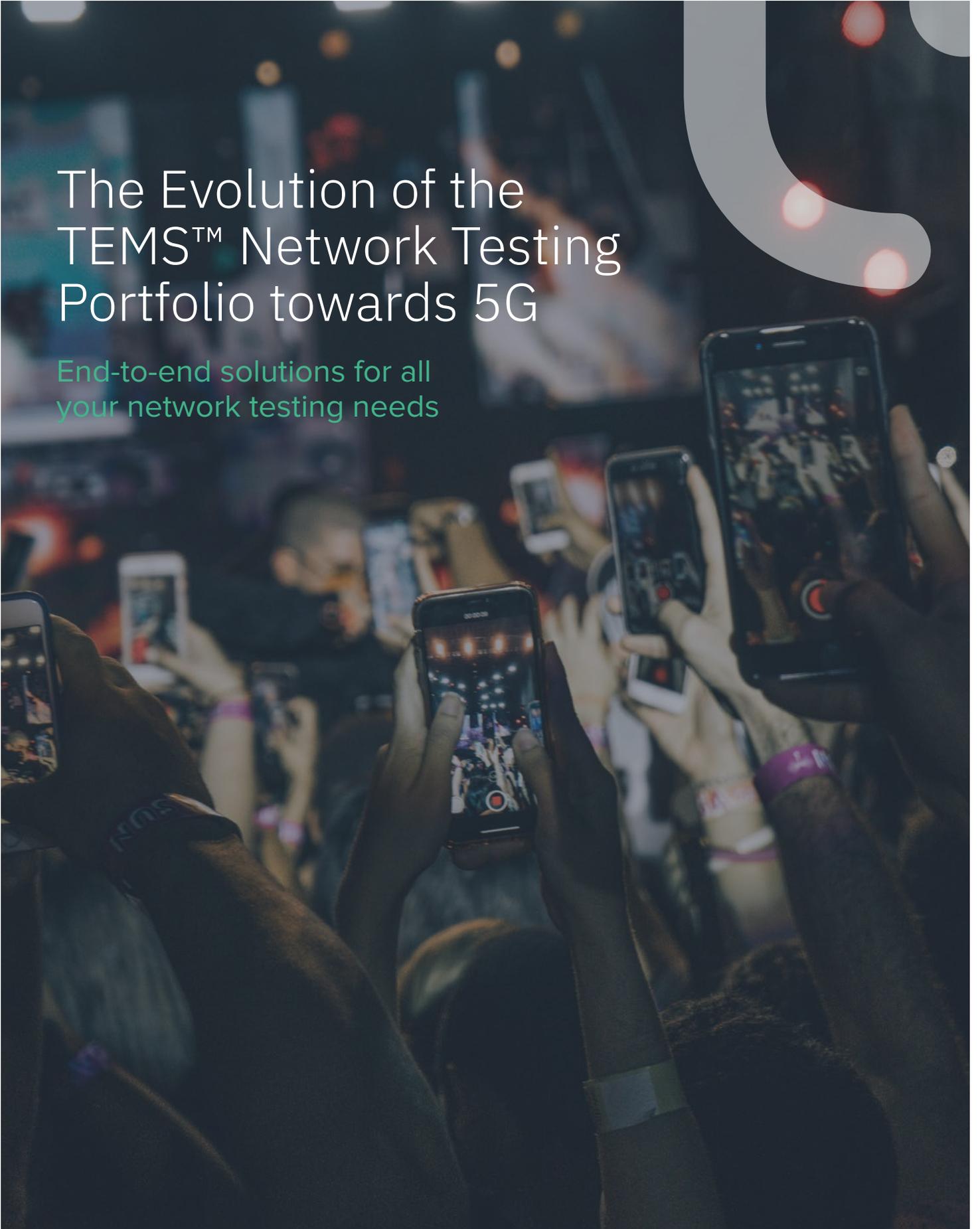


# The Evolution of the TEMS™ Network Testing Portfolio towards 5G

End-to-end solutions for all  
your network testing needs



# The TEMS™ Heritage and Promise

Infovista is the leading provider of cost-effective network performance orchestration solutions that help communications service providers, mobile operators and enterprises meet the challenge of providing top-quality user experience while increasing the capital efficiency of their fixed networks, mobile networks and enterprise WANs.

For more than 20 years, TEMS has been synonymous with the delivery of service excellence for mobile operators, vendors and engineering services providers worldwide. The TEMS portfolio of network testing solutions has enabled operators to provide competitive network performance and superior subscriber experience. It is trusted by the world's leading wireless network operators, ranging from the largest operators to the most widely deployed network equipment vendors.

Throughout this time, we have continually enhanced the TEMS portfolio, through the introduction of new models and capabilities, to anticipate and meet new requirements, driven by changing customer usage habits and advances in network and device technology. As a result, our unique TEMS solutions have been able to consistently meet and exceed the expectations of users, helping them to meet the challenges of each phase of mobile and fixed network evolution. Today, our expanding portfolio enables operators to confidently introduce and operationally assure new services.



\*June 2017 Ericsson Mobility Report

# Moving to the 5G Future

The mobile industry is continuing to evolve. For several years, mobile operators have been enhancing 4G networks with VoLTE, ViLTE and VoWiFi. Adoption of 4G is surging, with the number of LTE subscriptions expected to exceed 5 billion by 2022\*.

Video Streaming is the next challenge facing the mobile industry, with users demanding more bandwidth every month. Congestion caused by increased data traffic, is happening regularly in many mature LTE networks, as the unabated demand for data continues. The increased availability of smartphones and the insatiable demand for video will only make matters worse.

<b>75%</b>		In 2022, video will account for ~75% of mobile data traffic*
<b>4.6B</b>		VoLTE subscriptions worldwide expected to reach 4.6B in 2022*
<b>90%</b>		More than 90% of mobile data traffic will come from smartphones in 2022*

It's a global phenomenon. Regions matter. Some countries have seen early adoption, but everywhere is catching up fast. A slew of new devices will accelerate matters further, bringing a better experience to users at affordable prices.

<b>11X</b>		In 2022, there will be 11x more mobile data traffic in Central and Eastern Europe and Middle East and Africa (CEMA)*
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At the same time, operators are extending capabilities to prepare for the massive deployment of IoT devices and for the emergence of critical IoT solutions. 5G is now standardized and being rolled out throughout the world supporting eMBB have started with significant global adoption and new enhancements to support a wider range of B2B use cases likely from 2020. The industry is poised for the next phase of growth, driven by consumer and business demand.

<b>0.5B</b>		5G subscriptions will exceed half a billion by end of 2022*
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# Network Evolution and the Evolution of TEMS™

Infovista has been actively testing 5G networks around the world since 2018. We have been heavily involved in the 5G networks in North America and elsewhere. Dozens of mobile network operators and vendors have selected TEMS tools to help them better understand 5G, and ultimately solve their challenges adopting it.

Working together with major chipset vendors, smartphone producers and RF scanner suppliers we have been able to verify 5G performance from a number of different networks. Hence, our TEMS tools support the latest 5G scanners and smartphones. Uniquely, we have an in-depth understanding of the planning requirements for 5G, and have therefore been able to help early on. [Check out our list of active 5G users.](#)

**A growing diversity of use cases and applications is fueling these technical advances:**

- Streaming media
- Public safety networks
- Smart cities

- Internet-of-Things (IoT)
- Virtual reality and augmented reality
- Connected cars

**This evolution creates new business challenges for operators. They must wrestle with the problems of:**

- Densifying the network and expanding coverage
- Building the foundations of 5G
- Acquiring high definition maps with detailed vegetation and tuning 5G propagation models
- Expanding network coverage while containing costs
- Anticipating changing customer demands
- Launching new devices, technologies, and services
- Maintaining and growing subscriber revenues
- Enhancing the mobile subscriber’s experience
- Reducing churn and acquiring customers
- Maximizing operational efficiency
- Detecting and fixing intermittent faults
- Understanding customer experience and the effect network performance has on customer opinion

**TEMS™ OVERVIEW**



As the industry evolves, so too must the solutions that operators need to help them accomplish their business goals and objectives – and to confront these challenges.

Infovista’s TEMS portfolio of network performance measurement and analytics solutions is leading the way, ensuring that operators continue to deliver excellence and deliver uninterrupted, high-quality services to their customers, cost-effectively and efficiently.

**The TEMS portfolio offers a comprehensive, full-stack architecture, from data collection to test analysis.**

 <p><b>DATA COLLECTION HARDWARE</b></p>	<p><b>ACTIVE NETWORK TESTING</b></p>	 <p><b>NETWORK TEST ORCHESTRATION</b></p>	 <p><b>NETWORK TEST ANALYSIS</b></p>
 <p><b>Data Collection Hardware.</b> Probes, phones and custom-designed hardware on which the active test software runs are available in different form factors to support various test environments and use cases.</p>	 <p><b>Active Network Testing.</b> Active network testing software enabling layer 1 to 7 end-to-end network testing, supporting attended and unattended use cases.</p>	 <p><b>Network Test Orchestration.</b> Centralized platform enabling management, control and real time reporting &amp; analysis of the network test results.</p>	 <p><b>Network Test Analysis.</b> Insightful Post processing &amp; analysis of collected network test results using the TEMS products or 3rd party network test solutions.</p>



## TEMS™ Portfolio

The TEMS portfolio provides outstanding measuring and analysis capability to understand network performance and subscriber experience. It's optimized for operators, helping them perform more testing, across a wider geographic area, faster, while maximizing the efficient use of engineering resources. They drive efficiency through automation, orchestration and seamless integration.

### **TEMS delivers key operational advantages:**

- Increased insight into network performance and subscriber experience across the network
- Large-scale testing before and after new technology deployments
- Faster gap analysis and network improvements where needed most
- Quicker issue identification and resolution
- More efficient processes and use of engineering personnel

### **While offering key business advantages:**

- Higher customer satisfaction with the mobile network experience
- Higher ARPU from increased data usage, add-on-services, and plan upgrades
- Higher revenue from new subscribers and additional subscriptions
- Lower churn from increased loyalty
- Reduced operational and labor costs

To meet these challenges, the TEMS network testing portfolio has evolved with the introduction of cloud based solutions; TEMS Paragon, TEMS Sense, managed and controlled by TEMS Director, in addition to our market leading products for; network verification (TEMS Investigation), walk testing (TEMS Pocket), and analysis (TEMS Discovery).

**TEMS™ INVESTIGATION**

**TEMS Investigation**, our market-leading network testing solution, allows you to test every new function and feature in your network. This allows you to better understand customer experience and to verify, optimize and troubleshoot your mobile network. Through our close cooperation with equipment vendors, chipset manufactures and device vendors we are able to use all major new devices. This allows us to quickly provide in-depth subscriber (QoE) and the network (QoS) insights to enable you to make better network investment choices.

Whether you are rolling out a new network technology such as LTE or 5G, implementing a new network service like NB-IoT or VoLTE, or optimizing an existing mobile infrastructure, TEMS Investigation gets the job done right the first time. When integrated with TEMS Director, TEMS Investigation becomes a key component of your mobile network test platform.

TEMS Investigation is now able to test 5G NR networks with both scanners and devices. We have performed trials and demonstrations around the world, and over 170 vendors and mobile operators from more than 50 countries have selected TEMS Investigation for 5G.

We now support almost all 5G devices on the market. In particular, we support all versions of the Samsung Galaxy S20+ and Samsung Galaxy S20+ Ultra 5G devices, plus Huawei, OnePlus, Xiaomi, Sony, ZTE, Oppo, Vivo, Askey, Netgear and Wistron.

We are able to provide full chipset logging on all three 2nd generation chipsets from Qualcomm, Samsung and HiSilicon.

**TEMS™ POCKET**

**TEMS Pocket** is our premium portable testing solution. TEMS Pocket allows you to verify, optimize and troubleshoot your mobile network in environments requiring portability, such as malls, stadiums, offices, and other large venues. Its advanced testing capabilities, including the ability to support multiple devices and a scanner, provides the subscriber (QoE) and the network

(QoS) actionable insights to improve your subscribers' mobile experience.

With over 80% of all mobile data traffic occurring indoors, TEMS Pocket lets you plan and optimize your indoor and small cells investments with great efficiency. When integrated with TEMS Director, TEMS Pocket becomes a key component of your mobile network testing platform.

TEMS Pocket is now able to test 5G NR networks with both scanners and devices. In particular we support all versions of the Samsung Galaxy S20+ and Samsung Galaxy S10+ 5G devices, plus devices from OnePlus.

All TEMS Pocket devices now includes indoor automatic pinpointing as standard, which reduces the need for manual intervention when testing indoors. This feature alone has considerably reduced the cost of inbuilding site verification, and means that for most use cases, TEMS Pocket is much more effective to use.

**TEMS™ DISCOVERY**

To ensure your network KPIs are exceeded and your subscriber experience gives you a competitive edge, you need to quickly find where and what issues are arising in your network. With the complexity of today's multi-technology, multi-band networks, you need the tools to accurately and efficiently find the problems and implement the solutions.

**TEMS Discovery** is the wireless industry's most comprehensive network analytics and optimization platform, providing you with unparalleled insight into network performance as perceived by your subscribers at the device, application and network level. This holistic approach is unique to TEMS Discovery, empowering you to lock-in premium subscribers by ensuring they receive the service levels they demand, around-the-clock, from any location, and across voice, data and integrated media services.

TEMS Discovery fully supports 5G NR analysis, processing both data from scanners and devices.

**TEMS™ PARAGON**

**TEMS Paragon** is our premiere drive test system, optimized for mobile network benchmarking projects. You can use it to compare the performance of multiple networks, bands and technologies synchronously to discover how your network performs next to others.

Fully integrated with TEMS Director, it provides you with innovative scripting engine, remote device control capability, turn-by-turn navigation and innovative technologies to reduce your operational costs and improve the quality of your results.

Whether you are a mobile operator, a consulting firm, or a regulator, TEMS Paragon supports the latest commercially available devices and offers you the in-depth TEMS network testing capabilities you want in a ruggedized multi-device system.

We are able to provide full chipset logging on all three 2nd generation chipsets from Qualcomm, Samsung and HiSilicon.

**TEMS™ SENSE**

Ensure that no subscriber gets left behind. Deploying **TEMS Sense** maximizes your lifetime customer value. Your mobile subscribers rely on high quality, uninterrupted services. To maintain first rate service, even during network upgrades, you need to continuously monitor your network performance end-to-end. Staying proactive means staying ahead of potential issues.

With our powerful network testing and measurement software, TEMS Sense, you can implement automated, remote monitoring of service performance from a variety of locations. Using comprehensive active service testing capabilities, TEMS Sense provides you with complete end-to-end service performance visibility so you can avoid potential issues and give your subscribers the quality they deserve.

TEMS Sense has been deployed by many mobile operators rolling out 5G NR NSA, as a way of ensuring that the legacy 4G network is not affected by the increase in signaling needed to support 5G. TEMS Sense is able to detect small changes in Quality of Service, and hence ensure no degradation occurs.

TEMS Sense is now able to test 5G NR networks with both scanners and devices. In particular we support all versions of the Samsung Galaxy S20+ and Samsung Galaxy S10+ 5G devices, plus devices from OnePlus.

**TEMS™ DIRECTOR**

**TEMS Director** is a web-based service that allows you to remotely control and manage a fleet of TEMS probes. In addition, it links the data collected by these probes with thresholds deciding what tests need to be performed. TEMS Director helps you decide which work orders should be executed by each probe, and which routes should be driven to collect sufficient data. In the long run, this allows you to better manage your team, improving their efficiency and reducing the need for highly skilled individuals.

TEMS Director helps you improve overall efficiency, increase productivity, and reduce operational costs. It is an all-in-one solution for remote management and monitoring of a variety of mobile and/or fixed test probes, as well as real-time data analytics and reporting.

With TEMS Director, your team can plan and manage multiple network testing projects across a variety of TEMS solutions, including TEMS Pocket, TEMS Investigation, TEMS Paragon and TEMS Sense, all from a centralized back-office web-based user interface.



## Infovista help customers affected by COVID-19

Every day, operators across the world conduct drive testing to ensure that mobile networks are working as expected – a critical requirement not just for consumers but to ensure reliability for first responders and critical national infrastructure. However, the drive testing process often requires a two-person team within the same vehicle.

Developed by Infovista and released in early April, the new TEMS™ Investigation Driver-Only option allows operators that had previously sent out two person teams of a driver and operator for mobile network analysis to instead use an automated option that directs routes, captures data and alerts the sole driver with tasking data.

**Find-out more**

The evolution of the TEMS portfolio means that mobile network operators, engineering services providers, infrastructure vendors, and industry regulators are better equipped to ensuring a competitive network experience for subscribers and do so more effectively and efficiently.

With TEMS, Infovista is anticipating the challenges you will face and providing solutions to ensure you continue to deliver excellence to your subscribers. We help you make the most effective investments to succeed in the transition to the next phase of mobile network technology.

**With the evolved TEMS portfolio, Infovista now offers end-to-end solutions for all your network testing needs.**

**Visit [www.infovista.com](http://www.infovista.com) today to learn more or request information.**

## About Infovista

Infovista, the leader in modern network performance, provides complete visibility and unprecedented control to deliver brilliant experiences and maximum value with your network and applications. At the core of our approach are data and analytics, to give you real-time insights and make critical business decisions. Infovista offers a comprehensive line of solutions from radio network to enterprise to device throughout the lifecycle of your network. No other provider has this completeness of vision. Network operators worldwide depend on Infovista to deliver on the potential of their networks and applications to exceed user expectations every day. Know your network with Infovista.