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SENZA  
FILI

# The evolution of 5G network testing



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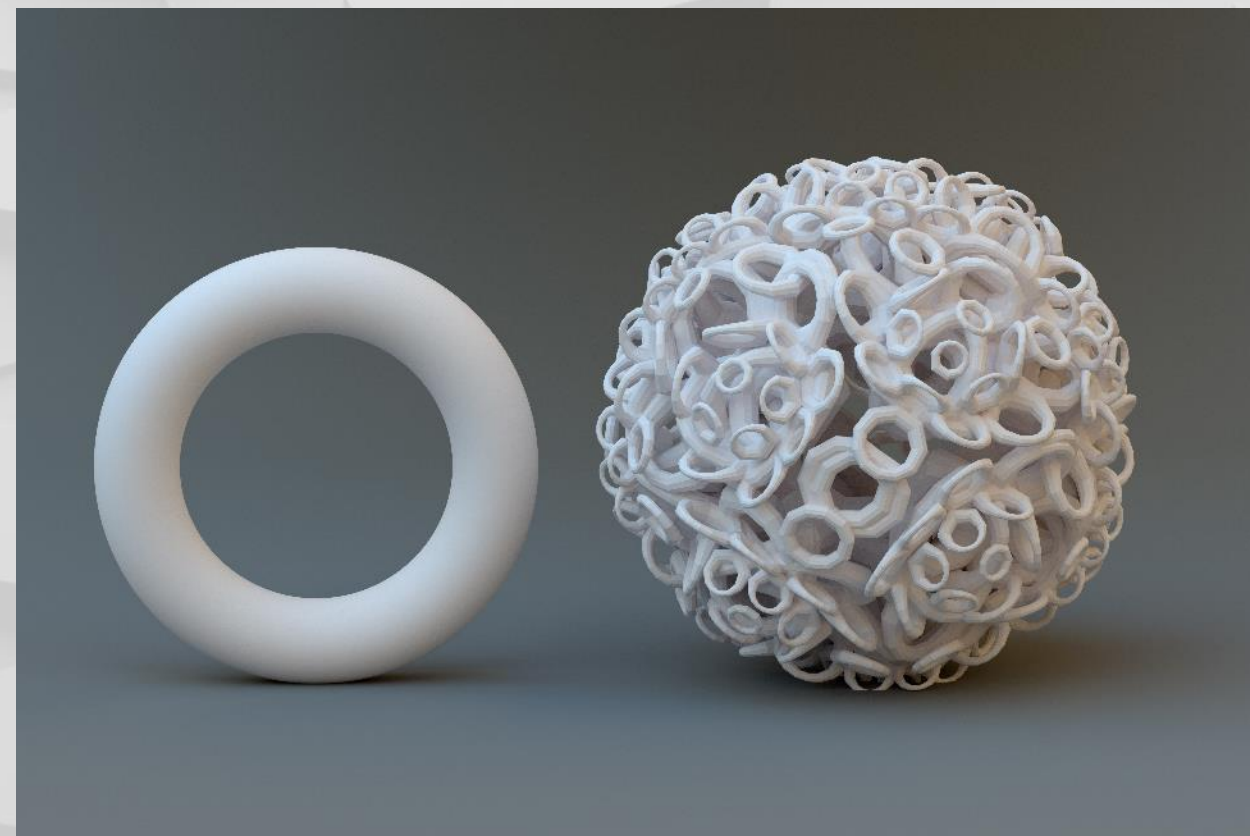
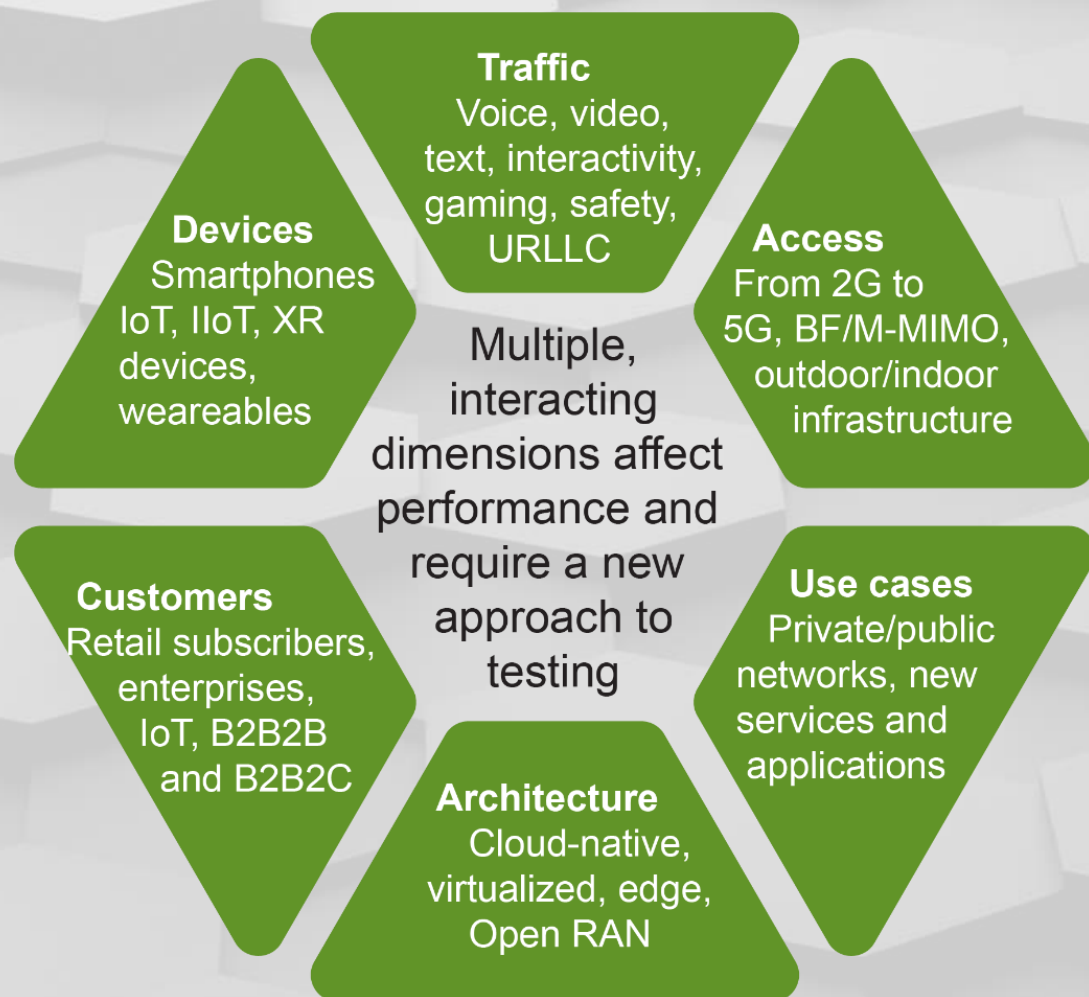


# Wider horizons for next-generation testing

The evolution from drive testing to multi-level automated testing in 5G

Monica Paolini, Senza Fili

# Testing more complex networks with new tools



Wireless networks have to do more, and so does testing

# What new testing platforms need

- Assess subscriber-perceived performance
- Test for specific services, traffic types, devices
- Add location, time and context awareness
- Increase precision and granularity
- Include data from multiple sources
- Preserve scalability in increasingly complex networks
- Enable multi-level testing, with the ability to drill down when needed
- Automate the testing process to reduce costs and manage the increased volume of test data
- Conduct testing without the active participation of skilled RF engineers
- Combine new testing methodologies with traditional ones



# More granularity in testing

New use cases

New metrics

Metrics interaction

Application and service-based testing

Dynamic testing

User-perceived performance



# Two new testing use cases: Online gaming and IoT



Big opportunity: new service, new revenues  
New requirements: performance, latency, reliability, safety  
New testing metrics and environments

# Technological advances increase testing efficiency

Automation

AI/ML

Testing orchestration and unified management

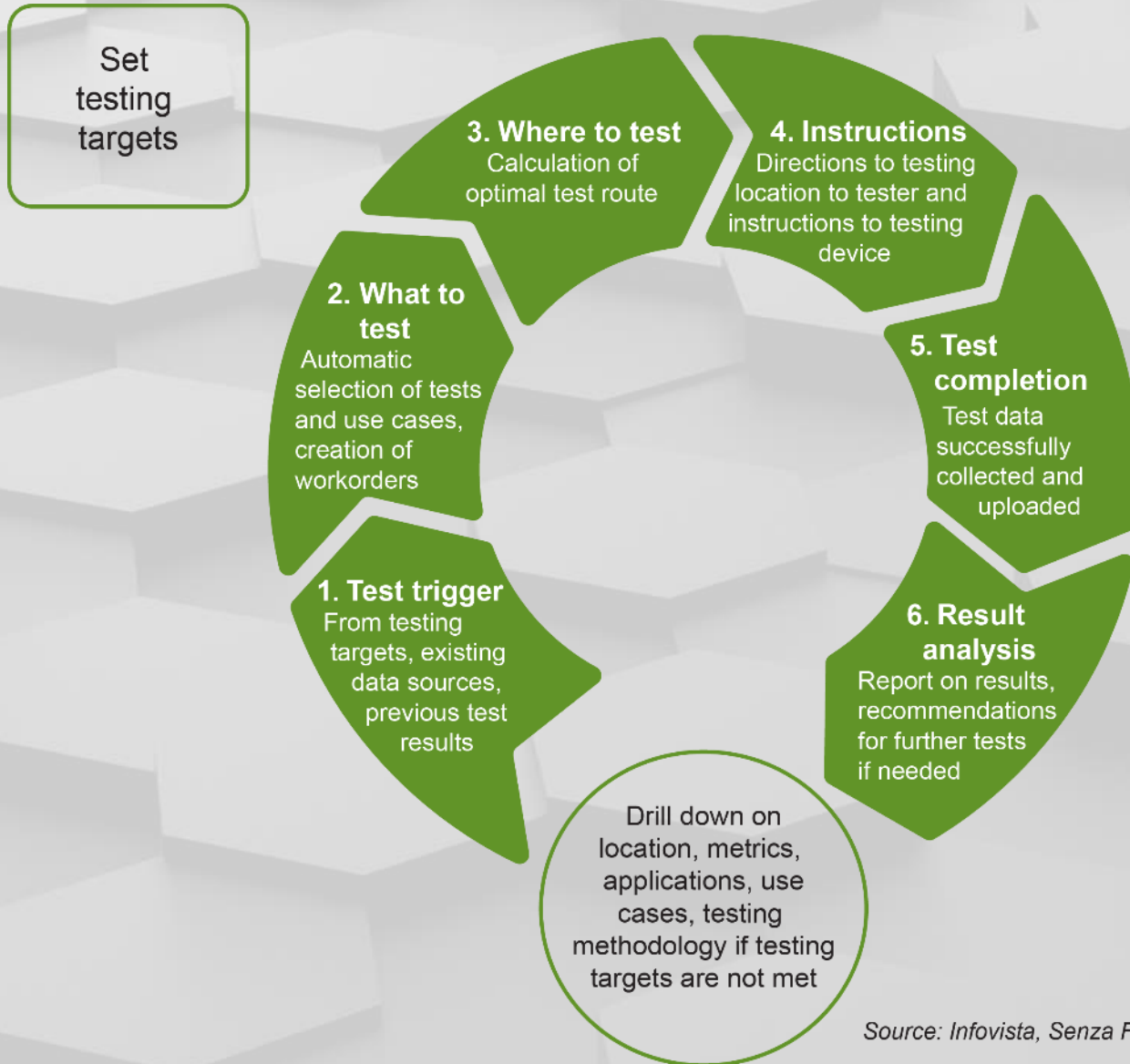
Real-time analysis

Remotely managed devices



Everybody, every device can participate in testing

# Multi-level testing to get the best value



Source: Infovista, Senza Fili



# The expanded role of testing



A gradual evolution path toward a richer and more efficient, multi-level testing platform



Increasing granularity and scalability in testing complex and dynamic networks



Testing solutions covering subscriber experience and IoT terminals

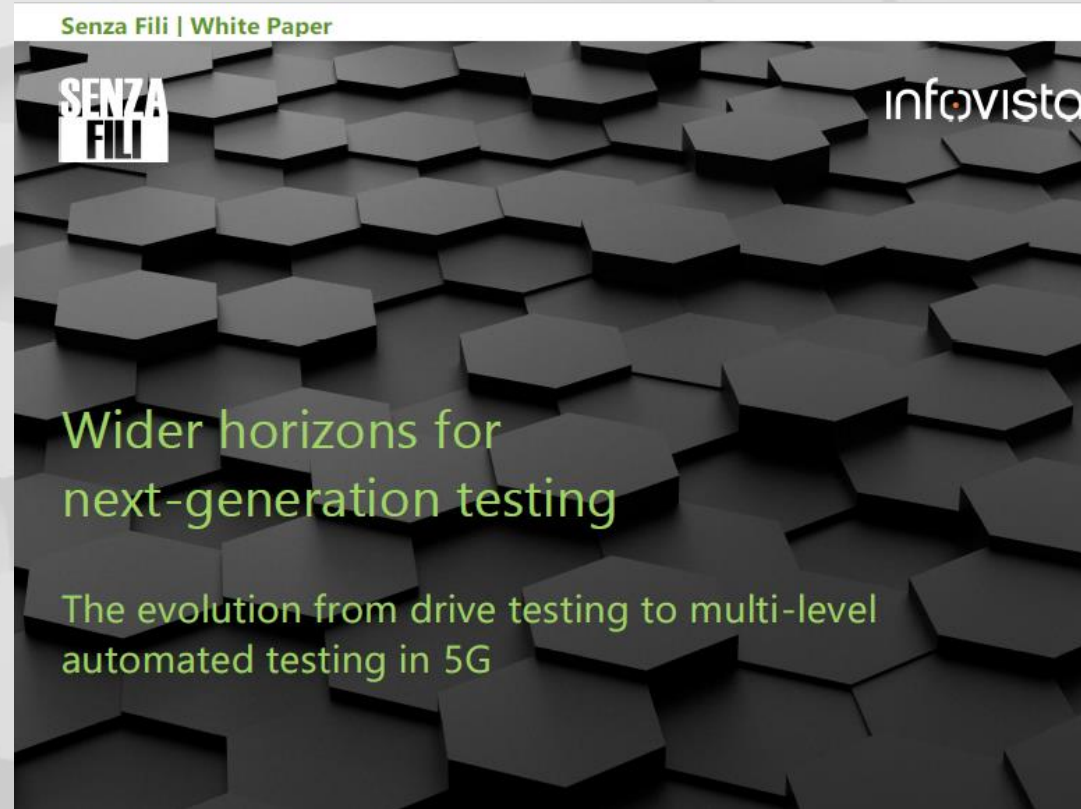


Wider testing approach to cover specific use cases



Beyond testing: Monitoring, planning, sustainability

# More resources: New white paper from Senza Fili



Download the paper at [www.senzafili.com](http://www.senzafili.com)

# 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](http://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)

# The evolution of 5G network testing

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KNOW YOUR NETWORK™



# Introducing Infovista

A specialist independent software vendor; working with the most advanced CSPs

1,500+

Customers



150+

Countries



900+

Professionals



11

Offices



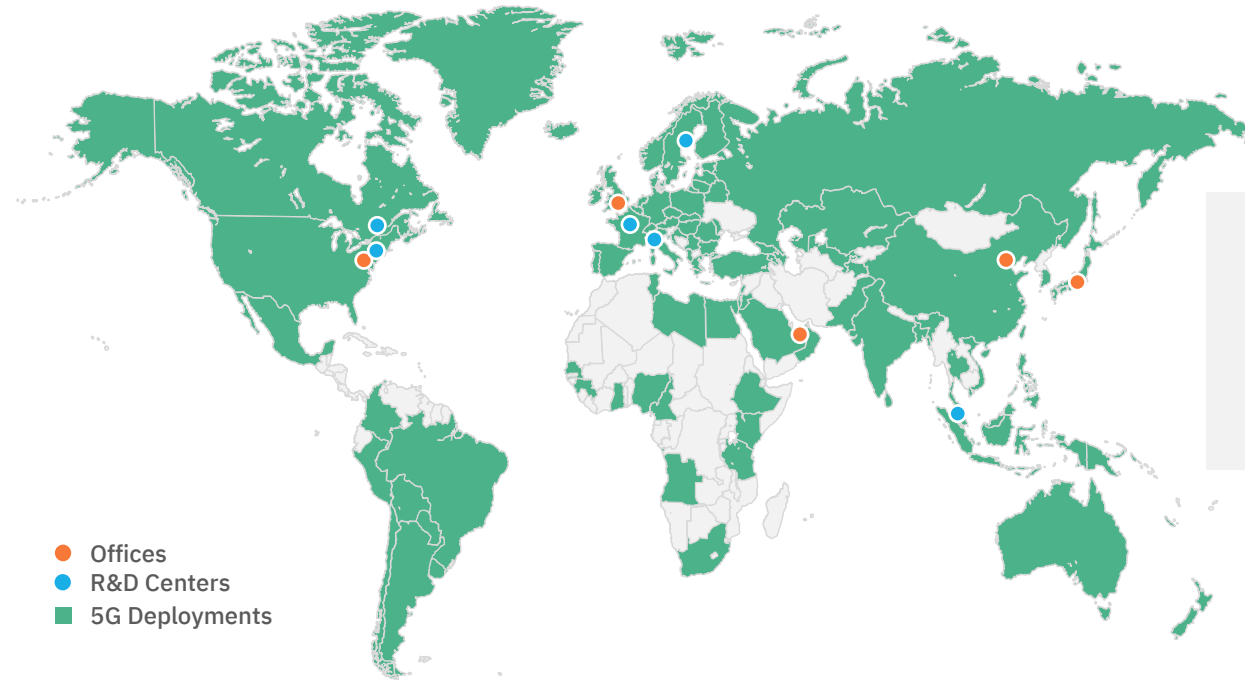
6

R&D centers



2

Business units



## 5G Leader

Customers: 546

Countries: 112

Users: 10930



T-Mobile



dish

Rakuten

KDDI



ooredoo



ERICSSON



zain

infovista

# TEMS™ portfolio

For over 25 years, TEMS™ has been recognized as the leading network testing solution by mobile network operators and vendors worldwide

Orchestration  
and Analytics



TEMS™ Cloud

Cloud solution providing orchestration and analytics



TEMS™  
Discovery

Network analytics and optimization platform

Network  
Testing



TEMS™  
Investigation

Network testing and troubleshooting solution

Drive testing



TEMS™  
Pocket

Portable testing and troubleshooting solution

Walk testing



TEMS™  
Paragon

Mobile network benchmarking solution

Benchmarking



TEMS™  
Sense

Automated remote network monitoring solution

Remote testing



TEMS™  
SSV

Automated 5G site verification solution

Site verification

# Why does network testing need to evolve?



# The evolution of 5G network testing

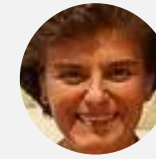
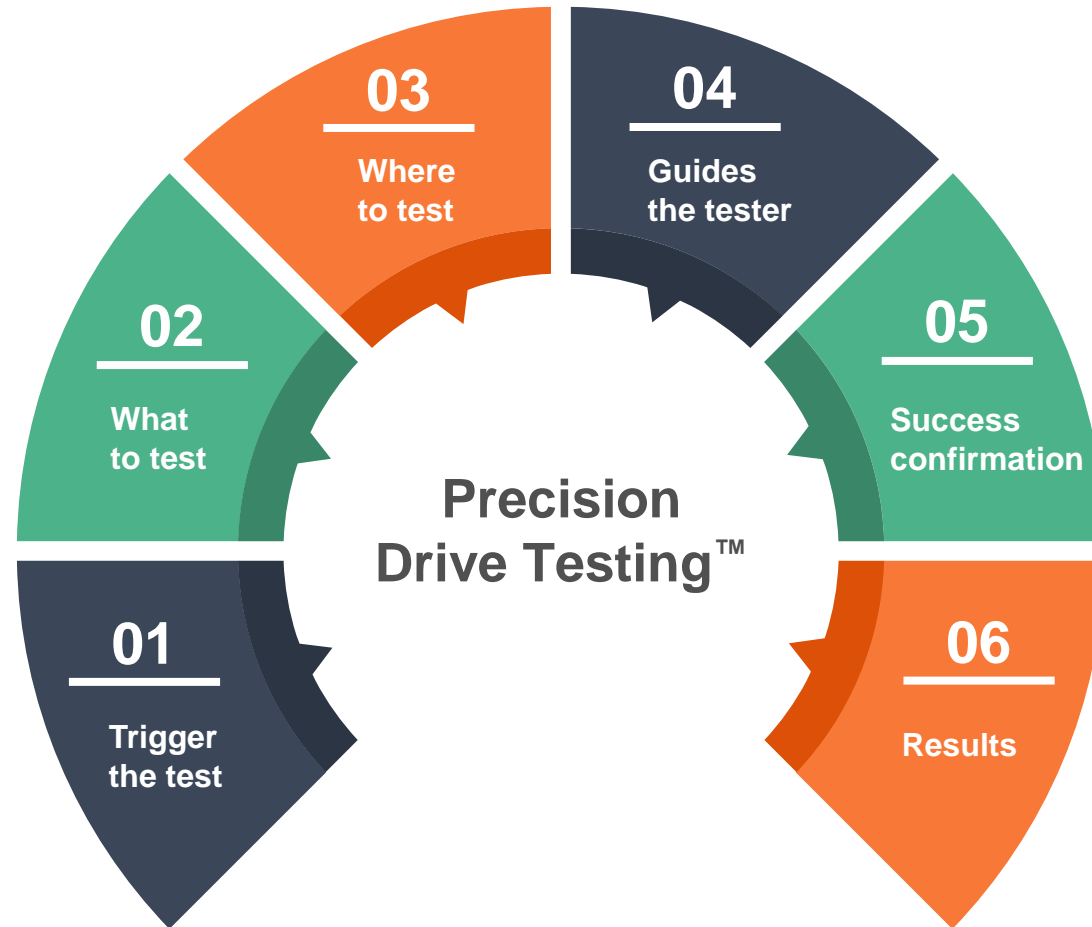
## 5 innovations from TEMS





# Automate drive testing with Precision Drive Testing™

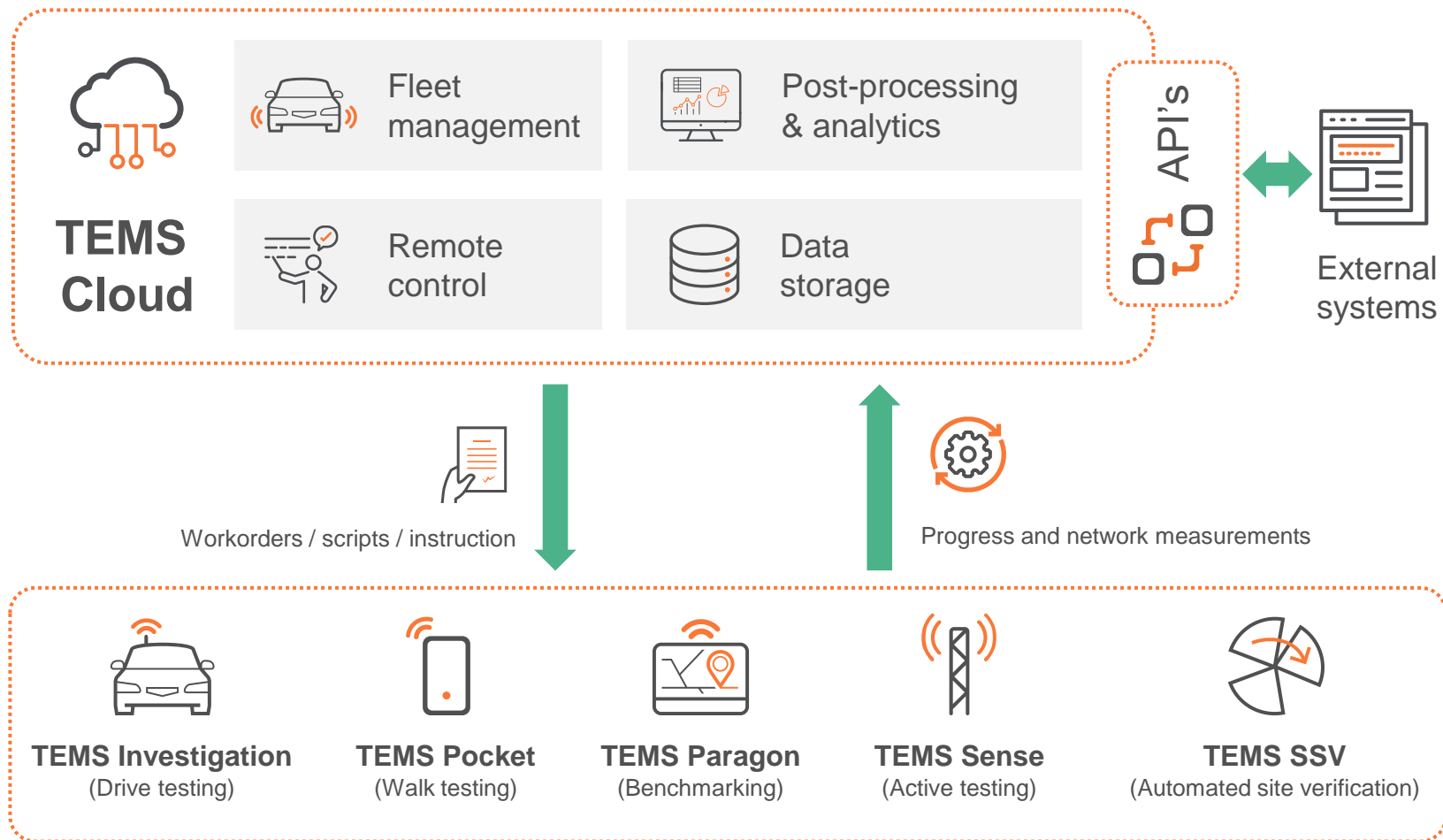
Innovative and automated AI/ML-based drive testing methodology



*“Precision Drive Testing transforms the drive testing process from being engineering driven to AI/ML data driven, from manual to autonomous and from something very few can do to something that can be done by anyone.”*

Dr. Irina Cotanis, Technology Director, Infovista

# Centralize orchestration and reporting with TEMS™ Cloud



## Efficiency

Centrally manage projects, testers, test equipment, analytics and reporting

## Consistency

Ensure consistency and best practice for test methodologies and reporting

## Simplicity

Simplify field operations with workflow automation and tester guidance

# Regulatory compliance

## Customer challenges

- Following a merger, the customer was required to prove the consolidated entity met the specified 5G network build-out and performance commitments agreed to with the regulator

## Our solution

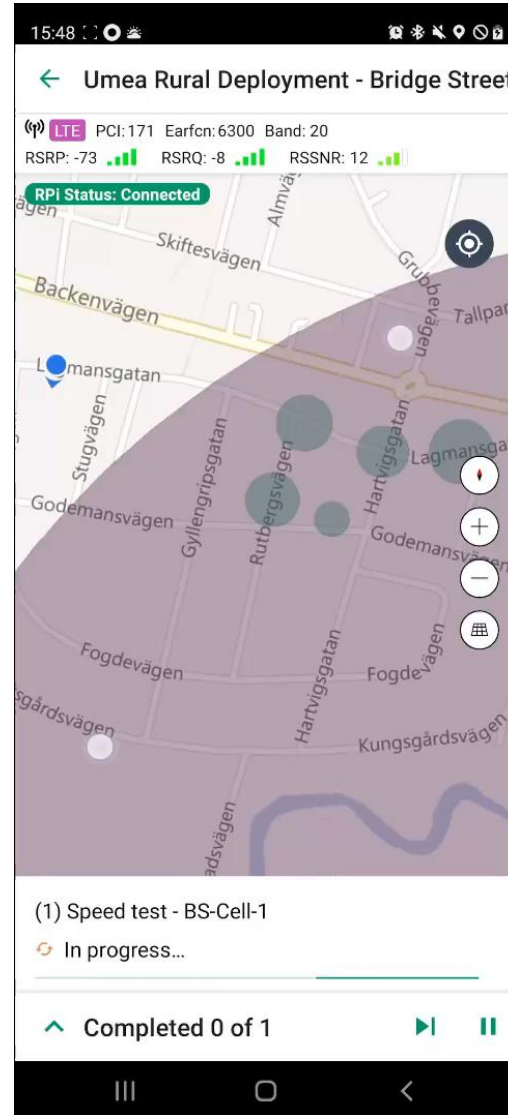
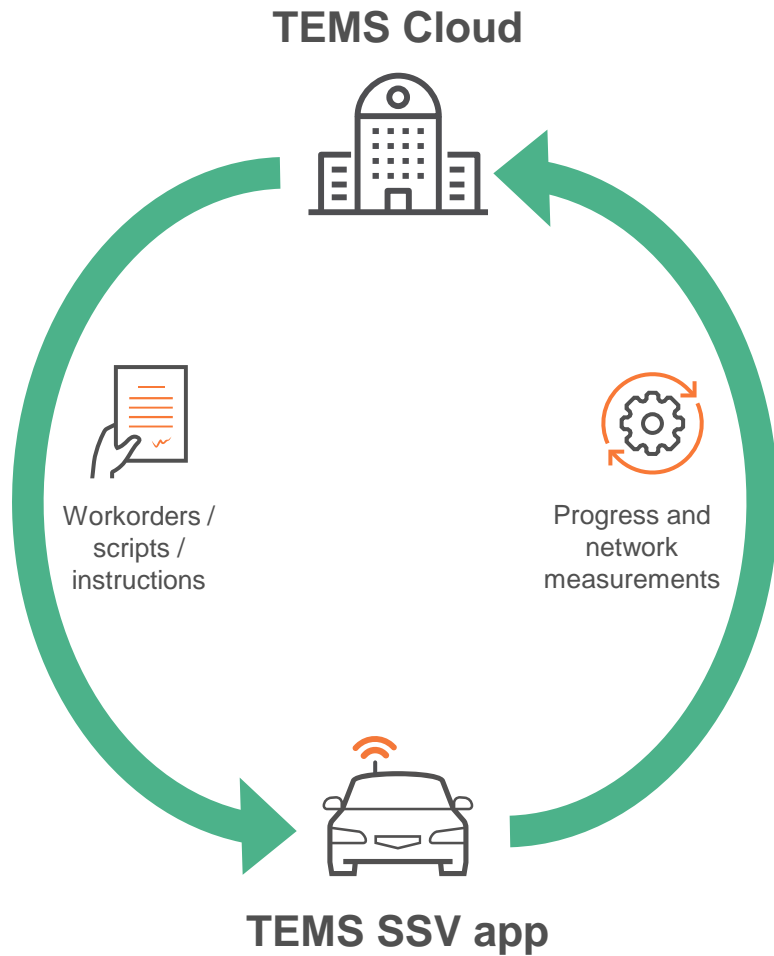
- TEMS Paragon managed centrally by TEMS Cloud

## Proven benefits

- Uniform script distribution across drive test teams
- Native python scripts to enable testing of regulator specified OTT apps
- Cloud-based device orchestration from a central office for efficiency
- Seamless synchronization between devices and TEMS Cloud
- **Successfully undertaking the largest benchmarking project ever (~1 million drive test miles)**



# Verify 5G sites faster with TEMS™ Site Verification



- 1 Manage testing centrally
- 2 Minimize field time with AI/ML
- 3 Guide testers
- 4 Prevent re-tests
- 5 Scale operations
- 6 Analyze results centrally

# Understand user experience with TEMS™ UX testing

Accurately measure QoE for all native and OTT applications and services

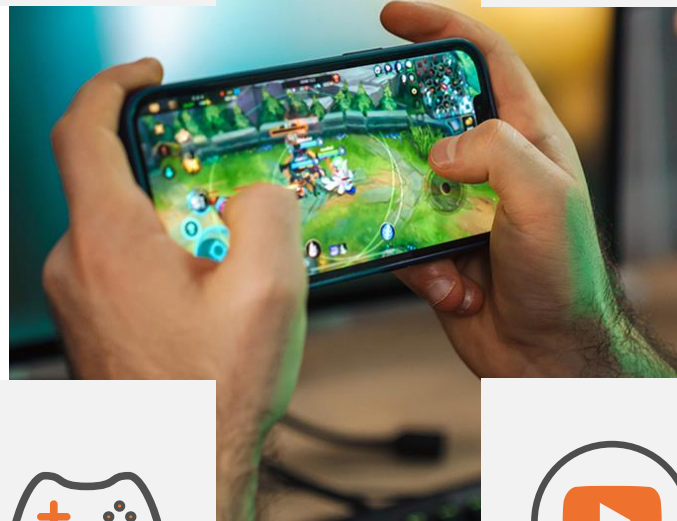
## sQLEAR

Voice quality testing for VoNR,  
VoLTE & OTT voice



## Generic OTT voice testing

OTT voice quality testing with a  
generic client approach



## Interactivity Scoring

User interactivity testing with generic  
OTT service/app traffic patterns



## Generic OTT media testing

OTT application testing with a  
generic framework approach

# Leverage remote testing with TEMS™ Sense

Minimize field trips with remote monitoring of service performance



## Unattended

Unattended solution delivering round-the-clock active monitoring of end user QoE

## Flexible deployment

Mount in fixed locations (airports, stadiums...) or in vehicles (taxis, public transport...). Scalable to hundreds of units

## Remote management

Manage and control units remotely. Collect, visualize and analyze data in real time

# Major event monitoring by a Regulator

## Customer challenges

- With Qatar hosting the FIFA World Cup Qatar 2022™ the country's regulator, CRA, wanted to be able to monitor performance of all the country's operators at key locations

## Our solution

- TEMS Sense units were installed at key locations identified by CRA. Each TEMS Sense unit has 4 SIM card slots so all operators can be monitored from a single box. The units are remotely managed and configured to automatically test and present the results on a centralized dashboard

## Proven benefits

- The solution provides CRA with visibility into the performance of all the mobile networks at key locations such as airports and stadia



# Q&A





# Thank you!

[www.infovista.com](http://www.infovista.com)

