TEMS Pocket 22.1 Overview

Handheld Testing Solution

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Agenda

- Introduction & Portfolio
- Operators Challenges
- TEMS Pocket Overview & Key Benefits
- TEMS Pocket Use Cases
- Architecture
- Introducing 5G Testing
- Devices

Introduction & Portfolio

Who We Are

The leader in modern network performance
We give you complete visibility and unprecedented control to deliver brilliant experiences and maximum value with your network and applications

Global Presence

Regional headquarters in Ashburn, VA, Paris and Dubai to offer in-region services and support

More than **700** employees in **20** regional offices

Partnerships and alliances with major industry leaders

More than **1,500** customers in **150** countries

Our complete portfolio covers enterprise and service providers from **SD-WAN** to **5G** and **beyond**

We Know 5G.

Explore our latest 5G deployments.

CUSTOMERS	COUNTRIES	USERS
172	55	2472

Don't fall behind. Use an integrated 5G solution.

Our experts are supporting major 5G trials and deployments with Tier 1 mobile network operators and leading 5G network vendors around the globe. Learn from their real-life experiences and demo the only integrated 5G solution on the market that covers your entire rollout.

Talk to a 5G Expert

Infovista – One Integrated 5G Solution One Efficient 5G Rollout

- ✓ A complete 5G NR compliant solution set to help you design, optimize and test your 5G network
- ✓ Actively engaged in pre-standard trials with Tier One operators and leading network vendors
- ✓ 80% of CSPs and over 250 Mobile Operators leverage our solutions to build better networks
- ✓ Over 20 years experience in providing radio planning, optimization and testing solutions

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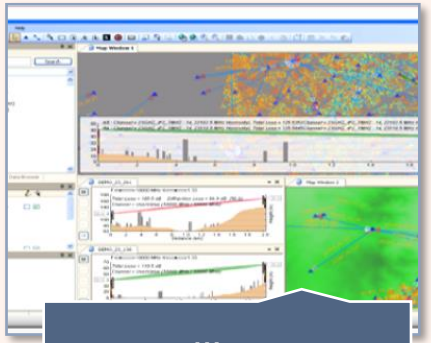
Infovista 5G Portfolio

RAN Engineering Products

Planet

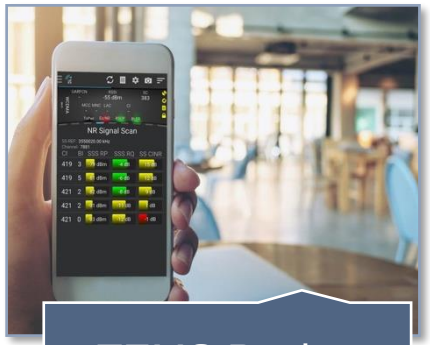


Ellipse

Geodata

TEMS Investigation

Scanners & UEs



TEMS Pocket

TEMS Paragon

TEMS Discovery

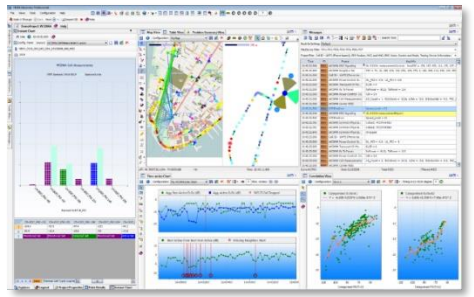
TEMS Sense

TEMS Network Testing Solution

Real-time analytics and orchestration

TEMS Director

Post-processing and analysis



TEMS Discovery

Data Collection

TEMS Investigation

TEMS Pocket

TEMS Paragon

TEMS Sense

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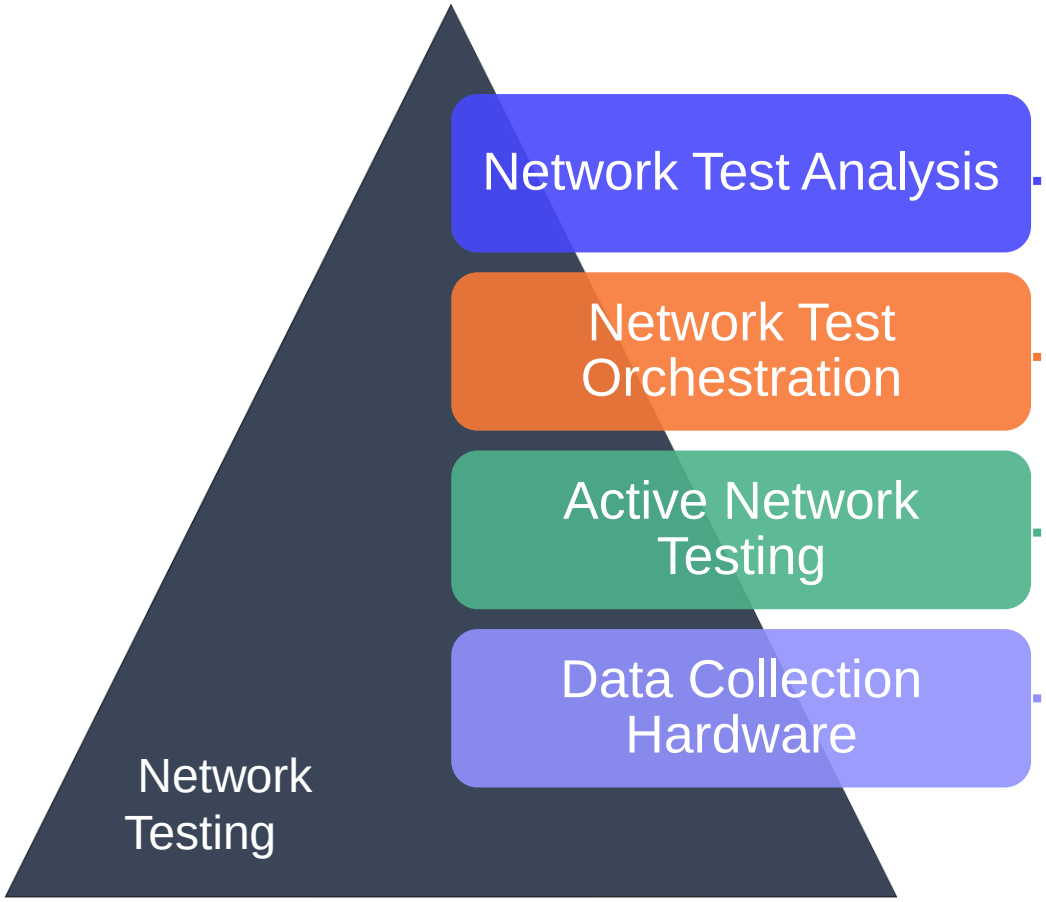
RAN Engineering Portfolio – Network Testing



Network Test Analysis

TEMS Discovery

Insightful Post Processing & Analysis of collected network test results using the TEMS products or 3rd party network test solutions.

Network Test Orchestration

TEMS Director

Centralized platform enabling management, control and real time reporting & analysis of the network test results.

Active Network Testing

TEMS Paragon | TEMS Pocket | TEMS Investigation

Active network testing software enabling layer 1 to 7 end-to-end network testing, supporting attended and unattended use cases.

Data Collection Hardware

TEMS Sense

Probes, phones, scanners and custom-designed hardware on which the active test software runs and available in different form factors to support various test environments and use cases.

Qualcomm, Samsung PCTEL, R&S

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5G-Ready Products

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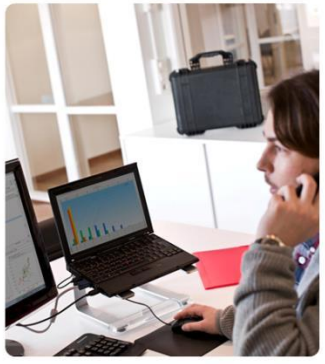
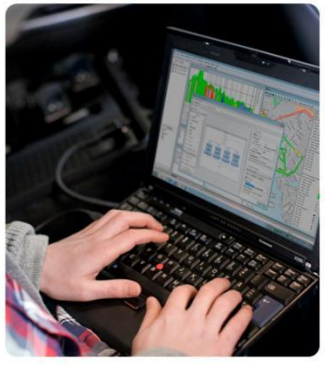
Use Areas and Technologies

SITE VERIFICATION AND ACCEPTANCE

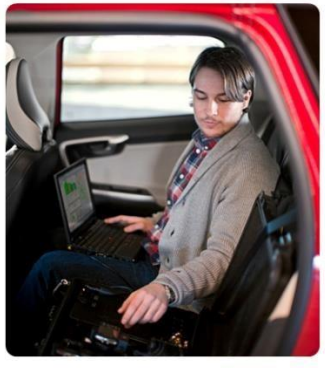
INITIAL TUNING



NETWORK ACCEPTANCE



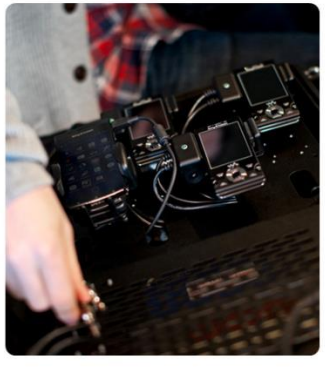
SERVICE QUALITY MONITORING



OPTIMIZATION

TROUBLESHOOTING

NETWORK VERIFICATION



BENCHMARKING

INDOOR AND OUTDOOR

WCDMA
HSPA

GSM
GPRS
EDGE

LTE (FDD/TDD)
LTE NB-IOT
LTE CAT M1

LORA

TD-SCDMA

CDMA2000 EV-DO (Rev. A/B)
CDMA2000 EV-DO (Rel. 0)
CDMA2000 (1X)
cdmaOne (IS-95)

5G NR

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Overview and benefits

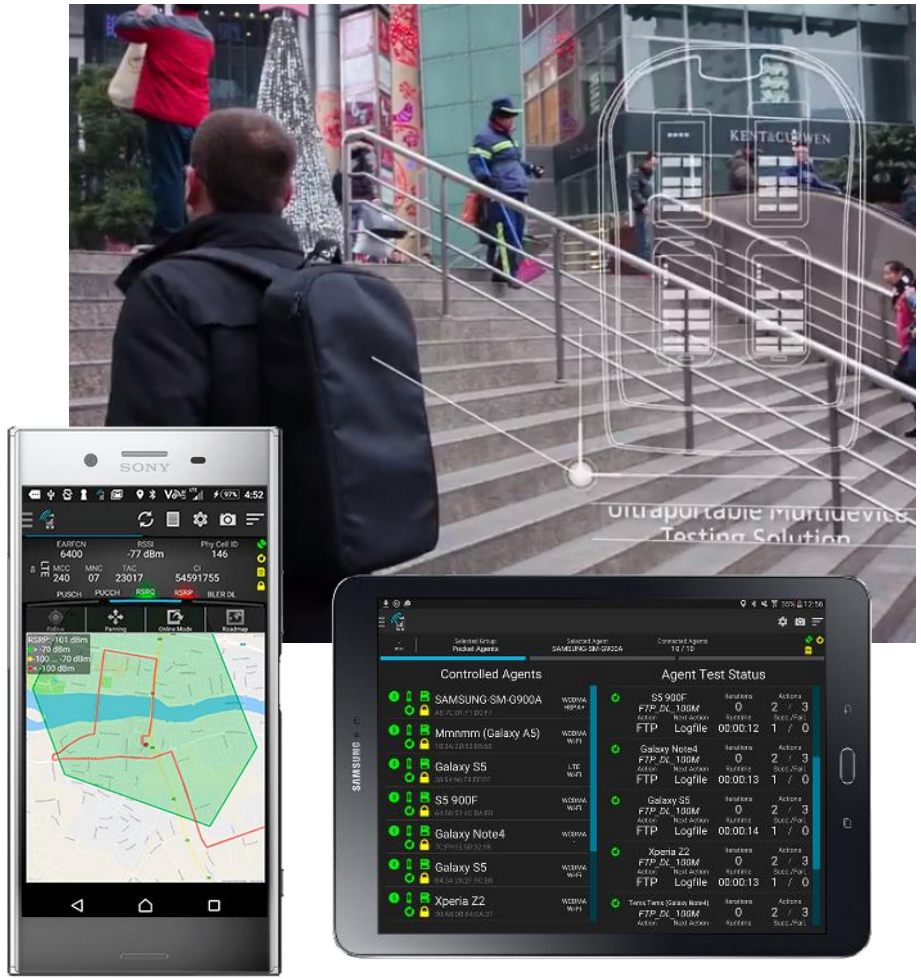
TEMS™ Pocket
Ultraportable Network Testing Solution for Indoor and Outdoor

What is TEMS Pocket?

TEMS Pocket is a compact, ultra-portable solution for testing and benchmarking network performance and subscriber experience indoors (buildings), underground (subways), and densely populated pedestrian areas (urban sidewalks).

Why TEMS Pocket?

The majority of mobile voice and data connectivity happens in indoor environments, which is why Infovista's industry-leading TEMS Pocket is the ideal ultra-portable walk-testing solution for measuring QoS and QoE performance and quality everywhere mobile subscribers walk, run, work and congregate.



TEMS™ Pocket – Benefits

Test in any location

Operators can easily test locations such as inside restaurants, shopping malls, subways, trains, boats, event venues

Target user experience

Allows the tester to truly test networks and services, end-to-end from a subscriber perspective

For the entire HetNet deployment

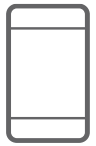
Integrates with indoor planning and design solutions for efficient preliminary network surveys, all the way to design tuning

Optimize equipment utilization

Via our Global License Server you can monitor and optimize equipment utilization and users can easily share licenses to reduce costs.

Smart testing

Workflows and automation to reduce time and enable for non-technically skilled users to perform tests.



Small, convenient form factor

Captures a range of data that normally requires laptops or even larger tools

Multi-device measurement

Offers a multi-device measurement environment, in which one controller device controls the actions of up to 14 agent devices, without additional hardware

Single interface

Allows users to operate and control multiple devices through a single interface

Implemented on a range of handsets

Supports the widest range of device brands on the market. One of the first air interface test and measurement tools to support the Android OS

TEMS Pocket - Charter

Enhancing data collection experience in multiple areas by leveraging TEMS Pocket's embedded core platform to be used for a wider audience while increasing the number of handheld devices supported.

OPEX Reduction by providing smart testing

- Automated Indoor pinpointing reduces test time with 50% and improves accuracy
- VeriSite reduces time and effort needed for outdoor site verification
- Intelligent workflows - designed for technical and non-technical users

Support evolving technologies and network transformation

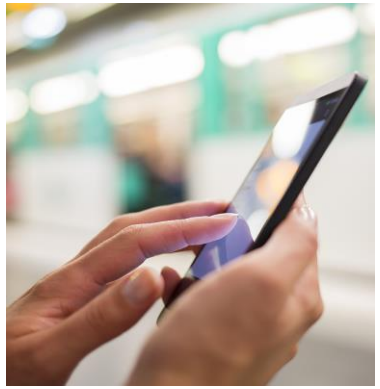
- Video Service Testing, VoLTE/ViLTE, IoT, 5G, and future technologies
- Strong vendor relationship, first-to-market with new available commercial devices

Tight integration with the TEMS portfolio to create robust solutions

- Improve efficiency and cost saving for users
- Flexible packages tailored to address different project needs

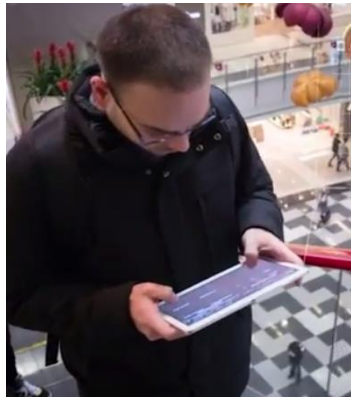
Use Cases

TEMS Pocket Use Cases



Testing & Troubleshooting

Single Site Verification (SSV)



Benchmarking

Real-time Monitoring & Reporting

Testing & troubleshooting

Smart testing

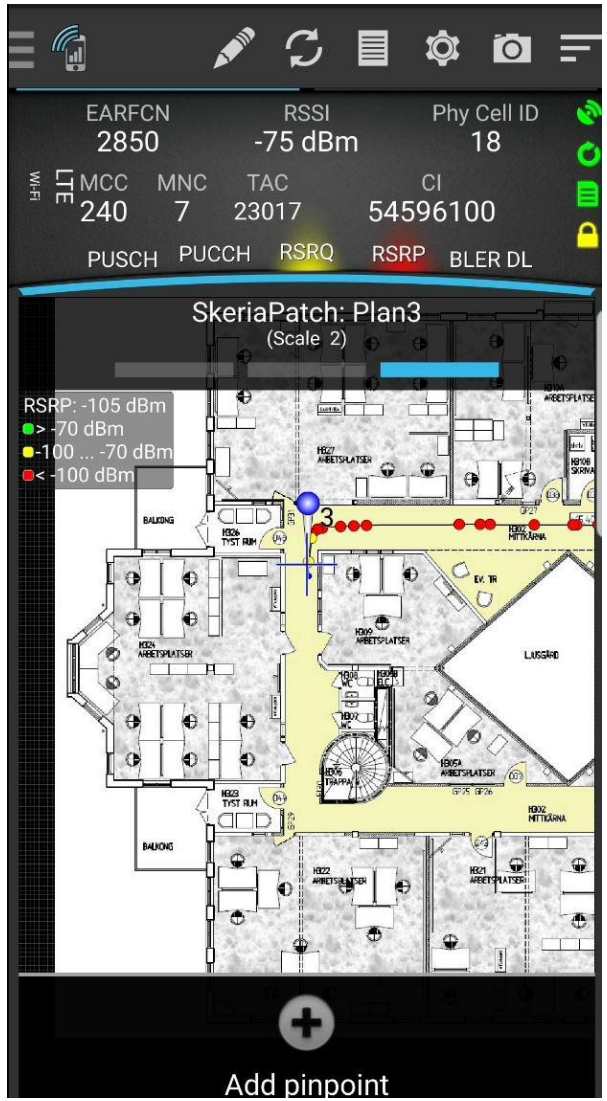
- Automatic pinpointing to save 50% of test time
- Quick start via integration with third parties (iBwave) to set up building information
- Customizable events to speed up troubleshooting
- Powerful scripting including parallell tasking including control functions to fulfil the market's widest need of tests cases.
- One tool to test all.

Evolving technologies and network transformation

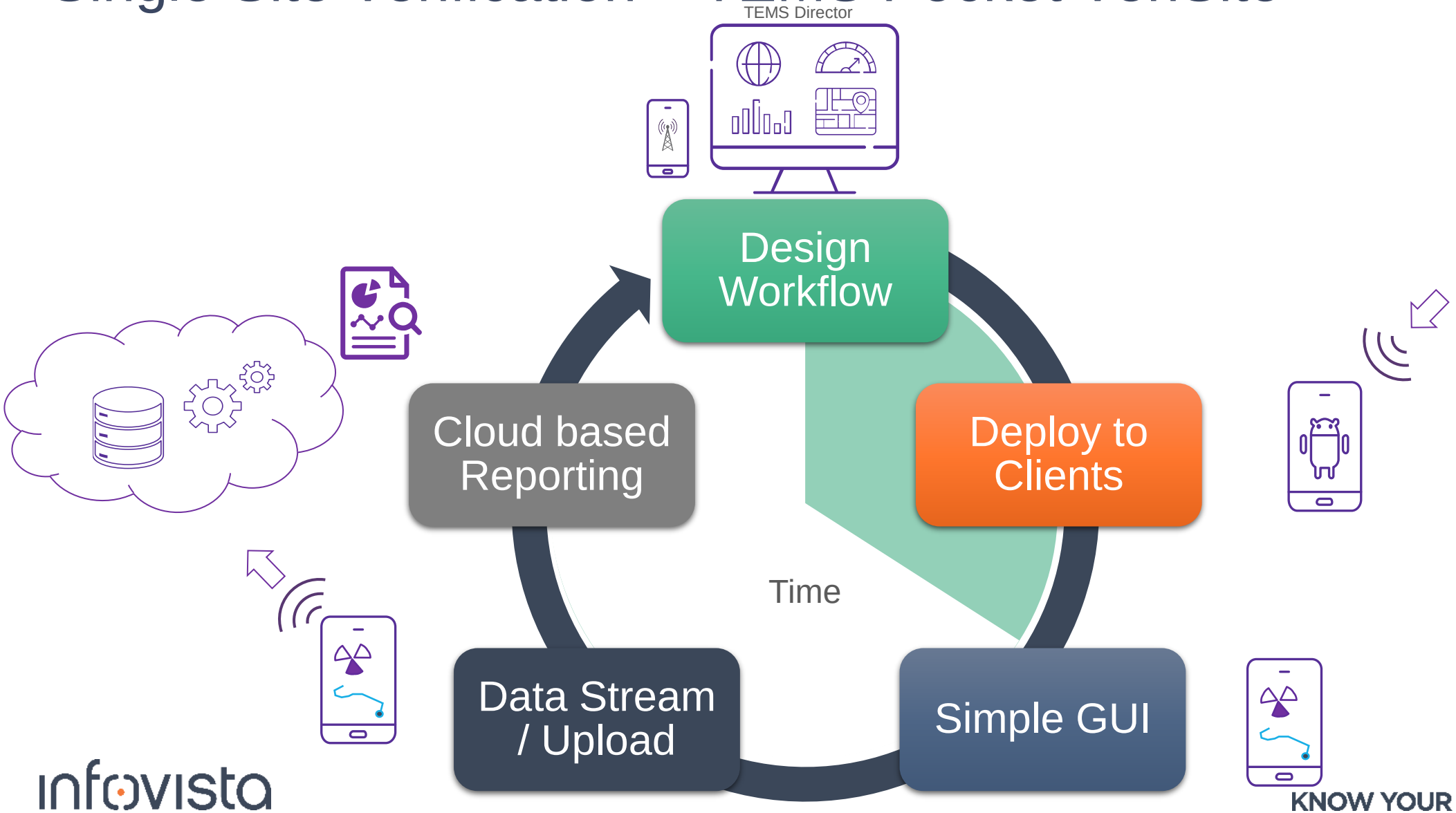
- Light weight scanning solution to verify 2-5G networks (control the scanner via the UE)
- Latest devices & FW

Integration in the TEMS Portfolio

- Complete set of KPIs and information elements logged in format compatible with TEMS Discovery & TEMS Director.



Single Site Verification – TEMS Pocket VeriSite



TEMS Back-Pack Ver.4- 2020 Q1

New generation back-pack having strong requirements about Modularity and Flexibility

- Can support up to 12 phones, optionally it can be configured with the PCTEL IBFlex/ HBFlex when scanning is required
- Controller agent- a tablet UE as master control unit, with support for automated pinpointing
- Battery pack- hot swap and charging without removing the batteries.
- “Telescopic tube” 2x antennas on the side, as well as a magnetic plates on top
- Internal USB hub for charging and communication
- Inbuilt control panel (led display) for charging and temperature
- Cooling fans, additional cooling using Colling packs
- Rain cover/ protection cover
- Ergonomic design with ventilation

Back-Pack solution, conceptual pictures

Version with 6 mobile phones and PCTEL scanner.

Version with 12 mobile phones.

Real time monitoring & reporting

Smart testing

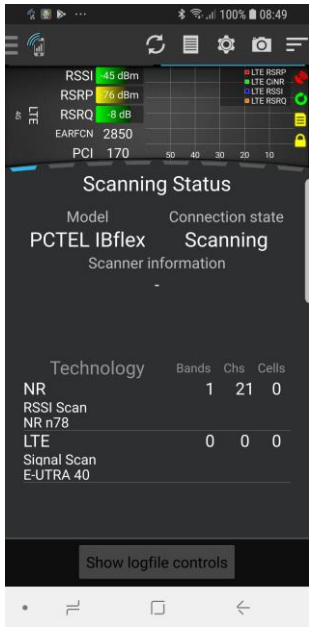
- Menus and views adopted to technology tested, intuitive to use and optimized for the task performed. Context sensitive. Saves time to only look at views of interest.
- Instant reports on-screen to ensure data collection is done.

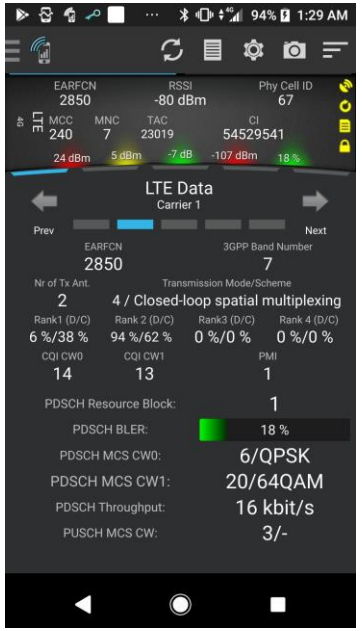
Evolving technologies & network transformation

- Complete set of KPIs and information elements logged in format compatible with TEMS Discovery & TEMS Director.

Integration in the TEMS Portfolio

- Automatic upload of collected information to central storage.





Architecture

Architecture

Data Collection

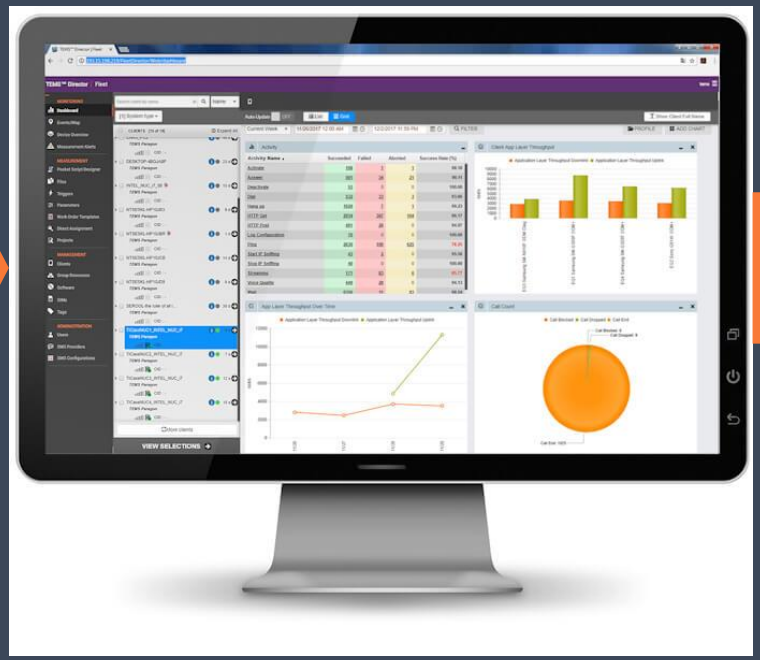
Indoor Tests using TEMS Pocket

Benchmarking using TEMS Pocket

Single Site Verification
Using TEMS Pocket Verisite

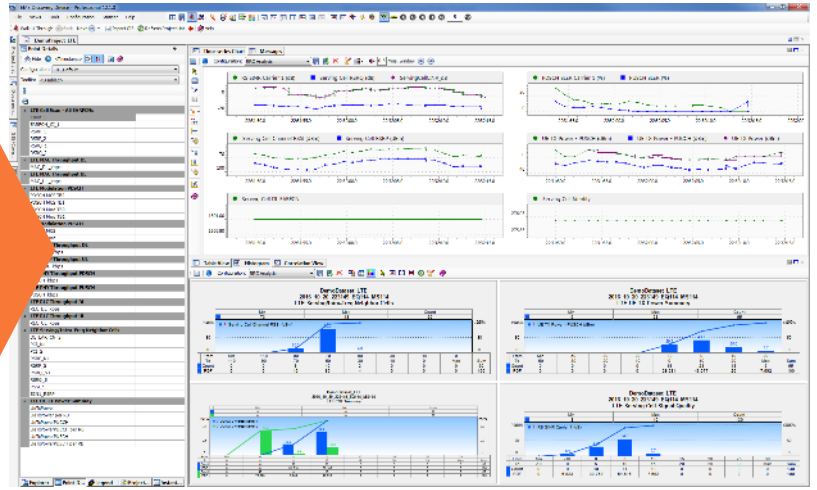
Data is collected via a number of collection devices, fixed or mobile, indoor or outdoor

Real-time Test Orchestration
TEMS Director



All tests are managed centrally, with real-time data analysis & reporting

Analytics & Post-Processing



Collected data is further exploited using TEMS Discovery or 3rd party solutions

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Introducing 5G Testing

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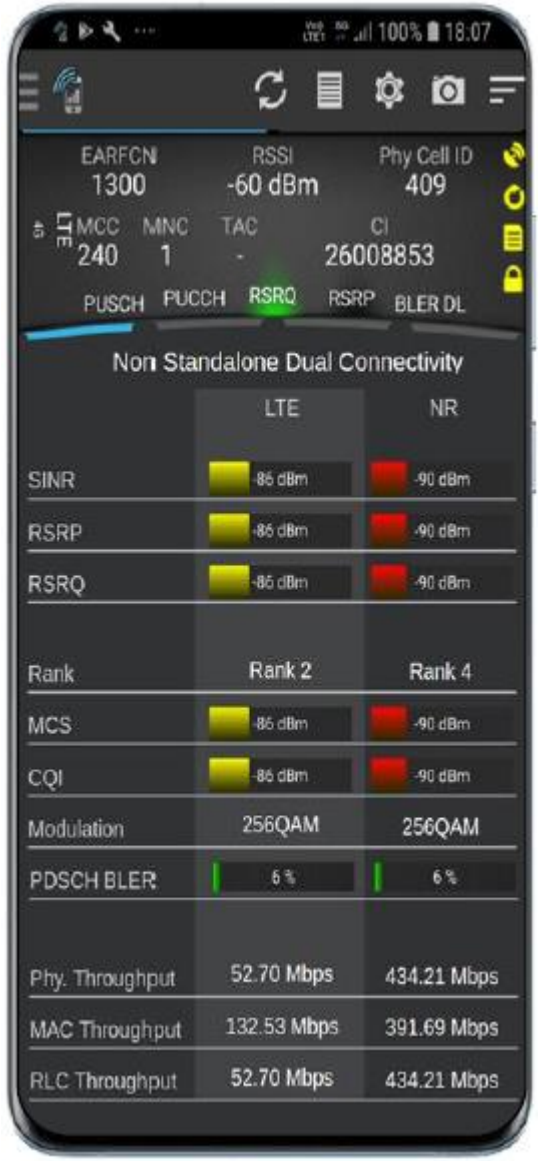
Introducing 5G NR Testing

- **TEMS Pocket 22.1** Including additional NR information
- **Chipset**
  - Qualcomm SD865 based versions for Americas, Asia
  - Samsung Exynos 990 based version for EU/Asia
- **5G**
  - 5G Non-Standalone (NSA), Standalone (SA), Sub6 / mmWave
- **LTE**
  - Enhanced 4x4 MIMO
  - Up to 7CA
  - LTE Cat.20. Up to 2.0Gbps Download / Up to 150Mbps Upload



What's New - 5G Developments

We support devices that are built with 2nd generation chipsets...

Close cooperation with vendors and operators has allowed us to develop support for a huge number of devices (quickly)... Connected device support is key for success.

- The new Qualcomm Snapdragon 865 Platform provides a number of key features
  - Includes new Qualcomm X55 modem supports 5G SA and DSS. It provides 7.35Gbps in mmWave and 5.1Gbps in sub-6GHz.
- The new Samsung Exynos 990 5G Mobile Processor
  - Includes new Samsung Exynos 5123 5G Modem supports E-UTRA-NR Dual Connectivity (EN-DC) that provides 7.35Gbps in mmWave and 5.1Gbps in sub-6GHz

- Requires TEMS Pocket 5G option

5G NR Stand-Alone testing

For early adopters, infrastructure vendors and labs, now possible to test 5G NR Stand-Alone, where 5G radio bearer is used for both control signaling and payload transfer. (Previously, in NSA mode, only the payload used the 5G radio bearer)

Part of that, TEMS Pocket supports full Layer-3 signaling, RRC (Radio Resource Control inf.), as well as NAS (Non-Access Stratum related inf.), crucial for availability and connectivity verification.

Samsung Galaxy S20+ has the capability to collect 5G NR SA information, (so do other devices with Qualcomm X55 or Exynos 5123 chipset)

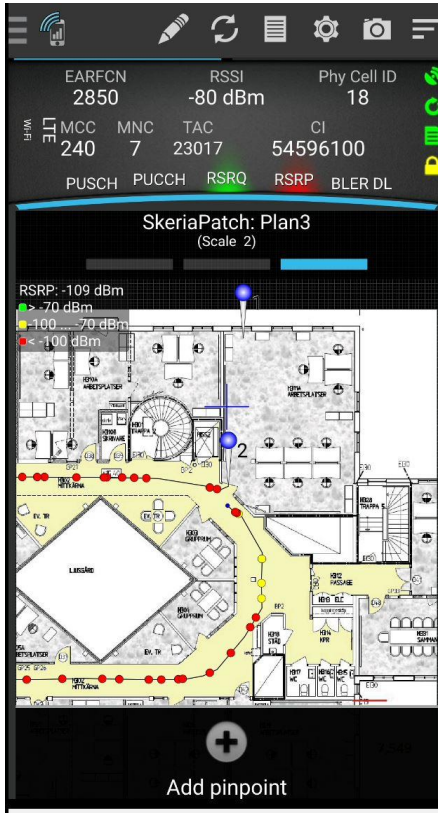
Picture/ KPIs

Auto-Pinpointing

Indoor Testing through Cutting Edge Innovation

Reduces time to collect data with up to 50%

Location resolution is handled directly by the TEMS Pocket device and replaces legacy pinpointing techniques. It means that users can simply set up the device and go, focusing on monitoring test progress instead of tracking waypoints on the screen.



For more information visit:

https://www.infovista.com/resources/tems/automatic-pinpointing-with-tems-pocket

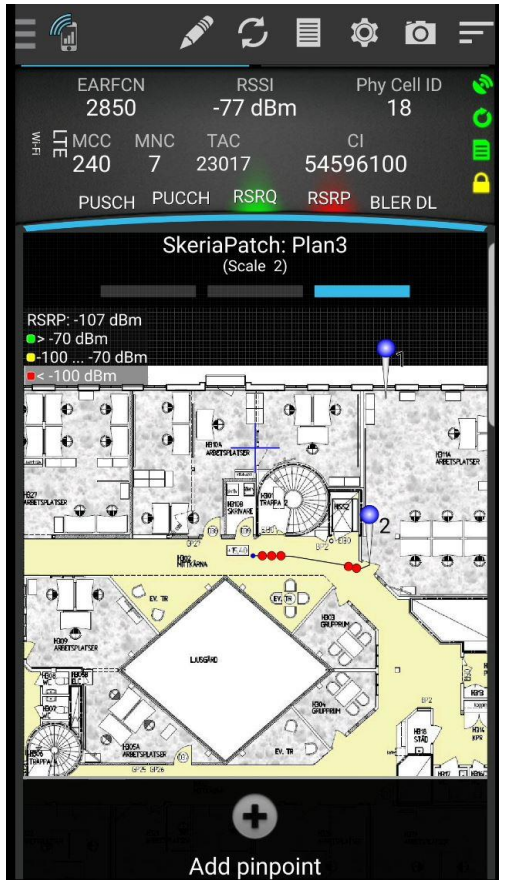
How to use the auto pinpointing

Start by adding two pinpoints manually

The automatic pinpointing utilize the device's sensors and camera

Point the device in a 45 degree angle forward while walking.

The device will vibrate and issue a warning if there are any issues identifying the environment. Then just point the device to the roof or walls and continue walking.



Scanning

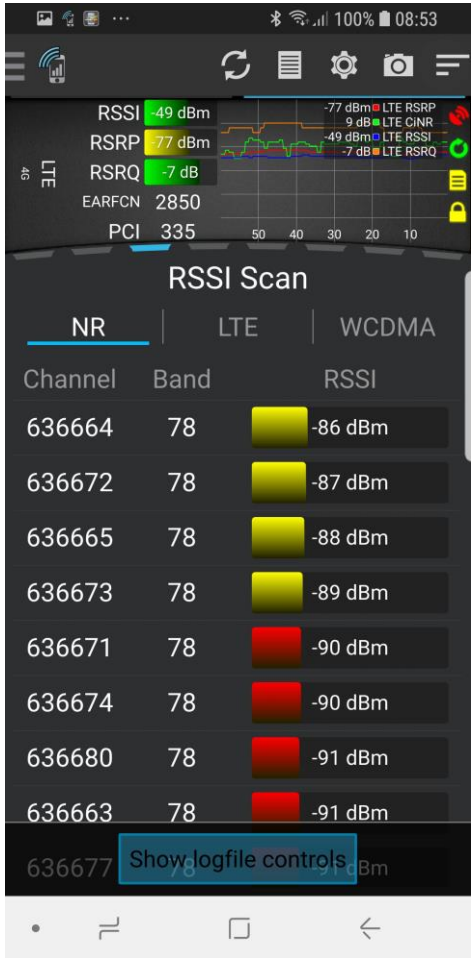
Light weight 5G scanning solution

Support for 5G scanners, RSSI scan

TEMS Pocket provides a light weight solution for 5G scanning. Connecting your scanner via Bluetooth or USB to your TEMS Pocket saves about 1kg in absolute weight compared to a PC-based solution making it optimal for indoor and walk testing. Walk testing 3 hours corresponds to about 14000 steps, with a weight reduction of 1kg it's a significant saving.

Combined with our automated pinpointing, providing an even more accurate positioning makes TEMS Pocket the optimal tool for your 5G roll-out.

Requires TEMS Pocket PCTEL Bundle, 12-months



IoT Improvements

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What’s New – IoT Improvements

Requires TEMS Pocket IOT option , 12-months

TEMS Pocket 22.0.1 further enhanced with new features allowing you to test and verify IoT characteristics important for different applications.

- Round Trip Time (RTT) delay testing, by doing service testing (FTP/ HTTP/ UDP/ Ping) over DoNAS, which is important to verify for time critical applications
- Power saving mode verification, by measuring belonging L-3 timers (T3412/ T3324) controlling the eDRX logic, giving you the possibility to avoid unnecessary power consumption impacting IoT battery performance negatively, and shortening the uptime.

TEMS Pocket Remote

TEMS Pocket Remote

This option allows TEMS Pocket devices to be controlled remotely from TEMS Director-Fleet.

This allows these devices to be used by completely unskilled staff, whose only task is to move them around.

Devices

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Samsung Galaxy S20+

Fully TEMSified device

- Samsung Galaxy 20+ – SM-SC52 (Japan Docomo variant)
- Samsung Galaxy 20+ – SM-SCG02 (Japan AU variant)
- Samsung Galaxy 20+ – SM-G986W*
- Samsung Galaxy 20+ – SM-G986U*
- Samsung Galaxy 20+ – SM-G986B*
- Samsung Galaxy 20+ – SM-G9860

Qualcomm Snapdragon 865 based devices

- Sony Xperia 1 II (mark2) 5G – XQ-AT51 (US / EEA / Russia)
- Sony Xperia 1 II (mark2) 5G – XQ-AT52 (TW / HK / SEA)
- OnePlus 8 5G – IN2011, IN2013, IN2017
- Xiaomi Mi 10 Pro 5G – M2001J2G

Other devices supported

Supported devices supplied by Infovista	Introduced in version	End of Maintenance
OnePlus 7 Pro 5G GM1920	TP21.2	2020-09
OnePlus 7 Pro GM1913	TP21.2	2020-09
OnePlus 8 5G IN2011, IN2013, IN2017	TP22.1.1	2021-09
Samsung Galaxy A90 SM-A908B	TP21.3	2020-11
Samsung Galaxy S20+ 5G SM-G986B/U	TP22.0.1	2021-06
Samsung Galaxy S10+ 5G SM-G977B/U/T	TP21.2	2020-09
Samsung Galaxy S10 SM-G973F/U	TP21.2	2020-09
Samsung Note 10+ 5G SM-N9760	TP21.2	2020-09
Samsung Note 10+ 5G SM-N976Q	TP21.2	2020-09
Sony Xperia 1 (mark II)	TP22.1.1	2021-09
Xiaomi Mi Mix 3 5G M1810E5GG	TP21.3	2020-11

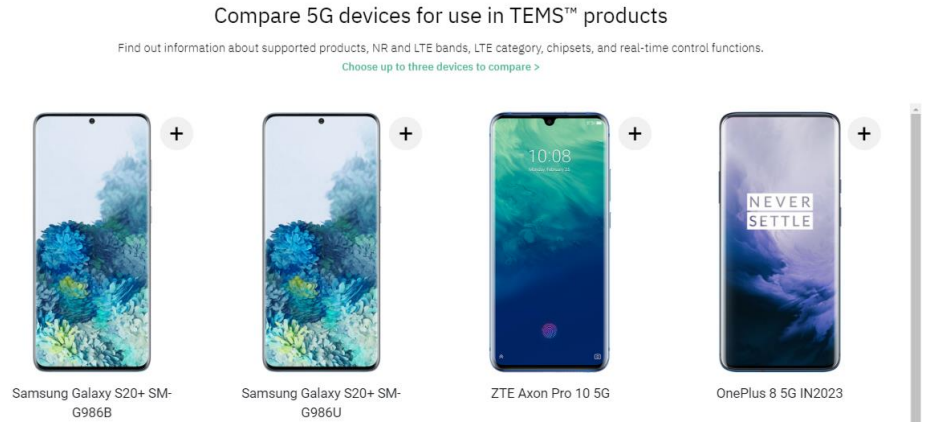
New Devices

Devices supported by TEMS is now available here

- https://support-tems.infovista.com/document/Test/DeviceList/index.php

Moreover, we have included a new Device Comparison tool on the TEMS page

- https://know.infovista.com/device-comparison/p/1?utm_source=website&utm_medium=ad&utm_campaign=TEMSPortfolio

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We know 5G.
https://know.infovista.com/weknow5g/p/1