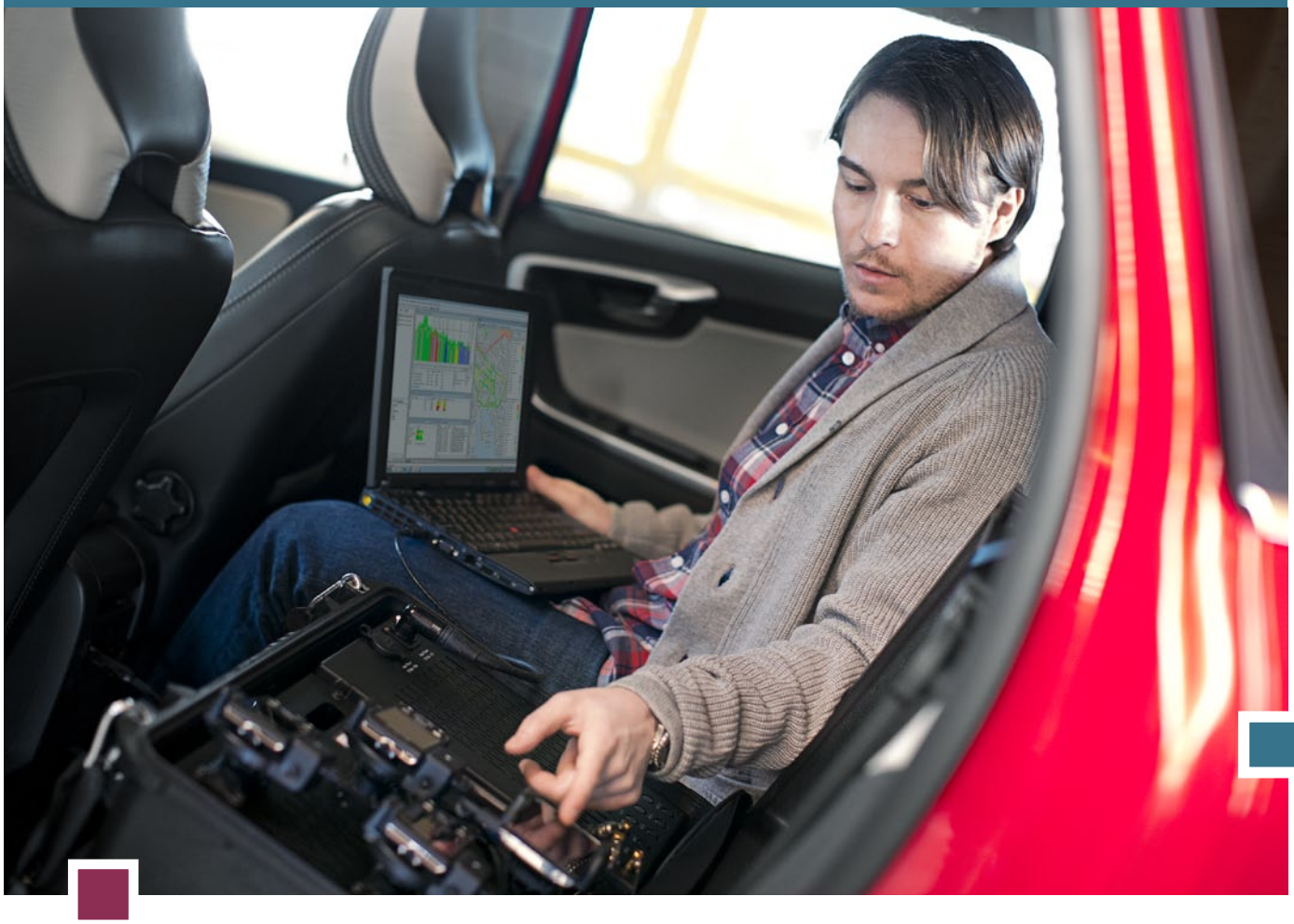
ascom

TEMS™ PRODUCTS

TEMS™ INVESTIGATION
THE INDUSTRY-LEADING AIR INTERFACE TEST TOOL



TEMS Investigation has been the world's leading wireless network testing tool for over a decade. With a reliable history of success that serves as a solid foundation for the innovations and advances to come, it is the number-one choice for operators worldwide.

With its wide array of features, TEMS Investigation collects data better than any product on the market

ENTRUST YOUR NETWORK TO THE PROVEN LEADER

Mobile operators have a great deal invested in their networks' performance, from the satisfaction of their customers to the revenue that fuels their business and future growth. To ensure network availability and quality, operators must troubleshoot and optimize the performance of their wireless networks from rollout through expansion. For this, they need a drive-test optimization and troubleshooting tool that can continuously evolve to support today's and tomorrow's wireless network technologies while keeping total cost of ownership (TCO) down.

Used in more than 180 countries worldwide, TEMS Investigation is the industry-leading tool for troubleshooting, verification, optimization, and maintenance of wireless networks. Offering data collection, real-time analysis, and post-processing all in one, TEMS Investigation eliminates the need for multiple tools, reducing costs and saving time and effort for operations staff. TEMS Investigation supports all major technologies, making it the ideal testing solution both for rolling out new networks and for ensuring seamless integration with existing networks.

MULTI-TECHNOLOGY, MULTI-VENDOR

Designed for in-vehicle, in-building, and pedestrian-area testing, TEMS Investigation's powerful, versatile features are essential throughout the network's lifecycle. Using TEMS Investigation, operators can increase accessibility, improve retainability, and achieve better service performance.

The commitment, experience, strength, and future direction of Ascom Network Testing ensure that TEMS Investigation is constantly updated to meet the evolving needs of the wireless industry. Support for LTE (FDD and TDD), GSM, GPRS, EDGE, WCDMA, HSPA, HSPA+, TD-SCDMA, CDMA (IS-95 to EV-DO Rev B), and WiMAX, together with support for a wide range of services, makes TEMS Investigation the ideal choice for network operators.

"...operators can increase accessibility, improve retainability, and achieve better service performance"

TEMS Investigation also supports a large number of measurement devices from all major vendors across multiple technologies. Its presentation and reporting features can be applied to any event or radio parameter that is measured. The highly flexible and intuitive user interface keeps training costs to a minimum and allows users to take full advantage of its powerful features.

A COMPLETE SOLUTION

TEMS Investigation offers operators one tool to collect, analyze, and post-process the data used for monitoring, troubleshooting, and optimization. This complete solution eliminates the need for multiple tools, reducing costs and saving time and effort.

The multi-mode functionality for system verification, troubleshooting, and optimization of radio access networks allows users to:

- Verify compressed mode behavior, and optimize intersystem handover and cell reselection
- Verify and compare coverage and performance between different technologies

The tool ensures seamless integration among LTE, WCDMA/HSPA, and GSM/GPRS/EDGE networks as well as LTE, CDMA EV-DO, CDMA2000, and IS-95 networks. This multi-technology, multi-vendor approach, together with flexible licensing and packaging, allows customization according to the operator's individual needs and requirements. Other advantages include regional technical support, training, and seamless integration with other products in the TEMS Portfolio from Ascom Network Testing. These benefits all contribute to efficient workflows and improved productivity, allowing operators to focus on ensuring network quality.

UNRIVALED DATA COLLECTION

CUSTOMER BENEFITS

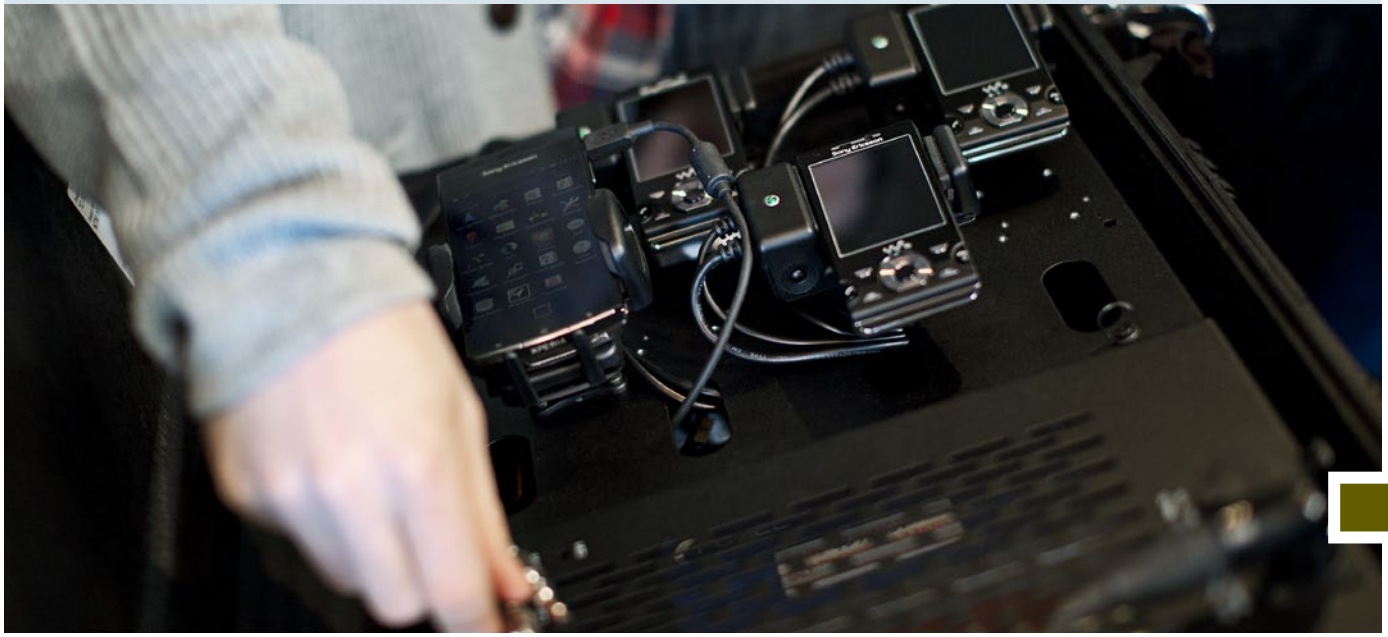
- Maximized return on investment – one complete tool for multi-mode system verification, optimization, analysis, and benchmarking
- Solutions tailored to individual needs – multi-technology and multi-vendor support, flexible licensing and packaging
- Testing from a user perspective – geographically positioned user data
- Early availability – new technologies verified before they go live
- Easy user interface – short learning curve, reduced training costs
- Effective work processes – quick to set up, easy to use, time-saving capabilities
- Future-proof – scalable, adaptable, and constantly updated to meet evolving needs

TEMS Investigation supports more than 280 devices, including smartphones, phones, scanners, PC cards, USB modems, and fixed wireless terminals from all major vendors across multiple technologies, which can be used to collect geographically positioned data from a user's perspective.

An array of robust features makes data collection simple and effective. These include automatic device detection; customizable workspaces users can share; device control; strong, intuitive service control to manage and automate information gathering; event audio indicators; and real-time data presentation.

In TEMS Investigation, multiple devices can be connected and can run simultaneously to minimize the time spent collecting data. In addition to traditional RF data, L2/L3 messages, and IP information collection, TEMS Investigation supports testing of CS and PS services including voice, video telephony, UDP, TCP, FTP, HTTP, Ping, e-mail, WAP, MMS, SMS, video streaming, and VoIP.

TEMS Investigation collects data better than any product on the market. It employs exclusive device capabilities and specially developed algorithms to perform measurements and collect information that other vendors' tools cannot. These include service quality algorithms for voice, video streaming, video telephony, and mobile TV (SQI, VSQI, VTQI, and MTQI), unique device control functions, and the powerful GSM/WCDMA scanning capabilities in the Sony Ericsson UEs. Equipment cases and backpacks containing battery solutions are among the accessories used to optimize in-vehicle, in-building, and pedestrian-area testing.



POST-PROCESSING AND REPORTING FUNCTIONALITY

TEMS Investigation and its integrated TEMS™ Discovery post-processing application can be used to process and analyze logfiles from TEMS Investigation, TEMS™ Pocket, and TEMS™ Automatic.

TEMS Investigation supports more than 1,000 information elements (IEs) and 150 events can be presented in more than 250 predefined presentation windows. This flexibility allows users to change presentation windows to match specific requirements and optimize the analysis view for different tasks. Events can be defined in order to locate problem areas. All presentation windows are synchronized and all settings are saved in workspaces that can be reused or shared between users.

At any stage of test execution, an HTML report can be generated summarizing the results obtained up to that point. TEMS Investigation supports replay of logfiles and simultaneous analysis of multiple logfiles with TEMS Discovery.

TEMS Discovery for post-processing

TEMS Discovery is a highly configurable and user-friendly post-processing solution for air interface measurement data. It allows engineers to easily assess wireless performance and quickly pinpoint network problems. From TEMS Discovery, users can interact with all data used for troubleshooting a wireless network.

Data is presented in map views, summary message views, detailed message views, time charts, table views, metric correlation views, histograms, reports, and drilldown point detail views. Versatile data aggregation methods as well as time, distance, and geographical grid binning make it easy to analyze the data from a statistical viewpoint.

TEMS Discovery includes a built-in reporting tool with a number of predefined reports such as the RAN-Tuning report that can be used for in-depth analysis of the accessibility, retainability, and performance of the radio access network, spanning both circuit-switched and packet-switched services. TEMS Discovery also supports KPI reports presenting statistics related to service performance.

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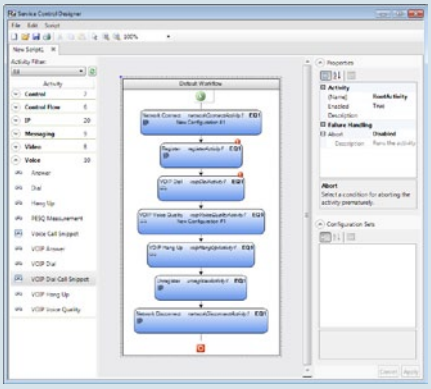
KEY FEATURES

Sony Ericsson Xperia arc

Supporting Rohde & Schwarz TSMW LTE scanner



VoIP testing with PESQ measurement
using the intuitive service control designer

- GSM, GPRS, EDGE, WCDMA, HSPA, HSPA+, CDMA (including EV-DO Rev B), WiMAX, and LTE (FDD and TDD) support
- Support for more than 280 devices from Sony Ericsson, Ericsson, Nokia, LG, Samsung®, Qualcomm® TM, and Qualcomm chipset-based vendors
- Support for Android™, Symbian™, and Windows Mobile®-based smartphones
- Newly supported terminals include: Sony Ericsson Xperia™ arc, Nokia C7, Sierra Wireless™ AirCard® 313U/319U/AC320U, Sequans® SQN3010A-USB-M1, Qualcomm TD9200 TDD, LG FM300/MN270, Samsung Galaxy S 4G/SCH-I510/SGH-A307/SCH-R380, Huawei E367/E372/E392, Vodafone K5005, ZTE AL621/MF682, and HTC Imagio™
- External scanner support: PCTEL SeeGull MX/EX/EX mini/LX, Rohde & Schwarz® TSMW, Andrew i.Scan®, DRT 4301A WiMAX, DRT 4301A LTE, Anritsu™ ML8720C/ML8780A, and Ascom SRU (Scanning Receiver Unit)
- LTE (FDD and TDD) UE and scanner measurements
- Support for LTE/UMTS and LTE/EV-DO dual-mode measurements
- Powerful and unique control and measurement capabilities, GSM and WCDMA scanning, and TEMS Pocket functionality in Sony Ericsson W995
- Service testing including voice, video telephony, FTP, HTTP, UDP, TCP, Ping, e-mail, WAP, MMS, SMS, VoIP, and video streaming
- Service control designer to control and automate testing
- TEMS setting manager for sharing of service and scanner settings
- Automatic upload of logfiles
- Audio quality measurements, including PESQ (mobile-to-mobile and mobile-to-fixed)
- VoIP PESQ measurements
- Speech Quality Index (MOS, dBQ), Video Streaming Quality Index (MOS), Mobile TV Quality Index (MOS), and Video Telephony Quality Index (MOS)
- Data service performance verification with generic device in any data access network (utilize any device with drivers for Windows enabling an IP data connection)
- Layer 2 and 3 decoding
- IP protocol trace capabilities
- In-building measurements (pinpointing)
- Real-time presentation and analysis of IEs and events
- User-configurable presentation windows, events, and threshold values
- Predefined presentation windows including maps, line charts, bar charts, status windows, and message windows
- User-configurable logfile export including MDM format for CDMA
- TEMS Discovery for post-processing and reporting functionality including Google Earth™ export, RAN tuning reports, and KPI reports for voice, video telephony, video streaming, FTP, HTTP, e-mail, WAP, and MMS
- Flexible packaging and licensing, including floating SW licensing solution
- Windows® 7 and Windows® Vista compatible

TEMS Investigation is a complete, cost-effective, and convenient compact solution for the active field engineer

www.ascom.com/tems

LTE FEATURES

- LTE measurements collected with devices from Samsung, LG, Qualcomm, Sequans, Huawei, Sierra Wireless, ZTE, Pantech®, etc., as well as PCTEL SeeGull MX/EX/EX mini, R&S TSMW, Andrew i.Scan, and DRT 4301A LTE scanners
- TD-LTE UE measurements with Qualcomm TD9200 TDD and Sequans SQN3010A-USB-M1
- LTE/UMTS and LTE/EV-DO dual-mode measurements
- More than 150 specific LTE IEs and events
- More than 30 predefined LTE presentation windows
- Support for FTP, HTTP, Ping, UDP, TCP, and VoIP service testing in service control designer
- Serving and neighbor cell measurements
- LTE DL and UL information
- Throughput and delay measurements
- LTE cell load and missing neighbor evaluation
- CS fallback events and information
- LTE scanning measurements include signal scans for up to 12 EARFCNs, spectrum scan, and enhanced power scan (PCTEL only)

HSPA FEATURES

- Approximately 100 HSPA-specific IEs
- Support for dual-carrier HSPA devices (up to 42 Mbps)
- HSPA-related events
- Predefined HSDPA and HSUPA presentation windows
- Application layer throughput
- Full decoding of HSPA messages
- HS 64 QAM, 16 QAM, and QPSK modulation rates
- MIMO-related information elements
- HS CQI
- DSCH BLER, retransmission rate and throughput (kb/s)
- HS Phy requested, scheduled, and served throughput (kbit/s)
- HS UL Average Serving Grant and E-TFCI
- HS-SCCH channelization code information

WCDMA FEATURES

- More than 300 IEs
- Predefined WCDMA-specific presentation windows
- Phone-based scanning: CPICH scan, SIB decoding, and NW search
- Audio quality measurements including PESQ and Frequent AQM
- SQI, SQI-MOS, VSQI, VTQI, and MTQI
- Scanning and UE-based missing neighbor detection
- Decoding of Layer 2 and 3 messages
- Serving/active set + monitored/detected neighbor information
- GSM neighbor measurements in WCDMA
- Pilot pollution and missing neighbor detection
- Intra- and inter-frequency handover information
- RLC throughput UL/DL
- Transport channel logging
- RRC state logging
- RACH report

GSM/GPRS/EDGE FEATURES

- More than 300 IEs
- Predefined GSM-specific presentation windows
- Phone-based scanning
- Audio quality measurements including PESQ and Frequent AQM
- SQI and SQI-MOS
- Serving + neighbors measurements
- C/I per timeslot and C/A measurements
- GSM channel verification
- Decoding of Layer 2 and 3 messages
- WCDMA neighbor measurements in GSM
- Hopping information
- GPRS protocol messages
- DTX usage
- GPRS and EGPRS status and timeslot information

WiMAX FEATURES

- More than 50 IEs
- Predefined presentation windows
- Preamble scan (5, 10 MHz Bandwidth)
- Continuous wave scan (10, 12.5, 15, 25, 30, 50, 250 KHz Bandwidth)
- MAC decoding (FCH, DL-/UL-MAP, DCD, and UCD)

TD-SCDMA FEATURES

- Close to 200 IEs
- More than 25 presentation windows
- Advanced device control functionality
- Support for UE and scanner measurements
- TD-SCDMA specific events
- Layer 3 and mode reports decoding
- TD-SCDMA radio parameters
- Midamble/SyncDL Top N scanning
- RSSI scanning
- Physical channel monitor
- Missing neighbor detection
- GSM neighbor measurements in TD-SCDMA
- Audio quality measurements including PESQ

CDMA FEATURES

- Approximately 300 IEs
- CDMA-specific events
- Predefined presentation windows
- Audio quality measurements including PESQ
- SQI-MOS
- Layer 3 and mode reports decoding
- General CDMA information
- CDMA mobile and server information
- CDMA radio parameters
- A/C/N set information
- CDMA EVDO Rev. B Multicarrier Serving channel Information
- Follow-phone functionality with scanner

DATA AND SERVICE TESTING

- IP protocol trace
- Application throughput UL/DL
- Session information including current and mean throughput UL/DL
- Delay measurements
- AQM/PESQ measurements
- VoIP measurements including PESQ and jitter buffer metrics
- Streaming video
- FTP, HTTP, Ping testing
- E-mail, MMS, SMS testing
- TCP and UDP testing
- Utilize service control designer

Note: Measurement capabilities of handsets vary. TEMS Investigation has functionality that exceeds that of any one supported handset.

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