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TEMS™ INVESTIGATION
THE INDUSTRY-LEADING AIR INTERFACE
TEST TOOL



TEMS™ Investigation has been the world leader 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 over a decade of industry leadership, TEMS Investigation sets the standard for network testing and optimization”

Used in more than 180 countries worldwide, TEMS Investigation is the true industry-leading solution for troubleshooting, verification, optimization, and maintenance of wireless networks.

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.

Support for LTE, GSM, GPRS, EDGE, WCDMA, HSPA, HSPA+ and GAN (UMA), TD-SCDMA, CDMA (IS-95 to EV-DO Rev A), iDEN, and WiMAX, together with support for a wide range of services, makes TEMS Investigation the ideal choice for network operators.

TEMS Investigation 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 at a minimum and allows users to take full advantage of the powerful features. Experienced TEMS Investigation users will instantly recognize the well-proven user interface and way of working.

The commitment, experience, strength, and future direction of Ascom Network Testing ensure that TEMS Investigation is constantly updated to meet evolving needs.

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.



A COMPLETE SOLUTION

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 WCDMA/HSPA, GAN, and GSM/GPRS/EDGE networks as well as 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 work processes, allowing operators to focus on network quality.

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



UNRIVALLED DATA COLLECTION

TEMS Investigation supports more than 200 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.

Features such as automatic detection of devices, customizable workspaces that can be shared among users, device control functionality, intuitive and powerful Service Control (formerly known as command sequences) to control and automate data collection, event audio indications, and real-time data presentation make data collection simple and effective.

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, FTP, HTTP, Ping, e-mail, WAP, MMS, SMS, video streaming, and VoIP.

TEMS Investigation collects data better than any product on the market. In addition to standard parameters, it employs specially developed algorithms to 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), and the powerful WCDMA and GSM 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.



CUSTOMER BENEFITS

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
- **Familiar user interface** – short learning curve, reduced training costs
- **Effective work processes** – quick to set up, easy to use
- **Future-proof** – scalable, adaptable, and constantly updated to meet evolving needs

POST-PROCESSING AND REPORT 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.

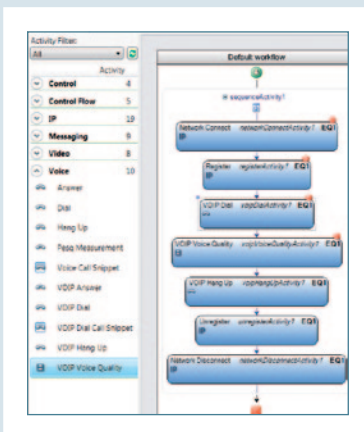
TEMS Discovery for post-processing

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 drill-down 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 view.

TEMS Discovery includes an inbuilt reporting tool with a number of pre-defined 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.





VoIP testing with PESQ measurement using the intuitive and smooth Service Control

KEY FEATURES

- GSM, GPRS, EDGE, GAN (UMA), WCDMA, HSPA, HSPA+, CDMA (including EV-DO Rev A), WiMAX, and LTE support
- Support for more than 200 devices from Sony Ericsson, Ericsson, Motorola, Nokia, Qualcomm TM, and Qualcomm chipset-based vendors
- Newly supported terminals include: Nokia C5, LG enV Touch (CDMA/ EV-DO), Samsung Omnia i910 (CDMA/EV-DO), and HTC Touch Pro 2. USB modem UM175 (CDMA/EV-DO), and PCTEL scanners for LTE, CDMA, and GSM
- GSM and WCDMA terminal scanning
- TEMS Pocket option
- MRU option
- External scanner support: PCTEL SeeGull EX, SeeGull EX mini, SeeGull LX, DRT 4301A WiMAX, DRT 4301A LTE SISO, Anritsu ML8720C, and ASCOM SRU (Scanning Receiver Unit)
- Service testing including voice, video telephony, FTP, HTTP, UDP, Ping, e-mail, WAP, MMS, SMS, VoIP, and video streaming
- Service Control (Command sequences) to control and automate testing
- Automatic upload of logfiles
- Audio Quality Measurements, including PESQ (mobile-to-mobile and mobile-to-fixed)
- Speech Quality Index (MOS, dBQ), Video Streaming Quality Index (MOS), Mobile TV Quality Index (MOS), and Video Telephony Quality Index (MOS)
- Layer 2 and 3 decoding
- IP protocol trace capabilities
- In-building measurements
- Real-time presentation of IEs and events
- Integrated version of 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
- 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
- Flexible packaging and licensing, including floating SW licensing solution
- Windows® 7 and Windows® Vista compatible

LTE FEATURES

- LTE measurements collected with Samsung devices, Qualcomm devices, and LG devices
- Support for DRT 4301A and PCTEL EX LTE scanners
- More than 130 specific LTE IEs
- More than 30 predefined LTE presentation windows
- Support for FTP, HTTP, Ping, and UDP service testing in Service Control (command sequence)
- Serving and neighbor cell measurements
- LTE DL and UL information
- Throughput and delay measurements
- 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
- 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
- Intra- and inter-frequency HO 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 time slot information

WIMAX FEATURES

- More than 50 information elements
- 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 information elements
- 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

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
- 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 (PESQ)
- Streaming video
- FTP, HTTP, Ping testing
- E-mail, MMS, SMS testing
- UDP testing
- Service Control (Command sequence) for service testing

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



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