

YOUR OSS PARTNER



International Ltd.
Your OSS partner



About TTG

TTG Int. LTD, a privately-owned company established 2001, is the leading global provider of best-in-class proactive and customer oriented approach to Service Assurance as well as customized OSS software solutions to the telecoms industry.

TTG's growth has been outstanding to its exceptional vision and leadership in the development of 2G, 3G, LTE and 5G technologies, NGNs as well as Fix networks. The expertise gained in these technologies has enabled TTG to pioneer the agnostic OSS tools such as Performance Management, Anomaly Detection with AI, Central Equipment Identity Register (CEIR), Mobile Number Portability (MNP), Fault & Alarm Management, Leased Line Inventory, Configuration Management, Subscriber Experience, 5G-EMS, 5G-Service Quality Monitoring, Transmission Inventory and Planning of such 2G, 3G, 4G, 5G, WCDM, PDH/SDH and IP/MPLS networks. Our OSS tools are designed by telecommunication engineers that have been in the operator's site for many years. All these unique expertise is added in our OSS software excellence, systems integration and network engineering.



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Corporate Strategy

Corporate Strategy & Philosophy

TTG International Ltd. is the leading OSS supplier. We have Global Supplier Agreements with a number of clients. Our strategy is to maintain this leading position by organic growth, partnerships and acquisitions.

Moreover, our strategy is to extend the scope of the product offering to Telco's by joint developments, partnerships or other commercial arrangements.

The software is offered to our client as a complete Solution including Consultancy, Training and Support. Our consultants, who will work with you to install and configure the system, are all TTG's employees with considerable experience in OSS projects worldwide.

Our Customer Service capability is available 24 hours a day, 365 days a year. It offers advice and assistance to optimize the use and benefits of your system.

We continually review our products and services by both internal and external quality audits to ensure we continue to offer professional and high quality products and services.

Markets

TTG International Ltd.'s market focus is totally on the telecoms sector, primarily the mobile sector, though we have clients using the product for Broadband and Wireless local loop applications. Our prospects and clients are broadly in the following sectors:

- Mobile operators
- Equipment suppliers
- Telecommunication construction companies
- Telecom Regulatory Authorities

TTG is one of the founder companies of HTK (Communication Technologies Cluster) and involved in E2E National 5G Network Project. TTG develops EMS and SQM for 5G network elements. This project is supported by BTK (Telecom regulatory Authority in Turkey) & TUBITAK and planned to launch at the end of 2020.

Financial History and Status

TTG International Ltd. has achieved a strong financial record since its formation in 2001 with consistent revenue and profit growth. It is one of the fastest growing OSS technology companies in Turkey.

Products and Services Portfolio

All Tools have been developed completely by TTG International Ltd. with the original architects are still in the development team. The products are not only very stable and mature but also are continuously being enhanced.

Vision:

To provide innovative OSS solutions for Telecom.

Mission:

To focus on our customers' market challenges and need by providing excellent OSS network solutions and services, enabling them to achieve maximum value for their business.

Development Strategy:

- Serving our customers is the only reason TTG exists.
- Customer demand is the fundamental driving force of our development.
- Innovative solution and high quality.
- Low operating costs and meeting our customers' requirements.
- Tools are designed to meet our customers' requirements.
- Continuous development for ensuring high-quality end-to-end OSS solutions.



Let us light your way to success



The Role of T-TOMS*

* TTG TELECOM OSS MANAGEMENT SYSTEMS

T-TOMS (TTG - Telecom OSS Management Systems) offers best-in-class applications on single or multiple platforms. TTG offers a number of best-in-class applications that extend T-TOMS for switching transmission, signaling, data/IP, 2G, 3G, LTE, IMS infrastructure and services management that will accelerate the transition to Fourth Generation (4G) networks. Currently T-TOMS can provide a complete management solution in the following areas, regardless of whether your network is fixed or mobile.

Network Management

- Service Assurance
- Performance Management
- Fault & Alarm Management
- Transmission Inventory Management
- Configuration Management
- Parameters Management
- Accounting
- Security
- Mind Set: Continuous monitoring, ceaseless curiosity about what useful information the network can yield and dynamic performance analysis of the infrastructures are a must for operators to improve network quality.



T-TOMS provides end-to-end management of convergent networks and services with seamless integration of other applications and technologies.

Role of T-TOMS

T-TOMS has been developed to provide a basis for the long term, logical development of management solutions for telecommunications network. T-TOMS models integrated management systems and system components, by specifying an environment in which these components can inter-operate and implements automated management functions. This architecture has been developed to provide as much flexibility as possible so that you can:

- Define and implement network management strategies based on your needs
- Manage existing network elements in real-time
- Add new resources to your network when needed without interruption
- Continue to use inherited applications
- Easily integrate with third party applications

T-TOMS implements an open, distributed architecture that covers all your network management OSS tools. T-TOMS can connect to network elements using advanced OSS tools functions. The OSS products are designed carefully and specifically for the management of telecommunications and corporate networks.

The T-TOMS Client, displays T-TOMS data using interface applications to provide a comprehensive system of full network management.

■ NORTH-H

PERFORMANCE
MANAGEMENT

■ SxQM

SUBSCRIBER EXPERIENCE
QUALITY MANAGEMENT

■ FAMAN

FAULT & ALARM
MANAGEMENT

■ CMEx

CONFIGURATION MAN-
AGEMENT EXPERT

■ NET-TRANS

TRANSMISSION
MANAGEMENT

■ TIPS

TRANSMISSION
INVENTORY &
PROVISIONING

■ PMS

POWERLINE
MONITORING SYSTEM



Network Optimization Reporting Troubleshooting & Health Indicator

Measure for the Success

Managing a wireless network has always been a balancing act: Operating at maximum efficiency while maintaining competitive quality of service (QoS), deploying capacity whenever needed as traffic increases and making the most of the frequency spectrum whilst avoiding interference. NORTH-I is the solution for communications providers across the world, enabling them to maximize QoS through optimum network performance.

NORTH-I Performance Manager

TTG's NORTH-I solutions have set the standard for dependable multi-vendor, multi technology performance management. NORTH-I manages GSM, CDMA, GPRS, UMTS, IMS, LTE, POTS, SDH/SONET, SS7 and Sigtran, IN, ATM, Frame Relay, IP, LTE and other technologies today.

Lowest Cost of Ownership

NORTH-I takes performance management to the next level by increasing the performance of your network, your customers and your business. Built using cutting-edge technology, it has the flexibility to collect and interpret terabytes of data from, almost, an unlimited range of sources in near real-time. With its extremely customizable architecture, robust, easy-to-use Web-based administration and reporting tools, dashboard, report portal, industry-standard database and open interfaces including SQL, ODBC, XML and CORBA, SNMP NORTH-I Performance Manager enables full control over your data.



NORTH-I



Comprehensive Solutions

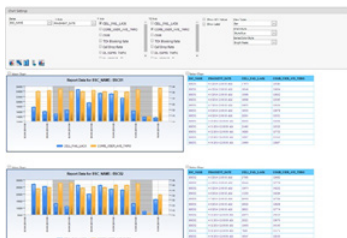
NORTH-I Performance Manager comes with a wide range of technology sets, making it simple to manage different technology types. Each Set comes with domain-specific data models, vendor-specific statistics and consistent vendor-neutral Key Performance Indicators (KPIs) along with value-added reports and graphs, delivering intelligence from day one.

Flexible and Future-proof

NORTH-I Performance Manager can be easily customized and extended to meet your explicit requirements. From supporting new technologies to innovative new ways of looking at your network data, NORTH-I Performance Manager delivers a comprehensive solution, today and tomorrow.

NORTH-I Features

- GSM Technology Set
- UMTS Technology Set
- GPRS Technology Set
- Transmission Technology Set
- Performance Alarm Viewer Module
- Performance Profiling Module
- Prediction Module
- NORTH-I Dashboard
- NORTH-I Ad hoc Report Development & Analysis Module
- NORTH-I / GIS
- Anomaly Detection





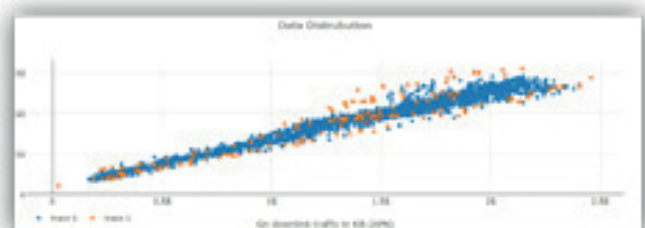
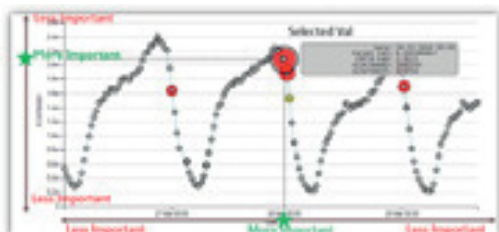
Anomaly Based Intrusion Detection

Understanding & Utilizing Data Trends

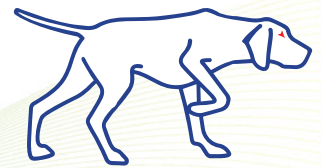
We understand all the needs from operator's point of view as well as network operation experts'. In order to find out the root cause of "what is happening in the network", we analyze data trends and put them into different classes using machine learning algorithms. ABID+ checks which KPIs are closely related, how their trends are changing over time and reports them periodically. It keeps track of current trends and compares them with huge datasets to find out anomalies in the network.

ABID+ helps to understand data trends based on time series. It can understand the previous trends by day, weekly, hourly, monthly and yearly and find out current anomalies in the network based on region and cells. This feature gives more advantage to the network expert to find out root causes and their behavior for anomalies+ in the network.

ABID+ is able to show the data for single and multi-dimensional comparisons of the network data. We determine the different data trends and preferable threshold values from the operators and finally classify the anomalies in the network. It is able to show the confidence intervals and multi-dimensional graphs for the correlated KPI groups decided by special algorithms. Users can check up to n dimensional graph views to find out real KPI values which can cause the anomaly.



ABID+



Advanced Reporting & Dashboard

ABID+ is able to show different KPI graphs based on different filters consisting of cell, RNC, NodeB, eNodeB, BSC and BTS. It finds out the most frequent anomalies in the network by cell and region and displays them in the dashboard. It shows all the regions using map over the available network regions and shows their analytics.



ABID+ has several features to understand anomalous data and the root causes. It is able to demonstrate multi variant and multi-dimensional anomalies in the network data. Special algorithms increase its ability to learn from previous network data. It also uses correlation techniques to find out the most correlated groups of KPIs for root cause analysis.



Configuration Management Expert

Minimize multi-vendor and multi-technology network complexities while maximizing quality of service levels while reducing the OPEX.

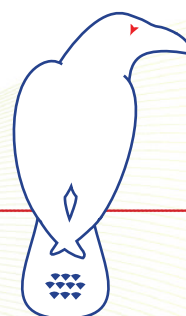
Maintaining and improving Quality of Service is an imperative task of day-to-day operational activities. As technology rapidly evolves to 4G and beyond, operators are contend with both legacy and new generation systems and ensuring that both are equally managed, optimized and deliver high quality of service for the benefit of their end users.

TTG's network configuration solution effectively allow multi-vendor and multi-technology mobile operators the ability to manage different vendors and technology network configuration settings, as well as provides invaluable insight into the overall call process, furnishing engineers with the luxury of time to tackle network problems and formulate strategic decisions that enhances the networks overall performance

The CMEx platform is an automated solution that brings together multiple data sources regardless of your vendor and technological preferences, within the mobile operator's network, to enable both engineering and operations departments to view the network consistency. The CMEx automatically identifies the inconsistencies in the network.

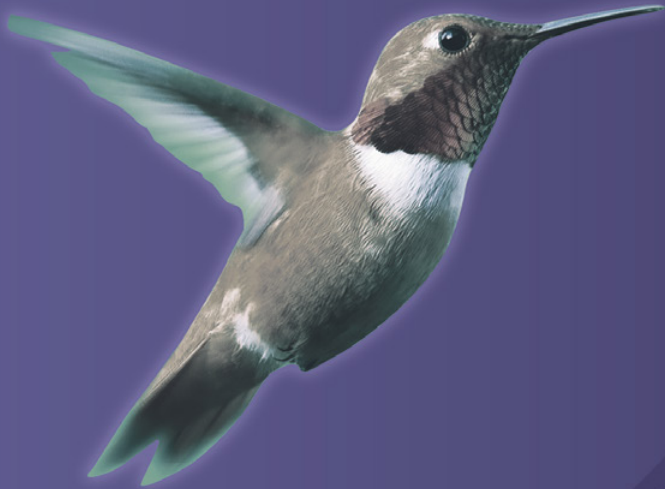
With the CMEx a hidden configurations problem/s that may cause the poor performance can be detected before a fault or customer complaints arises. It is a positive move towards pro-active network management.





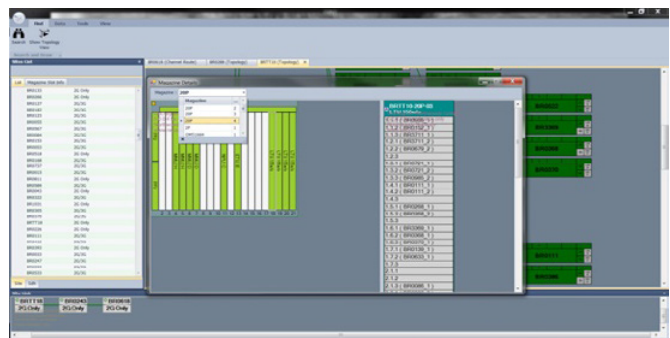
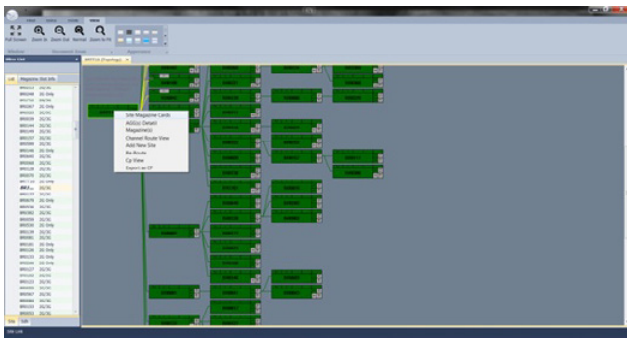
- Configuration Reports
 - Change Reports
 - Inconsistency Reports
- Default Parameter Settings
 - Cell Parameters
 - NodeB Parameters
 - RNC Parameters
- All Parameters
 - All RNC Parameters
 - All Cell Parameters
- Handover Parameters
 - Handover Parameters
 - Blind Handover
 - Neighbors Report

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Transmission Inventory & Provisioning system

TIPS (Transmission Inventory & Provisioning system) tool is a strategic solution focused on meeting the challenges facing mobile operators who are offering high-speed data and interactive multimedia services over their mobile networks. This intelligent inventory/configuration solution provides a consolidated cross-technology end-to-end view of transmission network. TIPS collects all the inventory/configuration information automatically via SNMP, CORBA, TLI Base and SQL-based. With the aid of TIPS transmission operations & maintenance and planning engineers are able to view current capacity and paths of their transmission network.

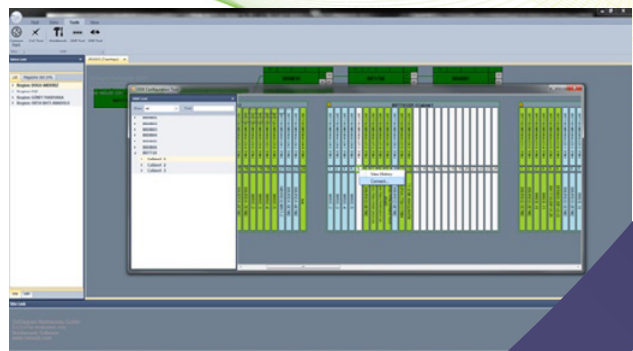


TIPS



Benefits

- Rapid return on investment can be achieved from the use of the TIPS:
- Reduced capital expenditure on transmission network infrastructure through targeted build and better utilization of network resources.
- Reduced operational expenditure through efficient planning and engineering and increased workforce productivity.
- Faster return on investment for new network build due to targeted network expansion to areas of high demand/revenue.
- Faster deployment of new equipment leading to a more rapid increase in network coverage.
- Faster provisioning with fewer errors and reduced risk of failure due to accurate network data.





Network Transmission Management

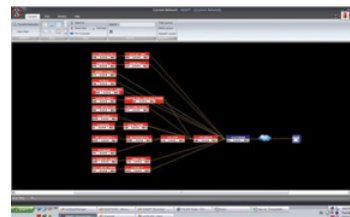
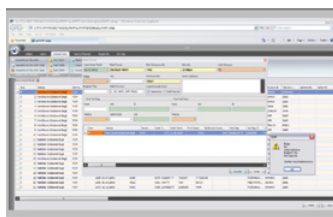
Without transmission leased-line inventories, no OPEX or CAPEX benefit can be realized!

NET-TRANS LLM (Leased Line Management)

Transmission planning and inventory management

Today, companies face high equipment and labor costs which could be considerably reduced by keeping correct inventory records and planning. In addition to that, Telecommunication operators should make their infrastructure investments in an efficient and cost effective manner. Reliable network transmission, automation, planning and inventory solutions are required. From that point of view, NET-TRANS has been developed in consideration of the increasing requirements of the telecommunication market. Thanks to this co-ordination, telecom operators preserve their investments, increase efficiency and reduce costs.

TTG International Ltd. developed the NET-TRANS as a strong and easy to use Network Transmission Planning and Inventory Management software. With correct transmission planning and inventory management, network data flow and service provision are offered through and increase in physical and artificial capacity increments. Using NET-TRANS, network transmission planning, inventory, budget / payments and requests, fast service provision and service cost management all become possible.



NET-TRANS



Features

NET-TRANS includes the following basic features:

- It has a dynamic design according to Leased Line applications and procedures.
- Request of a Leased Line (new, transfer, cancellation etc.) can be made through the regional offices of the operator by completing the relevant parts of the program. Requests are automatically transmitted to the Head Office, where automatic application letters to the transmitting company (Telecommunication) are compiled.
- History of each line can be monitored.
- Payment for each Lease Line to the Service Provider Company (for example Turkish Telecommunication) is filed (advance, monthly rental, transfer fee etc.).
- Any new daily, weekly, monthly (or between any two dates) requests, transfer requests, cancellation requests and contract numbers can be monitored in graphic or report format through NET-TRANS on the basis of the line speed and purpose of use.
- NET-TRANS offers a flexible reporting feature. Non-standard reports are easily created by using the Report Developer module.
- The reports and database information created can be transferred to or received from such mediums as Excel, TXT, HTML or XML when required.
- The software can form the entire physical or logic structure of the entire transmission network.
- Offers active grid features.
- Rental, rental dates and contract information and related alarms can be formed.
- Easily integrated into other corporate management systems.
- Easily managed with maximum efficiency.
- Easily generalized.



Fault & Alarm Management

FAMAN SERVER: A high-speed, in-memory database, optimized for collecting events and designing filters and views, rule set, trouble ticket, integration, reports, report development, etc. which provide the core processing functions for the FAMAN suite. The FAMAN application includes the following components:

Fault Management (FAMAN): Performs alarm filtering and reduction and presents alarms from the entire network on a single screen.

Fault Correlate: Pinpoints the root cause of network faults using network-wide topology data and conditional rules. **Fault Maintenance:** Proactively solves network faults by automatically sending predefined commands to the network elements in response to alarms.

Trouble Ticket: Manages trouble tickets from creation through resolution and facilitates application of known solutions to recurring problems.

Filters: System has filtering for most of the fields such as alarm severity, alarm state, alarm type, by node, etc. as well as Location, Area, Region and so on.

Integration: FAMAN is able to integrate to others tools. **Report Development:** System has very flexible and easy to use report development module to help you develop your requirements.

Reports/Statistics: FAMAN has variety of reports (hourly, daily, weekly, monthly and historical) that user are able to get them with a mouse click.

Rule Set: FAMAN (MeerKat) has a rule set that allows user to define their-own rules. **Schedule:** FAMAN has a scheduler for predefined jobs such as; Reports, command sending, proactive warning and so on.

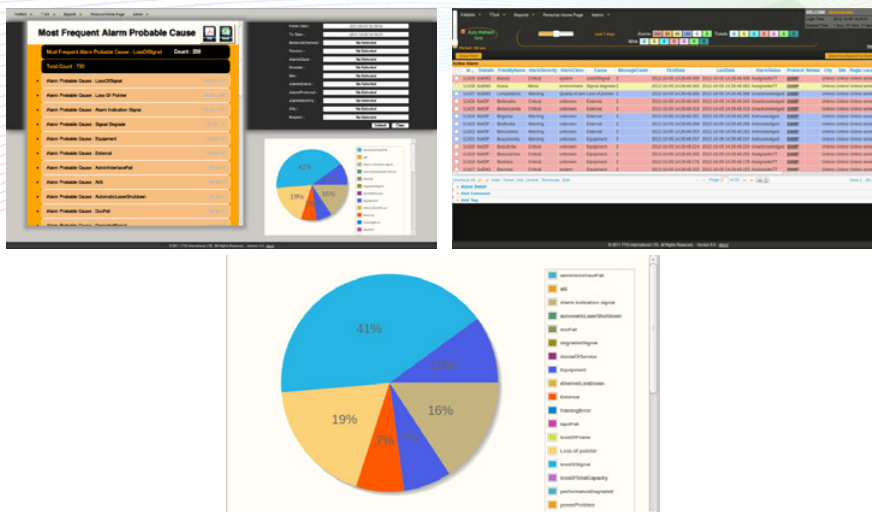
Reports

Reports are supplied as standard with the FAMAN Management Module giving, for example:

- Alarm Summary
- List of the Most Frequent Alarms
- Average Alarm Duration
- SLA reports
- List of objects that generate most of alarms
- Daily distribution of alarms
- Historical reports
- TT reports, etc.
- Many mores



- Real-time, Multi-vendor and Multi-domain.
- Lower mean-time-to-repair and increases network uptime and efficiency.
- Faster problem resolution by rapidly determining the root cause of a problem.
- Prioritizes repair activities according to affected customer or service.
- Automatic alarm dispatch (SMS and e-mail) and escalation.
- Automates resolution of problems, freeing staff to make better use of their time and expertise.
- Efficiently solves network problems and customer reported troubles by automating the creation of trouble tickets.
- Alarm via on GIS.
- Tailor network alarm monitoring and management to your specific requirements.





Measure Subscriber Experience for the Success

Measure Subscriber Experience for the Success

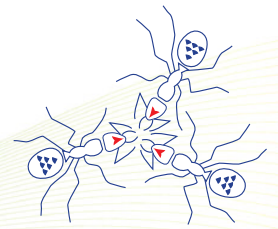
The ultimate system for continuous reporting real customer experience facts directly from your very own subscribers. Actual locations of problems are pinpointed using “Subscriber Experience” with targeted automatic reporting of network problems that really matter.

Subscriber Experience is based upon commercial mobile handset phones. Simply download TTGs’ SubEx Agent applications to any mobile handset phones and your Subscriber Experience data will be constantly collected and reported in near real time for instant, user-friendly web-based replay and analysis. All data collection and reporting is fully transparent to the handset user. Subscriber Experience smart phone applications are available for iPhone, Android, Blackberry and other devices. All Subscriber Experience details are available on maps with immediate filtering of call events, dropped calls, low signal, no service, serving sites and more. TTG SxQM provides operator focused analysis to locate continuous black-spots, measured over any duration and to report system issues such as problematic cells, missing neighbor options and unexpected coverage.

Put your subscribers in the optimization to continually show;

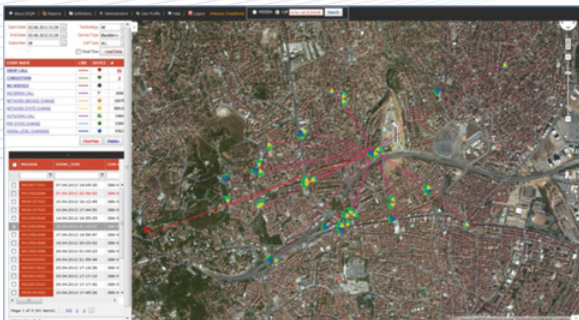
Where - they receive “No Service”. Where - their calls are being dropped. Where - location of handover failures. Which - sites are under-performing. Where - the coverage holes are in your network. What - levels of in-building coverage are being delivered.

SxQM



Advantages of SxQM

- Vendor-independent.
- Centralized, cost-effective online deployment.
- Runs on commercial smartphones.
- Non-intrusive passive testing.
- Distributed active testing.
- Complete solution including Agent distribution, data collection and content package.
- Wide range of collected data including a large pool of radio interface counters.
- Collect data from competitor networks for benchmarking purposes.
- Visualize data using standard "Google Maps" reporting.
- Indoor and outdoor drive testing.



Real coverage based on subscriber experience



Telecom Equipment Registry Management

Control Your Handset Ecosystem

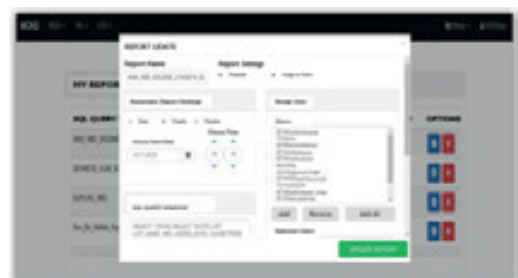
TERM is a CEIR (Central Equipment Identity Register) database of the IMEI numbers of blacklisted and whitelisted handsets. It keeps track of unapproved, software changed, cloned, illegal and stolen devices enabling rapid querying. TERM allows the mobile devices to enter the network according to device status. With its cutting edge technology, TERM brings modularity and extensive controlling capability to Telecom Regulatory Authorities. sonnel can be dispatched with necessary data regarding what problems in which location to reach the site faster.

Using TTG's enhanced algorithms TERM analyzes and reports non-standard, cloned, illegal (unregistered) IMEIs with daily scheduled jobs such as Grey List counter processing, CDR analyzing processes, Cell Id coordinate jobs and scheduled reports.

TERM periodically or instantly updates the operators' EIR database after an operation causes a List Change for full synchronization.

TERM has user friendly web based graphical user interfaces (GUI) for the Authorities as well as user friendly web pages enabling subscribers to carry out:

- Personal Import Registration
- Call Centre Lock/Unlock IMEI
- Querying the status (whether it is legal or illegal) of any IMEI

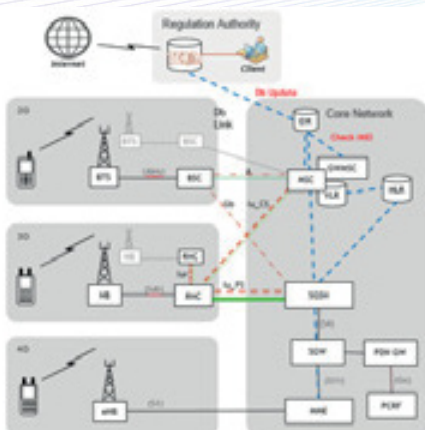


TERM



TERM Functions:

- Detection of GSMA registered valid IMEIs.
- Customization according to Telecom Regulatory Authority requirements.
- Enhanced SIM Box detection capability.
- Enhanced Reporting possibilities allowing the users creating their reports dynamically
- Enhanced Log Tracing system for every single transaction.
- Level based user management possibilities including out-of-authority users such as Importers Module or PIRM users.
- User based, access permission based and IP based system security.



IMEI tracing capability based on history evaluated from CDRs

- IMEI used by all MSISDNs
- MSISDN used by all IMEIs
- First / Last usage dates





Portable Numbers System

The platform provides centralized ordering, porting provisioning and number administration information for ported numbers,

TTG's MNP solution consists of a HW & SW platforms including:

- Centralized Reference Database
- Repository for Ported Numbers
- Interface Processes which provide;
 - Centralized ordering
 - Porting Provisioning
 - Number Administration Information for Ported Numbers
- Centralized Porting Message exchange between operators;
 - WEB Service
 - Two Processes of Porting Cycle;
 - INITIATION
 - ACTIVATION
- Porting Cycle to be completed typically in 4 days
 - Contractual / Financial Obligations to be settled
 - Timers are associated for compliance

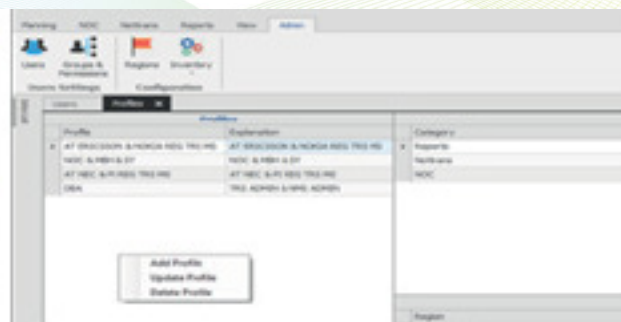


PORTUS



Main Features

- Reporting module allows users access a wide range of reports. Reporting administrator can create and schedule reports via the GUI
- Users can run the reports manually or can receive the scheduled reports via email

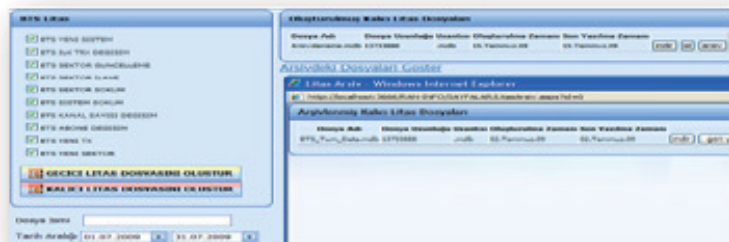




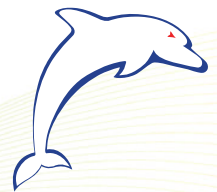
Information Reports for Telecommunication Authority -NETWORK

INFORTANT Provides monthly registration and reporting of systems belonging to telecommunications infrastructure operators (BTS-Base Station, GR-Repeater, RL-Radio Link). The main objective of the software is to ensure that the data of all the regions and systems used are collected in a standard format and aggregated into a single center. Users can input data via forms or they can import the data from an Excel or CSV files prepared in a certain format in batches. Users can then generate LITAS Access Files (Licensed Telecommunication Infrastructure Systems), required by telecommunications companies and authorities.

INFORTANT collects data from network as well as from other tools (OSS/BSS) to give a high level network inventory visibility from TRX, cell, NodeB, eNodeB, transmission and assigned frequencies in addition to visibility about monthly new additions, replace, remove, relocation activities within a month, quarterly and annually.

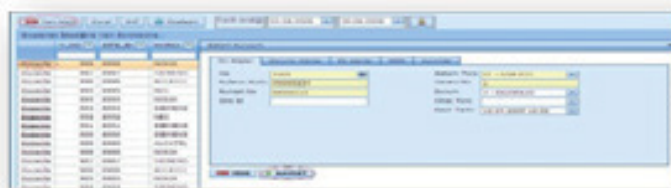


IMPORTANT



Main Features

- Structured Modules and Configurable design
- Admin and Login module
 - User control with profile and authority description
 - Logging of user actions
 - User Settings
 - Subscriber Change
 - Group Processing
 - Definitions
- Ability to modify the algorithm if the BTK process changes
- Automatic data capture and control of data from systems
- Manual enter for importing site and transmission site inventory
- Ellips tool file converter module
- Export data through “mdb, excel, csv” format.
- Report Mode:
 - 6RL Distribution Report
 - Permanent Litas File
 - BTK Excel Reports





Q Management Of Wireless Systems

MOWS USE CASES

- Management of frequency allocation
- Management of applications and approvals
- Management of wireless devices locations
- Management of wireless device audits
- Management of complaints

MOWS MODULES & FUNCTIONS

BSM (Base Station Module) is used for the management of fixed or mobile base stations such as new base station applications, changing the data of any approved base station, approval process, uploading a new application/update request on behalf of specified Service Provider

MMRM (Maritime Mobile Radio Module) is used for the registration of Marine devices such as VHF radio devices, mobile satellite devices and Navigation radio devices.

SPM (Service Provider Module) is used for the management of wireless devices installed by Service Providers. Basically, used for:

- new installation of wireless device applications
- changing the data of any approved and installed wireless device
- Regulatory approval process
- uploading a new application/update request on behalf of specified Service Provider

RLM (Radio Link Transmission Module) is used for the management of RadioLink Transmission data used by Service Providers. Basically, used for



- new Radio Link Transmission applications
- changing the data of any approved Radio Link
- Regulatory approval process
- uploading a new application/update request on behalf of specified Service Provider

SPRM (Service Provider Registry Module) is used for the management of Service Providers. It is the main registry database where base station or radio link modules are granted.

CAM (Complaint & Auditing Module) is used for the management of complaints and audits of wireless devices such as new complaint incident, inserting the complaint results, scheduling an audit, inserting the results of an audit

QEM (Quarterly Evaluation Module) is used for the management of quarterly declared Service Provider data evaluation.

CCM (Cost Calculation Module) is used for the management of annual costs of permitted wireless devices such as Marine Wireless Devices, Base Station or Radio Link Transmission. Basically, used for;

- listing and monitoring of annual costs and the payment status of these costs for Base Stations,
- RadioLink Transmissions etc. of their own
- listing and monitoring of annual costs and the payment status of these costs for Base Stations, RadioLink
- Transmissions or Marine Wireless Devices etc. for all Service Providers or Device owners

RM (Reporting Module) is used for creating, scheduling or assigning reports and allow user to export the reports any standard format such as word, excel, pdf, html, etc.

LTM (Log Tracing Module) is provide the system administrators the detailed logging capability of the system and troubleshooting any specific action

NM (Notification Module) is used for sending email notifications for pre-defined actions.

CM (Configuration Module) is used for listing and configuring the default settings of the modules.



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