

NET-7 Network Monitoring System



▶ The Key to Optimization and Increased Revenue

Designed to meet the most demanding requirements of both fixed and mobile network operators, NET-7 is a robust, non-intrusive monitoring system that reports all activities related to the messages exchanged by different network nodes.

NET-7's flexible, highly modular design offers network operators a scalable, cost-effective monitoring solution for SS7, GSM and GPRS networks:

- ▶ Complete monitoring system management and network supervision
- ▶ Traffic monitoring and analysis
- ▶ Signaling protocol test and traffic accounting
- ▶ Call and procedure trace
- ▶ Interconnection monitoring
- ▶ Roaming monitoring
- ▶ Mobility management analysis
- ▶ Intelligent network monitoring
- ▶ Fraud detection
- ▶ Easy-to-use Windows® interface
- ▶ Seamless integration with all Microsoft Office® applications
- ▶ Library of more than 150 protocols and protocol variants for both fixed and mobile 2G, 2, 5G and 3G networks

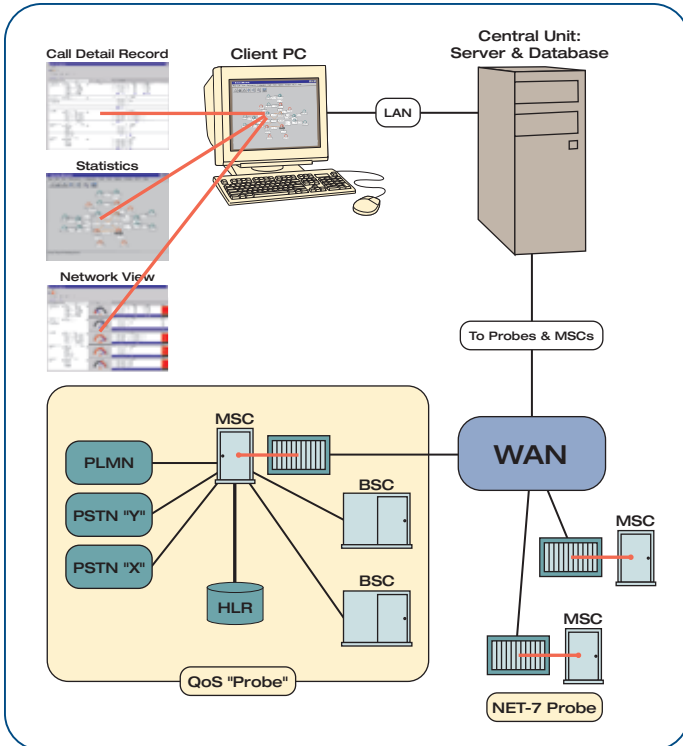
Features and Benefits

NET-7 enables you to maximize revenues and improve operational efficiency in the following ways:

- ▶ Prevent revenue losses due to fraud with proactive detection capabilities
- ▶ Minimize losses due to billing errors with accurate generation of customer Call Detail Records for every call and call attempt
- ▶ Locate and bill for previously unbilled services
- ▶ Increase customer satisfaction and reduce churn by delivering better Quality of Service (QoS)
- ▶ Build and strengthen your network's reputation for quality and enjoy smoother relations with regulators, other operators, and carriers
- ▶ Provide a comprehensive QoS solution to your Operations and Maintenance, Planning and Engineering, Quality, Marketing, Security and Billing departments
- ▶ Increase maintenance efficiency by centralizing operations and enabling fast, accurate troubleshooting and planning
- ▶ Increase revenue-per-customer by increasing network uptime

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► Application Brief



► GSM Network

System Architecture

NET-7 meshes seamlessly with current network architecture and can range from a small, single-site system with few links, to a fully distributed, multi-site system that has thousands of links. NET-7 is comprised of remote monitoring probes that connect the SS7, GSM and GPRS networks under observation to a Central Unit via a communications network (WAN with TCP/IP).

NET-7 links to the network at the Monitoring Site interface, located in a network node (e.g., local exchange, transit exchange, STP or MSC link, or databases such as SCP and HLR). Monitoring Sites—which can be distributed anywhere in the network—contain one or more racks equipped with:

- Monitoring probes equipped with different interface boards to access SS7, GSM, and GPRS network links
- Mass storage of raw signaling data
- WAN connectivity hardware (e.g., hubs and routers)
- GPS antenna(e)

Central Site

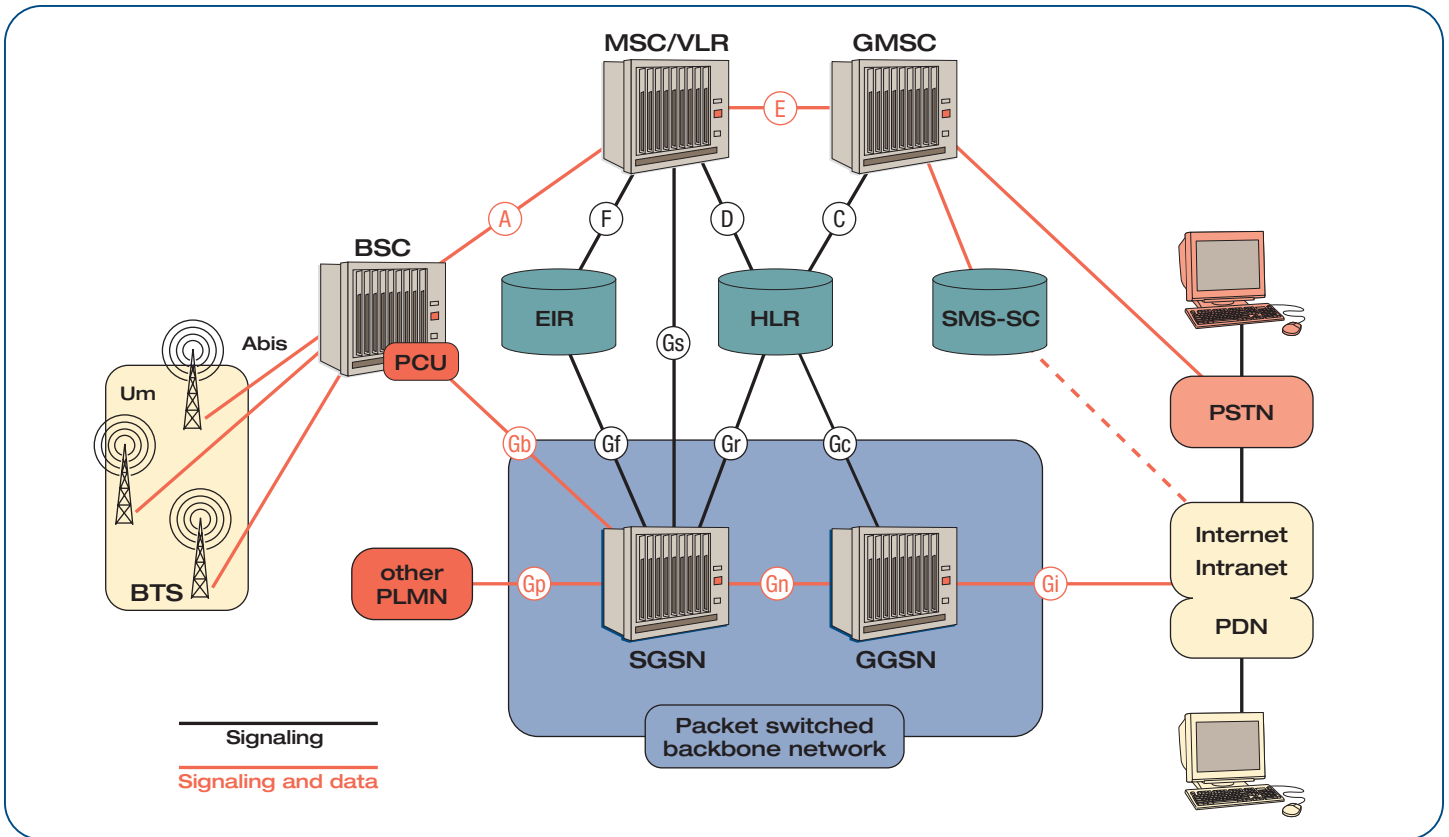
NET-7's Central Unit collects, analyzes and presents network data, displaying it to one or more users, who can be located at different user sites. To meet a wide range of potential system applications, a large number of user sites can be supported by a single Central Unit. The main functions of NET-7's Central Unit are:

- Management and control of all the monitoring probes
- System-wide measurement, data collection, correlation and storage
- Elaboration of network-wide information based on individual sites' data
- Data presentation to the user(s)
- Interface with other applications

The Central Unit provides the graphic user interface to control the system. It is comprised of a UNIX server equipped with an ORACLE® relational database and one or more Windows client workstations. Client workstations can be located either at the same site as the server, or in different geographic sites, connected to the server via a WAN.

The UNIX server is a SUN® SPARC server, the configuration of which depends on the number of monitored links, and the amount and type of applications being run. If more processing power is required, more servers can be used to share applications or database and network management functions.

Through the client workstation, NET-7 provides operators with a graphic representation of network activity. Multi-layered maps and alarm-management features help you pinpoint any major network problem in real time. You can obtain network-wide, correlated information, and you can troubleshoot by drilling down to a single event or element in the network.



► GPRS Network

Tapping Into a Wealth of Data

Data Collection

NET-7's monitoring probes provide simultaneous monitoring of SS7, GSM, and GPRS signaling data links, collecting and decoding signaling information and alarms. Connections to the telecommunications network are made through protected monitoring points, or at the Digital Distribution Frames level by means of T-pieces, which provide a high-impedance connection. The monitoring probes interface with the links in both directions.

NET-7's monitoring probes provide the following functions:

- Non-intrusive interface to E1/T1 and 10/100 Mb/s Ethernet signaling links
- Analysis of different SS7/GSM/GPRS/IN/CDMA/TDMA signaling protocols and protocol variants
- Decoding and storage of signaling data on a local hard disk

- Evaluation and storage of real-time statistics and counters
- Evaluation and storage of call- and transaction-related information
- Communication and synchronization with other monitoring probes for multi-protocol, distributed call trace
- Transmission of relevant information to the Central Unit

No user intervention is required for normal operation of this data collection system. Once a monitoring probe has been configured, it becomes completely autonomous, analyzing and storing data, which is then collected by the Central Unit.

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To facilitate the consolidation and interpretation of collected data, information about network structure is stored in the system, which allows NET-7 to determine such things as the origin and destination of each call. An optional feature enables operators to store raw data at the Monitoring Site using a file server with a large disk array. This enables operators to store every single protocol message unit for many days. Different Monitoring Probes access the same file server via the LAN, and both the Central Server and different clients can access this data without transferring large files in advance.

Data Synchronization and Correlation

Data collected by different Monitoring Probes needs to be synchronized across the entire network to ensure accurate interpretation. To do so, a GPS is provided for each of the Monitoring Sites so that information gathered by the Central Unit can be analyzed in the correct sequence.

To reconstruct information across the system, data correlation might be required among different Monitoring Probes. Once configured, Monitoring Probes can communicate with each other and build all the relevant information before sending it to the Central Unit—without any user intervention.

Data Analysis and Storage

Signaling information is decoded by NET-7 at different layers of the protocols to provide operators with both on-line, real-time information, and off-line analysis from recorded data. Statistical measurements and counters used to evaluate the performance of the signaling network are provided at different intervals, based on specific protocol messages. Call- or transaction-related information is also provided by the system to enable the generation of Call Detail Records for every call attempt or procedure in the network.

Data storage can occur either in the Central Unit, or locally in the Monitoring Probe hard disk, in order to protect data should any communication problems arise with the WAN. Local storage capability, coupled with data elaboration functions performed at the Monitoring Probe level, allows operators to reduce the amount of data transferred over the WAN.



► Network Operation Center

Elementary Network Information

The elementary information processed by NET-7 is SS7- and GPRS-specific signaling. By analyzing this flow, NET-7 Monitoring Probes are able to generate protocol data (dumps of MSUs), Call Detail Records (CDRs), statistic counters and alarms in real time.

MSUs

MSUs feed the protocol analysis and call-trace applications. Features include:

- All messages are time-stamped and displayed in real time to the operator, who can determine the level of detail at which the information is displayed
- Information can be stored for subsequent, off-line analysis
- Irrelevant information can be filtered out according to such parameters as message type and physical link
- Analysis processes can be triggered by certain conditions, specified by the operator

- With optional hardware equipment (raw data feature), every single protocol message can be captured and stored

CDRs

For analysis at the individual call level, complete CDRs are generated in real time at the end of the call and, optionally, at the call setup for each and every call. This allows top-down analysis for maintenance purposes, and enables operators to identify problems such as wrong network configurations, interworking problems, circuit blocking, and so on.

Operators can focus their troubleshooting efforts by choosing which CDRs to display. For example, in one instance, operators may wish to view only the CDRs of calls with no answer, while other situations may require that an operator view CDRs of calls with a transmission performance above or below a certain threshold, or calls related to a certain circuit group. CDRs can also be fed to external applications for various purposes, such as billing verification and fraud detection.

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Statistics

NET-7's statistic counters can be correlated with user-defined thresholds to generate alarms for specific events. These alarms can then be displayed on network maps and detected using the NET-7 alarm browser.

Data Visualization

Maps and Alarms

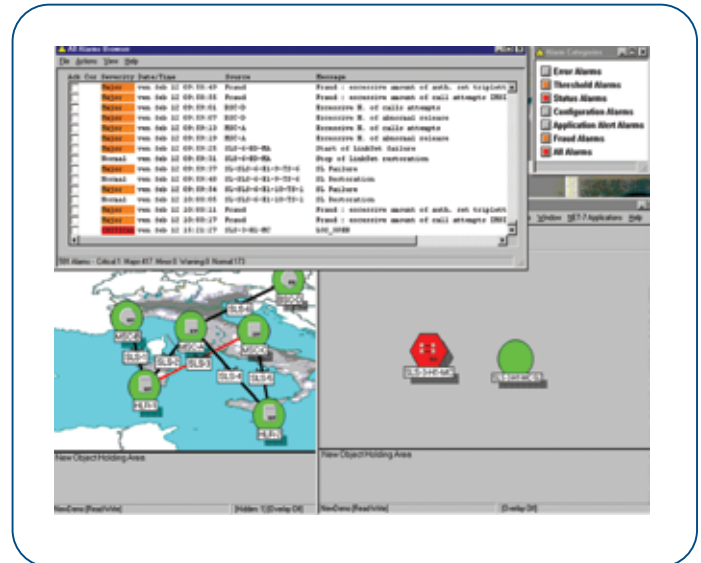
Based on the OpenView Network Node Manager, NET-7's map and alarm management system provides operators with a global view of network performance and behavior. Presented visually in a hierarchical format, these maps represent both the monitored and monitoring networks in terms of nodes and the connections between them.

Depending on the status of the network and/or the values of various parameters associated with a specific connection, operators can get a quick indication of a connection's status. An alarm browser is available to search and acknowledge alarms, the relative severity of which can be configured by the operator. By clicking on the maps of various network elements, operators can display all of the alarms associated with a specific element's status.

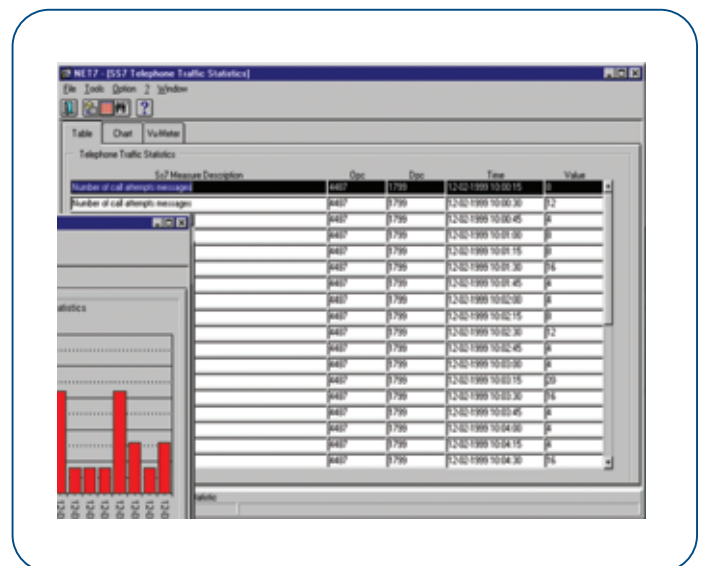
Other Reports: Tables and Graphs

Using elementary information like individual CDRs and SS7 statistical counters, NET-7 allows you to generate additional visual representations that can help you evaluate complex parameters and measures for different origins and destinations along the network.

Signaling and traffic information presented in tabular form or on a NET-7 map can also be displayed as a graphic diagram, giving you yet another way to interpret network data and discern behaviors. Information can be plotted according to many different parameters, depending on your needs, including performance variation according to the time of day, and performance variation according to the physical circuit or the destination of the calls. Information may also be aggregated according to such categories as interconnected network operator, direct customer, and so on.



► Alarm Browser



► Traffic Statistics

Applications

- ▶ Real-time status monitoring
- ▶ Traffic monitoring and signaling measurements
- ▶ Statistics BSSAP, MAP, Q.752, TTS
- ▶ Signaling accounting
- ▶ CDR (Call Detail Record) and TDR (Transaction Detail Record) generation
- ▶ Traffic analysis and profiling
- ▶ Quality of Service reports according E.422 recommendations
- ▶ Billing verification
- ▶ Protocol analysis
- ▶ Multi-protocol, network-wide procedure trace
- ▶ Fraud detection (e.g., excessive amount and/or duration of calls, user or destination black listing, and so on)
- ▶ Carrier/Destination traffic monitoring and analysis (QUATTRO Application)
- ▶ “Welcome” and personalized information message generation for roamers (SMS Ciao System)
- ▶ Performance analysis of Intelligent Network services
- ▶ Roaming supervision and SIM cloning detection
- ▶ Routing verification
- ▶ GPRS network optimization tools (NET-GPRS Application):
 - Protocol analysis
 - GPRS procedure trace

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For More Information

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You will find NET-7 pages under the network monitoring section.

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