SIEMENS

EWSD – for the New Network Generation

Technical System Description

As we stand on the threshold of the 21st century, major challenges are facing the world of telecommunications:

Competition is growing within the market
Subscriber traffic volume is increasing
The range of new services is expanding
Speech and data networks are growing together
Internet usage is increasing rapidly
Multimedia services present new opportunities

Switching the Future.

EWSD

Innovations

Siemens was quick to realize the direction in which telecommunications was developing. The digital electronic switching system EWSD was therefore given a major innovative overhaul and is now in a position to solve the telecommunications problems of tomorrow.

For network operators, EWSD represents the latest in communication technology, providing a fast and cost-efficient response to all the challenges facing the telecommunications markets.

EWSD implements all telecommunications applications on a proven hardware platform. This platform is a highly economical and reliable one and represents a sure investment for the future.

Network operators who choose EWSD choose continuity. EWSD is already the best-selling product of its type and is being used successfully in over 100 countries throughout the world. By the start of 1998, over 150 million access lines had been installed, which means that one in every five calls in the world is processed with EWSD technology.

EWSD is the solution for telecommunications requirements in the 21st century.

EWSD
The Proven Platform for Telecommunications Requirements

Network operators throughout the world are preparing for the challenges about to face telecommunications networks in the next century.

All the prerequisites for meeting these challenges are already available from EWSD, which provides the necessary functions on a common platform.

- EWSD PowerNode – for a more powerful and dynamic network

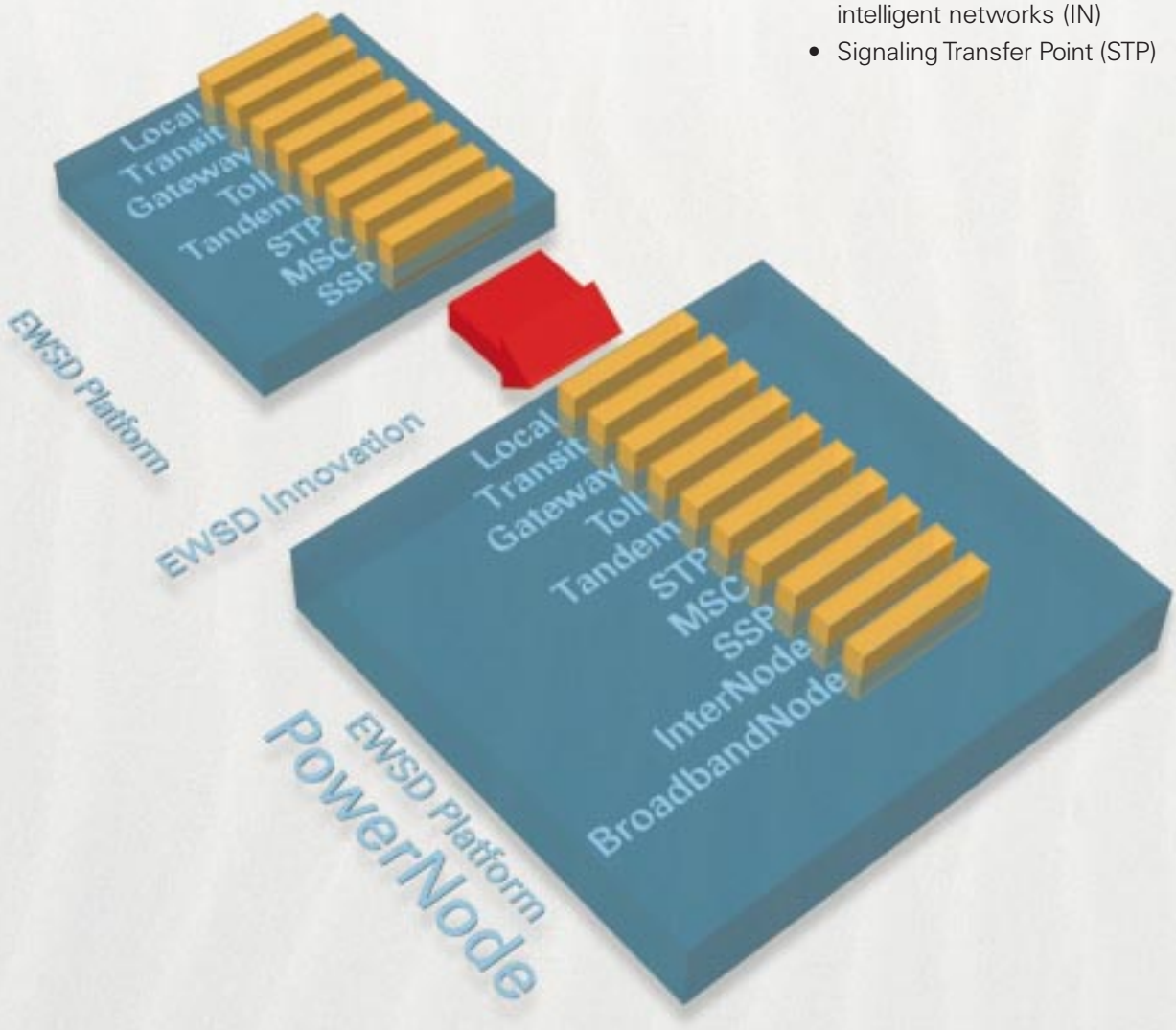
From the very beginning, EWSD was developed as an open system with a flexible hardware and software architecture. The EWSD Power Node is the logical continuation of this trend. It incorporates the powerful new EWSD hardware platform, on which both the new and the classical switching applications can run simultaneously. There are unlimited possibilities for future applications. The EWSD PowerNode offers a flexible, economic solution for all requirements resulting from different network structures and sizes.

The **new applications** implemented on the EWSD platform are:

- EWSD InterNode – to optimize Internet access
- EWSD BroadbandNode – the bridge to the world of multimedia services

The **classical applications** can also be used on the EWSD platform:

- Local network node
- Transit network node
- Network interworking node in fixed networks
- Mobile communication network node in mobile networks
- Service Switching Point (SSP) in intelligent networks (IN)
- Signaling Transfer Point (STP)



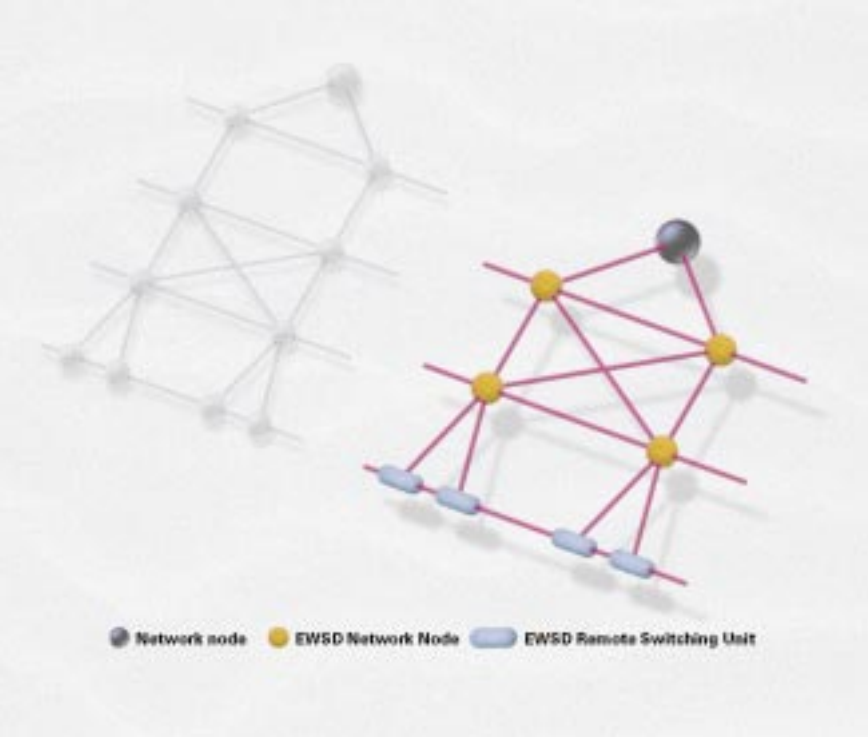
EWSD PowerNode

The **EWSD PowerNode** is the answer to the changes currently underway in network structure. With the EWSD PowerNode, the network can now attain the high power level it requires to deal with the rapid increase in subscriber traffic in conjunction with new services.

The change in network structure, i.e. network consolidation, is a result of the costs situation facing network operators. As networks become deregulated, competition is growing among the various telecommunications networks, and prices for existing services are falling all the time. Network operators are now trying to offset the effects of the lower prices by reducing their operating costs.

On the one hand, network consolidation means decreasing the number of network nodes and dismantling network hierarchies; however, it also results in control functions being centralized among a small number of network nodes. Existing analog network nodes or the smaller digital network nodes are being replaced by remote line units. Those network nodes that remain have to be powerful enough to take on the control of the subscribers at the remote line units.

The growing need for powerful networks is also due to an increase in subscriber traffic, which primarily results from the new communications services with transmission rates of up to 2 Mbit/s. These communications services include the integrated services digital network (ISDN), online services and the Internet, as well as services with n x 64 kbit/s.



The **EWSD PowerNode** has the capacity to cope with major network consolidation. It covers all network-node applications, such as those for local network nodes, transit network nodes and network interworking nodes.

The **EWSD PowerNode** can also be used as a mobile services switching center (MSC) in mobile networks or as a service switching point (SSP) in intelligent networks (IN). In addition, the PowerNode hardware can form a cost-efficient basis for a standalone signaling transfer point (STP).

While the individual system components are now much more powerful, the **EWSD PowerNode** is still based on the tried and tested hardware and software structure of EWSD. This means that existing EWSD network nodes can be easily upgraded to incorporate the more powerful components. Existing EWSD periphery can still be used with the **EWSD PowerNode**, so any investment in EWSD periphery retains its value.

One important element of the **EWSD PowerNode** is the remote switching unit (RSU), which covers the needs of the large remote line units.

EWSD InterNode

The **EWSD InterNode** integrates Internet technology into the EWSD system: it creates the basic conditions required for speech and data networks to grow together.

Network operators have the core competency to amalgamate their current communications processes with the Internet world. Also, with their existing network, they already have the ideal infrastructure for linking up to the Internet.

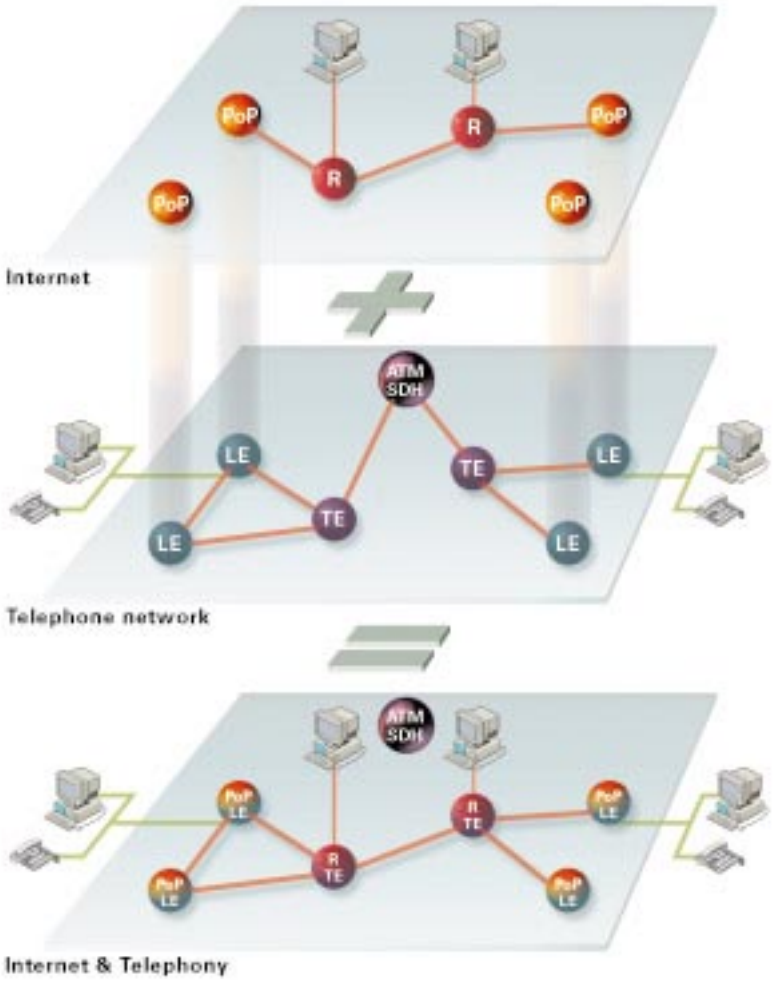
Through the Internet, network operators can themselves take on the role of Internet service provider, as well as opening up a completely new source of income by providing high bit-rate connections over the regular subscriber line.

The number of Internet users is multiplying throughout the world every year, with a corresponding increase in Internet traffic. New applications such as the World Wide Web (WWW), Voice over Internet and e-mail are also contributing to the growth in traffic.

In the network structure of the future, the **EWSD InterNode** links the telephone network to the Internet. The interface between subscribers and the Internet is formed by the point of presence (PoP), which is integrated in the **EWSD InterNode**. A common platform shared by the **EWSD InterNode** and EWSD PowerNode ensures common management, billing and optimum interworking of Internet users and telephone subscribers. The **EWSD InterNode** thus means low startup investment for Internet access as well as optimized operating costs.

The **EWSD InterNode** offers unrestricted access to Internet services. In addition, the **EWSD InterNode** provides value-added services that are only possible through a combination of the Internet and telephony.

Each subscriber with access to the Internet via the **EWSD InterNode** remains fully accessible by telephone during the Internet session. Meanwhile, the network operator benefits from a higher call rate and from additional call-charge income.



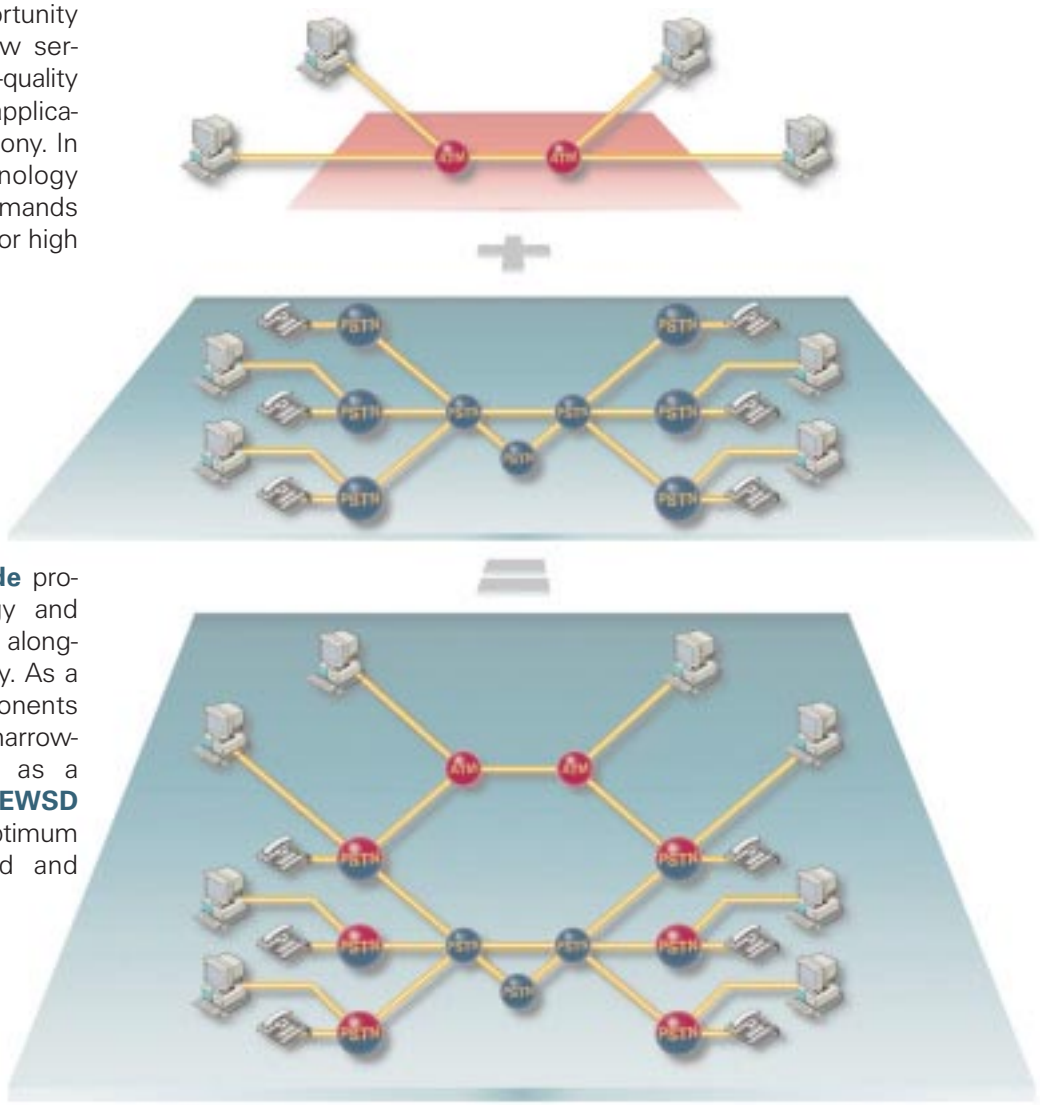
EWSD BroadbandNode

The **EWSD BroadbandNode** is the foundation stone for a future-oriented network in which various types of technology, such as ISDN in the public network (PSTN) and broadband communication, harmoniously operate together through the asynchronous transfer mode (ATM).

Broadband technology offers the network operator the opportunity to introduce completely new services, e.g. services with high-quality graphics and multimedia applications as well as videotelephony. In addition, broadband technology can meet subscribers' demands for shorter response times for high bit-rate applications.

A common hardware platform for narrow-band and broadband technology in the **EWSD BroadbandNode** ensures common management, billing and optimum interworking. The **EWSD BroadbandNode** requires low startup investment for broadband access while also ensuring optimum operating costs.

ATM subscribers and ATM trunks to other broadband networks can be connected cost-efficiently by means of the **EWSD BroadbandNode**. ATM lines are also available on the remote subscriber concentrators (DLU) and the remote switching unit (RSU).



The **EWSD BroadbandNode** provides ATM line technology and ATM switching technology alongside narrow-band technology. As a result, several system components can be used for both a narrow-band application as well as a broadband application. The **EWSD BroadbandNode** ensures optimum interaction of narrow-band and broadband technology.

Local network nodes

Local network nodes are used for switching the incoming and outgoing traffic for the subscribers connected. Up to 600,000 subscribers may be connected to an EWSD local network node.
To this end, EWSD offers the complete range of subscriber interfaces:

- analog lines
- ISDN basic accesses (ISDN-BA)
- ISDN primary rate accesses (ISDN-PA)
- V5.1 interface
- V5.2 interface
- high bit-rate lines universal asymmetrical digital subscriber line (UDSL), symmetrical digital subscriber line (SDSL)
- 2-Mbit/s high-speed lines

Subscribers are connected to the EWSD system by means of digital line units (DLU). Depending on the network situation, the DLUs can be positioned locally in the EWSD network nodes or as remote DLUs in proximity to the subscribers to be connected.

Within EWSD, the remote switching unit (RSU) assumes the function of large remote line units. The RSU can be used in the consolidation of traditional networks and also in the creation of new networks in place of small network nodes or DLU clusters. Up to 50,000 subscribers can be connected to an RSU. Internal traffic is switched through directly in the RSU. This reduces the load on the transmission equipment to the controlling EWSD network nodes. As a result, the transmission paths can be dimensioned in a cost-effective manner.

Transit network nodes

In the transit or long-distance network nodes, interregional traffic is switched to and from other network nodes. Up to 240,000 incoming, outgoing or bothway trunks may be connected to EWSD transit network nodes.

Signaling Transfer Point (STP)

Signaling transfer points transfer received signaling messages in quasi-associated signaling traffic to another STP or a signaling end point, on the basis of a destination address. No call processing is performed on the signaling messages in a signaling transfer point. The entire signaling traffic is handled solely via the message transfer part (MTP, levels 1, 2 and 3). User parts (level 4) are not involved, or are not even present in the STP. A signaling transfer point can be integrated in a network node or it can form a separate node in the signaling network. In the case of a stand-alone STP, only SS7 signaling channels are connected. There are no subscriber lines or trunks.

As a safeguard, signaling transfer points may be duplicated in an SS7 network (so-called "mated pairs"). This means that if one STP fails, the second STP can take over the whole traffic load. A backbone configuration is implemented on a higher SS7 network level as a general, network-wide safeguard. One variant of the stand-alone STP is the signaling relay point (SRP). The SRP also contains the SCCP global title translation function (GTT).

Network interworking nodes

Network interworking nodes are used for switching international and intercontinental traffic. They also form the point of connection to networks of other national operating companies and to mobile networks. EWSD includes all the functions required for this, such as international signaling, echo compensation for intercontinental connections and satellite connections as well as interadministrative billing.

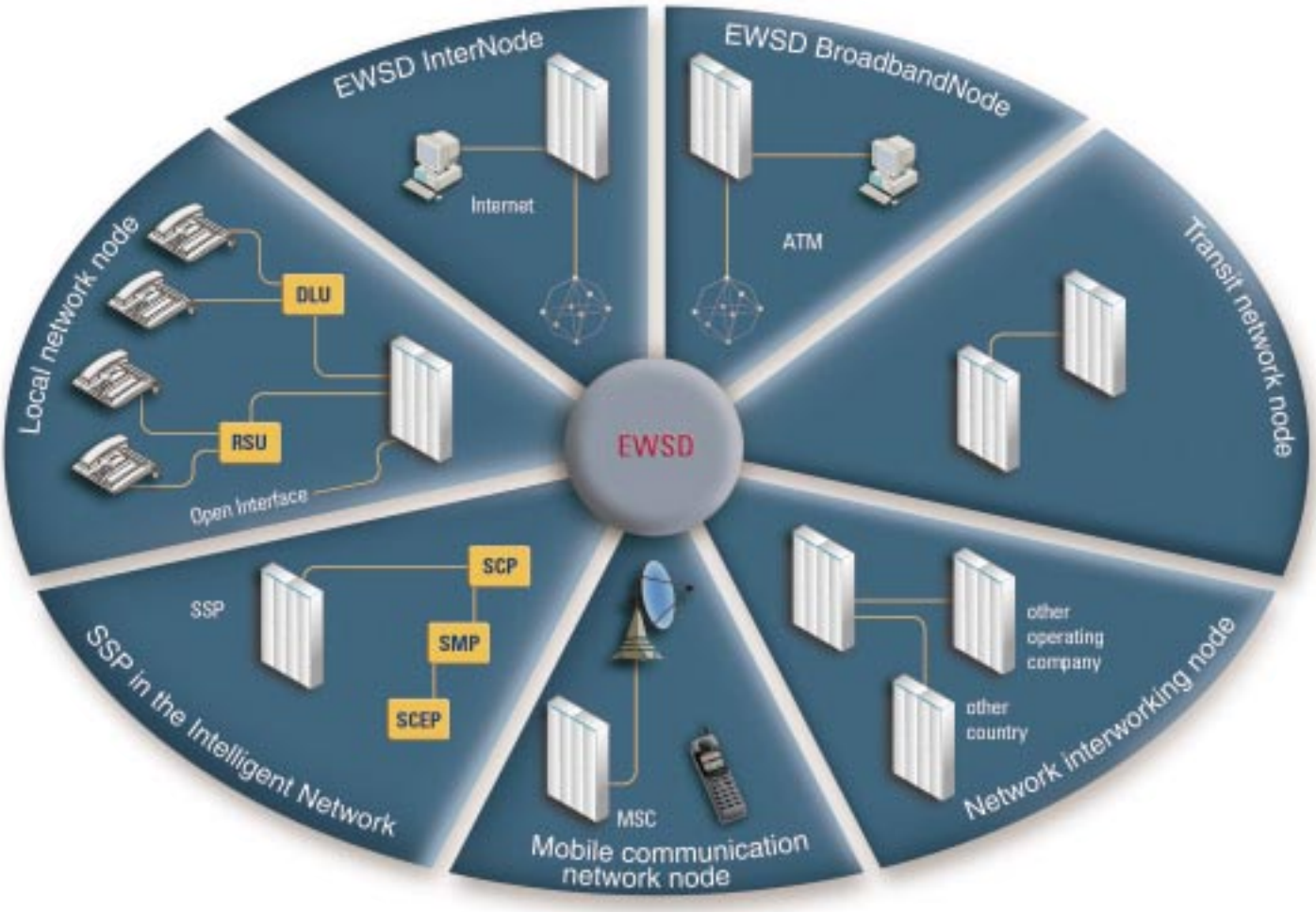
Combined network nodes

The functions of local network nodes, transit network nodes and network interworking nodes can be combined in a single EWSD network node. The number of subscriber lines and trunks to be connected is determined by the maximum traffic capacity of the particular network node. The maximum possible overall traffic load is 100,000 erlang.

Mobile communication network nodes

In the Siemens mobile communication system, EWSD assumes the functions of the switching subsystem (SSS). EWSD provides all the mobile-specific functions that are needed for operating a mobile communication network.

With the mobile services switching center (MSC), EWSD operates as a mobile communication network node in controlling the traffic within the mobile communication network and the traffic to the fixed network and to other mobile communication networks. The database function of the visitor location register (VLR) is implemented in the same network node.



network and to other mobile communication networks. The database function of the visitor location register (VLR) is implemented in the same network node.

There are separate EWSD network nodes for the database functions of the home location register (HLR) / authentication center (AC) and the equipment identification register (EIR). As one of the world's leading suppliers of telecommunications technology, Siemens offers a complete mobile communication solution under the name AirXpress.

Service Switching Point (SSP) in the intelligent network (IN)

The term intelligent network (IN) is used throughout the world to represent a network architecture in which services are controlled from a central location.

In the standardized architecture of an IN, EWSD is implemented as a service switching point (SSP). The EWSD-SSP thereby provides the service access function within the IN. EWSD network nodes at each network level can be easily equipped with the SSP functions: all that is required is a software expansion.

With its product portfolio, Siemens offers a complete IN solution under the name INXpress.

As an alternative to the conventional IN solution on several levels, EWSD also permits a reduced number of lucrative IN services on the basis of compact solutions on a single level.

EWSD
The Complete Range of Telecommunications Services from a Single Source

EWSD offers a complete range of services for all telecommunications sectors and applications. This means that a network operator using EWSD has a considerable advantage over rival operating companies.

Each service is accompanied by a wide range of features. By configuring its network to meet a specific market demand, the network operator can therefore stand out from the competition.

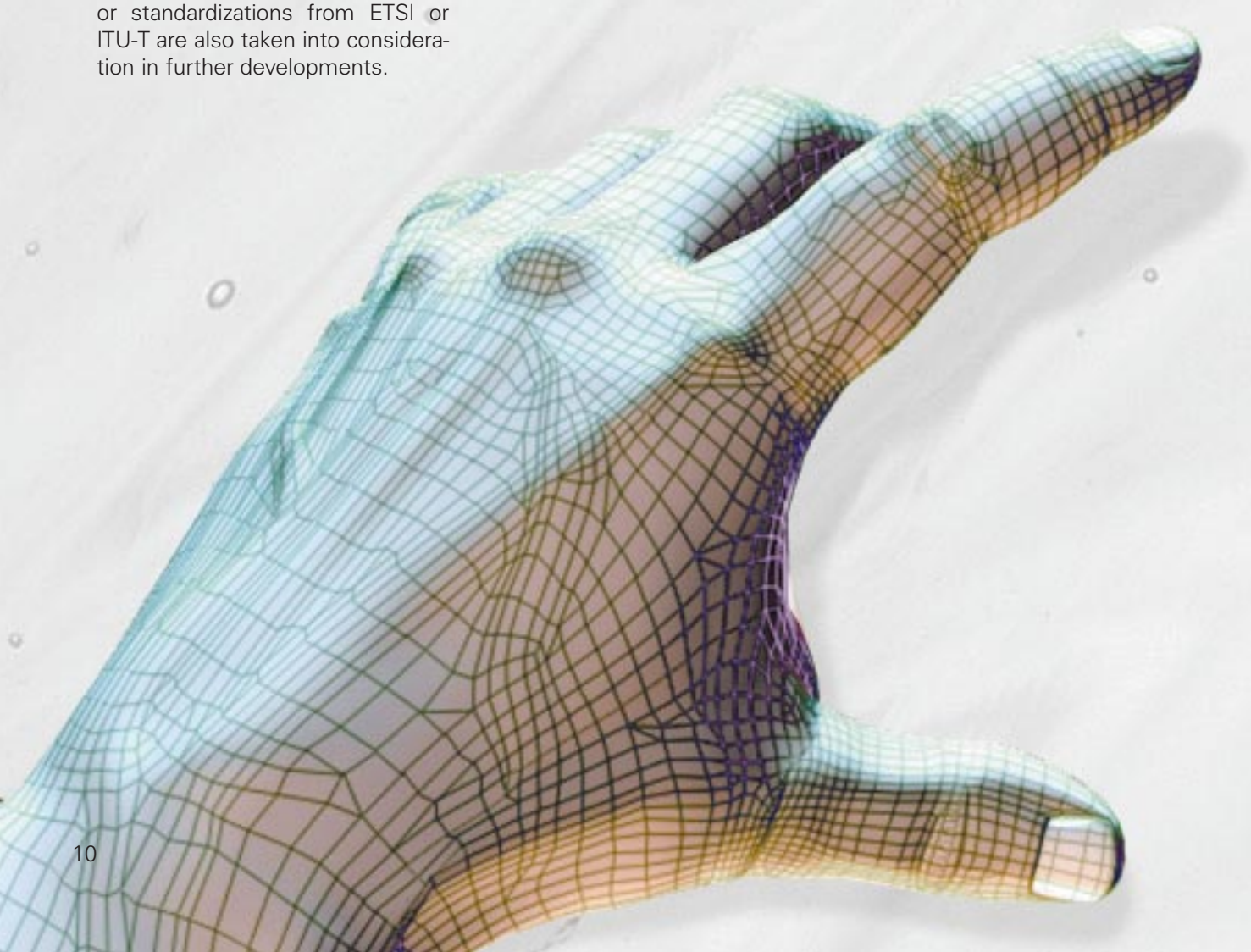
The EWSD feature spectrum was developed with market requirements in mind. In the future, the feature spectrum will continue to evolve in keeping with the growing needs of subscribers and network operators. Feature recommendations or standardizations from ETSI or ITU-T are also taken into consideration in further developments.

ADSS

The term advanced subscriber services (ADSS) refers to the feature spectrum made available to analog subscriber lines. Analog features facilitate the act of telephoning, improve subscriber accessibility, increase the level of user-friendliness, and help subscribers to cut their costs.

ISDN

The integrated services digital network (ISDN) offers a high-performance infrastructure for new telecommunications applications. Every ISDN subscriber is provided with two 64 kbit/s user channels and one 16 kbit/s signaling channel. In addition to telephony, an ISDN line can also be used simultaneously for data services such as image transmission and data transmission. A wide range of features is available to ISDN subscribers.



GeoCENTREX

GeoCENTREX is the EWSD product name for its central office exchange service. GeoCENTREX provides the function of private branch exchanges within EWSD. Using GeoCENTREX, analog subscribers as well ISDN subscribers and existing private branch exchanges can be integrated throughout the network in a virtual private branch exchange.

EWSD InterNode

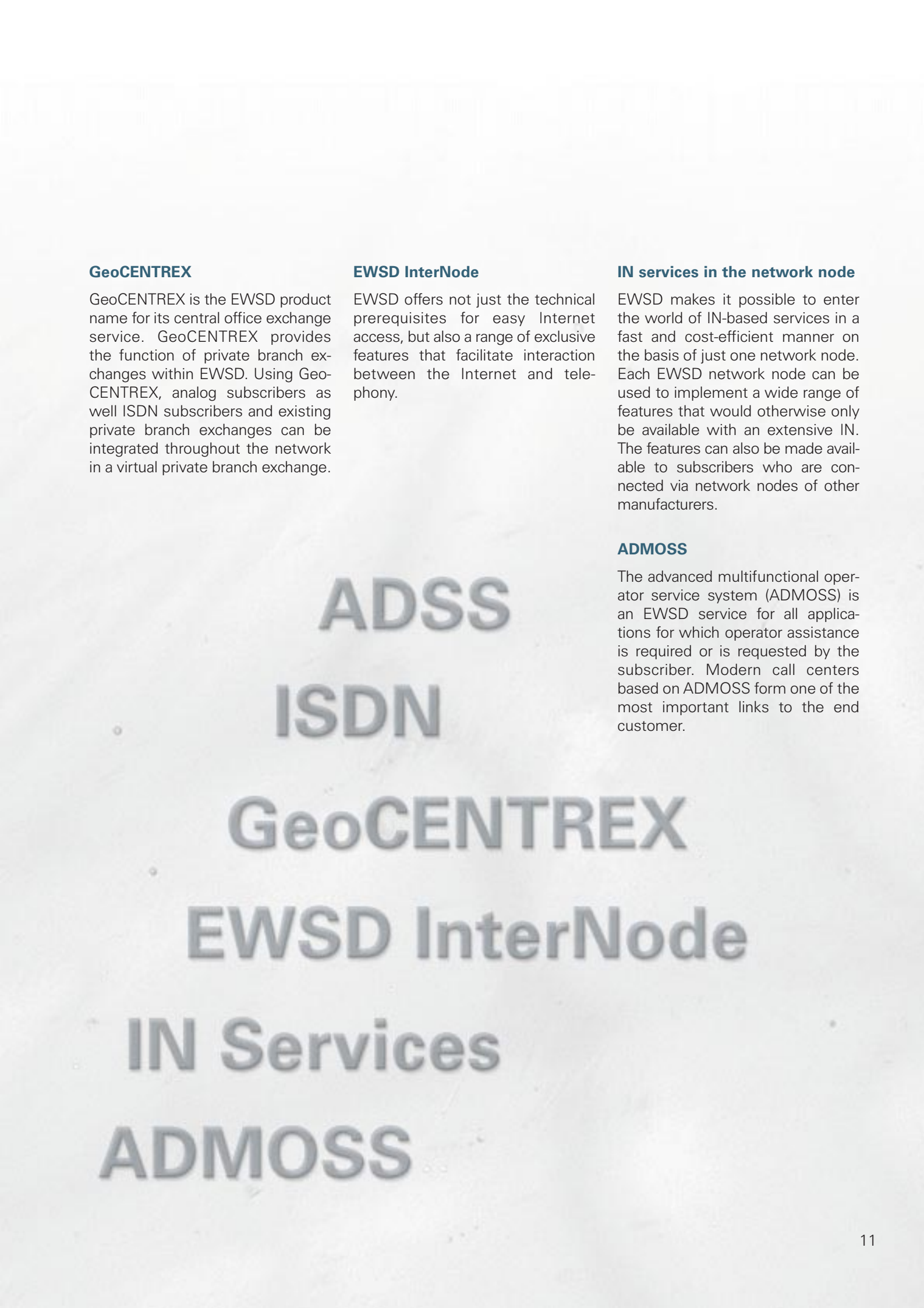
EWSD offers not just the technical prerequisites for easy Internet access, but also a range of exclusive features that facilitate interaction between the Internet and telephony.

IN services in the network node

EWSD makes it possible to enter the world of IN-based services in a fast and cost-efficient manner on the basis of just one network node. Each EWSD network node can be used to implement a wide range of features that would otherwise only be available with an extensive IN. The features can also be made available to subscribers who are connected via network nodes of other manufacturers.

ADMOSS

The advanced multifunctional operator service system (ADMOSS) is an EWSD service for all applications for which operator assistance is required or is requested by the subscriber. Modern call centers based on ADMOSS form one of the most important links to the end customer.



ADSS
Advanced Subscriber Services

The Advanced Subscriber Services (ADSS) provide EWSD with the entire spectrum of all analog features. Each network operator can now adapt its range of features to meet the specific needs of its customers.

Subscriber features for incoming calls

Using the **Call Forwarding (CF)** feature, a subscriber can forward incoming call requests to any desired destination.
Calls can be forwarded either immediately (Call Forwarding Unconditional, CFU), when there is no reply (Call Forwarding on no Reply, CFNR) or when the line is busy (Call Forwarding on Busy, CFB). When a subscriber has activated call forwarding, an announcement can be used to inform calling parties that their call request is being forwarded. For the individual call forwarding types CFU, CFNR, CFB, different call forwarding destinations can be reached independently of each other.

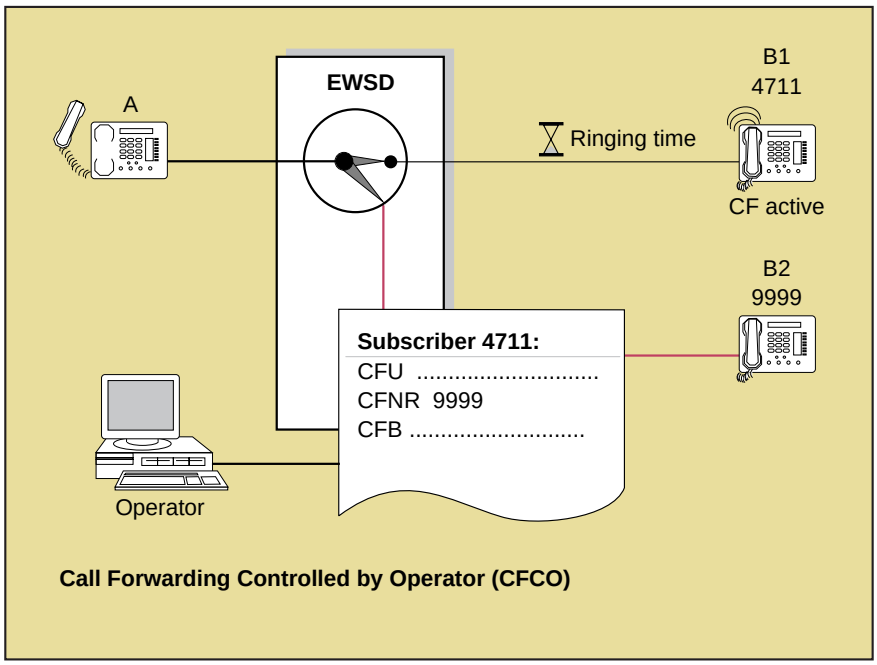
With the feature **Call Forwarding Controlled by Operator (CFCO)**, it is the operator who creates the destinations for a subscriber's call forwarding.

With the feature **Call Forwarding to a Fixed Announcement (CFFA)**, a subscriber can forward incoming calls requests to a specific announcement. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

With the feature **Call Forwarding to a Group of Announcements (CFGA)**, a subscriber can forward all incoming call requests to one of 15 possible announcements. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

With the feature **Call Forwarding to an Operator (CFO)**, a subscriber can forward all incoming call requests to an operator. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

With the feature **Call Forwarding to a Voice Mail Service (CFVMS)**, a subscriber can forward all incoming call requests to a voice mail system. Here, the calling party can leave a message. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.



Call Forwarding Controlled by Operator (CFCO)

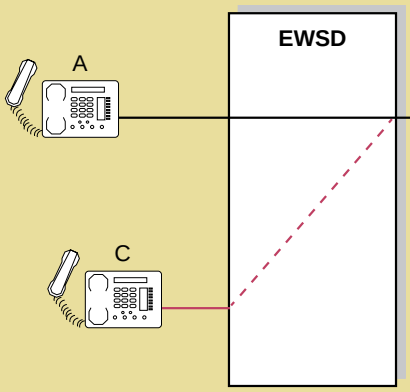
A subscriber using the feature Call Forwarding to a Voice Mail Service (CFVMS) can be notified of a new voice mail message by means of the feature **Message Waiting Indication (MWI)**.

The feature **Multiple Simultaneous Call Forwarding (MSCF)** supplements the Call Forwarding (CF) feature. Up to 10 incoming call requests can be forwarded simultaneously to a specified destination (e.g. to a voice mail service).

The **Call Waiting (CW)** feature makes it easier to reach a subscriber. This feature notifies a subscriber on an existing call that another party is trying to set up a connection to this line. The subscriber can then decide to accept or ignore the waiting call.

The **Call Waiting Deluxe (CWD)** feature is an extension of Call Waiting (CW). This feature provides the analog subscriber with more possible ways of reacting to waiting calls. For example, the subscriber can forward the call, set up a three-party conference, or hold either the incoming or the existing call and switch between the two.

In the **Distinctive Call Waiting (DCW)** feature, different call waiting tones enable the subscriber to differentiate between different types of waiting calls.
For instance, the subscriber can recognize forwarded calls or differentiate between national and international calls.



Possible reactions when CWD is active:

Incoming Call	Existing Call
ignore	hold
reject	hold
accept	terminate
accept	put on hold
put on hold	hold
set up a three-party conference	
forward	hold

Call Waiting Deluxe (CWD)

The **Distinctive Ringing (DR)** feature enables the subscriber to differentiate between certain types of connections by means of different ringing sequences.
For instance, the subscriber can recognize forwarded calls or differentiate between national and international calls.

If a subscriber does not wish to be disturbed, the **Do Not Disturb (DND)** feature can be activated to forward incoming calls to a different destination, e.g. a general announcement.

With the feature **Multiple Subscriber Number (MSN)**, up to four different directory numbers can be assigned to one line. EWSD treats each multiple subscriber number as an independent directory number to which features can also be assigned on an individual basis.
Using the **Different Ringing** feature, calls to each individual directory number can be signaled with different ringing sequences.

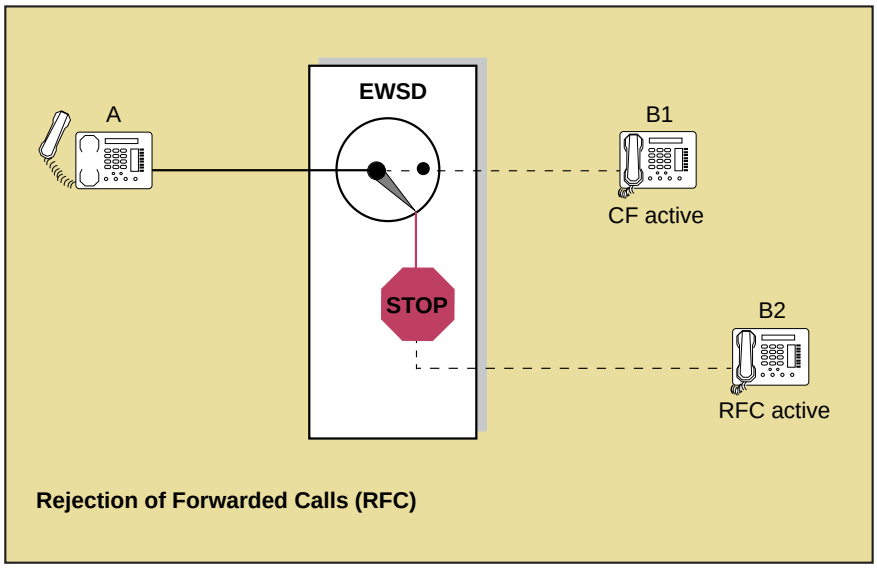
The feature **Parallel Ringing (PRNG)** simultaneously signals calls to two separate lines belonging to the same subscriber, e.g. a fixed line in the PSTN and a mobile number. The subscriber can accept the call on either of the two lines.

The feature **Rejection of Forwarded Calls (RFC)**) enables subscribers to automatically reject call requests forwarded to them.

With the feature **Selective Call Acceptance (SCA)**, only those call requests from certain defined directory numbers are connected through to the line. All other call requests are rejected. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

Using the feature **Selective Call Forwarding (SCF)**, call requests from defined directory numbers or with specific prefixes can be forwarded to any destination. Similarly, call requests from defined directory numbers or with specific prefixes can be excluded from call forwarding. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

With the feature **Selective Call Rejection (SCR)**, call requests from certain defined directory numbers are rejected. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.



Rejection of Forwarded Calls (RFC)

With the feature **Selective Call Waiting (SCW)**, waiting call requests from defined directory numbers are indicated to the called subscriber by means of different call waiting tones. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

With the **Selective Ringing (SR)** feature, call requests from certain defined directory numbers are signaled to the analog subscriber by means of different ringing sequences. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

WIth the feature **Series Completion Service (SCS)**, a group of directory numbers can be created for a subscriber (individual line or PBX). If the subscriber is called but is busy, the call request is automatically forwarded sequentially to an available subscriber within the directory number group.

Subscriber features for outgoing calls

With the **Abbreviated Dialing (ABBD)** feature, a subscriber can draw up an individual abbreviated dialing list. The directory numbers chosen are assigned an abbreviated number in the list. The connection can then be set up by simply dialing the abbreviated number. During call setup, EWSD automatically converts the abbreviated number into the full directory number.

With the **Automatic Recall (AR)** feature, a called analog subscriber is able to initiate the last call that could not be set up originally (e.g. because the call was terminated by the calling party). The subscriber activates recall by dialing the appropriate feature code. EWSD then automatically sets up the recall connection.

If required, the subscriber using Automatic Recall can arrange for the directory number of the subscriber who is being re-called to be announced or displayed on an appropriate terminal.

The feature **Call Completion to Busy Subscriber (CCBS)** enables the subscriber to ring back automatically. The calling subscriber activates this feature when the called subscriber is busy. The network then indicates by means of recall as soon as the called party has become available. If the calling party accepts this ringback call, the EWSD automatically sets up the connection once again to the called subscriber.

The feature **Call Completion on no Reply (CCNR)** also enables the calling subscriber to ring back automatically. The calling subscriber activates this feature when the called party does not reply. The network then indicates by means of recall as soon as the called party becomes active again (e.g. when he/she is free again after initiating a call).
If the calling party accepts this ringback call, EWSD automatically sets up the connection once again to the called subscriber.

With the feature **Fixed Destination Call (FDC)**, also known as Hotline, a call can be made to a specific destination without having to dial. Call setup can begin as soon as the handset is lifted or after a predefined period of time.

With the feature **Selective Call Originating (SCO)**, call setup can be suppressed to certain defined directory numbers (black list functionality) or, alternatively, calls are only permitted to defined directory numbers (white list functionality). The black list/white list functionality can be administrated for each individual subscriber.

An analog subscriber can use the **Subaddressing (SUBA)** feature, for example, to reach a specific terminal of an ISDN subscriber.

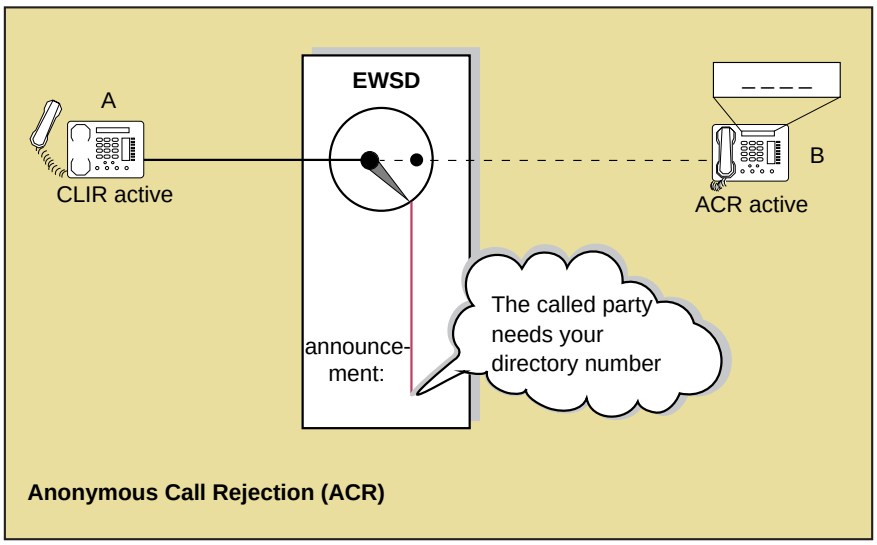
The **Call Barring** feature enables the subscriber to protect his or her line from unauthorized use. The operating company can specify up to 32 traffic restriction classes, from which the subscriber is free to choose a suitable one. In addition, a code-dependent restriction is also possible for prevention of unauthorized feature usage on a line.

Display features

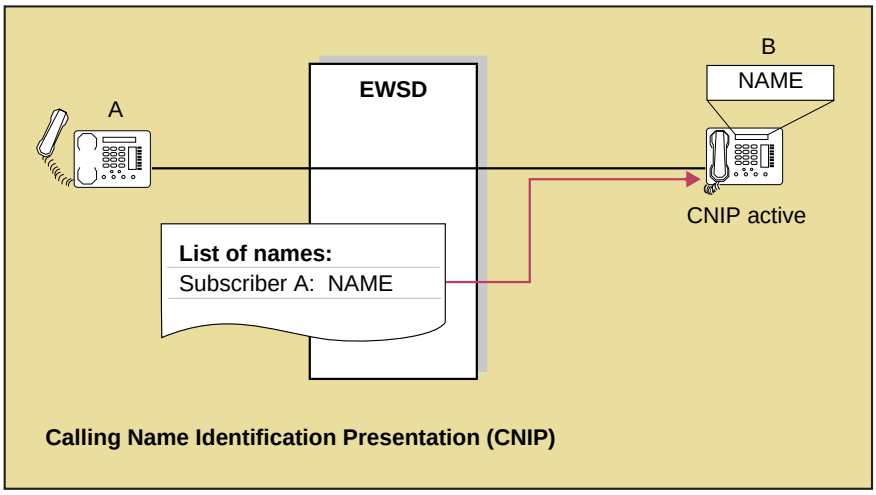
With the feature **Anonymous Call Rejection (ACR)**, a subscriber can automatically reject a call request if a calling subscriber suppresses display of his or her directory number. In this case, the calling subscriber hears a special tone or an announcement indicating incomplete call setup.

With the feature **Called Line Identification Restriction (CALR)**, an analog subscriber who has activated call forwarding can suppress display of his or her directory number at the forwarding destination.

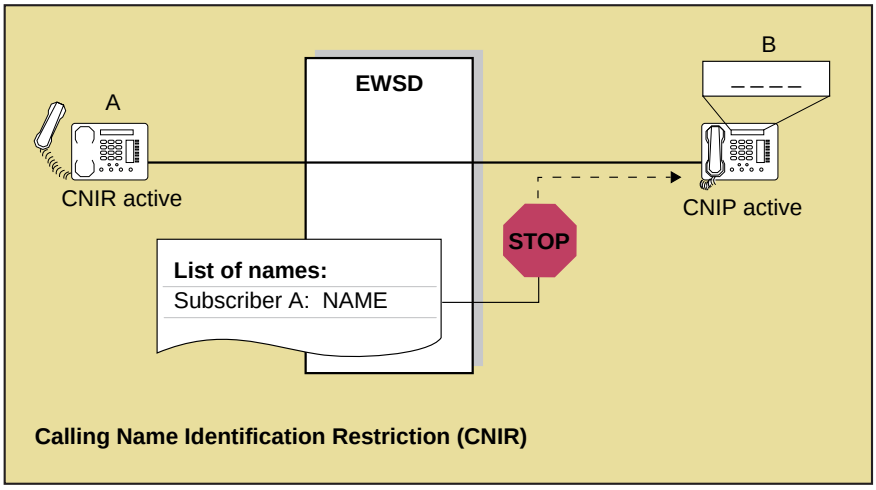
With the feature **Calling Line Identification Presentation (CLIP)**, a called subscriber can request display of the calling party's directory number.



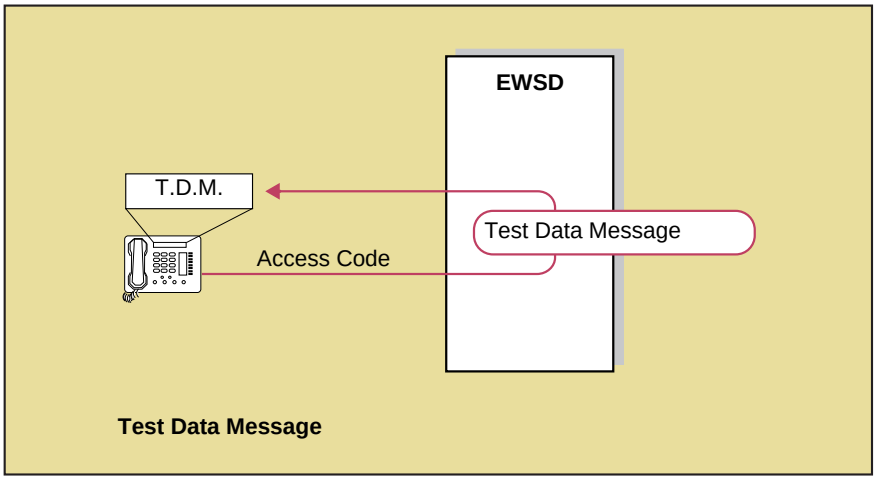
Anonymous Call Rejection (ACR)



Calling Name Identification Presentation (CNIP)



Calling Name Identification Restriction (CNIR)



Test Data Message

With the feature **Calling Line Identification Restriction (CLIR)**, calling subscribers can suppress display of their directory number for the called subscriber. Certain subscriber groups (e.g. police) can be assigned special permission authorizing them to ignore such suppression.

With the feature **Calling Name Identification Presentation (CNIP)**, a called subscriber can have the calling party's name displayed. For this feature, the subscribers' names must have been stored in the network node of the calling subscriber.

With the feature **Calling Name Identification Restriction (CNIR)**, a calling subscriber can suppress display of his or her name for the called subscriber. Certain subscriber groups (e.g. police) can be assigned special permission authorizing them to ignore such suppression.

With the feature **Connected Line Identification Restriction (COLR)**, a called subscriber can suppress display of his or her directory number for the calling subscriber.

The feature **Calling Line Identification for Waiting Subscribers (CLICW)** expands the possibilities of the Call Waiting (CW) feature. The subscriber receiving the waiting call is shown the directory number of the waiting subscriber as additional information.

With the **Test Data Message** feature, analog subscribers can check the correct operation of their terminal display. The test message is sent in the on-hook state.

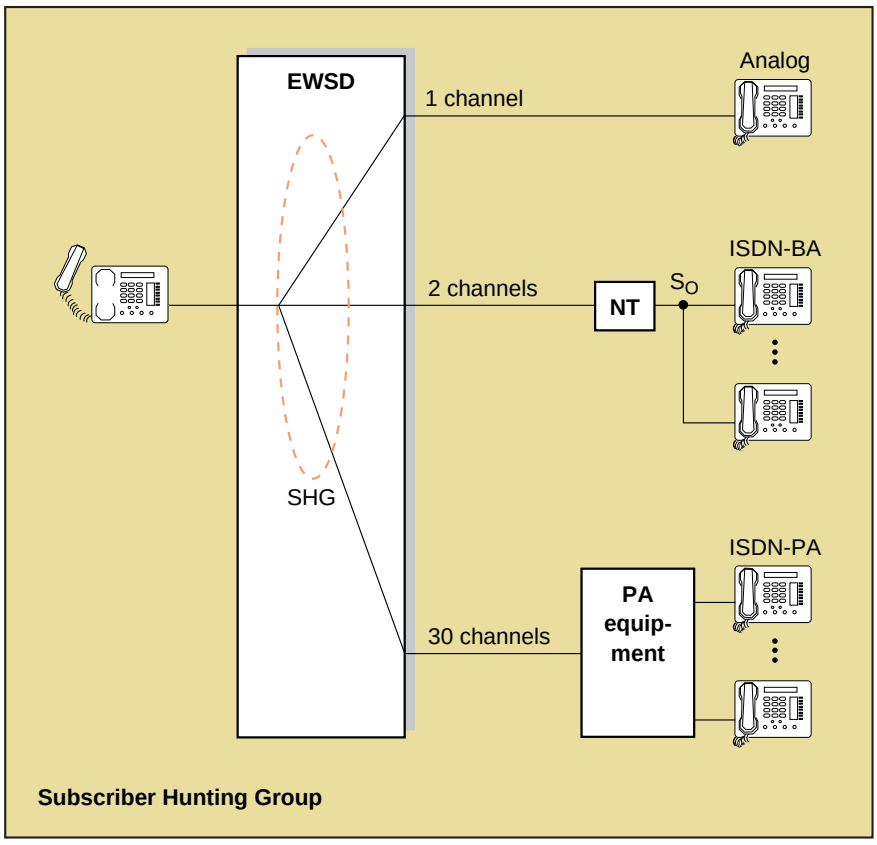
PBX features

The feature **Direct Dialing In (DDI)** permits direct inward dialing to subscribers hooked up to a private branch exchange (PBX). In this case, the calling subscriber dials the direct inward dialing number immediately after the PBX directory number.

The **Line Hunting (LH)** feature makes it possible to search for free lines in private branch exchanges. The search can be performed in various different orders, e.g. sequential search.

The feature **Subscriber Hunting Group** is an extention of the normal Line Hunting feature. It permits a network operator to combine existing subscribers having analog subscriber access, ISDN basic access and ISDN primary rate access in a subscriber hunting group. The following hunting principles are supported:

- sequential search
- circular search
- universial call distribution
- not sequential search



Subscriber Hunting Group

Conference features / Multi-party features

With the feature **Explicit Call Transfer (ECT)**, a subscriber can transfer calls to a third party. Before transfer, a connection must be set up to the third party. Call transfer for incoming calls is possible as soon as the telephone begins to ring.

The feature **Three-party Conference (TPC)** enables a subscriber to hold an existing call and to set up a connection to another subscriber. The initiating subscriber can switch back and forth between the two calls, terminate one of the calls or connect all calls to form a three-party conference.

With the feature **Large Conference (LC)**, up to 32 subscribers can be connected to form a single discussion group.

The **Telemeeting** feature makes it possible for subscribers to rent a private telephone conference circuit for a predefined period from the operator. The directory number for accessing the telephone conference is not public and is only given to the desired group of participants. Up to 7 parties can take part simultaneously in a telemeeting conference.

Call charge features

Using the feature **Automatic Verbal Announcement of Charges**, a subscriber can have the charges for the last call announced at the end of the call.

The feature **Reverse Charging System (RCS)** permits a calling subscriber to initiate a call for which the called subscriber is charged. A reverse-charge call is requested by means of a specific feature code. The called subscriber is informed that he or she is to be charged for the call.

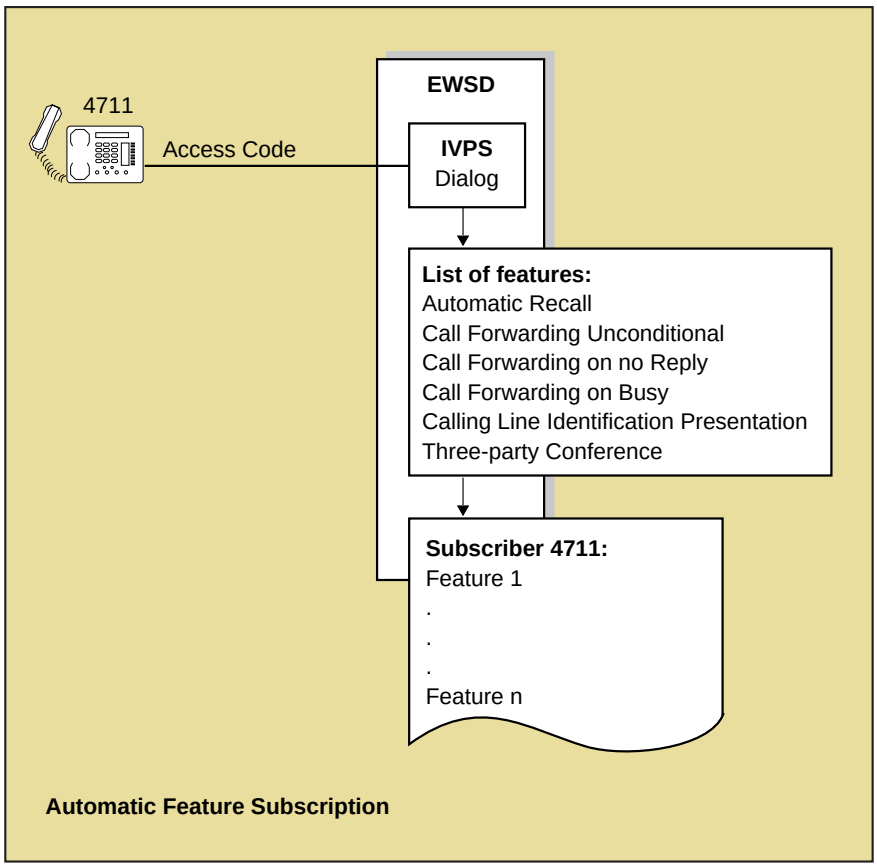
With the feature **Reverse Charge Call Rejection (RCCR)**, called subscribers (e.g. hotels) can protect their lines against calls for which they are expected to accept the charges.

With the feature **Subscriber Charge Indication**, a subscriber can have the charges incurred for a call transmitted in the form of meter pulses (12 kHz, 16 kHz). The subscriber must be equipped with a suitable terminal for display of this information.

Special subscriber features

With the feature **Alarm Call Service (ACS)**, a subscriber can receive a wake-up call at a time specified in advance. Such an alarm call is possible on a one-off basis or repeatedly at the same time over a number of consecutive days. In case of regular alarm calls, certain days of the week can be specified over consecutive weeks.

The feature **Automatic Feature Subscription** allows subscribers to assign themselves features from the feature package made available by the operating company. Feature administration takes the form of a user-friendly voice-controlled and announcement-driven dialog.



Automatic Feature Subscription

Individual lines (e.g. analog, ISDN) can be grouped together with the feature **Closed User Group (CUG)**. As a rule, subscribers in a closed user group are subject to certain traffic restrictions. This means that they can communicate with each other, but communication with subscribers outside of the closed user group is only possible with the appropriate authorization.

The **Feature Control Offline (FCOFF)** feature provides the subscriber with user-friendly feature control (activation, deactivation, status inquiry) with the help of a voice-controlled and announcement-driven dialog.

The **General Facility Reset (GFR)** feature enables the subscriber to reset various activated features by means of subscriber controlled input only.

With the **Keyword** feature, a subscriber can specifically protect his or her line. The subscriber can thereby prevent unauthorized feature usage on this line. Subscribers are free to administer their keyword themselves.

The feature **Malicious Call Identification (MCI)** is used to identify malicious or repeatedly annoying callers. The subscriber can activate this feature manually during an existing call or within a certain period of time following the end of the call. Automatic activation is possible immediately on call acceptance or as soon as the telephone starts ringing. If a specific directory number is under suspicion, callers can be monitored in respect of this particular number.

The feature **Nailed-up Connection (NUC)** provides semipermanent point-to-point connections between two lines.

The feature **Remote Control of Supplementary Services (RCSS)** provides subscribers with feature administration for their own line from any line within the network. This feature therefore provides the analog subscriber with remote control of the call forwarding features and of traffic restrictions.

The **Terminal Portability (TP)** feature allows a called subscriber to disconnect the terminal from one telephone socket and plug it into another socket within a predefined time during an active call. The connection remains intact.

The feature **Voice Data Protection** allows a subscriber to easily deactivate and reactivate those services (e.g. Call Waiting) that can interfere with data transmission (by injecting tones).

Operating company features

The **Access Barring** feature permits the operating company or the subscriber to block a line for incoming traffic, outgoing traffic or for all traffic. The following blocking variants are possible: Account Suspension, Maintenance Blocked, Request Suspension Originating, Request Suspension Terminating.

With the feature **Administrative Interception of Calls**, unsuccessful connections can be diverted to an operator, to an announcement or to a special information tone. This can happen, for instance, when a directory number has been changed or if the requested service is not available.

The feature **Coinbox Telephone Service** makes it possible to set up outgoing and incoming calls from public telephones. A special check can be made to ensure that the operation of these lines has not been impaired (e.g. as a result of damage).

The feature **Emergency Call Service (ECS)** supports fast and simple call setup in case of emergency, e.g. to the fire department or the police. After dialing a standard emergency number, the subscriber is automatically connected to the nearest emergency center. A subscriber can always set up a connection to the emergency number, even if his/her line is blocked for outgoing calls.

The **Line Lockout** feature is used to monitor lines for faulty behavior, e.g. permanent loop interruption.

With the **No Charge Calls** feature, the operating company can permit certain calls to be made without incurring any charges.

With the feature **Preference Category During Catastrophe**, the operating company can restrict outgoing traffic to certain priority subscribers (e.g. police, fire department, etc.) if necessary. Incoming traffic is not affected by this feature.

With the **Priority** feature, the operating company can provide preferential treatment for call setup to or from certain directory numbers. If all outgoing trunks are busy, the call attempt is automatically repeated at specified intervals.

With the **Trunk Offering** feature, the operator can intervene in an existing connection, for example, to offer a subscriber a waiting intercontinental call or to check the busy status of a subscriber line.

The feature **No Trunk Offering** can be used to prevent trunk offering.

ADSS feature spectrum

Subscriber features for incoming calls

- Call Forwarding (CF)
- Call Forwarding Controlled by Operator (CFCO)
- Call Forwarding to a Fixed Announcement (CFFA)
- Call Forwarding to a Group of Announcements (CFGA)
- Call Forwarding to an Operator (CFO)
- Call Forwarding to a Voice Mail Service (CFVMS)
- Message Waiting Indication (MWI)
- Multiple Simultaneous Call Forwarding (MSCF)
- Call Waiting (CW)
- Call Waiting Deluxe (CWD)
- Distinctive Call Waiting (DCW)
- Distinctive Ringing (DR)
- Do Not Disturb (DND)
- Multiple Subscriber Number (MSN), Different Ringing
- Parallel Ringing (PRNG)
- Rejection of Forwarded Calls (RFC)
- Selective Call Acceptance (SCA)
- Selective Call Forwarding (SCF)
- Selective Call Rejection (SCR)
- Selective Call Waiting (SCW)
- Selective Ringing (SR)
- Series Completion Service (SCS)

Subscriber features for outgoing calls

- Abbreviated Dialing (ABBD)
- Automatic Recall (AR)
- Call Completion to Busy Subscriber (CCBS)
- Call Completion on no Reply (CCNR)
- Fixed Destination Call (FDC)
- Selective Call Originating (SCO)
- Subaddressing (SUBA)
- Call Barring

Display features

- Anonymous Call Rejection (ACR)
- Called Line Identification Restriction (CALR)
- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)
- Calling Name Identification Presentation (CNIP)
- Calling Name Identification Restriction (CNIR)
- Connected Line Identification Restriction (COLR)
- Calling Line Identification for Waiting Subscribers (CLICW)
- Test Data Message

PBX features

- Direct Dialing In (DDI)
- Line Hunting (LH)
- Subscriber Hunting Group (SHG)

Conference features / Multi-party features

- Explicit Call Transfer (ECT)
- Three-party Conference (TPC)
- Large Conference (LC)
- Telemeeting

Call charge features

- Automatic Verbal Announcement of Charges
- Reverse Charging System (RCS)
- Reverse Charge Call Rejection (RCCR)
- Subscriber Charge Indication

Special subscriber features

- Alarm Call Service (ACS)
- Automatic Feature Subscription
- Closed User Group (CUG)
- Feature Control Offline (FCOFF)
- General Facility Reset (GFR)
- Keyword
- Malicious Call Identification (MCI)
- Nailed-up Connection (NUC)
- Remote Control of Supplementary Services (RCSS)
- Terminal Portability (TP)
- Voice Data Protection

Operating company features

- Access Barring
- Administrative Interception of Calls
- Coinbox Telephone Service
- Emergency Call Service (ECS)
- Line Lockout
- No Charge Calls
- Preference Category During Catastrophe
- Priority
- Trunk Offering
- No Trunk Offering

ISDN
Integrated Services Digital Network

The number of lines connected to the integrated services digital network (ISDN) is growing rapidly. EWSD provides its ISDN subscribers with a large number of user-friendly features. Compared with the ADSS feature range, ISDN features offer a wider scope of possibilities. They also include some additional features that are not possible with analog lines.

Bearer Services

The bearer services are responsible for network-wide transmission of information between two ISDN terminals. The transmission characteristics are in keeping with the OSI reference model (7-layer reference model for Open System Interconnection).

Bearer services are divided into the following circuit and packet-switched services:

- Circuit Mode, Speech
- Circuit Mode, 64 kbit/s unrestricted
- Circuit Mode, 3.1 kHz audio
- Packet Mode, Semipermanent B Channel Access
- Packet Mode, B Channel Access
- Packet Mode, Switched B Channel Access
- Packet Mode, D Channel Access

Teleservices

The teleservices are responsible for end-to-end communication. The communication functions include all transmission functions and communication protocols of the OSI reference model for controlling the different communication processes.

Teleservices are divided into:

- Telephony, 3.1 kHz
- Telephony, 7 kHz
- Teletex
- Telefax (Group 4)
- Videotex
- Videotelephony

Subscriber features for incoming calls

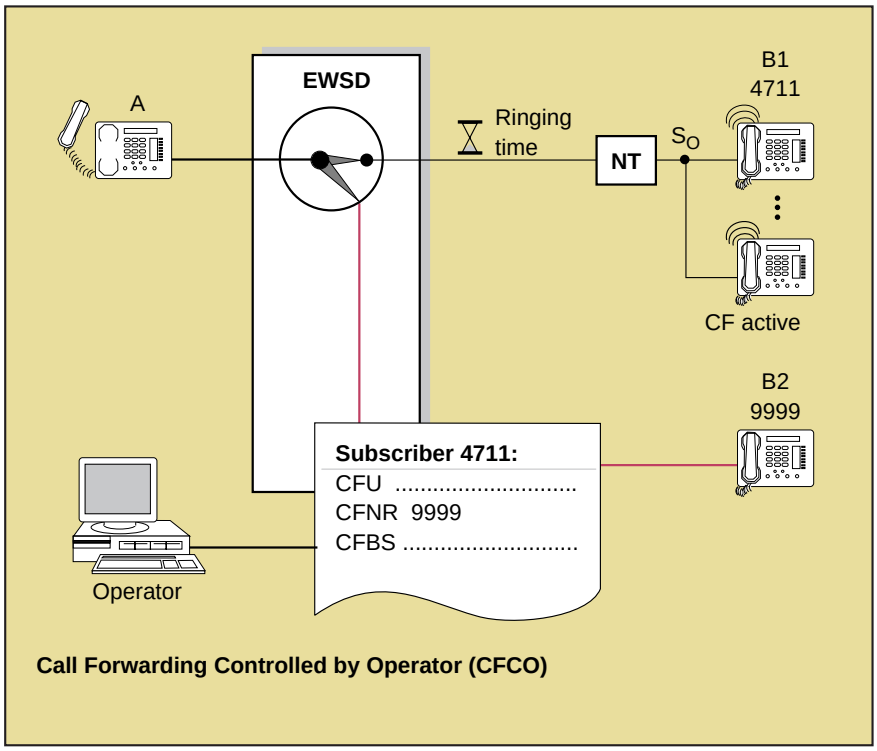
Using the **Call Forwarding (CF)** feature, a subscriber can forward incoming call requests to any desired destinations.
Calls can be forwarded either immediately (Call Forwarding Unconditional, CFU), when there is no reply (Call Forwarding on no Reply, CFNR) or when the line is busy (Call Forwarding on Busy, CFB). When a subscriber has activated call forwarding, an announcement can be used to inform calling parties that their call request is being forwarded. For the individual call forwarding types CFU, CFNR, CFB, different call forwarding destinations can be reached independently of each other.

With the feature **Call Forwarding Controlled by Operator (CFCO)**, it is the operator who creates the destinations for a subscriber's call forwarding.

With the feature **Call Forwarding to a Fixed Announcement (CFFA)**, a subscriber can forward incoming call requests to a specific announcement. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

With the feature **Call Forwarding to a Group of Announcements (CFGA)**, a subscriber can forward all incoming call requests to one of 15 possible announcements. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

With the feature **Call Forwarding to an Operator (CFO)**, a subscriber can forward all incoming call requests to an operator. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.



Call Forwarding Controlled by Operator (CFCO)

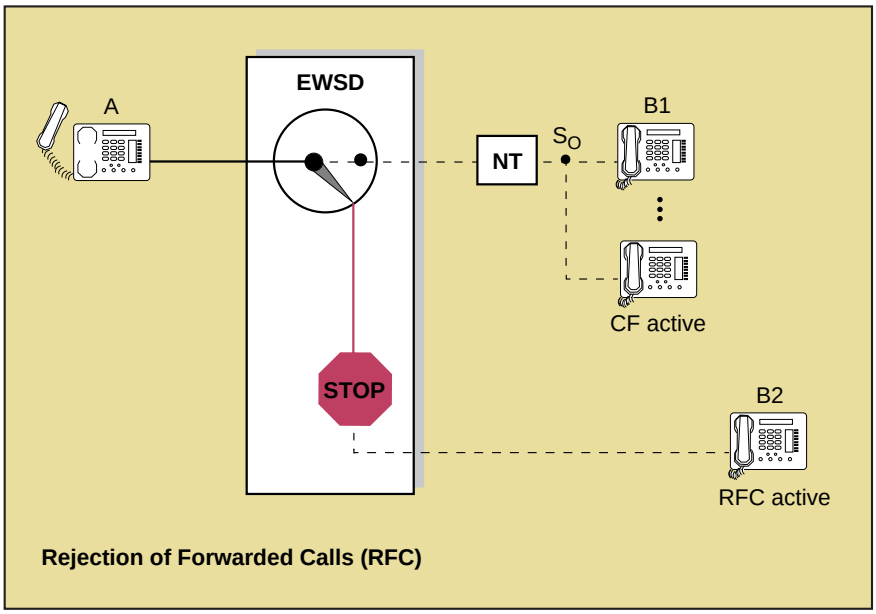
With the feature **Call Forwarding to a Voice Mail Service (CFVMS)**, a subscriber can forward all incoming call requests to a voice mail system. Here, the calling party can leave a message. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

A subscriber using the feature Call Forwarding to a Voice Mail Service (CFVMS) can be notified of a new voice mail message by means of the feature **Message Waiting Indication (MWI)**.

The feature **Multiple Simultaneous Call Forwarding (MSCF)** supplements the Call Forwarding (CF) feature. Up to 64 incoming call requests can be forwarded simultaneously to a specified destination (e.g. to a voice mail service).

The **Call Waiting (CW)** feature makes it easier to reach a subscriber. This feature notifies an ISDN subscriber with two busy channels that up to two other subscribers are trying to set up a connection to his or her line. The ISDN subscriber can then accept, reject or ignore a waiting call.

With the **Call Deflection (CD)** feature, incoming call requests are diverted to a previously defined subscriber if the called subscriber does not wish to accept the offered call. Forwarding can take place immediately, without ringing (as for Call Forwarding Unconditional, CFU) or after being requested by the called subscriber during the ringing phase. In case of call deflection on request, the subscriber can decide during the ringing stage whether to accept the call or to have it diverted. The ISDN subscriber can set up call deflection individually for every service and for every terminal connected to the basic access.



Rejection of Forwarded Calls (RFC)

If a subscriber does not wish to be disturbed, the **Do Not Disturb (DND)** feature can be activated to forward incoming calls to a different destination, e.g. a general announcement.

With the feature **Multiple Subscriber Number (MSN)**, up to 99 different directory numbers can be assigned to one ISDN access line. This makes it possible to reach the different specific terminals and services on a basic access line. EWSD treats each multiple subscriber number as an independent directory number to which features can also be assigned on an individual basis.

The feature **Parallel Ringing (PRNG)** simultaneously signals calls to two separate lines belonging to the same subscriber, e.g. a fixed line in the PSTN and a mobile number. The subscriber can accept the call on either of the two lines.

The feature **Rejection of Forwarded Calls (RFC)** enables subscribers to automatically reject call requests forwarded to them.

With the feature **Selective Call Acceptance (SCA)**, only those call requests from certain defined directory numbers are connected through to the line. All other call requests are rejected. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

Using the feature **Selective Call Forwarding (SCF)**, call requests from defined directory numbers or with specific prefixes can be forwarded to any destination. Similarly, call requests from defined directory numbers or with specific prefixes can be excluded from call forwarding. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

With the feature **Selective Call Rejection (SCR)**, call requests from certain defined directory numbers are rejected. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

With the feature **Selective Call Waiting (SCW)**, waiting call requests from defined directory numbers are indicated to the called subscriber by means of different call waiting tones. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

ISDN subscribers can use the **Subaddressing (SUBA)** feature to add additional digits to their standard ISDN directory number.
Callers can then use these additional digits, for example, to reach a specific terminal of an ISDN subscriber. The authorization for subaddressing can be specified individually for each service.

Subscriber features for outgoing calls

With the **Abbreviated Dialing (ABBD)** feature, a subscriber can draw up an individual abbreviated dialing list. The directory numbers chosen are assigned an abbreviated number in the list. The connection can then be set up by simply dialing the abbreviated number. During call setup, EWSD automatically converts the abbreviated number into the full directory number.

The feature **Call Completion to Busy Subscriber (CCBS)** enables the subscriber to ring back automatically. The calling subscriber activates this feature when the called subscriber is busy. The network then indicates by means of recall as soon as the called party has become available. If the calling party accepts this ringback call, EWSD automatically sets up the connection once again to the called subscriber.
For an ISDN subscriber, a waiting list can hold up to five unanswered calls.

The feature **Call Completion on no Reply (CCNR)** also enables the calling subscriber to ring back automatically. The calling subscriber activates this feature when the called party does not reply. The network then indicates by means of recall as soon as the called party becomes active again (e.g. when he/she is free again after initiating a call).
If the calling party accepts this ringback call, EWSD automatically sets up the connection once again to the called subscriber.
For an ISDN subscriber, a waiting list can hold up to five unanswered calls.

With the feature **Fixed Destination Call (FDC)**, also known as Hotline, a call can be made to a specific destination without having to dial. Call setup can begin as soon as the handset is lifted or after a predefined period of time.

With the feature **Selective Call Originating (SCO)**, call setup can be suppressed to certain defined directory numbers (black list functionality) or, alternatively, calls are only permitted to defined directory numbers (white list functionality). The black list/white list functionality can be administrated for each individual subscriber.

The **Call Barring** feature enables the subscriber to protect his or her line from unauthorized use. The operating company can specify up to 32 traffic restriction classes, from which the subscriber is free to choose a suitable one. In addition, a code-dependent restriction is also possible for prevention of unauthorized feature usage on a line.

Display features

With the feature **Anonymous Call Rejection (ACR)**, a subscriber can automatically reject a call request if a calling subscriber suppresses display of his or her directory number. In this case, the calling subscriber hears a special tone or an announcement indicating incomplete call setup.

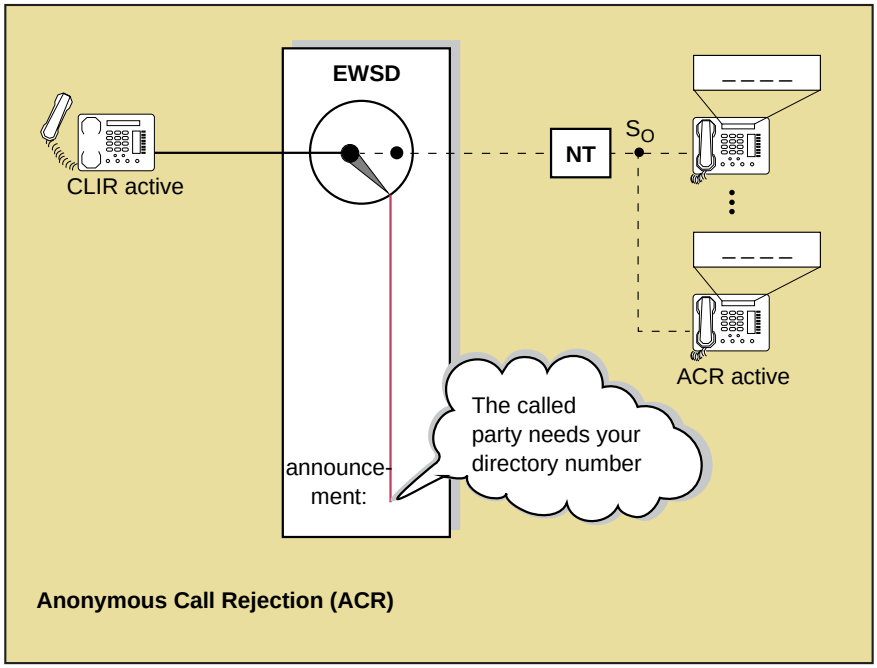
With the feature **Calling Line Identification Presentation (CLIP)**, a called subscriber can request display of the calling party's directory number.

With the feature **Calling Line Identification Restriction (CLIR)**, calling subscribers can suppress display of their directory number for the called subscriber. Certain subscriber groups (e.g. police) can be assigned special permission authorizing them to ignore such suppression.

With the feature **Connected Line Identification Presentation (COLP)**, a calling ISDN subscriber can request display of the called party's directory number.

With the feature **Connected Line Identification Restriction (COLR)**, a called subscriber can suppress display of his or her directory number for the calling subscriber.

The feature **User-to-User Signaling (UUS)** enables an ISDN subscriber to exchange certain additional information with another subscriber during call setup, call release or during the call itself. This information is transmitted over the D channel.



Anonymous Call Rejection (ACR)

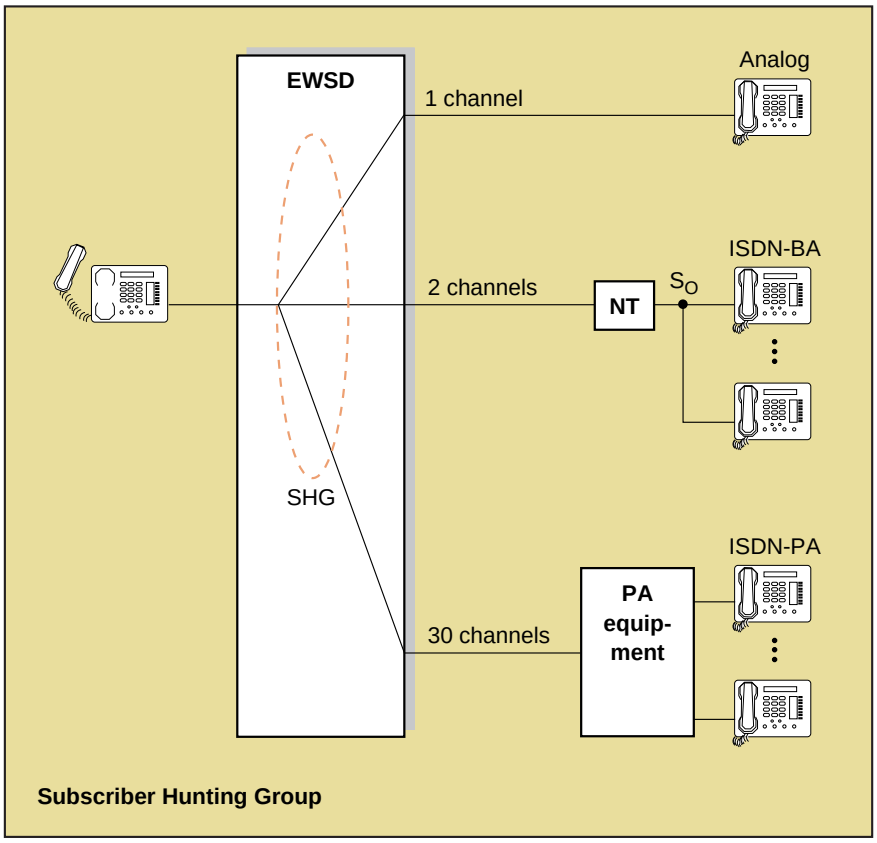
PBX features

The feature **Direct Dialing In (DDI)** permits direct inward dialing to subscribers hooked up to a private branch exchange (PBX). In this case, the calling subscriber dials the direct inward dialing number immediately after the PBX directory number.

The **Line Hunting (LH)** feature makes it possible to search for free lines on ISDN basic accesses or ISDN primary rate accesses to private branch exchanges. The search can be performed in various different orders, e.g. sequential search.

The feature **Subscriber Hunting Group** is an extention of the normal Line Hunting feature. It permits a network operator to combine existing subscribers having analog subscriber access, ISDN basic access and ISDN primary rate access in a subscriber hunting group. The following hunting principles are supported:

- sequential search
- circular search
- universial call distribution
- not sequential search



With the **Partial Rerouting** feature, an ISDN PBX subscriber can divert call requests from the PSTN to another destination in the PSTN.

The feature **Sharing of Primary Rate Access by Several PBXs** makes it possible to distribute an ISDN primary rate access over several private branch exchanges (PBX) with different pilot directory numbers.

Conference features / Multi-party features

The **Call Hold (CH)** feature enables an ISDN subscriber to interrupt an active call in order to set up a second call to another subscriber, to accept a waiting call or to initiate a supplementary service. The subscriber can then alternate between the active and the held connection

With the feature **Explicit Call Transfer (ECT)**, a subscriber can transfer calls to a third party. Before transfer, a connection must be set up to the third party. Call transfer for incoming calls is possible as soon as the telephone begins to ring.

The feature **Three-party Conference (TPC)** enables a subscriber to hold an existing call and to set up a connection to another subscriber. The initiating subscriber can switch back and forth between the two calls, terminate one of the calls or connect all calls to form a three-party conference.

With the feature **Large Conference (LC)**, up to 32 subscribers can be connected to form a single discussion group.

Call charge features

The feature **Advice of Charge (AOC)** permits an ISDN subscriber to be notified of the charges incurred for each individual call. The call charge information can be transmitted at the beginning of the call, during the call, and at the end of the call.

The feature **Reverse Charging System (RCS)** permits a calling subscriber to initiate a call for which the called subscriber is charged. A reverse-charge call is requested by means of a specific feature code. A display informs the called subscriber that he or she is to be charged for the call.

With the feature **Reverse Charge Call Rejection (RCCR)**, called subscribers (e.g. hotels) can protect their lines against calls for which they are expected to accept the charges.

Special subscriber features

With the feature **Alarm Call Service (ACS)**, a subscriber can receive a wake-up call at a time specified in advance. Such an alarm call is possible on a one-off basis or repeatedly at the same time over a number of consecutive days. In case of regular alarm calls, certain days of the week can be specified over consecutive weeks.

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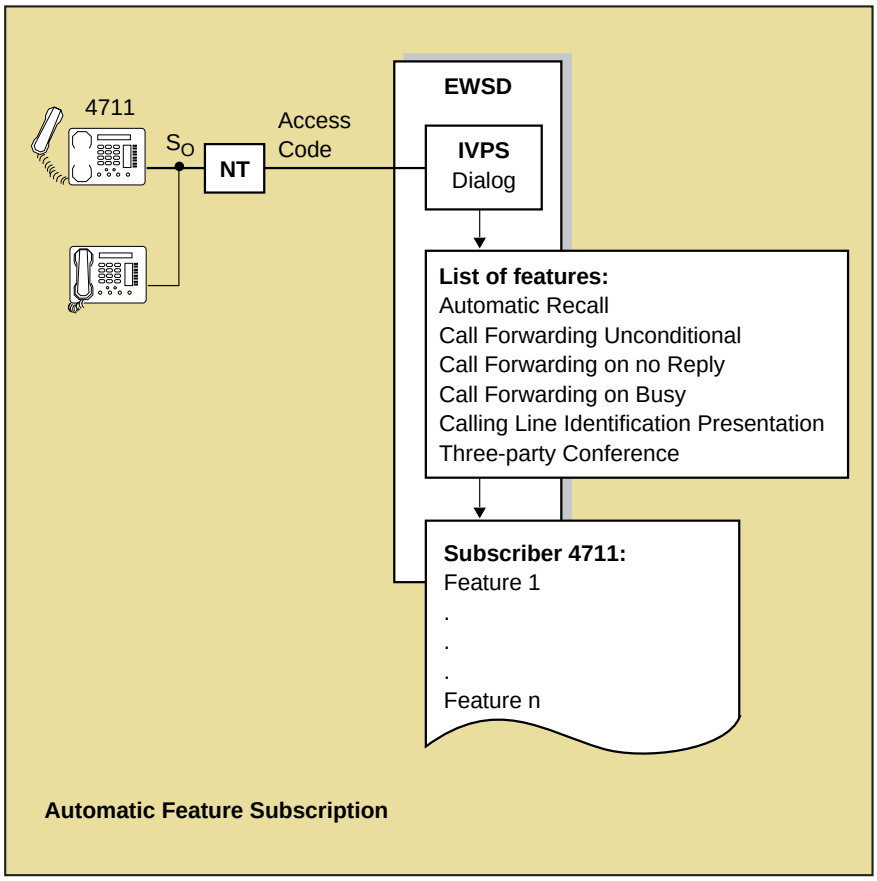

Automatic Feature Subscription

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The feature **Remote Control of Supplementary Services (RCSS)** provides subscribers with feature administration for their own line from any line within the network.

The **Terminal Portability (TP)** feature allows a called subscriber to disconnect a terminal from one telephone socket of an ISDN basic access and plug it into another socket within a predefined time during an active call. The connection remains intact.

Operating company features

The **Access Barring** feature permits the operating company or the subscriber to block a line for incoming traffic, outgoing traffic or for all traffic. The following blocking variants are possible: Account Suspension, Maintenance Blocked, Request Suspension Originating, Request Suspension Terminating.

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The feature **Emergency Call Service (ECS)** supports fast and simple call setup in case of emergency, e.g. to the fire department or the police. After dialing a standard emergency number, the subscriber is automatically connected to the nearest emergency center. A subscriber can always set up a connection to the emergency number, even if his/her line is blocked for outgoing calls.

The **Line Lockout** feature is used to monitor lines for faulty behavior, e.g. permanent loop interruption.

With the **No Charge Calls** feature, the operating company can permit certain calls to be made without incurring any charges.

With the feature **Preference Category During Catastrophe**, the operating company can restrict outgoing traffic to certain priority subscribers (e.g. police, fire department, etc.) if necessary. Incoming traffic is not affected by this feature.

With the **Priority** feature, the operating company can provide preferential treatment for call setup to or from certain directory numbers. If all outgoing trunks are busy, the call attempt is automatically repeated at specified intervals.

ISDN feature spectrum

Bearer Services

Circuit Mode, Speech

Circuit Mode, 64 kbit/s unrestricted

Circuit Mode, 3.1 kHz audio

Packet Mode, Semipermanent B Channel Access

Packet Mode, B Channel Access

Packet Mode, Switched B Channel Access

Packet Mode, D Channel Access

Teleservices

Telephony, 3.1 kHz

Telephony, 7 kHz

Teletex

Telefax (Group 4)

Videotex

Videotelephony

Mixed Mode

Subscriber features for incoming calls

Call Forwarding (CF)

Courtesy Call

Call Forwarding Controlled by Operator (CFCO)

Call Forwarding to a Fixed Announcement (CFFA)

Call Forwarding to a Group of Announcements (CFGA)

Call Forwarding to an Operator (CFO)

Call Forwarding to a Voice Mail Service (CFVMS)

Message Waiting Indication (MWI)

Multiple Simultaneous Call Forwarding (MSCF)

Call Waiting (CW)

Call Deflection (CD)

Do Not Disturb (DND)

Multiple Subscriber Number (MSN)

Parallel Ringing (PRNG)

Rejection of Forwarded Calls (RFC)

Selective Call Acceptance (SCA)

Selective Call Forwarding (SCF)

Selective Call Rejection (SCR)

Selective Call Waiting (SCW)

Subaddressing (SUBA)

Subscriber features for outgoing calls

Abbreviated Dialing (ABBD)

Call Completion to Busy Subscriber (CCBS)

Call Completion on no Reply (CCNR)

Fixed Destination Call (FDC)

Selective Call Originating (SCO)

Call Barring

Display features

Anonymous Call Rejection (ACR)

Calling Line Identification Presentation (CLIP)

Calling Line Identification Restriction (CLIR)

Connected Line Identification Presentation (COLP)

Connected Line Identification Restriction (COLR)

User-to-User Signaling (UUS)

PBX features

Direct Dialing In (DDI)

Line Hunting (LH)

Line Hunting, Reaching Single Devices by their MSN

Partial Rerouting

Sharing of Primary Rate Access by Several PBXs

Conference features / Multi-party features

Call Hold (CH)

Explicit Call Transfer (ECT)

Three-party Conference (TPC)

Large Conference (LC)

Call charge features

Advice of Charges (AOC)

Reverse Charging System (RCS)

Reverse Charge Call Rejection (RCCR)

Special subscriber features

Alarm Call Service (ACS)

Automatic Feature Subscription

Closed User Group (CUG)

Feature Control Offline (FCOFF)

General Facility Reset (GFR)

Keyword

Malicious Call Identification (MCI)

Nailed-up Connection (NUC)

Remote Control of Supplementary Services (RCSS)

Terminal Portability (TP)

Operating company features

Access Barring

Administrative Interception of Calls

Emergency Call Service (ECS)

Line Lockout

No Charge Calls

Preference Category During Catastrophe

Priority

GeoCENTREX
Central Office Exchange Service

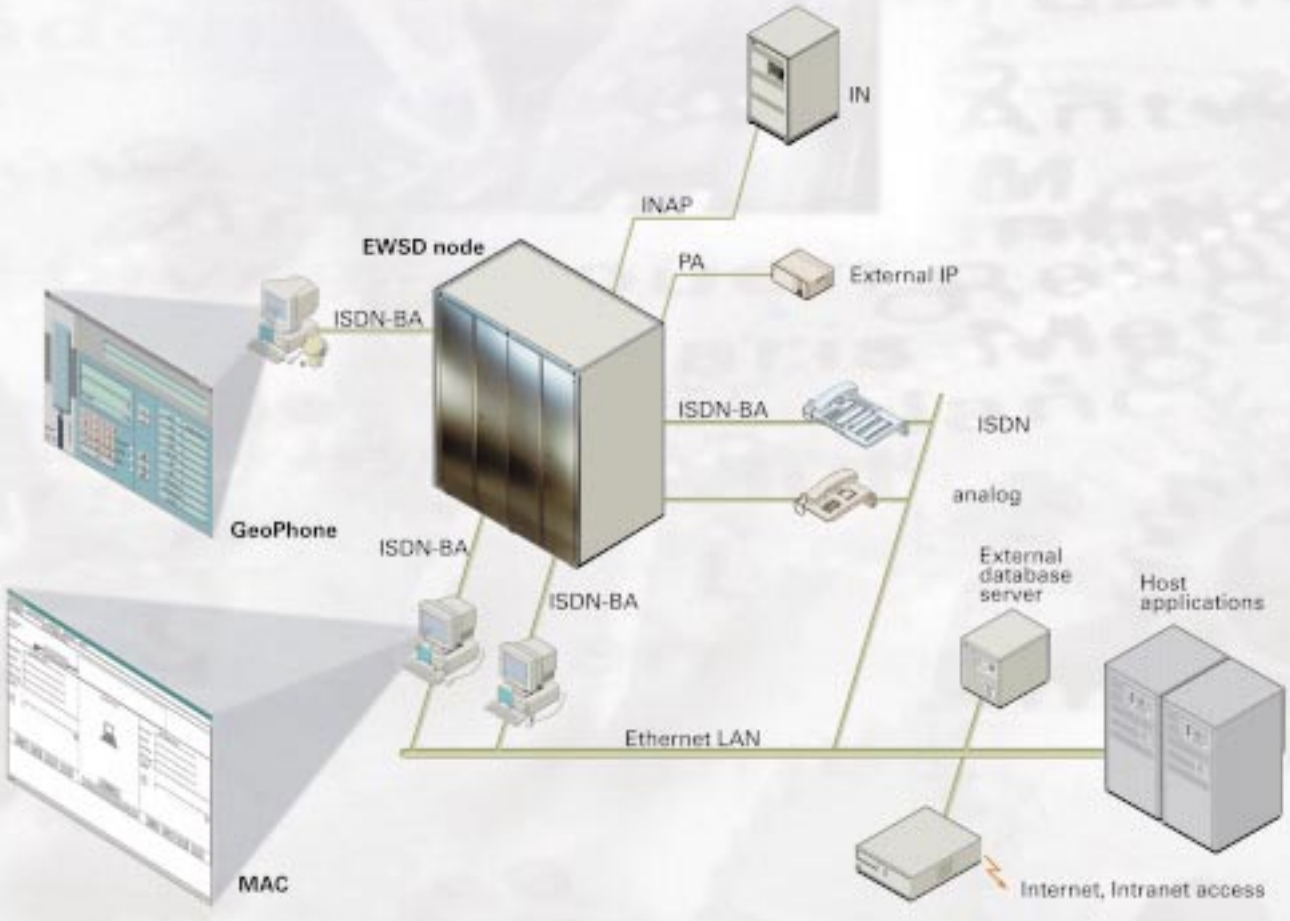
With GeoCENTREX (central office exchange service), EWSD can provide a comprehensive range of features for customized solutions of PBX functions in the public switched telephone network (PSTN). GeoCENTREX is an integral component of EWSD, thereby ensuring the service is provided with maximum reliability.

GeoCENTREX is much more flexible than conventional PBXs. For instance, the subscribers of a GeoCENTREX group are not bound to one particular location. Nevertheless, they still have access to all the common functions provided by a fixed-location PBX.

The maximum number of subscribers that can belong to a GeoCENTREX group is identical with the number of subscribers connected to the public network, i.e. there is virtually no limit. Existing PBXs can also be included in a GeoCENTREX group. Given the wide range of GeoCENTREX features and the ways in which they can be combined, solutions can be drawn up on a customer-specific basis. Features for subscribers in the PSTN can also be used by GeoCENTREX subscribers.

The Call Center function of GeoCENTREX meets one of today's special demands. A large number of companies are planning to improve their customer service by setting up a call center. In this respect, GeoCENTREX has fundamental solutions for meeting a company's present and future requirements.

Apart from its functional advantages, GeoCENTREX also offers clear advantages in terms of costs. For the end customer, in particular, savings are made in the connection costs and other costs associated with an expensive PBX (e.g. leasing of premises, maintenance and administration).



The GeoCENTREX function spectrum is divided into:

- GeoCENTREX group features

  GeoCENTREX proposes a group structure for the purpose of organizing subscribers. Groups can be formed on a local or network-wide basis. The group features provide additional options for the administration of the GeoCENTREX groups.

- GeoCENTREX subscriber features

  GeoCENTREX subscriber features can be assigned individually to each subscriber of a GeoCENTREX group. In principle, each GeoCENTREX subscriber can also access those features that can be used by a subscriber in the PSTN.

- Attendant Features

  GeoCENTREX groups are operated via GeoCENTREX attendant stations. The attendant stations can also be organized into groups; up to 4,095 attendant groups can be set up per EWSD network node. Administration is only possible for local GeoCENTREX groups.

GeoCENTREX group features

A **GeoCENTREX group** can be used to pool together subscribers that have a common numbering plan and a common feature spectrum. The GeoCENTREX group is restricted to subscribers on the same EWSD network node.

A number of GeoCENTREX groups can be pooled together to form a business group. A **business group** can extend throughout the network over several EWSD network nodes. Business groups are therefore particularly suited for companies that are present in several locations.

Sub-business groups can be formed within individual business groups. A specific feature spectrum can be defined for the subscribers organized within such a sub-business group. A sub-business group may also extend over several EWSD network nodes.

GeoCENTREX groups can also be created as **mini groups** of subscribers that primarily initiate calls to the PSTN. To this end, the subscribers are given special access rights. The subscribers can conduct their external calls directly (without having to dial an access code). For internal calls, however, an access code is necessary.

Within one EWSD network node, a number of GeoCENTREX groups can share the same attendant group, e.g. for common administration, call-charge handling, data management and traffic data administration. The attendant group and the GeoCENTREX groups it serves together form a **GeoCENTREX complex**.

Thanks to its **flexible group size**, GeoCENTREX can meet the needs of all customers. Up to 3,000 GeoCENTREX groups are administered in one EWSD network node. The maximum number of subscribers in all GeoCENTREX groups is restricted only by the maximum number of subscribers that can be connected to the EWSD network node.

Each GeoCENTREX group has a **group-specific private numbering plan**. The GeoCENTREX private numbering plan comprises local internal directory numbers as well as network-wide internal directory numbers.
A local internal directory number can be used to reach destinations within the same GeoCENTREX group.
A network-wide internal directory number can be used to reach destinations within a business group.

With the **group dialing** feature, an access code can be specified for the GeoCENTREX group. Using this access code, followed by the internal directory number, a GeoCENTREX subscriber not belonging to the group can reach any subscriber within this local GeoCENTREX group.

Special **access codes** can be defined within a private numbering plan, e.g. for accessing the PSTN, using private devices, connecting to the attendant.

The GeoCENTREX **feature codes** are used on a group-specific basis to activate, deactivate, interrogate and use the GeoCENTREX features.

Using the feature **Simulated Facility Groups**, the number of simultaneous calls with the PSTN can be restricted. This affects calls both from and to a GeoCENTREX group.

GeoCENTREX makes it possible to pool together subscriber-equivalent PBX hunting groups to form **Multi-Line Hunting Groups**. Special hunting methods exist for the search for free lines.
Incoming calls to subscriber-equivalent PBX hunting groups can be held by means of a queuing function whenever no free line is available in the multi-line hunting group.

The EWSD **intercept codes** are used for handling unsuccessful connections. In addition, **group-specific announcements** and tones can be set for internal calls.

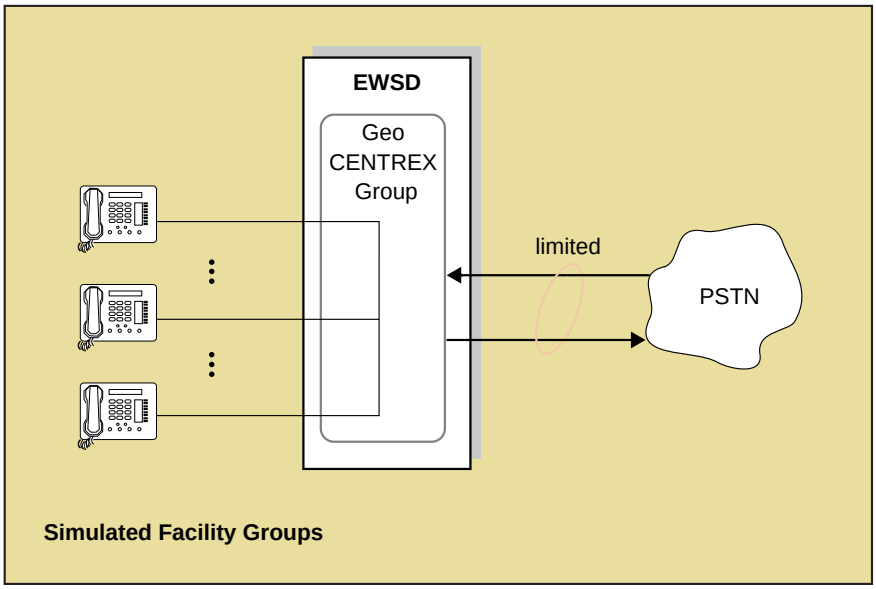
Call charges are recorded for GeoCENTREX in the same way as in the PSTN. To this end, EWSD provides the automatic message accounting (AMA) and periodic pulse metering (PPM) methods. Apart from the usual details, the AMA data records for GeoCENTREX subscribers can also contain information that is specific to GeoCENTREX.
In contrast to the zoning in the public network, GeoCENTREX group-specific zoning makes it possible to adapt an internal connection (local or network-wide) to the conditions of GeoCENTREX. Different call charge rates can be specified for group-internal and cross-group calls. Subscribers, PBXs and attendant-positions within a GeoCENTREX group can be divided into call charge areas.

EWSD offers specific types of **traffic measurement** for GeoCENTREX. These can be used in addition to the standard measurement for analog subscribers and ISDN subscribers.

GeoCENTREX comprises the complete **line spectrum** for analog subscribers and ISDN subscribers.

Analog individual lines or ISDN basic accesses and PBXs can be grouped together with the feature **Closed User Group (CUG)**. As a rule, subscribers in a closed user group are subject to certain traffic restrictions. This means that they can communicate with each other, but communication with subscribers outside of the closed user group is only possible with the appropriate authorization.
CUGs can be created in parallel to GeoCENTREX groups. GeoCENTREX subscribers can also be members of a CUG. Existing GeoCENTREX traffic restrictions are then added to the CUG traffic restrictions.

The feature **Nailed-up Connections (NUC)** can also be used with GeoCENTREX. A nailed-up connection is possible between subscribers within the same GeoCENTREX group as well as between a GeoCENTREX subscriber and a subscriber in the PSTN.



Simulated Facility Groups

GeoCENTREX subscriber features

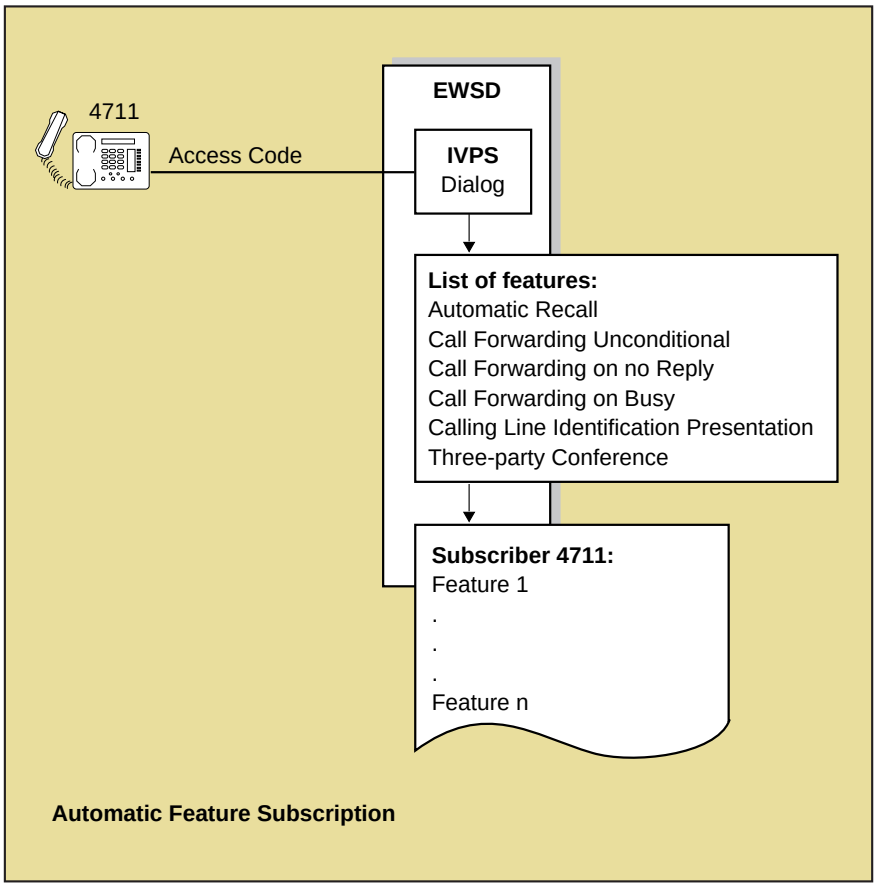
GeoCENTREX includes subscriber features for:

- Basic functions
- Call setup
- Call allocation
- Call control
- Call forwarding
- Call restrictions
- ISDN services
- Call display
- Call security
- Alarm call services
- Call tracing functions
- Call charging

Basic functions

GeoCENTREX offers the possibility of authorizing specific features on a subscriber-individual basis by means of an access code. The features requiring such authorization can be grouped together. Usage of the features contained in an authorization group is controlled by means of a **Customer Access Treatment Code (CATCODE)**.

The feature **Automatic Feature Subscription** allows subscribers to assign themselves features from the feature package made available by the operating company. Feature administration takes the form of a user-friendly voice-controlled and announcement-driven dialog.



Automatic Feature Subscription

Calls to the PSTN can be made via a specific network operator. In this case, the network operator is selected by means of a certain **Carrier Access Code (CAC)**.

A GeoCENTREX subscriber can use the function **Directory Number Portability (DNP)** in the same way as a subscriber connected to the PSTN.

The feature **Subscriber Emergency Override** enables those GeoCENTREX subscribers barred from making external calls to access an emergency center in case of an emergency. The call is set up by means of the access code for calls to the PSTN, followed by the emergency number in question.

The **Feature Control Offline (FCOFF)** feature provides the subscriber with user-friendly feature control (activation, deactivation, status inquiry) with the help of a voice-controlled and announcement-driven dialog.

The **General Facility Reset (GFR)** feature enables the subscriber to reset various activated features by means of subscriber controlled input only.

With the feature **Multiple Subscriber Number (MSN)**, up to 99 different directory numbers can be assigned to one ISDN access line. This makes it possible to reach the different specific terminals and services on a basic access line. EWSD treats each multiple subscriber number as an independent directory number to which features can also be assigned on an individual basis.

With the **Keyword** feature, a subscriber can specifically protect his or her line. The subscriber can thereby prevent unauthorized feature usage on this line. Subscribers are free to administer their keyword themselves.

With the **Priority** feature, the operating company can provide preferential treatment for call setup to or from certain directory numbers. If all outgoing trunks are busy, the call attempt is automatically repeated at specified intervals.

Using the feature **Subscriber Controlled Input (SCI)**, a subscriber of a GeoCENTREX group can activate, deactivate, modify and interrogate features for his or her line.

The **Terminal Portability (TP)** feature allows a called subscriber to disconnect the terminal from one telephone socket and plug it into another socket within a predefined time during an active call. The connection remains intact.

With the feature **Preference Category During Catastrophe**, the operating company can restrict outgoing traffic to certain priority subscribers (e.g. police, fire department, etc.) if necessary. Incoming traffic is not affected by this feature.

Call setup

With the **Abbreviated Dialing (ABBD)** feature, a GeoCENTREX subscriber can draw up an abbreviated dialing list, or the attendant can provide such an abbreviated dialing list.
The internal, national or international directory numbers chosen are each assigned an abbreviated number in the list. To set up a connection, the abbreviated access code must be dialed in addition to the abbreviated number. EWSD automatically translates the abbreviated number into the full-length directory number when the connection is set up. A GeoCentrex abbreviated dialing list can be used individually by just one subscriber or made available to several subscribers.

With the feature **Fixed Destination Call (FDC)**, also known as Hotline, a call can be made to a specific destination without having to dial. Call setup can begin as soon as the handset is lifted or after a predefined period of time.

Call allocation

With the **Automatic Recall (AR)** feature, a called analog subscriber is able to initiate the last call that could not be set up originally (e.g. because the call was terminated by the calling party). The subscriber activates recall by dialing the appropriate feature code. EWSD then automatically sets up the recall connection.

If required, the subscriber using Automatic Recall can arrange for the directory number of the subscriber who is being re-called to be announced or displayed on an appropriate terminal.

The feature **Call Completion to Busy Subscriber (CCBS)** enables the subscriber to ring back automatically. The calling subscriber activates this feature when the called subscriber is busy. The network then indicates by means of recall as soon as the called party has become available. If the calling party accepts this ringback call, EWSD automatically sets up the connection once again to the called subscriber.

The busy subscriber may be connected in the same GeoCENTREX group, in another GeoCENTREX group or in the PSTN. A waiting list can contain one unanswered call for an analog subscriber and up to five unanswered calls simultaneously for ISDN subscribers.

The feature **Call Completion on no Reply (CCNR)** enables the calling subscriber to ring back automatically. The calling subscriber activates this feature when the called party does not reply. The network then indicates by means of recall as soon as the called party becomes active again (e.g. when he/she is free again after initiating a call).
If the calling party accepts this ring-back call, EWSD automatically sets up the connection once again to the called subscriber.

The subscriber not replying may be connected in the same GeoCENTREX group, in another GeoCENTREX group or in the PSTN. A waiting list can contain one unanswered call for an analog subscriber and up to five unanswered calls simultaneously for ISDN subscribers.

With the feature **Call Pick-up (CPU)**, a GeoCENTREX subscriber can accept a call request that arrives on another line of the same GeoCENTREX group. For call pick-up within a GeoCENTREX group, call pick-up groups can also be formed, whereby a number of calls queue up simultaneously for acceptance.

The **Call Waiting (CW)** feature makes it easier to reach a subscriber. It indicates to a subscriber that other subscribers are attempting to establish a connection to him or her. In case of a busy analog GeoCENTREX subscriber, one call can be waiting at any one time. For a busy ISDN subscriber, however, there can be up to two more waiting calls. The GeoCENTREX subscriber can accept, reject or ignore a waiting call request.

Call Waiting (CW) for GeoCENTREX can be restricted to calls from the PSTN only or calls from other GeoCENTREX groups. Within a GeoCENTREX group, it is possible to wait on a subscriber even if that subscriber has not activated the Call Waiting (CW) feature.

The feature **Improved Paging** enables attendants and other GeoCENTREX subscribers to page partners within a GeoCENTREX group. The paged subscriber can accept the call with a special form of call pick-up.

The feature **Subscriber Barge-in (SBI)** enables a GeoCENTREX subscriber to break into an existing call without interrupting the connection. A warning tone is applied. The GeoCENTREX subscriber dials an access code followed by the internal number of the subscriber that is to be subject to intrusion.

With the feature **Subscriber Barge-in Rejection (SBIR)**, a subscriber can prevent other subscribers from intruding.

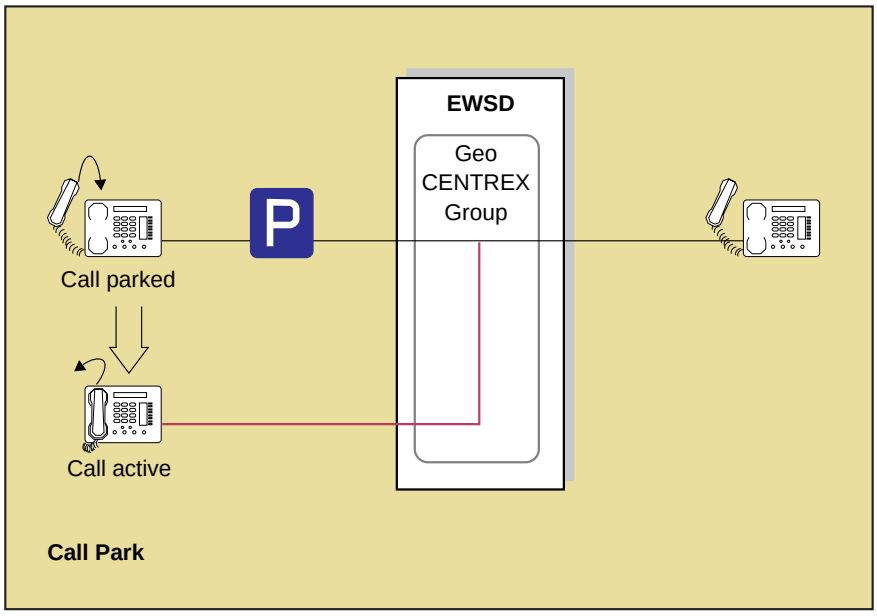
Call control

The **Call Hold (CH)** feature enables an ISDN subscriber to interrupt an active call in order to set up a second call to another subscriber, to accept a waiting call or to initiate a supplementary service. The subscriber can then alternate between the active and the held connection.

With the feature **Explicit Call Transfer (ECT)**, a subscriber can transfer calls to a third party. Before transfer, a connection must be set up to the third party. Call transfer for incoming calls is possible as soon as the telephone begins to ring.
For GeoCENTREX, call transfer can be permitted for all calls or restricted to either internal calls within the same GeoCENTREX group, incoming calls from within and outside of the GeoCENTREX group, external calls from outside of the GeoCENTREX group, or calls to the attendant.

With the feature **Secretarial Call Transfer**, two separate calls can be set up and subsequently interconnected.

The feature **Call Park** enables an analog GeoCENTREX subscriber within an network nodes to park a call and pick it up again from another line within the same GeoCENTREX group.



The feature **Three-party Conference (TPC)** enables a subscriber to hold an existing call and to set up a connection to another subscriber. The initiating subscriber can switch back and forth between the two calls, terminate one of the calls or connect all calls to form a three-party conference.

Call forwarding

Using the **Call Forwarding (CF)** feature, a subscriber can forward incoming call requests to any desired destinations.
Calls can be forwarded either immediately (Call Forwarding Unconditional, CFU), when there is no reply (Call Forwarding on no Reply, CFNR) or when the line is busy (Call Forwarding on Busy, CFB), only within the same GeoCENTREX group or business group/sub-business group, or only for incoming calls from outside of the GeoCENTREX group. When a subscriber has activated call forwarding, an announcement can be used to inform calling parties that their call request is being forwarded. For the individual call forwarding types CFU, CFNR, CFB, different call forwarding destinations can be reached independently of each other.

With the feature **Call Forwarding Controlled by Operator (CFCO)**, it is the operator who creates the destinations for a subscriber's call forwarding.

With the feature **Call Forwarding to a Group of Announcements (CFGA)**, a subscriber can forward all incoming call requests to one of 15 possible announcements. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

The feature **Call Forwarding to Fixed Destinations** permits call forwarding to destinations within the PSTN, such as 8 e.g. a fixed announcement or a voice mail service.

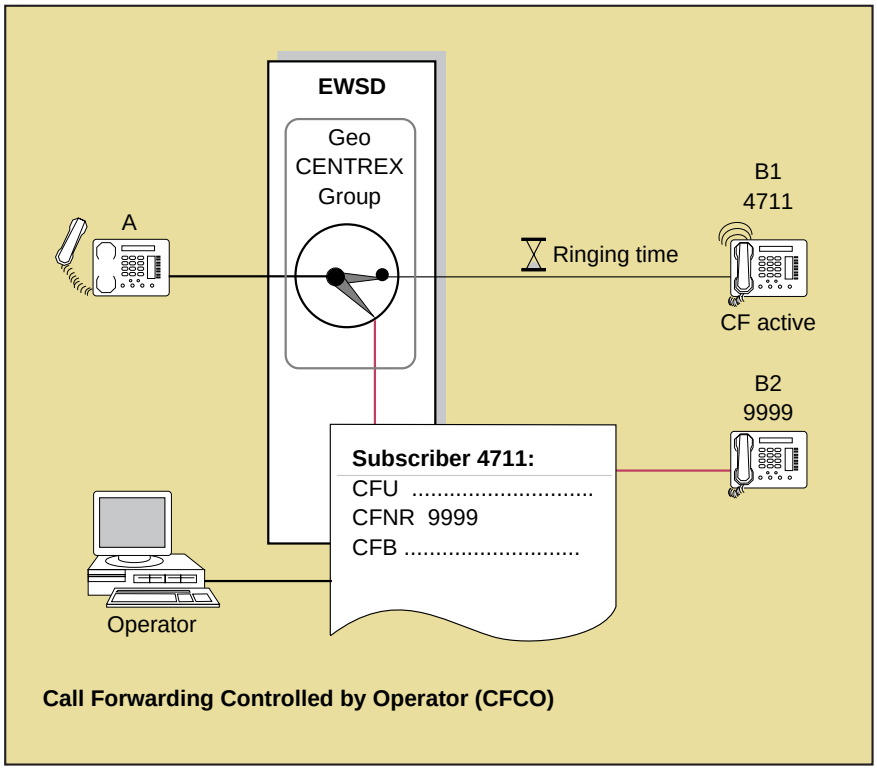
With the feature **Call Forwarding to an Operator (CFO)**, a GeoCENTREX subscriber can forward all incoming call requests to an attendant. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

With the feature **Call Forwarding to a Voice Mail Service (CFVMS)**, a subscriber can forward all incoming call requests to a voice mail system. Here, the calling party can leave a message. Calls can be forwarded either immediately or after a predefined period of time. During this waiting time the forwarding subscriber can still accept the call.

A subscriber using the feature Call Forwarding to a Voice Mail Service (CFVMS) can be notified of a new voice mail message by means of the feature **Message Waiting Indication (MWI)**.

The feature **Multiple Simultaneous Call Forwarding (MSCF)** supplements the Call Forwarding (CF) feature. With an analog subscriber, up to 10 incoming call requests can be forwarded simultaneously to a specified destination (e.g. a voice mail service). In the case of an ISDN subscriber, up to 64 incoming call requests can be forwarded simultaneously.

With the **Call Deflection (CD)** feature, incoming call requests are diverted to a previously defined subscriber if the called subscriber does not wish to accept the offered call. Forwarding can take place immediately, without ringing (as for Call Forwarding Unconditional, CFU) or after being requested by the called subscriber during the ringing phase. In case of call deflection on request, the subscriber can decide during the ringing stage whether to accept the call or to have it diverted. The ISDN subscriber can set up call deflection individually for every service and for every terminal connected to the basic access.



Call Forwarding Controlled by Operator (CFCO)

With the feature **Default Call Forwarding if Busy or No Reply (DCF)**, call requests from outside of the GeoCENTREX group are automatically forwarded if the called subscriber is busy or does not answer. The forwarding destination can be another subscriber or the attendant.

With the feature **Music on Hold**, music can be transmitted to subscribers put on hold for the duration of the holding time.

The feature **Remote Control of Call Forwarding (RCCF)** provides a GeoCENTREX subscriber with remote control of call forwarding (CF) functions on his or her line.

With the feature **Sequential Call Forwarding**, a call that has already been forwarded can be forwarded again. A call can be forwarded up to five times.

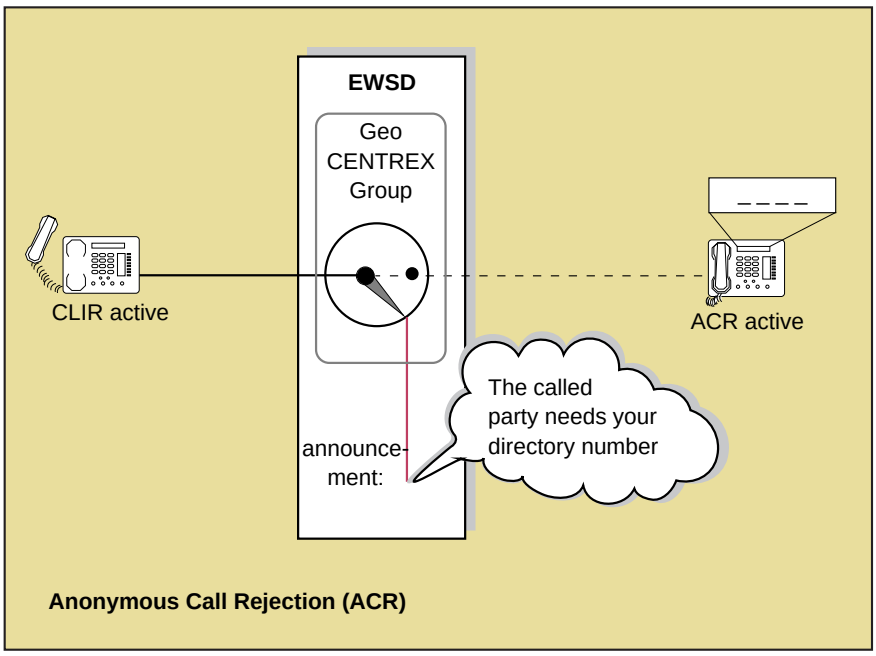
Call restrictions

The **Access Barring** feature permits the operating company or the subscriber to block a line for incoming traffic, outgoing traffic or for all traffic. The following blocking variants are possible: Account Suspension, Maintenance Blocked, Request Suspension Originating, Request Suspension Terminating.

With the feature **Anonymous Call Rejection (ACR)**, a subscriber can automatically reject a call request if a calling subscriber suppresses display of his or her directory number. In this case, the calling subscriber hears a special tone or an announcement indicating incomplete call setup.

Using the feature **Authorization Code (ATC)**, a GeoCENTREX subscriber can activate and deactivate traffic restrictions created by the network operator. The authorization code permits the subscriber to set up calls within a local GeoCENTREX group from all blocked lines.

GeoCENTREX subscribers and subscriber-equivalent PBXs can be assigned individual **Call Restrictions**. The following restrictions are possible: blocking for direct calls and blocking for attendant calls to the PSTN, blocking for direct calls and general blocking for all calls from the PSTN.



Anonymous Call Rejection (ACR)

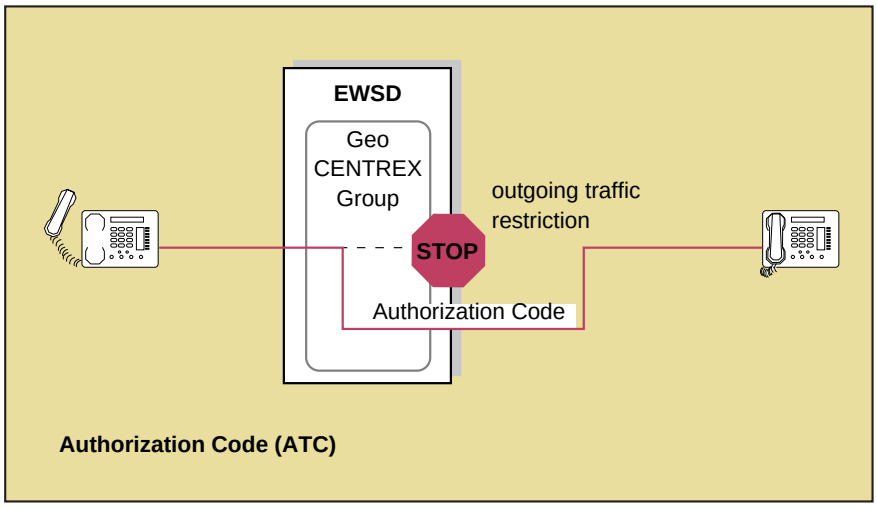
With the feature **Selective Call Originating (SCO)**, call setup can be suppressed to certain defined directory numbers (black list functionality) or, alternatively, calls are only permitted to defined directory numbers (white list functionality). The black list/white list functionality can be administrated for each individual subscriber.

The feature **Rejection of Forwarded Calls (RFC)** enables subscribers to automatically reject call requests forwarded to them.

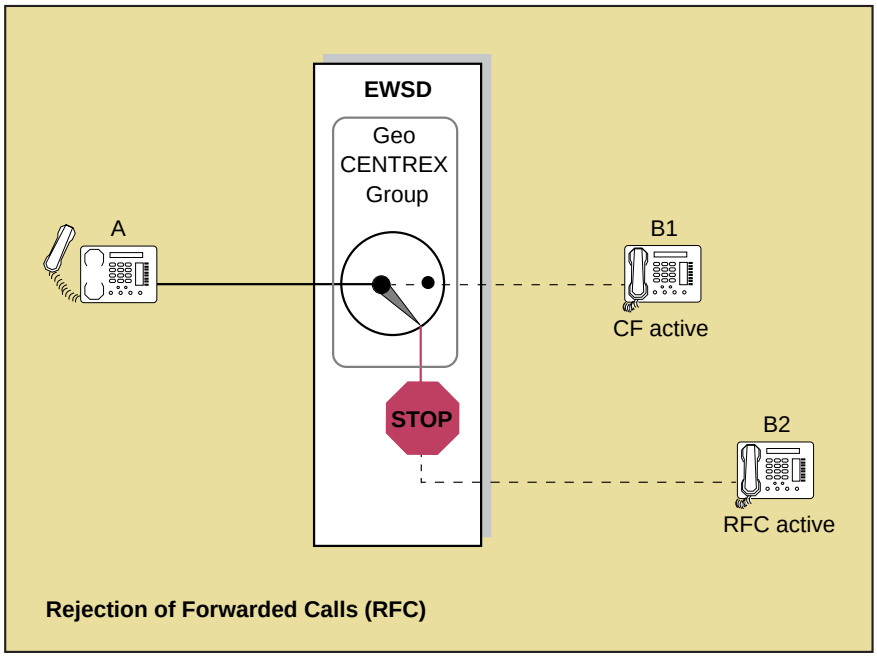
With the feature **Selective Call Acceptance (SCA)**, only those call requests from certain defined directory numbers are connected through to the line. All other call requests are rejected. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

Using the feature **Selective Call Forwarding (SCF)**, call requests from defined directory numbers or with specific prefixes can be forwarded to any destination. Similarly, call requests from defined directory numbers or with specific prefixes can be excluded from call forwarding. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

With the feature **Selective Call Rejection (SCR)**, call requests from certain defined directory numbers are rejected. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.



Authorization Code (ATC)



Rejection of Forwarded Calls (RFC)

The **Call Barring** feature enables the subscriber to protect his or her line from unauthorized use.
The operating company can specify up to 32 traffic restriction classes, from which the subscriber is free to choose a suitable one. In addition, a code-dependent restriction is also possible for prevention of unauthorized feature usage on a line.

ISDN services

The following **bearer services** can be used with GeoCENTREX:

- Circuit Mode, Speech
- Circuit Mode,
  64 kbit/s unrestricted
- Circuit Mode, 3.1 kHz audio

The **teleservices** that may be used with GeoCENTREX are:

- Telephony, 3.1 kHz
- Telephony, 7 kHz
- Teletex
- Telefax (Group 4)
- Videotex
- Videotelephony

ISDN subscribers can use the **Subaddressing (SUBA)** feature to add additional digits to their standard ISDN directory number.
Callers can then use these additional digits, for example, to reach a specific terminal of an ISDN subscriber. The authorization for subaddressing can be specified individually for each service.

The feature **User-to-User Signaling (UUS)** enables an ISDN subscriber to exchange certain additional information with another subscriber during call setup, call release or during the call itself. This information is transmitted over the D channel.

Call display

The feature **Call Waiting Indication** notifies the subscriber that another call request is waiting.

With the feature **Calling Line Identification Presentation (CLIP)**, a called subscriber can request display of the calling party's directory number.
For internal calls, the GeoCENTREX-internal number is displayed; for external calls, the PSTN directory number is displayed.

With the feature **Calling Line Identification Restriction (CLIR)**, calling subscribers can suppress display of their directory number for the called subscriber. Certain subscriber groups (e.g. police) can be assigned special permission authorizing them to ignore such suppression.

The feature **Calling Line Identification for Waiting Subscribers (CLICW)** expands the possibilities of the Call Waiting (CW) feature. The subscriber receiving the waiting call is shown the directory number of the waiting subscriber as additional information.

With the feature **Connected Line Identification Presentation (COLP)**, a calling ISDN subscriber can request display of the called party's directory number.

With the feature **Connected Line Identification Restriction (COLR)**, a called subscriber can suppress display of his or her directory number for the calling subscriber.

With the feature **Calling Name Identification Presentation (CNIP)**, a called GeoCENTREX subscriber or attendant can have the calling party's name displayed. For this feature, the subscribers' names must have been stored in the network node of the calling subscriber.

With the feature **Calling Name Identification Restriction (CNIR)**, a calling GeoCENTREX subscriber or attendant can suppress display of their name for the called subscriber. Certain subscriber groups (e.g. police) can be assigned special permission authorizing them to ignore such suppression.

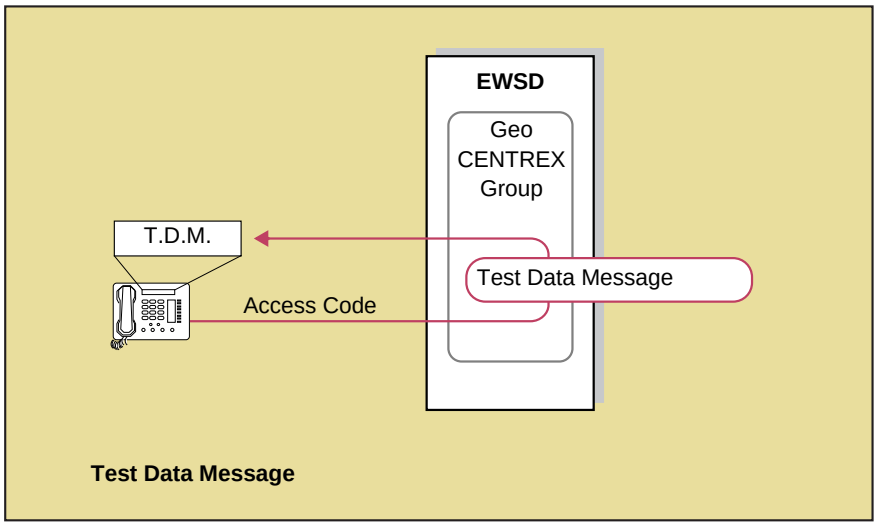
With the feature **Connected Name Identification Presentation (CONP)**, a calling GeoCENTREX subscriber or attendant can display the name of the called subscriber. The name of the calling subscriber must be created in the associated network node.

With the feature **Connected Name Identification Restriction (CONR)**, a called GeoCENTREX subscriber or attendant can suppress display of their call data for the calling subscriber. Certain subscriber groups (e.g. police) can be assigned special permission authorizing them to ignore such suppression.

With the feature **Different Ringing** it is possible to assign a special ringing sequence to certain incoming call requests. Application of the ringing sequence depends on the directory number of the calling subscriber.

The **Distinctive Ringing (DR)** feature enables the subscriber to differentiate between certain types of connections by means of different ringing sequences.
For instance, the subscriber can recognize forwarded calls or differentiate between national and international calls or between calls within a GeoCENTREX group and calls from outside a GeoCENTREX group.

The feature **Parallel Ringing (PRNG)** simultaneously signals calls to two separate lines belonging to the same subscriber, e.g. a fixed line in the PSTN and a mobile number. The subscriber can accept the call on either of the two lines.



With the **Selective Ringing (SR)** feature, call requests from certain defined directory numbers are signaled to the analog subscriber by means of different ringing sequences. The subscriber can define up to 50 directory numbers. It is also possible to specify partial directory numbers.

With the **Test Data Message** feature, analog subscribers can check the correct operation of their terminal display. The test message is sent in the on-hook state.

Call security

If a GeoCENTREX subscriber is to be protected from intrusion by an attendant, the feature **Attendant Barge-in Rejection (ABIR)** can be assigned.

In the **Distinctive Call Waiting (DCW)** feature, different call waiting tones enable the subscriber to differentiate between different types of waiting calls.
For instance, the subscriber can recognize forwarded calls or differentiate between national and international calls.

If a subscriber does not wish to be disturbed, the **Do Not Disturb (DND)** feature can be activated to forward incoming calls to a different destination, e.g. a general announcement.

With the feature **Reverse Charge Call Rejection (RCCR)**, called subscribers (e.g. hotels) can protect their lines against calls for which they are expected to accept the charges.

The feature **Voice Data Protection** allows a subscriber to easily deactivate and reactivate those services (e.g. Call Waiting) that can interfere with data transmission (by injecting tones).

Alarm call services

With the feature **Alarm Call Service (ACS)**, a subscriber can receive a wake-up call at a time specified in advance. Such an alarm call is possible on a one-off basis or repeatedly at the same time over a number of consecutive days. In case of regular alarm calls, certain days of the week can be specified over consecutive weeks.

Call tracing functions

The feature **Malicious Call Identification (MCI)** is used to identify malicious or repeatedly annoying callers. The subscriber can activate this feature manually during an existing call or within a certain period of time following the end of the call. Automatic activation is possible immediately on call acceptance or as soon as the telephone starts ringing. If a specific directory number is under suspicion, callers can be monitored in respect of this particular number.

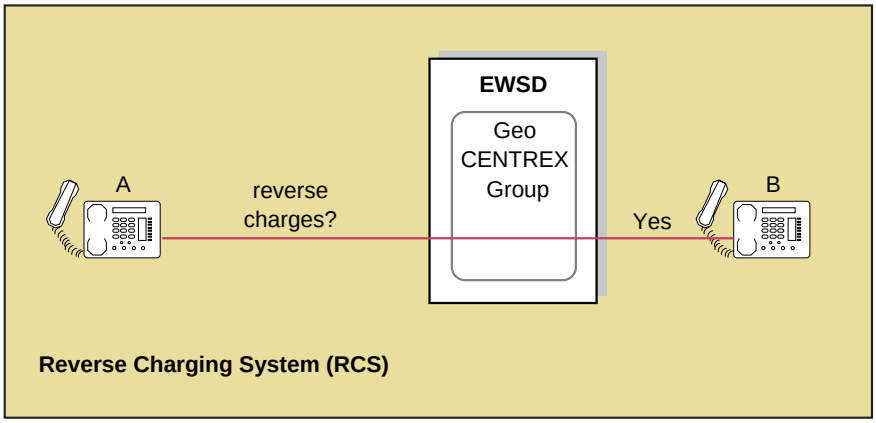
Call charging

A GeoCENTREX subscriber can be assigned an **Account Code (ACC)**. Using this, the subscriber can differentiate the charges for outgoing calls. Each preset account code can be overwritten by the subscriber for a current call setup. The account code in each case also appears in the AMA data record and in the message detail recording (MDR) data record.

The feature **Advice of Charge (AOC)** permits an ISDN subscriber to be notified of the charges incurred for each individual call. The call charge information can be transmitted at the beginning of the call, during the call, and at the end of the call.

The feature **No Charge Calls** enables the operating company to permit certain calls that are free of charge.

The feature **Reverse Charging System (RCS)** permits a calling subscriber to initiate a call for which the called subscriber is charged. A reverse-charge call is requested by means of a specific feature code.
The called subscriber is informed that he or she is to be charged for the call.



Reverse Charging System (RCS)

Attendant features

The GeoCENTREX attendant features are divided into:

- Attendant group features
- Attendant station features
- Multifunctional attendant console features

Attendant group features

The **Automatic Call Distribution System (ACD)** distributes the incoming calls among the available and active attendant stations within an attendant group.

The GeoCENTREX attendant groups can be divided into various task groups. The distribution of incoming calls among the task groups can be controlled on the basis of the call type.

The feature **Group Make Busy (GMB)** enables an attendant station with the corresponding authorization to block all stations belonging to the attendant group for the automatic call distribution system (ACD). This means that no more calls can be transferred via ACD.

With the feature **Link Failure Call Diversion (LFCD)**, all calls are automatically forwarded to a previously defined destination if all lines of a GeoCENTREX attendant group have failed.

The feature **Night Service (NS)** forwards all calls destined for an attendant group to a previously defined GeoCENTREX directory number. This forwarding becomes active when the attendant group cannot be reached, e.g. at night, at weekends and on holidays. The night service number can be assigned to a certain subscriber or a certain attendant station within the local GeoCENTREX group. Direct calls to a particular attendant are still possible.

Attendant station features

Using the feature **Attendant Barge-in (ABI)**, an attendant can intrude on an existing call without interrupting the connection.

The feature **Attendant Camp On (ACO)** enables the attendant to transfer an incoming call to a busy or an available GeoCENTREX subscriber located in the same business group as the attendant station. A busy analog subscriber is notified by means of a waiting tone; a busy ISDN subscriber is additionally informed by means of a terminal display. If the called subscriber does not answer, the call is automatically returned to the attendant.

With the feature **Attendant Emergency Override (AEO)**, the attendant can switch a call through to a GeoCENTREX subscriber if this subscriber cannot be reached directly from outside owing to a traffic restriction or active features, e.g. Do not Disturb or Call Forwarding.

With the feature **Logon for Basic Attendant Station**, an attendant logs on to a basic attendant station for the automatic call distribution system (ACD). From this time on, the attendant is transferred calls from the ACD. With the feature Logoff for Basic Attendant Station, an attendant logs off from the ACD.

An attendant can use the feature **Position Make Busy** to mark a station such that the call distribution system forwards no more calls to it. However, the attendant can still accept direct calls and set up calls at this station.

With the feature **Post Call Time (PCT)**, the attendant is assigned a new call only after a certain blocking time has elapsed since the previous call was terminated (by parking, call transfer, etc.). The attendant can use this time to reaccept a previously parked connection.

With the feature **Rerouting with Manual Acceptance Tone**, a call request is forwarded if it has not been accepted by an attendant after a certain predefined period of time. The attendant station in question is then automatically marked as "Position make busy."

Multifunctional attendant console features

Using the feature **Attendant Control of Facilities**, an attendant with the corresponding administrative authorization can block all lines of a GeoCENTREX group for direct calls to the PSTN and unblock them again.

With the feature **Call Park For Attendants**, up to six calls can be parked at one attendant station.

The feature **Call Presentation and Acceptance** automatically indicates to the attendant those calls that are transferred from the automatic call distribution system (ACD). The attendant must accept the call manually. For each attendant station, certain call types to be processed individually by this attendant station can be specified.

With the feature **Call Type Identification**, the attendant receives information on calls that have just come in and on the status of existing connections.

With the feature **Dial to Attendant,** GeoCENTREX subscribers can reach the attendant by means of an access code.

The feature **Dial through Attendant** permits GeoCENTREX subscribers who are blocked for direct calls to the public network to make a call by dialing a feature code and the required public directory number. The call distribution system forwards the connection to the MAC attendant, who controls the call setup to the public network.

The attendant has two options:

- to allow the call with or without answering (consultation with the caller), or
- to answer the call and then explicitly set up the desired connection and transfer it to the GeoCENTREX subscriber.

All attendants in an attendant group have access to a common **Directory Assistance** system. This is operated by means of a PC to which all attendants have access.

The feature **EWSD Database Administration** enables the administration of a GeoCENTREX group (private numbering plan, GeoCENTREX subscriber features, restrictions).

With the feature **Logon for Multifunctional Attendant Console**, an attendant logs on to a MAC for the automatic call distribution system (ACD). From this time on, the attendant is transferred calls from the ACD. With the feature **Logoff for Multifunctional Attendant Console**, an attendant logs off from the call distribution system.

The feature **Message Detail Recording (MDR)** provides detailed call information, thereby making it possible for GeoCENTREX customers to check the charges incurred within the GeoCENTREX group. The call data records are then transferred to the MAC, where they can be post-processed. This provides the possibility of, for instance, separate call charging for hotel guests.

The feature **Online Traffic/ Performance Reports** provides information on the status and performance of the attendant station and on the traffic via the call distribution system.

The feature **Redial Last Number** stores the last directory number dialed at the attendant station so that it can be accessed for calling the same number again.

With the **Serial Call** feature, the attendant can set up sequential calls to different internal and external partners. After each call, the subscriber is again connected to the attendant, who can then set up the call to the next subscriber.

With the feature **Traffic Data Handling**, the traffic statistics for the various parameters of the GeoCENTREX group are displayed on a half-hourly basis.

GeoCENTREX subscriber feature spectrum

Basic functions

- Customer Access Treatment Code (CATCODE)
- Automatic Feature Subscription
- Carrier Access Code (CAC)
- Directory Number Portability (DNP)
- Subscriber Emergency Override
- Feature Control Offline (FCOFF)
- General Facility Reset (GFR)
- Multiple Subscriber Number (MSN)
- Keyword
- Priority
- Subscriber Controlled Input (SCI)
- Terminal Portability (TP)
- Preference Category During Catastrophe

Call setup

- Abbreviated Dialing (ABBD)
- Fixed Destination Call (FDC)

Call allocation

- Automatic Recall (AR)
- Call Completion to Busy Subscriber (CCBS)
- Call Completion on no Reply (CCNR)
- Call Pick-up (CPU)
- Call Waiting (CW)
- Improved Paging
- Subscriber Barge-in (SBI)
- Subscriber Barge-in Rejection (SBIR)

Call control

- Call Hold (CH)
- Explicit Call Transfer (ECT)
- Secretarial Call Transfer
- Call Park
- Three-party Conference (TPC)

Call forwarding

- Call Forwarding (CF)
- Call Forwarding Controlled by Operator (CFCO)
- Call Forwarding to a Group of Announcements (CFGA)
- Call Forwarding to Fixed Destinations
- Call Forwarding to an Operator (CFO)
- Call Forwarding to a Voice Mail Service (CFVMS)
- Message Waiting Indication (MWI)
- Multiple Simultaneous Call Forwarding (MSCF)
- Call Deflection (CD)
- Default Call Forwarding if Busy or No Reply (DCF)
- Music on Hold
- Remote Control of Call Forwarding (RCCF)
- Sequential Call Forwarding

Call restrictions

- Access Barring
- Anonymous Call Rejection (ACR)
- Authorization Code (ATC)
- Call Restrictions
- Selective Call Originating (SCO)
- Rejection of Forwarded Calls (RFC)
- Selective Call Acceptance (SCA)
- Selective Call Forwarding (SCF)
- Selective Call Rejection (SCR)
- Call Barring

ISDN services

- Bearer Services
- Teleservices
- Subaddressing (SUBA)
- User-to-User Signaling (UUS)

Call display

- Call Waiting Indication
- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)
- Calling Line Identification for Waiting Subscribers (CLICW)
- Connected Line Identification Presentation (COLP)
- Connected Line Identification Restriction (COLR)
- Calling Name Identification Presentation (CNIP)
- Calling Name Identification Restriction (CNIR)
- Connected Name Identification Presentation (CONP)
- Connected Name Identification Restriction (CONR)
- Different Ringing
- Distinctive Ringing (DR)
- Parallel Ringing (PRNG)
- Selective Ringing (SR)
- Test Data Message

Call security

- Attendant Barge-in Rejection (ABIR)
- Distinctive Call Waiting (DCW)
- Do Not Disturb (DND)
- Reverse Charge Call Rejection (RCCR)
- Voice Data Protection

Alarm call services

- Alarm Call Service (ACS)

Call tracing functions

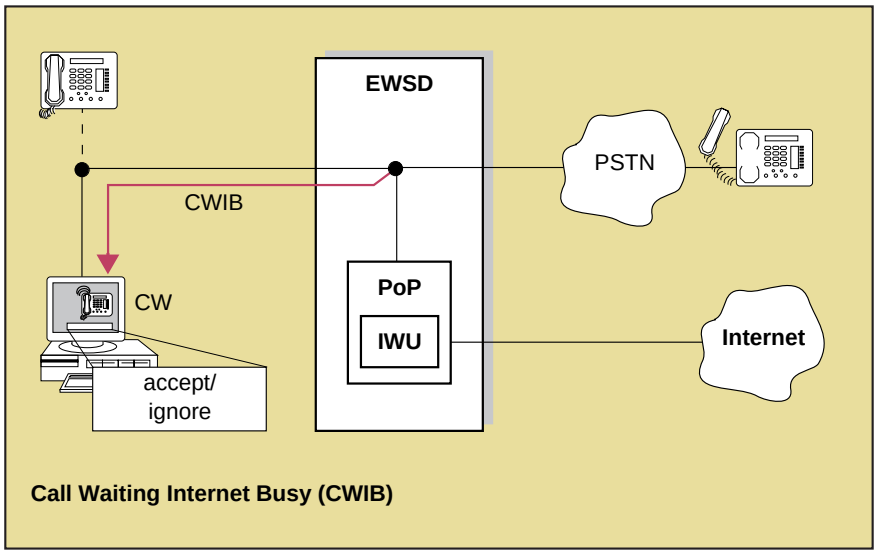
- Malicious Call Identification (MCI)

Call charging

- Account Code (ACC)
- Advice of Charge (AOC)
- No Charge Calls
- Reverse Charging System (RCS)

EWSD InterNode
Internet Supplementary Services

The combination of the Internet and the conventional telecommunications network in the EWSD InterNode results in a range of high-quality supplementary services. These increase the availability of the subscriber, enhance the user-friendliness and expand the administrative options for the line. Via the IN functionality of the EWSD it is possible to make the Internet supplementary services available to subscribers connected via network nodes of other manufacturers.

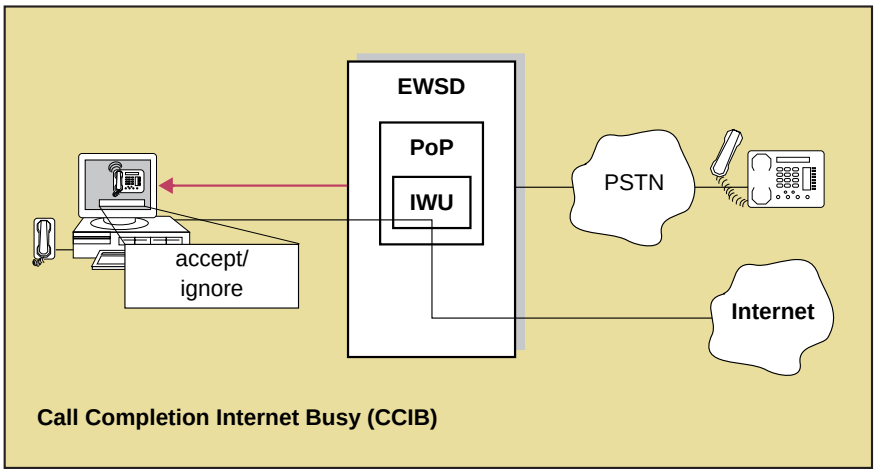


Call Waiting Internet Busy (CWIB)

Internet supplementary services

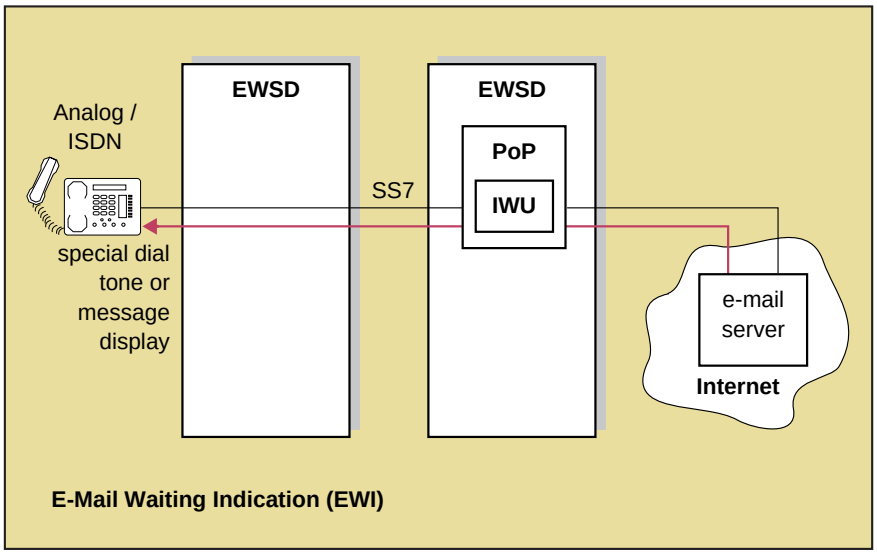
Analog subscribers cannot be reached for incoming calls as long as they are connected to the Internet via their subscriber line. However, with **Call Waiting Internet Busy (CWIB)**, analog Internet subscribers receive a visual message on their PC screen, informing them that a call is waiting on the public telephone network (PSTN). In this case, a subscriber is free to ignore or accept the telephone call. If the call is accepted, the Internet session is terminated.

The Internet supplementary service **Call Completion Internet Busy (CCIB)** is intended for subscribers using Voice over Internet (VoI) on their PC. With Voice over Internet and Call Completion Internet Busy (CCIB), a subscriber currently on the Internet can accept an incoming call directly on the PC, without having to interrupt the existing Internet connection.



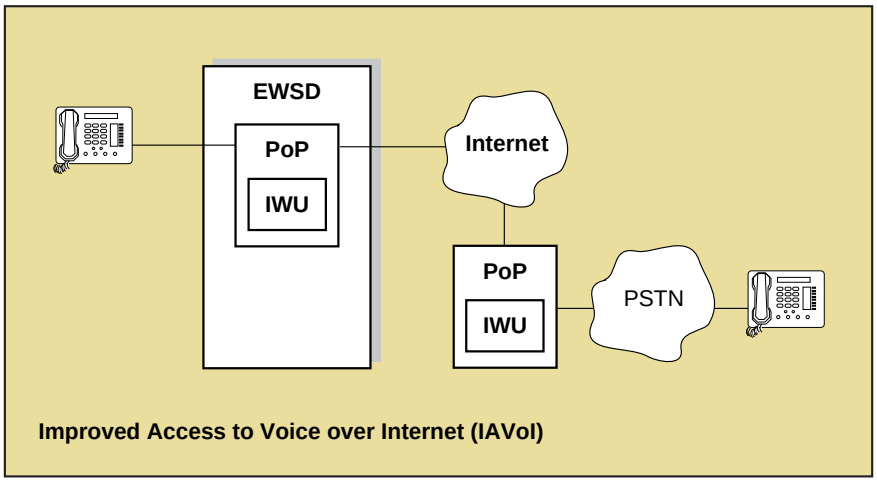
Call Completion Internet Busy (CCIB)

The Internet supplementary service **E-Mail Waiting Indication (EWI)** informs a subscriber that a personal message (E-mail) is waiting on the Internet. This information is sent to the subscriber either by means of a special dial tone or, provided a suitable terminal is available, on a visual display.

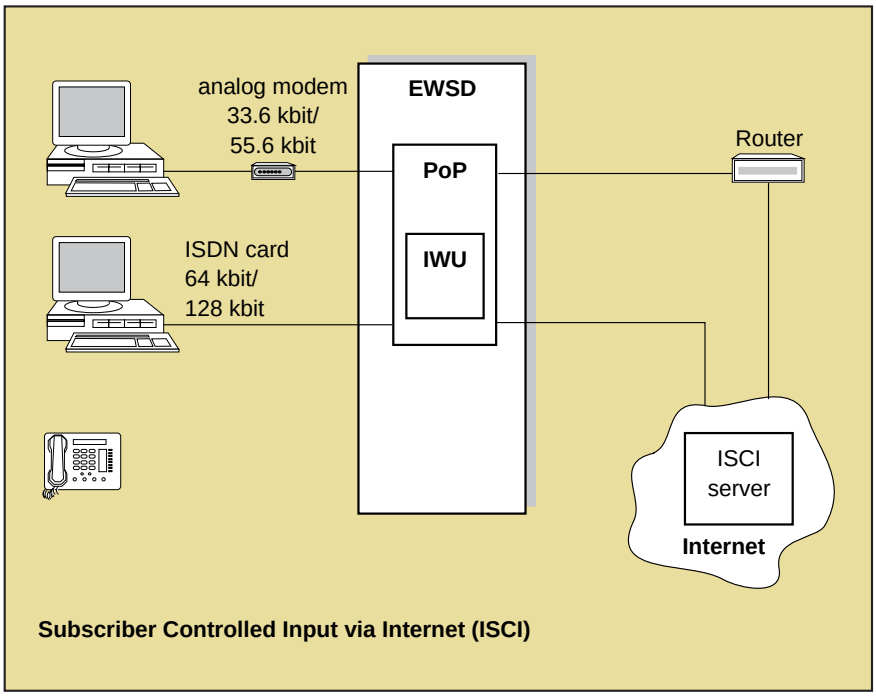


E-Mail Waiting Indication (EWI)

With the Internet supplementary service **Improved Access to Voice over Internet (IAVoI)**, the subscriber can also easily use the Internet for telephone calls. Voice over Internet calls are set up via single-stage standard dial procedures to the Internet, without the need for additional dial-up stages and authorization codes. For Voice over Internet calls, the subscriber receives clearly comprehensible information on the call charge. There is the possibility of having VoI connections listed on the monthly telephone bill. The call data is transferred in the usual EWSD format to the post-processing systems.



Improved Access to Voice over Internet (IAVoI)



Subscriber Controlled Input via Internet (ISCI)

With the Internet supplementary service **Subscriber Controlled Input via Internet (ISCI)**, subscribers can use a web browser to perform menu-driven administration and a visual check of their telephone subscriber features. This function is implemented by means of a special ISCI web server that uses standard Internet protocols to communicate with the Internet subscriber, translates the subscriber inputs and transmits them to the EWSD.

EWSD InterNode feature spectrum

Internet supplementary services

Call Waiting Internet Busy (CWIB)

Call Completion Internet Busy (CCIB)

E-Mail Waiting Indication (EWI)

Improved Access to Voice over Internet (IAVoI)

Subscriber Controlled Input via Internet (ISCI)

IN
IN Services in the Network Node

EWSD offers economical solutions for services that are otherwise only available in a classic intelligent network (IN). These IN services can be introduced into any EWSD network node by means of a software expansion.

With EWSD and its exchange-based IN solution, even new operating companies functioning solely in the long-distance network have the possibility of making their telecommunications services available to subscribers in local traffic.

EWSD based IN services

With the **Freephone** service, it is the called subscriber instead of the calling subscriber that accepts the charges for the connection. In this way, free telephone calls can be made to companies or mail order firms.

With the **Reverse Charging** service, a called subscriber can accept any charges incurred by a calling subscriber without the intervention of an operator. The called subscriber has a certain period of time after accepting the call to decide whether or not to accept the charges.

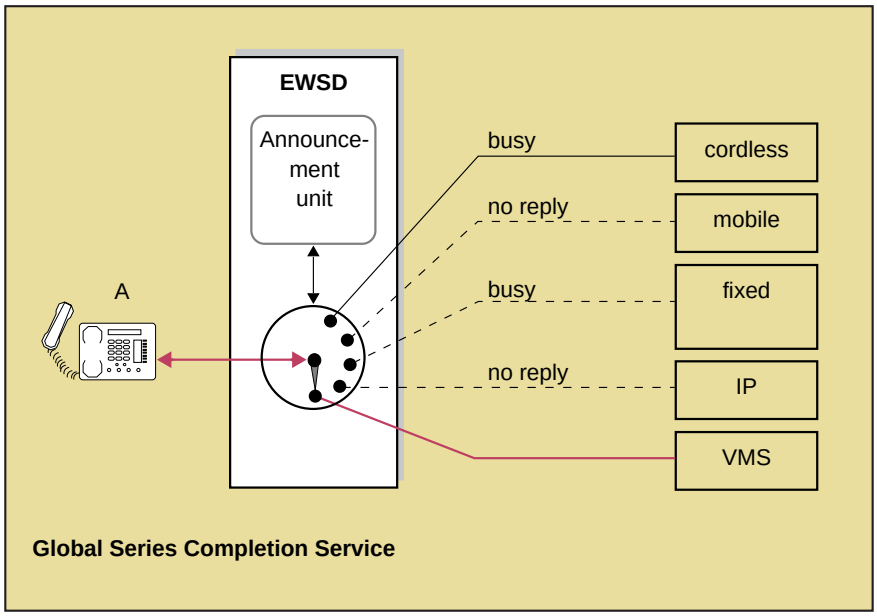
The **Televoting** service is used for votes taken via the telephone network. The users of this service are usually radio or TV stations or market research institutes. Those telephone subscribers wishing to participate in the vote dial a specified directory number to register their vote or opinion. When the vote has been successfully accepted, the caller receives confirmation, e.g. in the form of an announcement.

EWSD SSP direct access services

With the **Global Series Completion** service, a called subscriber can be reached at a number of terminals (e.g. in the fixed network and the mobile network) by means of a single service directory number. If the subscriber does not reply or a terminal is busy, the call is forwarded to the various terminals in succession.

With the service **Selective Reverse Charging**, subscribers can specify the calling subscribers for which they will accept a reversal of charges. The list of such callers can be administered by the actual subscriber. For instance, company employees could be authorized to make free telephone calls to the company headquarters.

With the service **Time-Dependent Call Forwarding**, a subscriber can forward incoming calls to various destinations at different times of the day. For example, calls to a residential directory number could be forwarded to a business number during office hours, and calls to the business number could be forwarded to the residential telephone number outside of office hours.



Global Series Completion Service

EWSD SSP services with direct and dial-up access

The EWSD SSP services with direct and dial-up access are divided into:

- Dial-up Access
- Travel Service
- Automatic Service Selection
- Commercial Freecall Service

Dial-up Access

With Dial-up Access an alternative network operator can enable end-customers of a different network operator to access the alternative network by dialing a directory number (with dialed or automatically prefixed carrier access code). In the network interworking node (incoming gateway) a check is made on the basis of the directory number of the calling subscriber (CLI) to determine whether this subscriber may use the carrier network and its features.

Features that can be used are:

– Barring of Destinations
– Follow on Calls
– Individual Traffic Restrictions

Travel Service

With the Travel Service, subscribers of an alternative network operator can telephone from every telephone or PBX from every network via the carrier's network, using a special service number and an authorization code.

In the carrier's network the subscriber can use the features

– Barring of Destinations
– Follow on Calls
– Individual Traffic Restrictions
– Abbreviated Dialing
– Fixed Destination Call

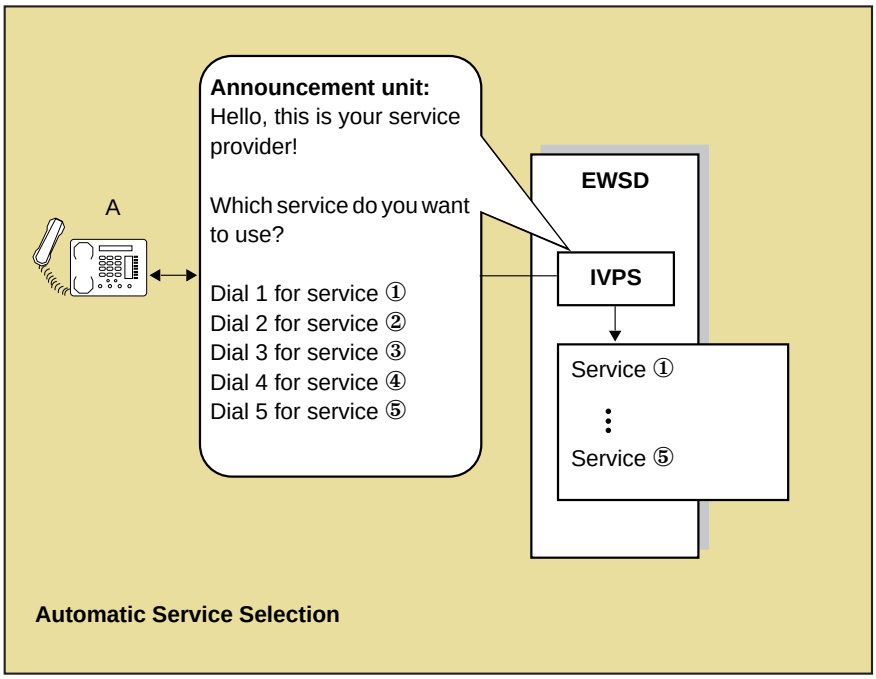
With the feature **Barring of Destinations**, the customer of an alternative network operator can specify up to 50 directory numbers for which an incoming call can be either permitted or not permitted. It is also possible to specify partial directory numbers.

With the feature **Follow on Calls**, the subscriber needs only to dial once into the network of an alternative operating company to be able to make several calls in succession through this network.

With the feature **Individual Traffic Restrictions**, customers of an alternative network operator can block certain destinations (e.g. specific countries) or destination areas (e.g. intercontinental) for their line.

With the feature **Abbreviated Dialing**, the customer of an alternative network operator has the possibility of initiating a call to the desired subscriber by dialing an individual abbreviated directory number.

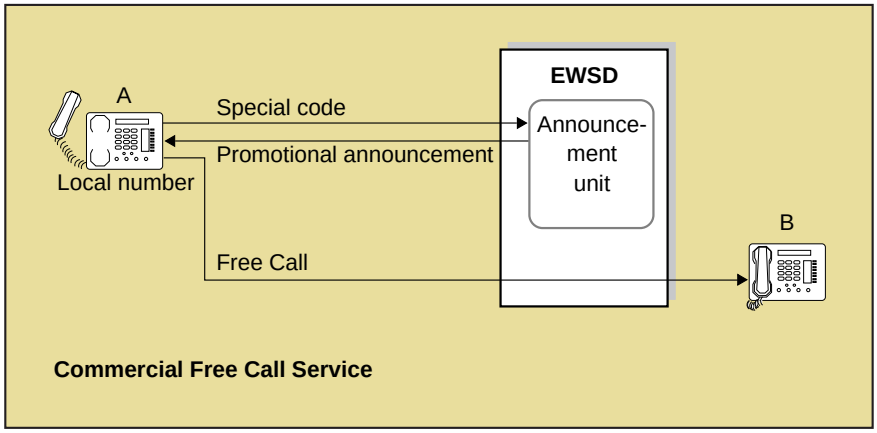
The feature **Fixed Destination Call** provides the customer of an alternative network operator with the possibility of setting up a call to a predefined destination by simply lifting the handset; the connection is made either immediately or after a predefined delay period. The feature is not activated if the calling subscriber starts to dial another directory number within the delay period.



Automatic Service Selection

Under a certain directory number, the service **Automatic Service Selection** offers subscribers a range of IN services, from which they can select a service using the menu and speech-driven instructions.

With the service **Commercial Free Call Service**, companies and advertising agencies can set up calls that are free of charge. The subscriber first hears a promotional announcement and then dials a local directory number to which the connection is made free of charge. The service subscriber decides whether or not such a call is to be restricted in time.



Commercial Free Call Service

IN feature spectrum

EWSD based IN services

- Freephone
- Reverse Charging
- Televoting

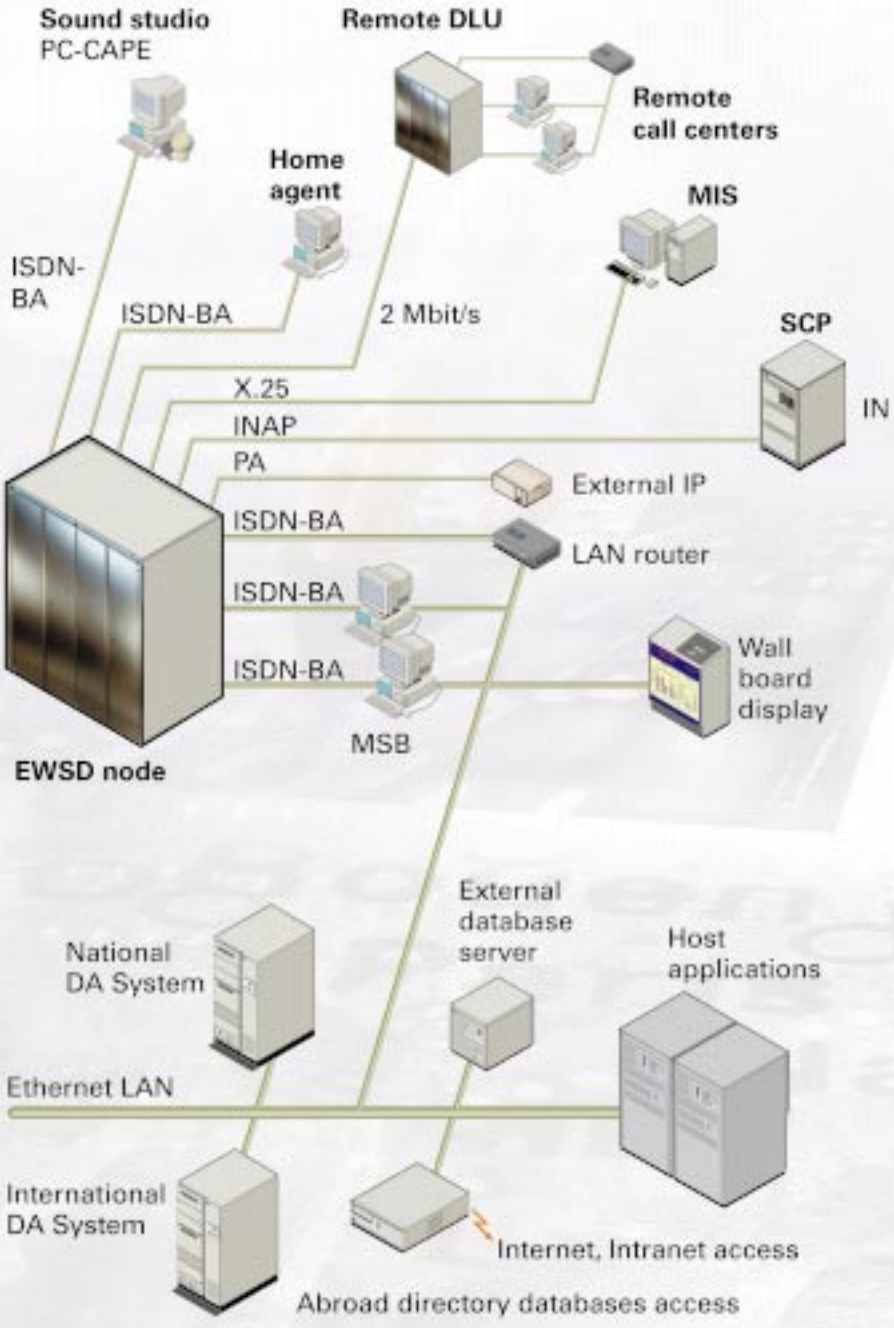
EWSD SSP direct access services

- Global Series Completion Service
- Selective Reverse Charging
- Time Dependent Call Forwarding

EWSD SSP services with direct and dial-up access

- Barring of Destinations
- Follow on Calls
- Individual Traffic Restrictions
- Abbreviated Dialing
- Fixed Destination Call
- Automatic Service Selection
- Commercial Free Call Service

ADMOSS
Advanced Multifunctional Operator Service System



The Advanced Multifunctional Operator Service System (ADMOSS) is the product developed by Siemens for integrating "call center" functions in the EWSD system. "Call center" is the term used to describe a collection of operator-controlled services at control terminals.

Thanks to its modularity and the latest line technology, ADMOSS can be used for a call center of practically any size and configuration. The number of control terminals can be increased according to the traffic volume and the growing range of services available; up to 4,095 control terminals can be served by an EWSD network node.

With ADMOSS, the control terminal function is performed by the multifunctional switchboards (MSB). The MSB are connected to EWSD by means of ISDN basic accesses, in the same way as subscribers are. An MSB comprises a standard PC with Windows NT as the operating system. An MSB is also specially equipped with a functionally extended keyboard, an audio adapter and a headset.

The MSB is a classic representation of computer telephony integration (CTI), i.e. it combines information technology and telecommunications. In addition to all the functions of a modern PC, such as a graphical user interface and menu-driven database access, the MSB also has all the features of modern telecommunications.

With ADMOSS the operators – known as agents – are hierarchically organized. Up to 9,999 agent IDs can be created, and 4,095 agents can be active at any one time.

The agent hierarchy consists of:

- 1 to 10 service groups
- per service group, 1 to 80 switching groups
- per switching group, 1 active chief supervisor
- per switching group, 1 to 255 supervisory groups
- per supervisory group, one active supervisor
- per supervisory group, up to 256 agents

Thanks to automated functions, the processing time required by an agent for individual services is reduced to a minimum. ADMOSS thereby supports high service quality with a low personnel level.

Automatic call distribution

Automatic call distribution (ACD) directs the subscriber requests for agent services to the agent groups responsible for dealing with the services in question. In distributing the calls, automatic call distribution (ACD) always selects the control terminal within the group that has been available for the longest time. If no agent in the group is available, the request is placed in a queue. During this time, the calling subscriber hears an announcement or a waiting tone.

Automatic call distribution (ACD) can react very flexibly to various traffic situations. Up to 16 different configurations can be created for distributing the different call types to agent groups. For instance, service requests can be distributed to a large number of control terminals during the day and to a small number of terminals at night.

Announcements and interactive voice response

The ADMOSS announcements play an important role in unburdening the agent of standard tasks and in increasing the service quality for the subscriber. ADMOSS uses an EWSD-internal Individual Digital Announcement System (INDAS) for its announcements.

The following announcement functions are available:

- Announcement or music when disconnecting or holding a call
- Announcement while waiting in queues on a first-in first-out basis
- Automatic greeting on assignment of terminal, plus automatic personal greeting
- Service-dependent announcements

Speech recognition and DTMF recognition enable voice-controlled and announcement-prompted dialog without the intervention of the agent. This unburdens the agent and thereby improves performance. For interactive dialog ADMOSS uses the EWSD-internal Integrated Voice Processing System (IVPS).

Traffic assistance

ADMOSS uses the EWSD call processing functions for traffic assistance. The traffic assistance functions can be divided into call processing functions, call charge functions and booking functions.

The **call processing functions** can be used to help the subscriber set up calls.

For example, the following features can be provided:

- Immediate and practically automatic call processing
- Service calls
- Directory number verification
- Outgoing code-11 and code-12 calls
- Trunk offering
- Agent-to-agent calls
- Intercept handling
- Call time restriction
- Large conference with up to 25 subscribers
- Call setup after directory number inquiry

The **call charge function** offers additional services such as:

- Call charge acceptance by a third subscriber
- Collect calls
- Ticket retrieval
- Information on call time and charges

With the **booking function** a subscriber can book a call up to three months in advance. A maximum of 60,000 bookings can be stored in EWSD. The following features are available:

- Call delay handling
- Appointment booking
- Permanent booking
- Alarm calls: automatic, semi-automatic, by the operator

Directory assistance

The directory assistance (DA) service offers direct access to national and international directory number databases. At the request of a subscriber, an agent can quickly and easily find out the desired directory number and forward this to the subscriber. As a special service, the agent can also, on request, set up a call immediately to the number in question.

The most important directory assistance functions are:

- Automatic announcement of the directory number requested
- Directory assistance followed by call completion
- Automatic call completion

Special call center features

ADMOSS offers some special features for call centers:

- Automatic screen-pop-up based on incoming call
- Outbound dialing, inbound dialing
- Skill-based routing
- Internet access
- Fax, e-mail
- Voice mail

ADMOSS feature spectrum

Automatic call distribution (ACD)

Announcements and interactive voice response

Announcement or music when disconnecting or holding a call

Announcement while waiting in queues on a first-in first-out basis

Automatic greeting on assignment of terminal, plus automatic personal greeting

Service-dependent announcements

Traffic assistance

Immediate and practically automatic call processing

Service calls

Directory number verification

Outgoing code-11 and code-12 calls

Trunk offering

Agent-to-agent calls

Intercept handling

Call time restriction

Large conference with up to 25 subscribers

Call setup after directory number inquiry

Call charge acceptance by a third subscriber

Collect calls

Ticket retrieval

Information on call time and charges

Call delay handling

Appointment booking

Permanent booking

Alarm calls: automatic, semi-automatic, by the operator

Directory Assistance

Automatic announcement of the directory number requested

Directory assistance followed by call setup

Automatic call completion

Special call center features

Automatic screen-pop-up based on incoming call

Outbound dialing, inbound dialing

Skill-based routing

Internet access

Fax, e-mail

Voice mail


DNM Administration - Task Wizard
File Edit View Window Help
Reference
Imported Tasks
Siemens Tree
DBPVFKDV_V2301_E_IND
DMEKDH
CF Create User ID
CF Display Commands
CF Display Job
CF Display LTG Variables
CF One Variable
CF Skip One
CF Skip Three
CF Skip Two
CF Special char
CF Ten Display Time
CF Ten Variables
INSTALLATION FUNCTIONS
MAINTENANCE FUNCTIONS
OPERATION/ADMINISTRAT
Scenario Files
DBPVFKDV_V2302_E_IND
Template
DBPVFKDV_V2301_E_IND
CF Create User ID
CF Display Job
CF Display LTG Variables
CF One Variable
CF Skip One
Nontemplate
CANCEL DIRECTORY
CREATE DIRECTORY
DISPLAY DIRECTOR
Temp
DBPVFKDV_V2302_E_IND
For Help, press F1
SIEMENS
HICOM

EWSD
Basic Functions Ensure Efficient Operation

The new generation of telecommunications networks makes even greater demands on the call processing functions of network nodes: the flow of traffic is constantly growing, subscribers are increasingly using more than just one service, the number of gateways is expanding, and economic considerations are calling for optimum utilization of network resources.

EWSD meets these demands to the full extent, proposing powerful solutions for all call processing functions.

Call processing functions are divided into the following groups:

- Call charge registration
- Traffic routing
- Network management
- Traffic data management
- Signaling
- Voice processing

Call charge registration

Call charges are the fees paid for utilization of the telecommunications services offered by an operating company. Call charge registration is therefore one of the most important basic functions to be performed by a network node.

In call charge registration, EWSD differentiates between:

– Subscriber charges
– Interadministrative charges
– Charges in the intelligent network
– Charges in the SS7 network

Connection charges and charges for the activation, deactivation and utilization of features can be recorded for each subscriber.

For interadministrative charging, the total amount of traffic is recorded on a time-related basis at the network boundaries.

Call charge registration in the intelligent network is not related to a particular line. Each service subscriber has a billing number under which the charges are added up.

Operating companies can agree on the SS7 traffic relations among themselves. Call charge registration in the SS7 network is divided into a component that is related to the message transfer part (MTP) and one for the signaling connection control part (SCCP). The MTP-related call charge registration counts the message signaling units received by or sent to a signaling point.
The SCCP-related call charge registration counts the message signaling units with global title translation (GTT).

EWSD proposes two different methods for the recording of call charges:

– Periodic pulse metering (PPM)
– Automatic message accounting (AMA)

With the **periodic pulse metering** method, call charge units are added up in subscriber-specific meters. To this end, EWSD generates meter pulses during a call. Each meter pulse corresponds to one call charge unit. The time interval in which one or more meter pulses are generated for a call is determined by the zoning result and is calculated on the basis of the tariff zone and the tariff itself.

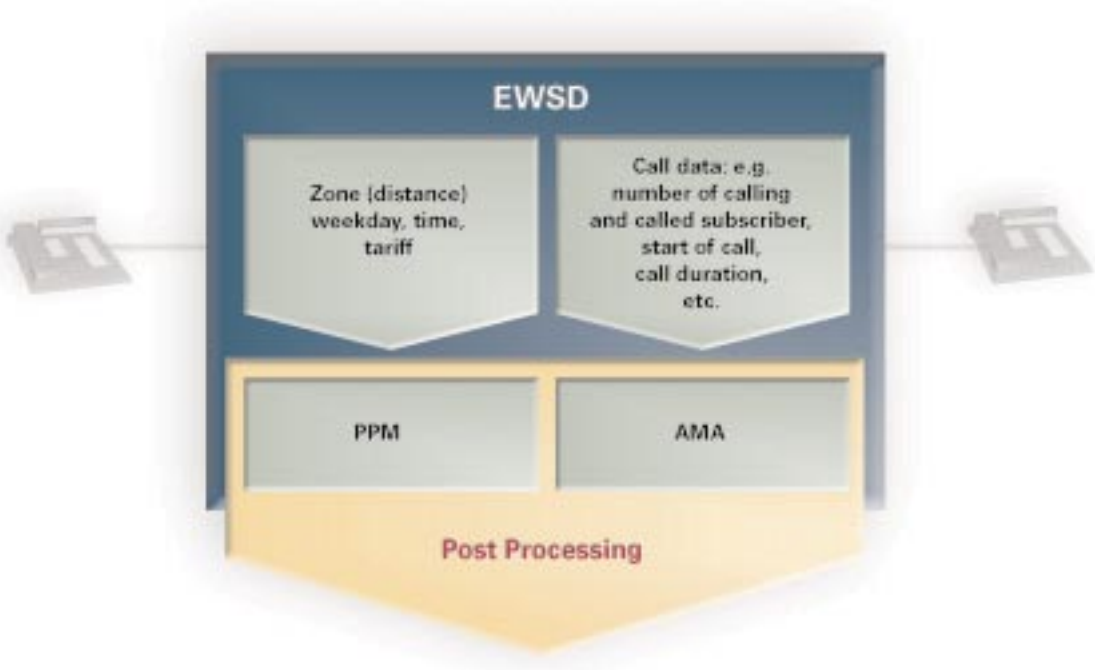
A tariff zone includes all those destinations having the same tariffs within a particular network node. Zoning is based on the following parameters:

– destination
  up to 15 dialed digits
– origin
  15 subscriber categories,
  4,047 local area codes per local network node,
  48 local area codes per transit network node,
  255 origin codes
– transmission quality
  speech, low-speed data transmission,
  64 kbit/s high-speed data transmission

The tariff is the unit of measurement for the charges incurred in making a call. Tariffs can be specified in both pulse tariff format as well as in currency tariff format. Up to 512 different tariffs can be created. The time interval can be set between 200 milliseconds and 30 minutes, in increments of 4 milliseconds.

The following items can be specified for each zone:

– 6 tariffs
– 6 weekday categories
– 8 fixed full holidays
– 8 fixed half-holidays
– 8 fixed national holidays
– 16 movable full holidays
– 16 movable national holidays
– up to 96 tariff switchovers per day and zone (in 15-minute steps)
– up to 1024 tariff change and tariff switchover sequences



Five charge meters can be freely assigned for each subscriber. It is the operating company which decides how to assign the meters. For example, charges may be recorded separately for local calls, long-distance calls, the number of connections, and the number of times features are activated.

The **automatic message accounting (AMA)** method stores connection data in a data record for each individual call. The connection data may include, for example, the directory number of the calling and the called subscriber, the time at which the conversation begins, the call duration, subscriber controlled input and feature usage. **Local automatic message accounting (LAMA)** in the local network node and **centralized automatic message accounting (CAMA)** in the transit network node record the connection data. For calculation of the charges, the AMA data records are transferred to external computing centers. A post-processing process then generates individual customer bills on the basis of the data records.

In addition to the basic functions, EWSD also offers a range of other important features for call charge registration.

With the feature **Charging by Account Code**, a subscriber can dial an account code when setting up a connection. In this way the subscriber can differentiate between the charges for outgoing calls made on a personal, a project-specific or a customer-specific charge account.

The feature **Centralized Tariffing** transfers the zoning and the recording of connection charges to central locations within the network.
A tariff determination point is responsible for the administration of tariff zones and tariffs as well as for determining the tariff zone and the tariff on a call-specific basis.
A charge generation point uses the tariff zones and the tariff information to generate the charges.
The charges are recorded in a charge registration point. All charge information is transmitted as SS7 messages in the network.
With this feature, only very few tariff zone tables and tariff tables need be administered in the network. This provides for fast and simple tariff switchover and special limited tariff offers ("happy hours"). The feature Centralized Tariffing can also be used in the intelligent network.

The feature **Flat Rate** provides the subscriber with an unlimited number of calls to certain specific destinations for a monthly flat rate.

The feature **Hotel Billing** transmits call charge information to a PC belonging to the subscriber (e.g. a hotel) as soon as the call has ended.

The feature **Interadministrative Charging and Statistics (IACHASTA)** provides a flexible means of call charge registration, geared toward administrative demands, between operating companies. IACHASTA can use both periodic pulse measuring (PPM) as well as automatic message accounting (AMA) for call charge registration.

The feature **Meter Observation (MOB)** is used for monitoring the charges incurred by individual subscribers. It is set up on request, whenever a subscriber lodges a complaint about a bill that was calculated on the basis of time-pulse metering. This feature records the charge-related connection data for all outgoing and incoming calls.

Traffic routing

During call setup from the calling subscriber to the called subscriber, traffic routing evaluates the dialed digits and works out an available connection path. EWSD has some very powerful routing functions, making optimum use of the available network resources, and therefore has no problem in coping with large volumes of traffic.

Special features provide additional means of routing the call processing traffic in the network and coping with the requirements of deregulated networks.

In deregulated markets, operating companies must be in a position to identify their subscribers as contractual partners. The means of identification is the subscriber's directory number. The feature **Black/ White List** can be used to identify authorized subscribers by means of a white list and those which are not authorized via a black list.

With the feature **Carrier Dependent Routing**, national and international calls, for example, can be set up via an alternative network operator in deregulated networks. The subscriber selects the desired operating company by means of a carrier access code. For calls set up without dialing an access code, the local network operator can specify two standard carriers. The subscriber can then change these settings by means of subscriber controlled input.

With the feature **Carrier Quota**, traffic can be distributed among different network operators according to a fixed or a dynamic sharing key. The sharing key can be either the trunk group size of the network operator in question, a predefined percentage quota or the incoming traffic volume measured for the carrier. Up to 20 carriers per destination can be administered.

With the feature **Customer Dependent Routing**, individual calls can be made via selected network operators or selected trunk groups that offer, for instance, better transmission quality.

The feature **Multiple Local Networks in one Network Node** allows the subscribers from up to 4,047 different local networks to be connected to one network node via remote digital line units (DLU). This means, for example, that subscribers belonging to a region with analog network nodes can be provided with ISDN services on an economical basis. Such subscribers are then switched physically to the remote ISDN-capable network node. However, they still remain members of their local network area.

With the feature **Number Portability**, subscribers can keep the same directory number when they move house within the same local network or switch to another operating company. EWSD automatically routes the calls for such subscribers to the right destination. The corresponding routing information is contained in a common database, which is interrogated as a preventive measure before each call setup or after an unsuccessful call setup. This special database is located in one or more EWSD network nodes in a central position in the network.

Business customers owning several private branch exchanges in the network can combine these into a single direct dial group. The feature **Overflow between PBX Groups** increases the availability and security of calls made between the PBXs. If an attempt is made to initiate a call to a PBX and all direct lines are busy or out of order, there is an automatic overflow to alternative paths via the other PBXs in the same group.

In order to release traffic paths for certain subscribers in sudden emergency situations, such subscribers can have the operating company assign them certain priorities. With the feature **Privileged Traffic**, prioritized subscribers receive special treatment. In outgoing traffic, lines can be reserved for such subscribers, an unsuccessful call attempt can be repeated or, in case of a call to a busy subscriber, the call can wait for the subscriber to become available.

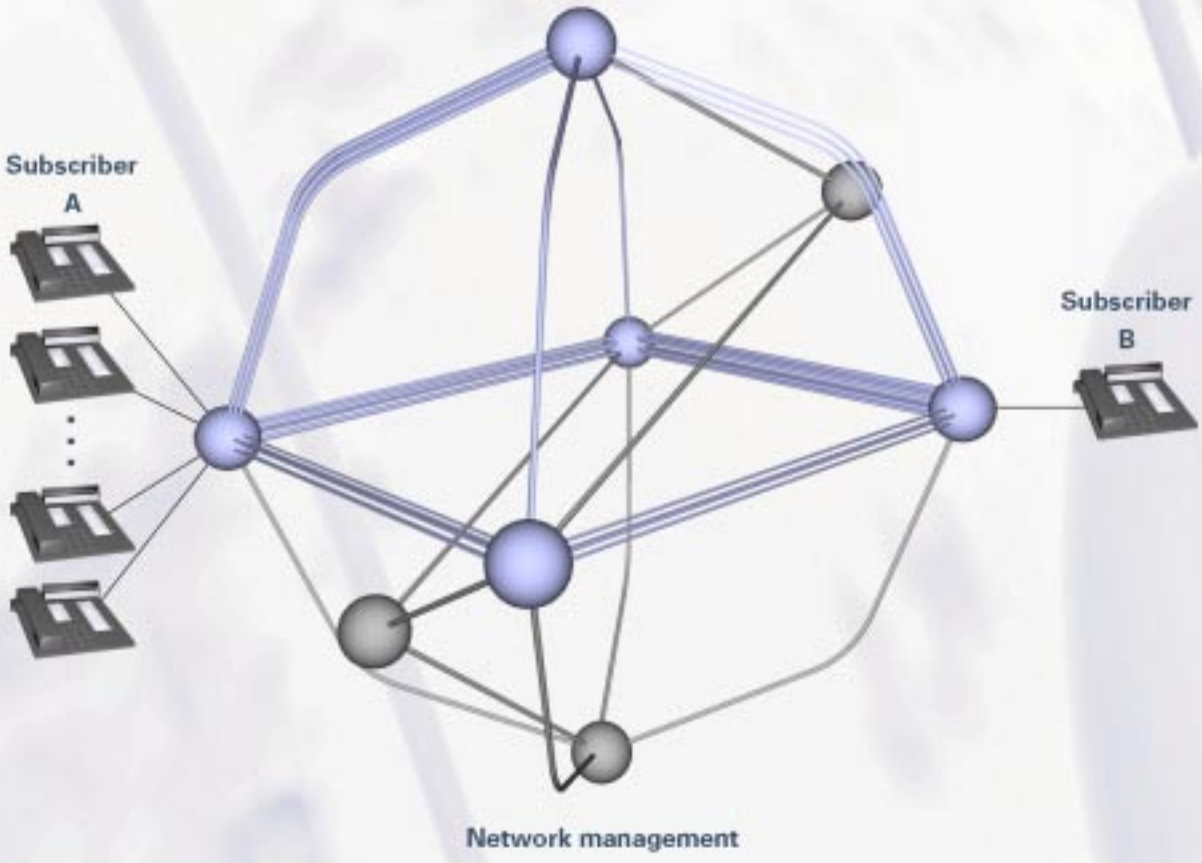
The feature **Traffic Routing Based on Transmission Quality** makes it possible to route ISDN traffic to its destination only on the transmission paths meeting certain quality criteria. The decisive factors in the selection of a transmission path are the transmission medium requirement (TMR) and the ISUP preference indicator (IPI).

Network management

The function of network management is, in the event of high load phases or failure of network sections,

- to make sure that the number of successful, charge-generating connections does not drop more than necessary
- to guarantee the highest possible call setup quality for subcribers

EWSD offers a range of powerful functions that ensure optimum utilization of the network resources, even in high load phases.



The feature **Optimized Dynamic Routing (ODR)** is used for load-dependent traffic routing. ODR automatically monitors any instances of insufficient or excessive load and, when necessary, regulates such situations. This is done by making optimum use of all traffic paths available on alternative routes.

The feature **Automatic Rerouting (Crank Back)** is used when a transit node cannot find an available traffic path to a desired destination during call setup. In this case, a message is signaled back to the preceding network node. A new route for the connection is then searched for in the preceding network node, via a different transit network node.

The feature **Automatic Congestion Control (ACC)** provides for automatic reduction of traffic to a specific overloaded network node. In case of overload, the network node affected transmits a message to the adjacent network nodes. These then reduce the traffic there.

The feature **Mass Call Control (MCC)** is used to detect mass calls. Mass calls to certain destinations can result from radio or TV quiz shows, for example. Since calls to mass-call destinations have a very small chance of being switched through, MCC reduces the traffic as close as possible to the origin, thereby granting priority to successful traffic to other destinations.

With the feature **Proportional Bidding**, traffic to a certain destination can be distributed among various different traffic paths according to a predefined percentage sharing key. In case of traffic bottlenecks restricted in time, this feature dynamically increases the call completion rate.

The feature **Call Rate Reduction (Leaky Bucket)** makes it possible to dynamically restrict the traffic to certain defined destinations. In high load phases, the network can thus be protected from overload.

The feature **Call Gapping** controls the throughput of call attempts to certain destinations. A time interval in which only one call attempt is permitted determines the upper limit of the maximum number of calls. The time intervals that can be set are 0.1 , 0.25, 0.5, 1, 2, 5, 10, 15, 30, 60, 120, 300, 600 seconds.

With the feature **Trunk Reservation**, the operating company has the possibility of prioritizing certain traffic types on selected trunk groups. A number of trunks in the group are reserved for privileged traffic.

Destinations in the network that are difficult to reach are detected by means of the feature **Hard to Reach Control (HTRC**). Usually, the reasons behind such situations are unforeseen events, such as adverse weather conditions and earthquakes. In such cases, traffic to the relevant destinations increases greatly. A high number of call attempts fail because the network is interrupted or regionally overloaded. To protect the network from unsuccessful traffic, this situation is reduced by HTRC as close as possible to the origin, thereby giving priority to the successful traffic to other destinations.

With the feature **Code Blocking**, the operating company can restrict the percentage of call attempts made to certain destinations. The limit can be set between 0 % and 100 %, in increments of 12.5 %.

The feature **Automatic Alternative Routing** is used for optimizing the search for routes. It is used when no available line can be found in the direct path during call setup. In such a case, this feature automatically reroutes the path search to the next defined alternative route. The overflow to other routing trunk groups can also be influenced by means of the functions "SKIP", "Cancel to" and "Cancel from".

Traffic data management

The traffic flow in modern communication networks can be guided optimally by means of a suitable network organization and load-dependent traffic routing. The basis for the planning of future-oriented networks is the traffic data recorded during operation.

For traffic data recording, the EWSD system proposes integrated functions that can be operated without any additional equipment.

Traffic measurement registers the events and status duration of the system or sub-systems. Traffic measurement can also be started for trunks with respect to direction and with respect to certain features. Traffic measurement thereby provides important information for the planning and operation of the network node and the network itself.

Traffic supervision periodically compares current traffic data with predefined threshold values. In this way, any irregularities in call processing can be identified at an early stage, leaving enough time for suitable countermeasures to be initiated. For example, cases of traffic overload can be recognized in good time and intercepted by means of the appropriate traffic management measures.

Through **subscriber observation**, data pertaining to certain individual connections is recorded. Based on the data recorded, conclusions can be made on the quality of service for specific connections, on the subscriber behavior and on the system and network behavior. In addition, such data can be used to deduce the expected traffic flow and the required resources.

With **traffic structure measurement**, data is recorded on a random basis from defined measuring objects. The selected measuring objects can be, for instance, the entire network node, all the originating traffic, all the incoming traffic, certain subscriber lines or trunks.

Signaling

EWSD can control the traffic from and to other network nodes with all the standard signaling systems, such as MFC R1, MFC R2, No. 5 and SS7. All signaling systems used are implemented in accordance with ITU-T.

In digital networks, the signaling system no. 7 (SS7) is predominantly used. The functions of SS7 are adapted to the needs of digital networks. The separation of functions between a common message transfer part (MTP) and several specific user parts (UP) results in greater flexibility.

Message transfer part (MTP)

The message transfer part (MTP) is a user-independent means of transporting messages between users. In principle, the message transfer part covers all the basic functions defined by ITU-T. In addition to these it has the following features:

- compatibility with ANSI standards
- option of 24-bit coding of the signaling codes

The feature **Multiple SS7 Networks** expands the range of functions with respect to network planning. With this feature, up to 32 SS7 routing domains can be administrated in a network node. This means that up to 32 operating companies in a communication network can maintain their own SS7 networks.

The feature **High Speed Signaling Links (HSL)** can be used to eliminate bottlenecks in SS7 communication between network nodes (e.g. between a signaling transfer point and a service control point in the IN). The Level 3 protocol of the message transfer part (MTP) does not allow more than 16 SS7 links between two network nodes, so that the maximum possible bandwidth is 16 times 64 kbit/s. The feature High Speed Signaling Links (HSL) offers an SS7 link using the maximum transmission rate for a PCM30 system (E1) or a PCM24 system (DS1). The Signaling ATM Adaptation Layer (SAAL), which was defined for broadband networks and is based on ATM cells, is used as the communication protocol for the Level 2 protocol of the message transfer part.

In deregulated networks, operating companies may agree upon SS7 traffic relations among themselves. The feature **SS7 Screening** ensures that only the agreed traffic can be processed. Traffic not included in the agreement is prevented and reported to the operating company.

The feature **SS7 Accounting** is used for call charge registration for SS7 traffic between different operating companies.

The feature **MTP route verification test (MRVT)** is an SS7 management function. Using this feature, the routing of the signaling traffic between an originating point and a destination point in the SS7 network can be tested. This test encompasses all relevant routing tables between the originating point and the destination point of a signaling connection.

User parts (UP)

Each user part (UP) comprises the coding, functions and protocols for the signaling for a particular user. The user parts thereby control e.g. the setting up and tear-down of user channel connections, the implementation of features, as well as administrative and maintenance functions for the user channels.

Basically, the following user parts are currently used:

- ISDN user part (ISUP)
- Signaling connection control part (SCCP)
- Transaction capabilities (TC)
- Operation and maintenance application part (OMAP)

EWSD also supports the IN application part (INAP) for intelligent networks (IN), as well as the mobile application part (MAP) and the base station application part (BSSAP) for use in mobile communication systems.

The **ISDN user part (ISUP)** comprises the signaling functions for controlling connections, for processing services and features and for the administration of user channels. The functions comply with the recommendations for ISUP 97 published by ITU-T in 1997 (corresponding to the ISUP Standard, version 3).

The ISUP implemented in EWSD is also characterized by:

- flexible adaptation to the existing channel-associated signaling or to the existing SS7, with the aid of extended ISUP screening functions
- proprietary portions for parts not defined by ITU-T, e.g. for GeoCENTREX, QSIG, charging, etc.

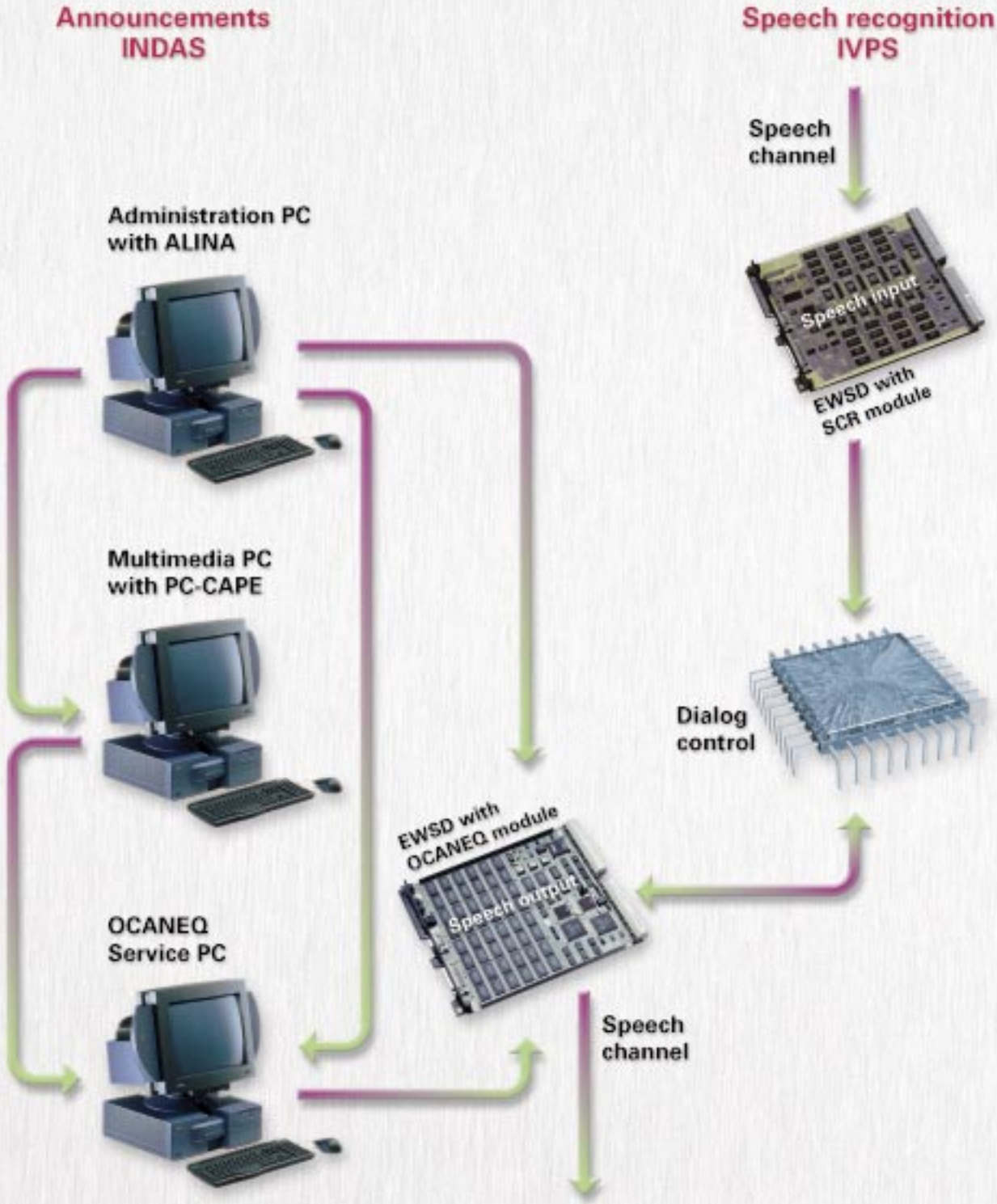
ISUP adaptations for national requirements have already been implemented for more than 70 projects.

The **signaling connection control part (SCCP)** serves to supplement the message transfer part.

Transaction Capabilities (TC) support the exchange of messages between users without any reference to a user channel connection.

SCCP and TC contain all the major functions defined by ITU-T.

The **Operations and Maintenance Application Part (OMAP)** contains functions for measurement and supervision of the SS7 network. For example, as part of the measurements defined for SS7, information on the load on the SS7 network is output at regular intervals (5, 15 minutes). These measurements can be started as required. The "first and interval" measurements only provide an information output if a specific event has occurred and this event recurs in the measurement interval (e.g. rejection of messages because of a routing error). "On occurrence" measurements are used to report all critical events immediately to the operator.


Announcements
INDAS
Speech recognition
IVPS
Speech
channel
Administration PC
with ALINA
Speech input
EWSD with
SCR module
Multimedia PC
with PC-CAPE
Dialog
control
EWSD with
OCANEQ module
Speech output
OCANEQ
Service PC
Speech
channel

Voice processing

Announcements are playing an ever increasing role in telecommunications today. They improve the service and user-friendliness in call processing and, in conjunction with dialog-driven functions, have become indispensable.

With its individual digital announcement system (INDAS), EWSD offers a powerful functional package with which suitable announcements can be independently composed in an easy and flexible manner.

In addition to the announcement system, EWSD also offers with the integrated voice processing system (IVPS) a speech-based solution for interactive dialog between the subscriber and the system.

A wide range of possible applications exists for speech-based dialog, such as:

- Dialog support for subscriber features
- Call completion after directory inquiries
- Automatic feature subscription
- Automatic provision of operator services
- Speech-menu-driven selection of operator groups (automatic operator selection)

Individual Digital Announcement System (INDAS)

The individual digital announcement system (INDAS) consists of:

- three software programs:
  PC-CAPE,
  ALINA,
  OCANEQ service software
- OCANEQ module

A normal PC is used to design and control the announcements using the software programs PC-CAPE, ALINA and OCANEQ service software. The three software programs can also be run separately on different PCs.

PC-CAPE (Cutting and Programming Equipment) is a versatile and efficient program for the production and modification of announcements. The PC on which it runs must be equipped with a microphone, a sound card and headphones or active loudspeakers.

ALINA (Administration of Language data for Individual Announcements) is used for the administration of the announcements.

OCANEQ Service Software is used for loading the speech data into the OCANEQ module.

The **OCANEQ Service PC** is a PC or notebook with Windows NT 4.0 which contains at least the OCANEQ service software.

OCANEQ (Operationally Controlled Equipment for Announcement) is the announcement system hardware in the EWSD switch. OCANEQ is a module installed in an LTG (line/trunk group).

Integrated Voice Processing System (IVPS)

The integrated voice processing system (IVPS) is based on the user **interaction LTG (UI-LTG)**. Each UI-LTG can perform 31 dialogs at any one time. Several UI-LTGs can be used in parallel in EWSD.

The UI-LTG contains for IVPS:

- SCR hardware module
- OCANEQ hardware module

The module **SCR** (speech recognition and code receiver) simultaneously supports the recognition of speech inputs and dual-tone multifrequency signals. Speech recognition is implemented on the module as additional software that can be loaded.

The module **OCANEQ** is also used in IVPS as an announcement device.

EWSD
Additional Functions Expand the Range of Applications

EWSD expands the range of applications for telecommunication services with additional functions.

QSIG

EWSD supports the interaction of private communication networks and private branch exchanges at different locations and in corporate networks over the PSTN. Here, EWSD takes on the role of a backbone network node. Private networks and PBXs can be connected to this EWSD backbone either directly or by means of a HICOM access node. The principal use of the HICOM access node is for traffic routing and conversion of QSIG and other network protocols (e.g. CorNet-N and DSS1).

The signaling information between the private network or the HICOM access node and EWSD is transported via QSIG. This is a standardized signaling system (reference point Q) for ISDN-based signaling between private communication networks and PBXs. QSIG ensures transparent transportation of the control information during feature usage. EWSD transports the signaling information in the PSTN as ISUP messages in the case of circuit-related connections. In the case of non-circuit-related connections, the signaling information is transported by means of TCAP. QSIG is also used for the network-wide functions of GeoCENTREX.

The following features can be offered throughout the network on the basis of QSIG:

Bearer services

- Circuit Mode, Speech
- Circuit Mode, 64 kbit/s unrestricted
- Circuit Mode, 3.1 kHz audio
- Packet Mode, Semipermanent B Channel Access
- Packet Mode, B Channel Access
- Packet Mode, Switched B Channel Access

Teleservices

- Telephony, 3.1 kHz
- Telephony, 7 kHz
- Teletex
- Telefax (Group 4)
- Videotex
- Videotelephony

Subscriber features

- Call Completion to Busy Subscriber (CCBS)
- Call Completion on no Reply (CCNR)
- Call Hold (CH)
- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)
- Connected Line Identification Presentation (COLP)
- Connected Line Identification Restriction (COLR)
- Call Forwarding (CF)
- Call Waiting (CW)
- Direct Dialing In (DDI)
- Multiple Subscriber Number (MSN)
- Subaddressing (SUBA)
- Terminal Portability (TP)

GeoCENTREX features

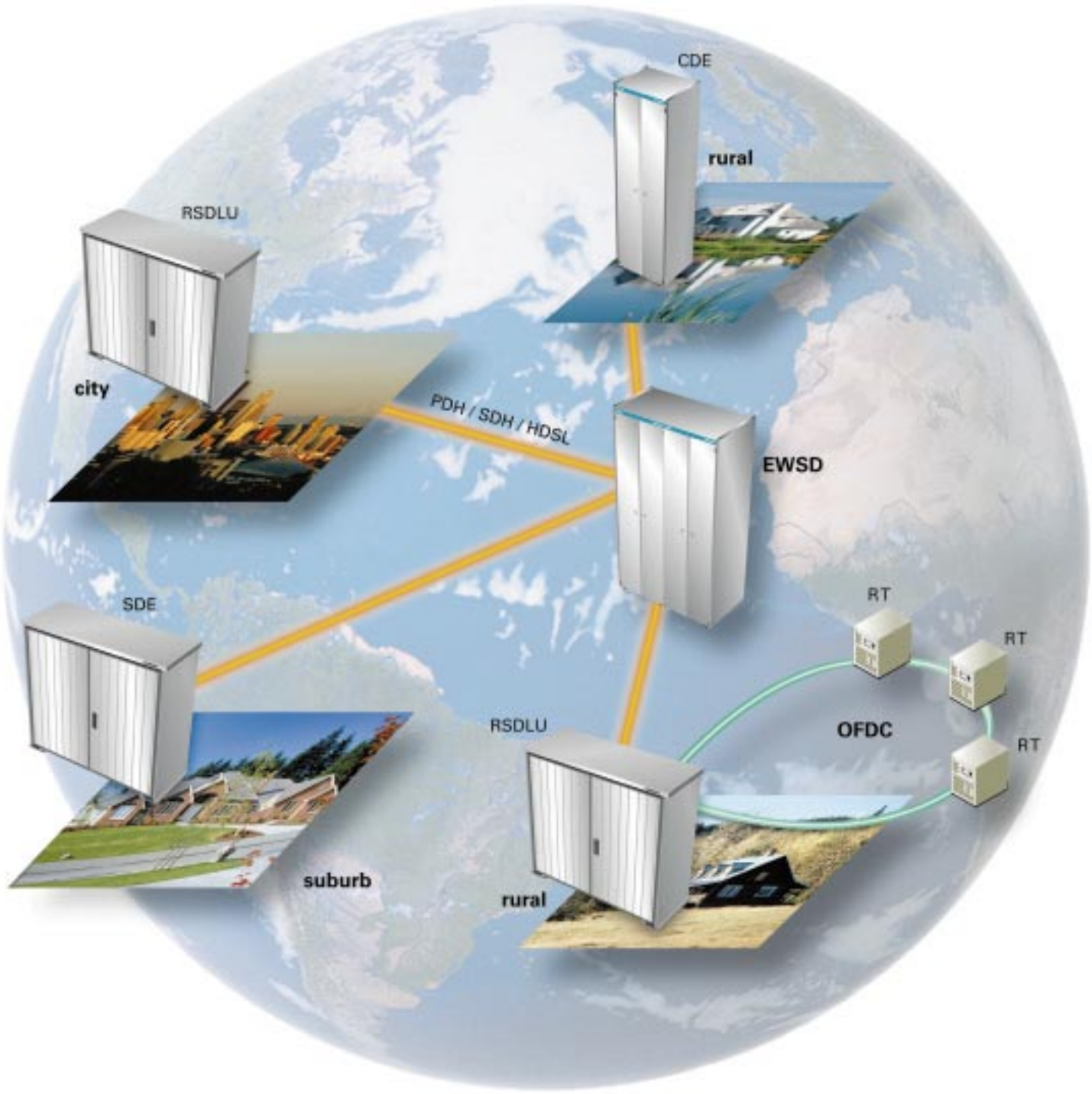
- Calling Name Identification Presentation (CNIP)
- Calling Name Identification Restriction (CNIR)
- Connected Name Identification Presentation (CONP)
- Connected Name Identification Restriction (CONR)

Cordless telephone mobility (CTM)

The cordless telephon mobility (CTM) service enables the subscriber to move freely within the geographical region of the corresponding network node. To avail of this service, the subscriber needs a DECT-standard terminal (DECT = digital European cordless telephone) or a suitable dual-mode mobile telephone (GSM and DECT standard).

The mobile link to the subscriber is created in a CTM region by radio base stations (RBS). In turn, a number of radio base stations are connected to a radio distribution unit (RDU). An RDU is connected to EWSD by means of a V5.1 or V5.2 interface.

Handover is possible within an RDU region.


CDE
rural
RSDLU
city
PDH / SDH / HDSL
EWSD
SDE
RT
RT
RT
OFDC
RSDLU
suburb
rural

EWSCountry
Cost-Efficient Call Processing for Rural Areas

The organization of telecommunications networks in rural areas poses a particular problem for network operators. On the one hand, subscribers there demand the same range of functions made available to subscribers in more densely populated areas. On the other hand, however, traffic density is low and, in many cases, is not sufficient to support economically viable operation of the line network and network nodes.

EWSCountry offers several solutions to ensure that, while maintaining low investment costs, subscribers in rural areas can still be provided with all the functions and features of a modern telecommunications network.

Remote shelter DLU (RSDLU)

The remote shelter DLU (RSDLU) integrates the complete range of telecommunications equipment that is required to incorporate into a communications network those groups of subscribers located far from the central EWSD network nodes. With RSDLU variants for 150, 400 and 700 subscribers, the network operator has the greatest possible flexibility in setting up and expanding its access network.

The RSDLU is equally suited for operation within a building or in the open air. The connection to the network node or between RSDLUs uses the following:

- PDH technology:
  State-of-the-art optical fiber technology with 2 x 2 Mbit/s and 34 Mbit/s.
  Existing 2-wire technology with HDSL
- SDH technology:
  State-of-the-art optical fiber technology with 155 Mbit/s or 622 Mbit/s

Optical fiber distributed concentrator (OFDC)

The optical fiber distributed concentrator (OFDC) represents cost-efficient line technology for subscribers in areas that are particularly sparsely populated. OFDC uses the latest optical fiber technology for the line.

Via an optical fiber ring of up to 1,000 km in length, up to 848 subscribers can be connected.

The interface to the optical fiber is situated in a DLU. The connection points in the optical fiber ring form remote terminals (RT). Each remote terminal can be used to connect up to 80 analog or 64 digital subscribers. In parallel with the subscribers, up to four PCM30 links can be connected. These PCM30 links can be used for connecting to other DLUs, for example. Apart from line technology, the remote terminals also contain the equipment for refreshing the signaling on the optical fiber ring.

Compact digital exchanges (CDE)

The compact digital exchange (CDE) is a physically compressed form of an EWSD network node. Depending on the capacity stage, up to 15,000 subscribers or up to 3,700 trunks can be connected to a CDE.

A CDE offers the same range of functions as a regular EWSD network node. Owing to its smaller size, a CDE is particularly suited for container installation.

Small digital exchange (SDE)

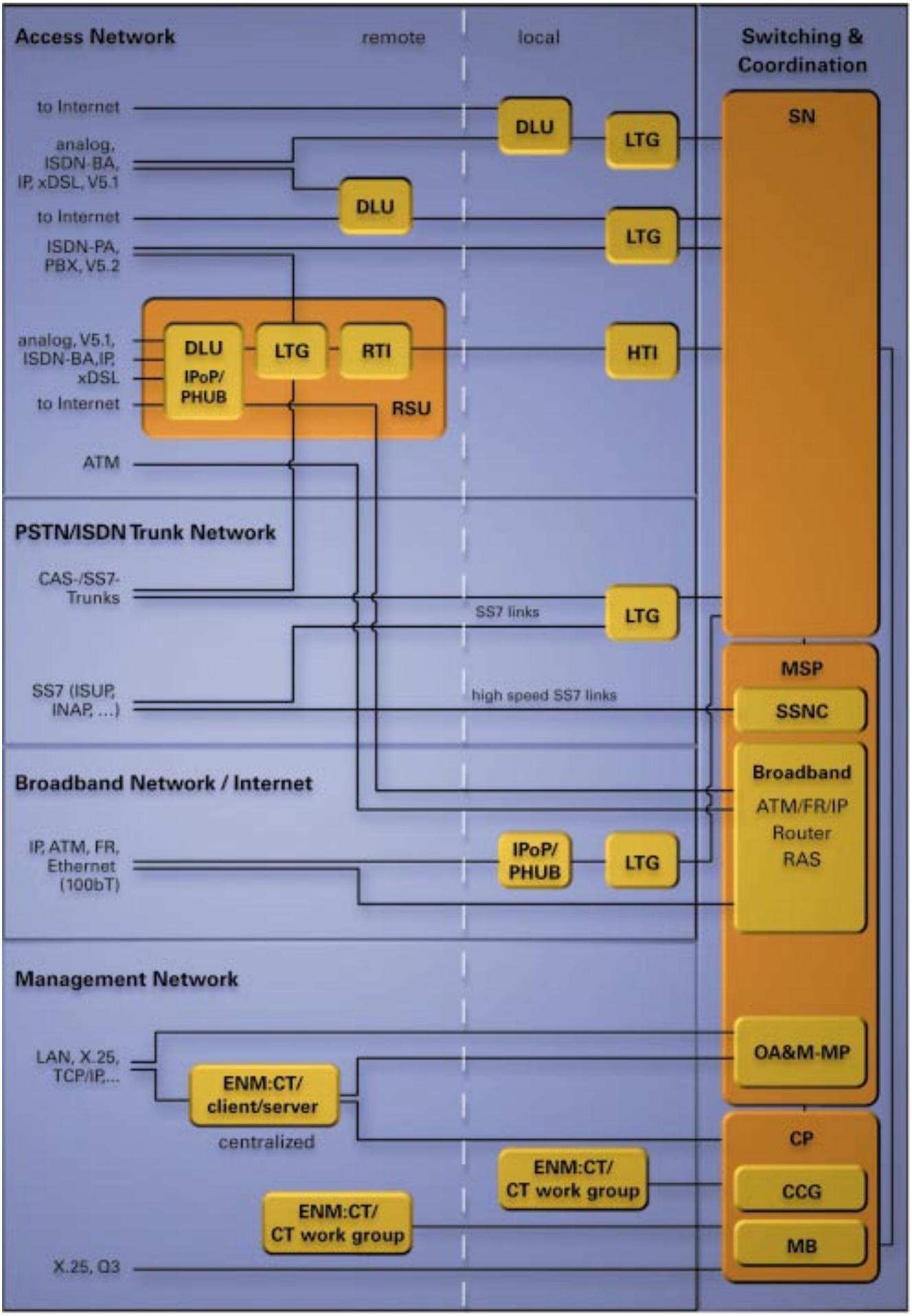
The small digital exchange (SDE) is a small but fully independent EWSD-compatible network node that can be used cost-efficiently with as few as 100 subscribers (analog or digital). The SDE is suitable for implementation of local network nodes and transit network nodes (for up to 960 trunks) as well as combined local/transit network nodes.

As far as its technical design is concerned, the SDE basically consists of components from the digital line unit (DLU) in the EWSD system. This means that, by simply replacing certain modules, the SDE can be expanded at any time into a DLU with the full range of EWSD features. Thus, as demand increases, the bulk of the original investment can be used again in setting up an EWSD network node.

The SDE exists in three basic configurations:

- Cabinet for up to 280 subscribers (switching part only)
- Cabinet for up to 280 subscribers (switching part, MDF, O&M-PC, rectifier, batteries)
- Cabinets for up to 3,400 subscribers (switching part only)

The SDE can be housed in containers. It therefore takes very little time to set it up temporarily, even in areas with an underdeveloped infrastructure.


Access Network
remote
local
Switching & Coordination
to Internet
analog, ISDN-BA, IP, xDSL, V5.1
to Internet
ISDN-PA, PBX, V5.2
DLU
LTG
DLU
LTG
SN
analog, V5.1, ISDN-BA, IP, xDSL
to Internet
DLU
IPoP/ PHUB
LTG
RTI
RSU
HTI
ATM
PSTN/ISDN Trunk Network
CAS-/SS7-Trunks
SS7 links
LTG
SS7 (ISUP, INAP, ...)
high speed SS7 links
MSP
SSNC
Broadband Network / Internet
Broadband
ATM/FR/IP Router RAS
IP, ATM, FR, Ethernet (100bT)
IPoP/ PHUB
LTG
Management Network
LAN, X.25, TCP/IP,...
ENM:CT/ client/server
centralized
OA&M-MP
CP
ENM:CT/ CT work group
CCG
ENM:CT/ CT work group
MB
X.25, Q3

EWSD Hardware
Powerful, Versatile and Flexible

EWSD performs all its functions on a single hardware platform. The hardware components are noted for their high static efficiency and a high dynamic loading capacity. Together, they ensure the exceptional degree of reliability provided by the EWSD system.

The EWSD hardware is based on the latest technology such as application-specific integrated circuits (ASIC), large-scale integrated (LSI) telecom chips and digital signal processors (DSP). In addition, through further technological development, the EWSD structure now takes up a lot less space.

Greater efficiency in the central system areas

The following components make up the central system area:

- Switching network (SN)
- Coordination processor (CP)
- Message buffer (MB)
- Central clock generator (CCG)
- Multi Service Platform (MSP) inklusive Signaling system network control (SSNC)

The **switching network (SN)** forms the heart of the network node. This is where the connections between origins and the desired destinations are created. Through the introduction of the new switching network D (SND), typical characteristic values have now been quadrupled.

With a traffic load of 100,000 erlang, 240,000 connectable ports and 2,016 LTG ports, the system now offers the greatest through-connecting capacity.

The new switching network still only comprises a handful of modules. It is structured in a single stage and free from blocking. This means that n x 64 kbit/s functions are also possible with no restrictions. Internally, the SN uses optical fibers for setting up connections.

The interfaces to existing line/trunk groups (LTG) are fully supported by the new switching network.

The **coordination processor (CP)** is the efficient partner of decentralized controls in the periphery. As a multiprocessor, the CP can be adapted to any performance requirement. In its maximum capacity stage, the CP displays a dynamic capacity for approximately 4 million busy hour call attempts (BHCA).

The coordination processor (CP) thereby forms the OA&M interface of EWSD. The EWSD NetManager (ENM) is available for local, remote or centralized operation. In addition to the X.25 interfaces currently available in EWSD for OA&M, the EWSD PowerNode now also has access to a more efficient LAN interface. This can be used to process file transfers at a much faster rate of 10 Mbit/s, e.g. for call charge data and traffic measurement data.

The **message buffer (MB)** serves to coordinate the exchange of messages within the network node between the CP, the SN, the SSNC and the LTGs. The new message buffer D (MBD) has an ATM-based communications bypass to the SSNC. The EWSD PowerNode thus applies ATM technology internally and benefits by the associated advantages in terms of speed. In this way, the message buffer relieves the CP and contributes to its high performance.

The **central clock generator (CCG)** is in charge of synchronizing the network node and, if necessary, the network itself. The CCG operates at a very high degree of precision and may additionally be synchronized by means of an external master clock.

The **Multi Service Platform (MSP)** forms the central part of the EWSD innovation architecture. The MSP processes:

- SS7 signaling for narrowband applications in the EWSD PowerNode
- Routing of Internet traffic in the EWSD Internode
- SS7 signaling for broadband applications in the EWSD BroadbandNode
- Switching of ATM traffic in the EWSD BroadbandNode
- OA&M tasks for reducing the load on the coordination processor

In the EWSD PowerNode the function of the **Signaling System Network Control (SSNC)** is implemented on the basis of the MSP. The SSNC is the high-performance EWSD subsystem for SS7 signaling via the message transfer part (MTP) and the signaling connection control part (SCCP). The SSNC is of scalable design; it can operate up to 1500 SS7 signaling links, and it processes more than 100,000 message signal units per second (MSU/s) as well as more than 4000 SCCP global title translations per second (GTT/s).

The SSNC can be used in all imaginable SS7 network applications, e.g. as:

- Signaling end point (SEP)
- Stand-alone signaling transfer point (STP)
- Integrated SEP/STP
- SCCP Relay

A further possibility is its use as a gateway between different networks, network operators or network topologies, such as ITU-T 14 bit and ITU-T 24 bit ANSI. For this application the SSNC offers features for recording and accounting traffic with adjacent networks as well as for screening. It is also possible to separate the network into a maximum of 32 individual networks. This is implemented within the EWSD system, it is completely transparent and complies with the standards.

With the SSNC, up to 4096 routes to other SS7 signaling points can be set up. With the SSNC it is possible to connect:

- SS7 links with 64 kbit/s
- SS7 high-speed links with 2 Mbit/s or 1.5 Mbit/s (E1/DS1 PCM links)
- Broadband links in ATM technology with n x 64 kbit/s or n x 56 kbit/s

As a future-proof system the SSNC also supports the interaction of narrowband and broadband signaling on MTP and SCCP level as well as a maximum message length of 4 kbyte on broadband links.

Greater efficiency and new functions in the system periphery

The following components make up the system periphery:

- Digital line units (DLU)
- Line/trunk groups (LTG)
- Integrated Point of Presence (IPoP) / Packet Hub (PHUB)
- Remote switching unit (RSU)

The current changes in the world of telecommunications are primarily affecting the subscriber line sector. Correspondingly, the goal behind EWSD innovation was also to strengthen the performance of the system periphery to a substantial extent and to integrate new functions.

The **digital line units (DLU)** concentrate the traffic from subscribers to the EWSD. They either form an integral part of the network node or are implemented remotely in proximity to the subscriber groups.

An important feature of the remote DLU is the emergency service. In the event of a breakdown of the signaling channels to the controlling EWSD network node, the emergency service allows the subscribers connected to the DLU (analog, ISDN, GeoCENTREX) to continue telephoning.

With the new digital line unit G (DLUG), subscriber lines can now be provided at an even more economical rate than before. Thanks to the progress made in integration density in semiconductor technology, extension modules for up to 32 subscribers are now possible for the very first time. This means that one DLU can be used for 2,000 subscriber lines.

The following items can be connected to the DLU:

- analog subscriber lines (POTS)
- ISDN basic accesses (ISDN-BA)
- high bit-rate subscriber lines up to 2 Mbit/s
- V5.1 interface

High bit-rate subscriber lines of up to 2 Mbit/s connected to the DLU are used for Internet access. Special extension modules are available for this purpose:

- universal asymmetrical digital subscriber line (UDSL)
- symmetrical digital subscriber line (SDSL)

Access networks from other systems can be connected to the V5.1 interface.

The DLUG takes account of the increased mean traffic density per subscriber through a fourfold increase in the transport capacity to the LTGs: 16 PCM30 systems transport traffic of up to 390 erlang. The DLUG is connected to four LTGs.

For the port area, the **line/trunk groups (LTG)** form the interface to the switching network. All line types can be connected to the LTGs, and all signaling procedures used on the lines can be processed by the LTGs.

One LTG can be used for connecting:

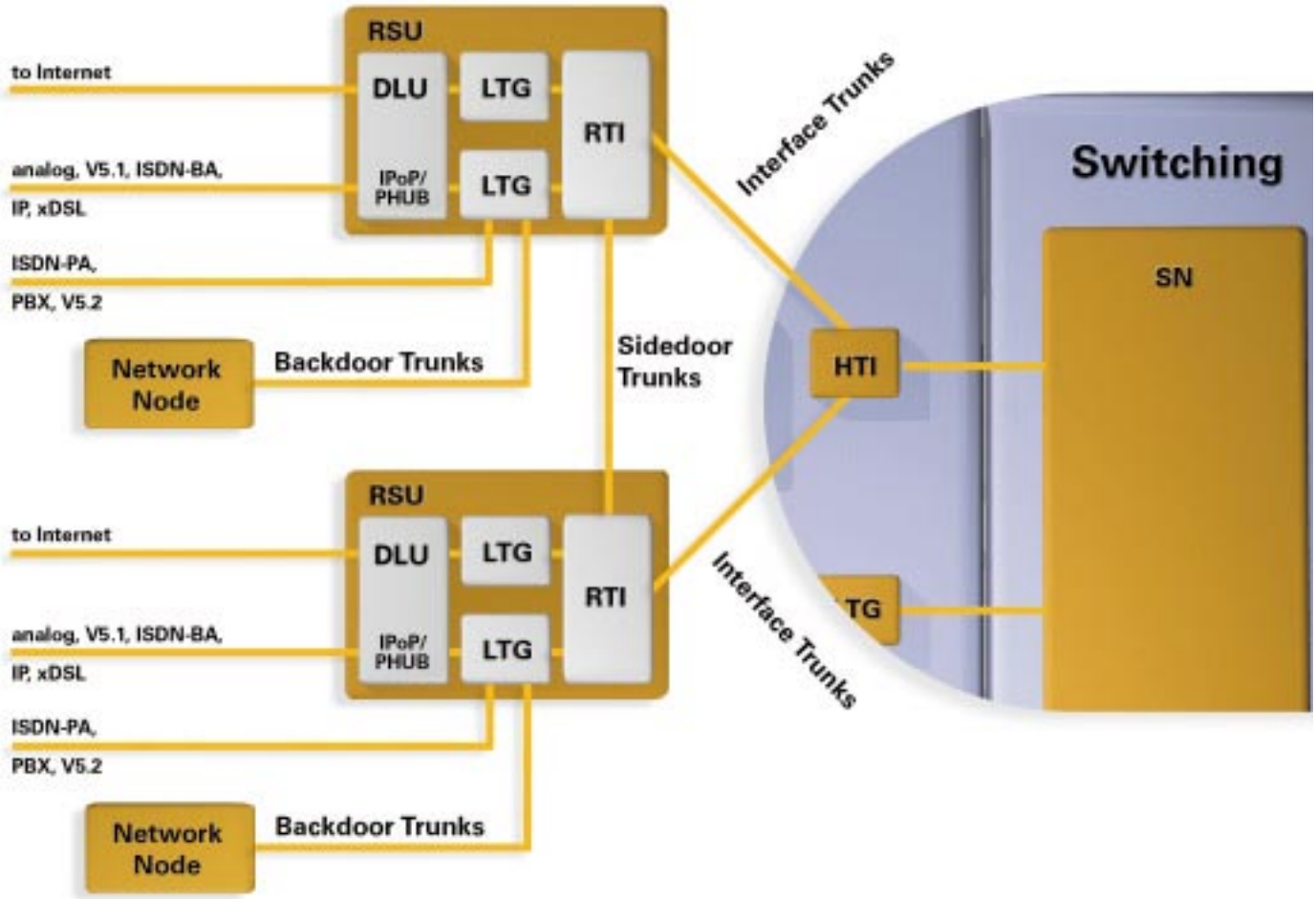
- up to four primary digital carriers (PDC) at transmission rates of 2,048 kbit/s (for trunks, remote DLU or primary rate access)
- up to two primary digital carriers at transmission rates of 4,096 kbit/s (for local DLU)
- access network via a V5.2 interface (for up to four V5 links)

For Internet access, EWSD has an **Integrated Point-of-Presence (IPoP)**. The IPoP offers all the basic functions of a remote Internet access server, such as

- dial-up access to the Internet, intranets or virtual private networks (VPN) for analog and ISDN subscribers, and
- voice packaging in accordance with the Voice-over-Internet standard.

The IPoP is connected to an LTG like a DLU.

The Packet Hub (PHUB) is likewise part of the DLU. It guides the high bit-rate Internet data traffic from the subscriber access to the Internet. The packet hub can also perform a remote access server function (RAS) for the Internet Service Provider (ISP).


RSU
DLU
LTG
RTI
IPoP/
PHUB
LTG
to Internet
analog, V5.1, ISDN-BA,
IP, xDSL
ISDN-PA,
PBX, V5.2
Network
Node
Backdoor Trunks
Sidedoor
Trunks
Interface Trunks
Switching
SN
HTI
RSU
DLU
LTG
RTI
IPoP/
PHUB
LTG
to Internet
analog, V5.1, ISDN-BA,
IP, xDSL
ISDN-PA,
PBX, V5.2
Network
Node
Backdoor Trunks
Interface Trunks
TG

The **remote switching unit (RSU)** occupies a very important position within the framework of EWSD innovation. In the consolidation of traditional networks as well as the construction of new networks, the RSU can take the place of small network nodes, DLU clusters or remote control units (RCU). Up to 50,000 subscribers can be connected to an RSU. Internal traffic is through-connected directly in the RSU. This reduces the load on the transmission equipment to the controlling EWSD network node. As a result, the transmission paths can be dimensioned in a cost-effective manner.

In the event of a breakdown of the signaling channels to the controlling EWSD network node, the RSU has an emergency service function. While the emergency service is in operation the connected subscribers still have access to a limited range of EWSD.

Like an EWSD network node, the RSU also offers the entire range of line interfaces:

- analog subscriber lines (POTS)
- ISDN basic access (ISDN-BA)
- ISDN primary rate access (ISDN-PA)
- high bit-rate lines (UDSL, SDSL)
- 2 Mbit/s leased line
- Internet access
- V5.1 interface
- V5.2 interface.

An RSU is made up of DLU, LTG and remote timeslot interchange (RTI). Of these, the RTI is the only new hardware development, i.e. the DLUs and LTGs already in use in the network node can be used in an RSU. Small EWSD network nodes, DLU clusters and remote control units (RCU) can thereby be easily converted into RSUs with the same hardware. Even remote DLUs can be directly connected to the RSU.

Interface trunks connect the RSU via the RTI to the controlling EWSD network node. For connection of the interface trunks the EWSD network node uses the host timeslot interchange (HTI). All data for call processing, charging and the OA&M is exchanged over signaling channels of the interface trunks. Sidedoor trunks connect neighboring RSUs and enable traffic routing without affecting the transmission equipment to the controlling EWSD network node. Backdoor trunks are trunks with SS7 or channel-associated signaling. They make the connection from the RSU to other network nodes.

EWSD Software
Intelligence for Every Application

The EWSD software is based on a modular design. This means it can easily be adapted to suit the specific needs of each operating company. It also means that new functions and features can be easily incorporated into the EWSD software.

The EWSD software is written in the programming languages CHILL, C++ and Assembler.

Software principles

The EWSD software, like the EWSD system in general, is subject to the highest degree of quality criteria.

Reliability – The reliability of the EWSD software is based upon its:

- practical accuracy, completeness, function performance
- consistency, integrity, error prevention
- fail-safety, minimum spread of error
- resistance to overload

Flexibility – The flexibility of the EWSD software is evidenced through its:

- operator-specific configurability
- system expansion during operation

Portability – The portability of the EWSD software is ensured through compilers that generate the program code for various different target computers.

User-friendliness – Operation of the EWSD software requires very little effort. The user-friendliness of the EWSD software is ensured through its:

- easy-to-learn operating language
- wide range of menu-driven operations
- interactive operation manuals
- resistance to incorrect operation
- operator control possibilities for certain system processes

Ease of maintenance – The EWSD software supports the detection and correction of errors through the:

- ease of performing minor software modifications
- modularity, optimized structure and transparency
- ease of testing

Efficiency – Efficiency within the EWSD software is achieved through the:

- implementation of compilers to generate a program code that is optimized for the operator's application program system
- use of measuring instruments to determine how often a program is called in within a particular processing sequence and low long its runtime is
- use of certain algorithms to solve specific tasks
- use of the programming language Assembler in tasks with a critical execution time
- program optimization by adapting program flow to the frequently occurring standard cases
- subdivision of complex tasks into sub-tasks that can be executed in parallel, independently of each other, starting at a specific processing time
- distribution of the tasks occurring over various processors
- privileging certain processes, so they can run, in part, without interruption
- assigning urgent processes a higher priority, so they can be executed before other processes of a lower priority.

Quality control – Quality controls are performed at all stages of software development. On completion of each stage in development, tests are performed to check that the results attained meet the defined requirements and fulfill the specified quality standards. Only after such quality controls have been performed is the result released for use as a basis in further developments.

The quality control measures are implemented on the basis of a chain reaction. The results obtained in the software development stages depend on each other with respect to quality, i.e. the final quality of one stage is the starting quality for the next stage.

The quality of analysis can be seen as the basis. This affects the entire development process, in particular the quality of design and of implementation. Detailed, planned code reviews are just as important for quality assurance as the extensive test phase. System release is subject to strict quality criteria.

Software architecture

The flexibility of the EWSD software is based upon the extensive use of transient software. Together with the node-specific database, this forms the application program system (APS). Only certain processors, such as the control within the switching network (SN), the control within the message buffer (MB), and the subscriber and trunk modules, actually contain firmware programs.

Just as the hardware is divided into subsystems with decentralized control, the EWSD software is also divided according to function. This means that the simpler functions to be performed more frequently are dealt with by the system periphery controls. The more general and complex functions are executed by the coordination processor (CP).

Each processor within EWSD has its own operating system. The scope of each operating system depends on the tasks to be handled and the resources to be managed by the processor. All operating systems perform their tasks under real-time conditions.

Database

EWSD operation requires a large volume of data. This data makes up the EWSD database, which forms part of the application software of the network node.

The database is characterized by the following features:

- rapid data access for call setup and clear-down within a short period of time
- data integrity and data consistency, to minimize the possibility of data errors
- optimum use of data memory capacity by using redundant data only where it is technically relevant
- expandable data structures, so the database can be easily adapted to expansions of the network node

Access to the database is only possible by means of special access procedures at certain defined interfaces. The application programs remain unaware of the manner in which the data is stored within the database (information hiding). The advantage of this is that the application programs remain unaffected by changes in data organization.

The database is administered centrally in the coordination processor (CP). In addition, copies of certain data are also available in the line/trunk groups (LTG) and in the digital line units (DLU). The signaling system network control (SSNC) contains a database independent of the CP. For security reasons, the entire database (CP and SSNC) is mapped to magnetic disk.

The database contains semipermanent data as well as transient data.

Semipermanent data describes the static capacity of the network node. It includes, e.g. the subscriber data, line data, routing and zoning data or data for system configuration.

Semipermanent data is subject to strict security requirements, as any data errors in the switching process would produce undesired results. A wide range of measures are taken to protect the semipermanent data, i.e.:

- semipermanent data lies in protected memory sectors
- data access is only possible by means of specific coordinated access procedures
- the semipermanent data is administered centrally
- personal and device-specific passwords are required for modifications
- all access is controlled by means of an authorization test
- all changes made to the database are recorded
- the distributed data is subject to an ongoing consistency check

Application programs have read-only access to semipermanent data. If necessary, however, the operator can modify the semipermanent data. Certain types of data can also be modified by means of subscriber-controlled input (e.g. creation of call forwarding).

Transient data describes the current status of the network node and the call-processing activities. It includes, e.g. information on the operating status of the hardware, the status of calls and the availability of resources. It also contains the results of call-processing activities (e.g. call charge data, traffic measurement data). Transient data is not write-protected; it is read and modified chiefly by the call-processing programs.

Recovery

The EWSD software is provided with safeguarding devices that ensure the system's availability and performance level. The recovery function comprises all the measures required for operation of the system or for reestablishment of fault-free operation following malfunction. The recovery function includes:

Installation recovery – this is performed to start operation of the system. It incorporates startup actions for initial operation of a new network node as well as startup actions for the implementation of a new version of the application program system (APS) in an existing network node.

Central recovery – this comprises the startup actions used to neutralize a malfunction of the coordination processor during operation and thereby reestablish the performance level of switching operation.

Recovery in the call-processing peripherals – this is used to neutralize a malfunction in a peripheral subsystem and to make the subsystem in question available once again to the coordination processor.

The choice of recovery level depends on the type and frequency of the malfunction occurring. By selecting the right recovery level, the system can be quickly returned to full performance without any effect on call processing. However, in case that the selected recovery level cannot fully eliminate the malfunction, the safeguarding programs initiate the next highest recovery level.

Overload handling

Bottlenecks in the available network capacity lead to an ever decreasing switching performance. As a result, many call requests are left unprocessed.

If the load exceeds a certain predefined limit, the overload handling function of EWSD comes into action.

The aim of overload handling is, at times of high load or overload, to reserve switching capacity for calls that are likely to be successful and so ensure that any loss of charges is reduced to a minimum.

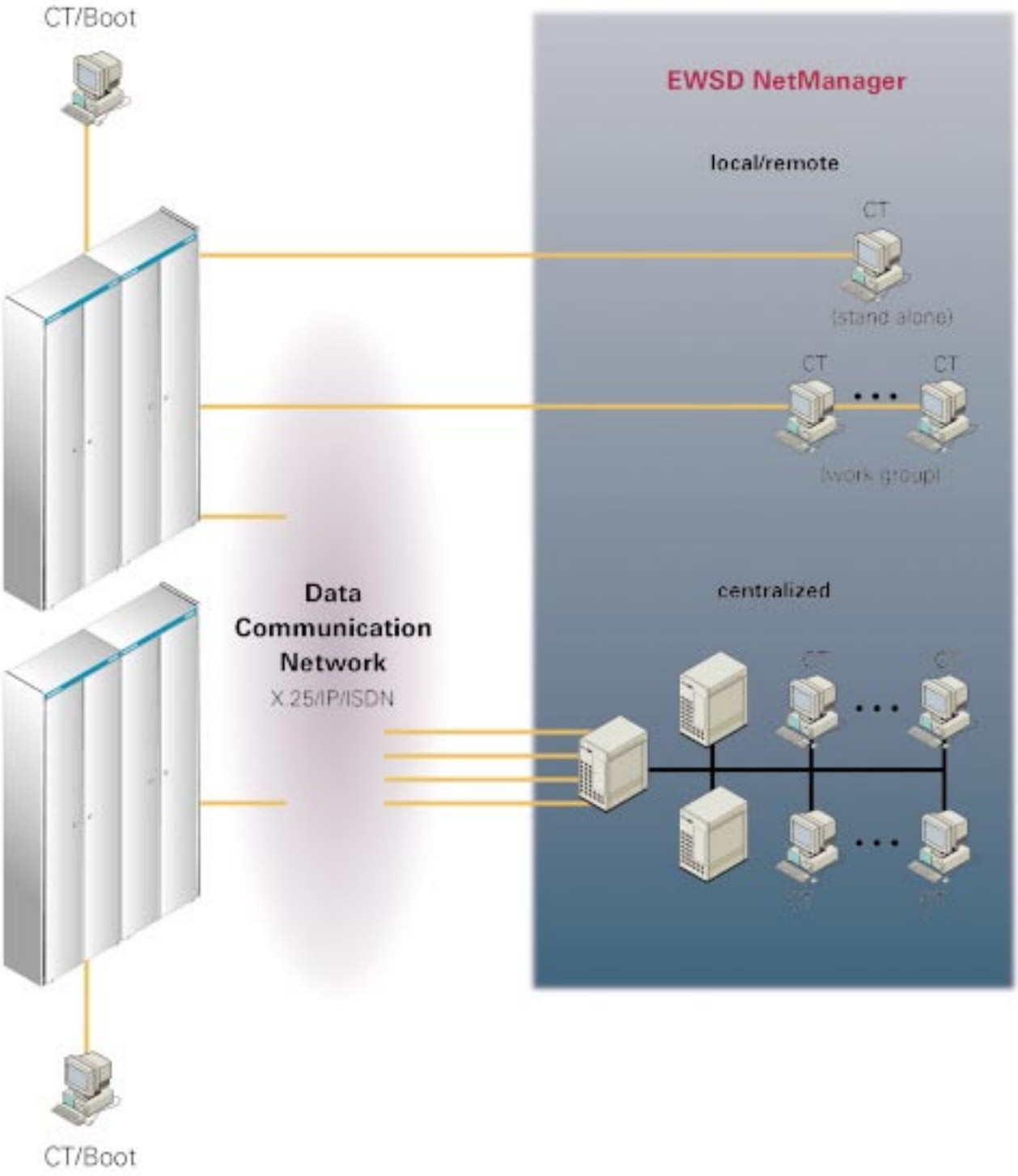
Overload handling comprises a range of control mechanisms. These reduce the load on the processors within the line/trunk groups and on the coordination processor, so these can use their control capacity for meeting call requests with available lines.

Existing connections are not affected by overload handling.

Software upgrade

New features in EWSD are made available in the form of a new version of the application program system (APS). Using the OSU function (optimized software upgrade), the APS can be changed with a maximum system downtime of approx. one minute.

EWSD Operation and Maintenance
Efficiency at an Optimized Cost



Modern communication networks are making ever-increasing demands on operation and maintenance. This is due to various changes that can be observed in the marketplace.

The primary cause is the transition from monopoly markets to deregulated markets. This has intensified the competition for network operators, who are now adapting their operating procedures to the changed conditions:

- by optimizing their O&M processes, starting with the improvement of customer service right through to a drastic reduction of the expenditure for management activities in the network nodes
- by speeding up the processing of their business
- by cutting down the "time to market" when introducing new features
- by modernizing customer services, e.g. by ordering and configuring products and services via the Internet

The networks are also subject to a continuous process of evolution, in the course of which the telephone network and the data networks are growing closer and closer together. Broadband data transmission using ATM technology is becoming increasingly important.

Network operators are therefore concentrating on O&M solutions that satisfy the changed requirements and secure their companies a competitive edge in the marketplace.

EWSD NetManager

The EWSD NetManager (EMN) is the efficient, cost-optimized management system for EWSD. It offers a complete range of facilities for performing all operating, administration and maintenance functions on EWSD network nodes and in EWSD networks. All operating procedures of the EWSD NetManager are tailored to EWSD. EWSD and EWSD NetManager interoperate via function-oriented proprietary interfaces and also via standard interfaces.

The EWSD NetManager guarantees low operating costs thanks to large-scale automation, easy execution even of complex operating tasks, and optimum resource management. Using interfaces based on the World Wide Web (WWW) it is also possible to operate the EWSD entirely via a Web browser.

Integration and coexistence

The EWSD NetManager can quite easily be integrated into any existing office environment.

The EWSD NetManager uses the Windows NT operating system, which is used all over the world. The graphical user interface and all the standard Windows NT functions are also available on the EWSD NetManager. This means a reduction in training costs, because every user with PC experience is immediately working in a familiar environment.

On a craft terminal (CT) it is possible to use Office applications (e.g. text editing, E-mail) as well as performing all EWSD operating functions. It is also possible to use a wide range of other commercial (Windows NT) software products on the craft terminal.

The WWW-based interfaces offer access to the graphical user interface (GUI) of the EWSD NetManager, irrespective of the basic hardware and software of the operator workstation (e.g. Windows NT, Windows 9x, MacIntosh, X-Terminal).

Thanks to its modern Java interface technology, the EWSD NetManager is also easy to integrate into complex existing management systems. A new version of the EWSD NetManager can be phased in. Coexistence with previous versions or with older EWSD management systems (e.g. Operation and Maintenance Terminal, data communication processor) is guaranteed, especially coexistence of the Unix-based versions of the EWSD NetManager (Node Commander) and the new NT-based version. By adding NT servers and by upgrading the client software it is possible to obtain a state-of-the-art EWSD NetManager.

In such a case, the operator is unaware of whether the function selected on the client terminal is running on the Unix server or the Windows NT server.

The Windows NT-based EWSD NetManager is a prerequisite for introducing EWSD Innovation in the network. It contains the complete IT infrastructure for Q3 and SNMP interfaces. It is also possible to use complete solutions for automation applications.

EWSD services and features

EWSD offers a comprehensive range of services and features. The EWSD NetManager fully supports the entire spectrum of EWSD services and features. The immediate availability of the EWSD services and features is guaranteed at all times by the appropriate version of the EWSD NetManager. Future EWSD versions will also automatically be provided with the optimal operating and maintenance functions by means of synchronized EWSD NetManager versions.

EWSD Innovation

The EWSD NetManager guarantees full operability of the innovation platform EWSD PowerNode and the innovation applications EWSD InterNode and EWSD BroadbandNode. In this way the EWSD NetManager supports the evolution of the networks and the introduction of new services.

Scalability

Scalability enables the EWSD NetManager to keep in step with the expansion of the network and the changing requirements of the operator. In its minimum configuration the EWSD NetManager consists of one or more craft terminals (CT), which can be connected to an EWSD network node as a local or remote unit. The craft terminals can be combined into work groups. In a client/server architecture the EWSD NetManager can perform the O&M tasks for several million EWSD ports from a central location.

Regardless of the configuration, the user interface is always the same for identical operational tasks, and the existing hardware can be used again.

The standard equipment of every EWSD network node also includes the CT/BOOT, a special version of the craft terminal. CT/BOOT provides all the functions required for putting the system into operation and for performing maintenance tasks on site.

Centralization

The EWSD NetManager is optimized for centralized operation of EWSD networks. This includes various functions.

Performing parallel management activities in several EWSD network nodes includes:

- Coordination of operating, administration and maintenance tasks depending on the task area, user, user groups, user rights
- Administration of access rights and passwords and updating in all EWSD network nodes

Processing of information from several EWSD network nodes includes:

- Reception and distribution of information according to user, user groups, applications
- Support of user- and task-oriented processes
- Supervision of EWSD network nodes
- Forwarding of alarms and messages to users, user groups and applications
- Centralized provision of services, logging, etc.

Administration of the management center includes:

- Administration of workstations
- Administration of users, user groups, user rights
- Night concentration

The security concept for centralized operation is implemented in accordance with DoD C2.

Customer-oriented user interface

The EWSD NetManager offers considerable scope for performing O&M tasks. The user interface on the craft terminal can be adapted according to specific requirements.

User-friendly input on the craft terminal is supported by:

- Command sequences that can be designed with graphical aids
- Predefined, customer-oriented command files and profile techniques
- Interactive help
- Electronically available user documentation with interactive operating and maintenance procedures

Automation

To supplement the user-friendly basic functions, the EWSD NetManager has applications for automation and improvement of efficiency in the service management and network management areas.

The applications can be used optionally on the EWSD NetManager. Each one represents a complete solution for the special requirements and problems of individual customers.

The following applications are available for **Service Management**:

- Subscriber Provisioning
  By means of improved subscriber administration it is possible, for example, to install a service in the network or network node as soon as an order is placed and to make the service available to the customer immediately. The application supports the operator by defining feature packages and by automatically selecting and allocating a free line.

- Subscriber Complaint System
  This application shortens the response time in cases of enquiries or trouble reports from the end customer. It helps to increase the customer's satisfaction with the network operator. Among other things, the operator has access to all subscriber data, which means that an operator processing a report can immediately call up the subscriber's status and perform line tests. This makes it easier to coordinate any repairs.
- GeoCENTREX Management
  This application offers support for the network-wide execution of GeoCENTREX administration tasks. Complex tasks can be dealt with more efficiently: Administration of GeoCENTREX groups: (numbering plans, call charge registration, subscriber administration, PBXs, hunting groups)

  Administration of attendant functions: (attendants, attendant groups, multi-functional attendant console, call distribution)
- Billing
  This application provides a complete solution for billing with end customers and between network operators.
  The application is based on AMA and IACHASTA, the billing methods used in EWSD. The call data recorded by these methods (date and time of the call, call duration, etc.) is collected automatically from the EWSD network nodes at regular intervals. If necessary, the call data can also be collected manually .
  Billing is based on the call data and on additional information such as membership of particular customer groups and the valid tariff.
  The bill can contain a breakdown of call charges, standing charges and special charges (e.g. for repairs).
  The application permits flexible allocation of tariffs, e.g. for specific customer groups. Likewise, special short-term tariffs (happy hour), for example, can be set up without any great effort.

The following applications are provided for **Network Management**:

- Call Routing
  Call Routing is used for configuration and control of the trunk network. The application provides the operator with a graphical user interface that is tailored to the necessary operating procedures – instead of individual commands. The interdependencies with the SS7 network are also taken into consideration. The operating procedures create trunk groups and trunks in both terminating points in parallel. Call Routing speeds up the configuration of the trunk network and at the same time improves the quality of the operating activities. Call Routing supports the operating sequence from the new codepoint to the routes and trunks. This greatly simplifies the operation of the various routing methods.
- SS7 Management
  SS7 Management is used for configuration and control of the signaling network. Like Call Routing, it is based on operating procedures instead of individual commands. The operating procedures create signaling links in both terminating points in parallel. SS7 Management speeds up the configuration of the signaling network and at the same time improves the quality of the operating activities. SS7 Management supports the administration of the MTP network and of the SCCP network.

Interfaces to other operating systems:

The EWSD NetManager provides dialog-oriented interfaces and report interfaces to other operating systems.

Via the dialog-oriented interfaces it is possible to carry out configuration tasks for service management and network management. These interfaces are based on the O&M process and the operating procedures. The interfaces are specified in JAVA, while the transport of the interface information is specified in CORBA or DCOM.

The report interfaces are used for transmitting alarm data, billing data, performance data, monitoring data, and other data required for network planning. In this context the EWSD NetManager performs a concentration and collection function, thus keeping external operating systems separate from the complexity of the data transport from the EWSD network node to the management system.

In addition to the interfaces to the EWSD NetManager, EWSD also continues to provide the standard interfaces with the protocols they support (Q3, SNMP, FTAM/FTP).

Security measures

EWSD has a wide range of security measures to protect against unauthorized access to the system and its data.

The security measures are divided according to the following functions:

- Administration of access rights
- Testing of access rights
- Identification and authentication
- Evidence collection and alarm processing
- Transmission security
- File and access protection

The **administration of access rights** encompasses the allocation of authorizations with respect to users, devices and applications, as well as authorization categories. The authorization rights determine which commands can be used by a user or a device or application.

Whenever a command is entered, the **testing of access rights** checks whether the user and the device have the required authorization.

The **identification and authentication** of users is performed by means of user IDs and passwords. In case of external computer systems, access authorization is checked by means of the network address, the processor name and the application name.

Evidence collection is used to prove the presence of unauthorized access to EWSD. Incorrect passwords and unauthorized sessions opened are recorded in cyclic files.

Alarm processing includes the actions taken to restore system security, such as sending an alarm to the system administrator, blocking certain devices and processors, blocking user IDs, interrupting sessions.

For **transmission security** with respect to data, the identification and authentication of the transmitting and receiving parties are checked. In addition, an access check prevents unauthorized users from using the resources required for data transmission.

For **file protection**, the files are assigned certain protective information. When a file is accessed, all the protective information taken together determines whether or not file access is permitted.

EWSD also includes **access protection** against external access by applications in TMN systems (telecommunications management network). Access protection operates on the Q3 interface between EWSD and the TMN.

File transfer

For file transfer to external systems, EWSD uses the FTAM function (file transfer, access and management). FTAM, based on the ISO standard 8571, forms an important component of the Q3 interface in the TMN.

FTAM is an application of the ISO reference model (layer 7). With FTAM, file transfer is performed according to the client/server principle. The client sets up the connection and sends tasks to the server. The server performs the tasks and returns the results to the client.

FTAM can assign access rights for all types of file access. In addition to read and write access to files on external computers, it is also possible to create and delete files and to read and modify file properties.

FTAM operates independently of the physical storage of data on the partner computer.

Subscriber line maintenance

A fully functioning subscriber line is required if a subscriber is to have reliable access to the services of a telecommunications network. Operating companies therefore endeavor to keep their subscriber lines free from faults and to clear any faults as soon as possible.

EWSD provides the greatest degree of efficiency with respect to its maintenance measures for subscriber lines. These ensure rapid detection and diagnosis of faults, thereby contributing to rapid fault clearance.

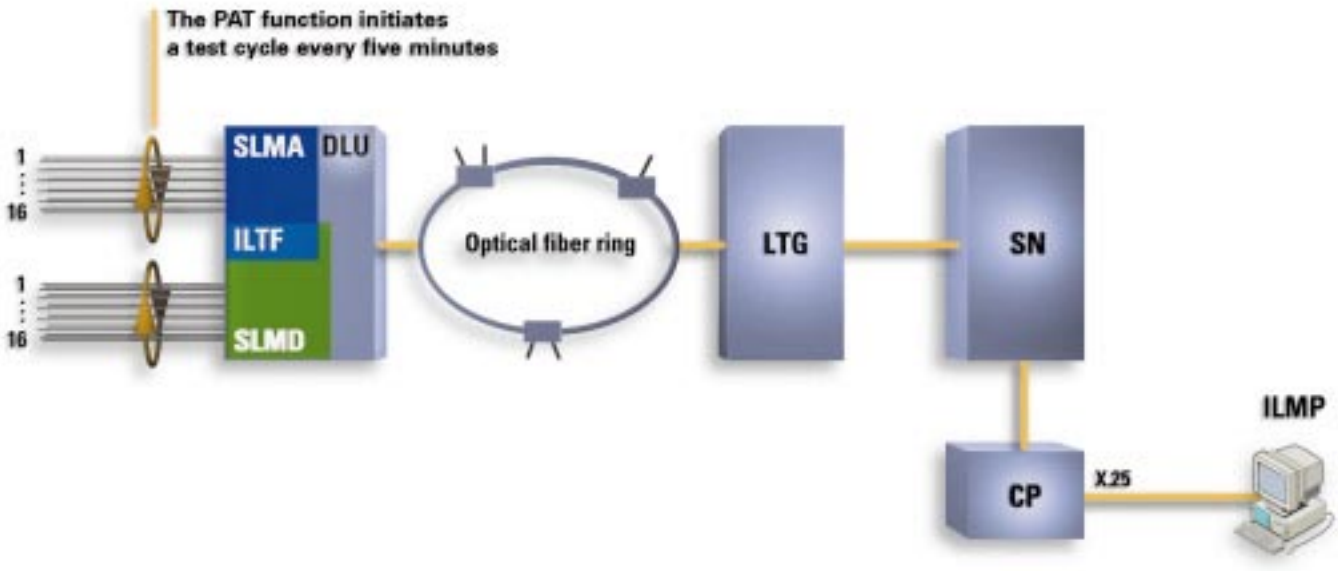
The maintenance measures apply to both analog as well as digital subscriber lines.

The **integrated line test function (ILTF)** detects a faulty subscriber line before the subscriber can even notice the fault. By means of the periodic access test (PAT), ILTF detects faults as soon as they occur on subscriber circuits, subscriber lines or subscriber terminals. This test is performed every five minutes.

For analog lines, the PAT function checks the:

- Availability of the subscriber terminal
- Quality of the subscriber line
- Subscriber circuit

For digital subscriber lines, PAT performs a level-1 activation. This checks the availability of level 1 as far as the network termination with the subscriber.



The ILTF testing functions are incorporated into every subscriber line module.

The following facilities are available for manual testing of subscriber lines:

- Test unit (TU)
- Line workstation (LWS)
- Subscriber line test PC (LT-PC)
- Ringback service (RBS)

In the new DLUG with line modules for up to 32 subscribers, the ILTF function for manual tests can be called up (instead of the TU).

External test equipment can be connected to EWSD by means of the Metallic Test Access (MTA).

Trunk maintenance

The operating quality of a communication network depends on the existence of fully functioning trunks and SS7 lines, among other things. As it does for subscriber lines, EWSD also provides effective functions for enabling rapid detection, diagnosis and localization of trunk faults.

The measures implemented in EWSD are divided into self-supervision, routine testing and demand testing.

Self-supervision is performed in the GP and in the CP. It comprises the following functions:

- Supervision of connection setup and clear-down (call irregularity monitoring)
- Supervision of trunks for certain permanent events (noisy port)
- Supervision for permanently blocked trunks (permanent trunks)
- Supervision of trunks for permanent status
- Supervision of trunks for extremely long connections
- Supervision for faulty trunks (killer trunks)
- Supervision of trunks with SS7 signaling
- Supervision of PCM links

Routine testing is performed in addition to self-supervision. A separate test program exists for each type of trunk. The scope of the tests is determined by the characteristics of the testing facilities in the network nodes at either end of the trunk.

Demand testing is initiated whenever a fault is detected. It is used for detailed fault diagnosis and fault localization. It is also possible to check the operability of a trunk following fault clearance.

The following test devices are available for the routine and demand testing of trunks:

- Automatic test equipment (ATE) and end-to-end test equipment (ETEAE)
- Trunk workstation (TWS)
- Test phone
- Automatic transmission measuring and signaling test equipment for international telephone trunks (ATME2)

Maintenance

Maintenance activities on EWSD are restricted to the processing of automatically detected malfunctions (corrective maintenance). There is no need for preventive maintenance.

Alarm surveillance reports the exact type of fault and its location, and the operating documentation provides detailed instructions on fault clearance.

For software maintenance, the operational support of a Technical Service Center can be called in.

In case that repair is necessary, Siemens can provide a repair and replacement service, supporting the logistics of the operating company.

EWSD
Structural Layout

Thanks to its consistently innovative hardware development, the EWSD system takes up less and less space. With its modular design and the increased use of plug-in connections, the system can now be assembled in much less time. Meanwhile, installation test manuals and acceptance test manuals help to ensure a smooth installation and acceptance of the network node.

EWSD complies with the relevant international standards **(European standard EN60950/ IEC60950)** in respect of human safety, protection of property, electromagnetic compatibility, etc. Compliance with these standards is confirmed by the CE label in each rack.

The entire hardware of an EWSD network node is housed in **racks**. The number of racks required can vary according to the capacity stage of the system. The racks are enclosed in cases, which have front and back doors to ensure unrestricted access to the interior.

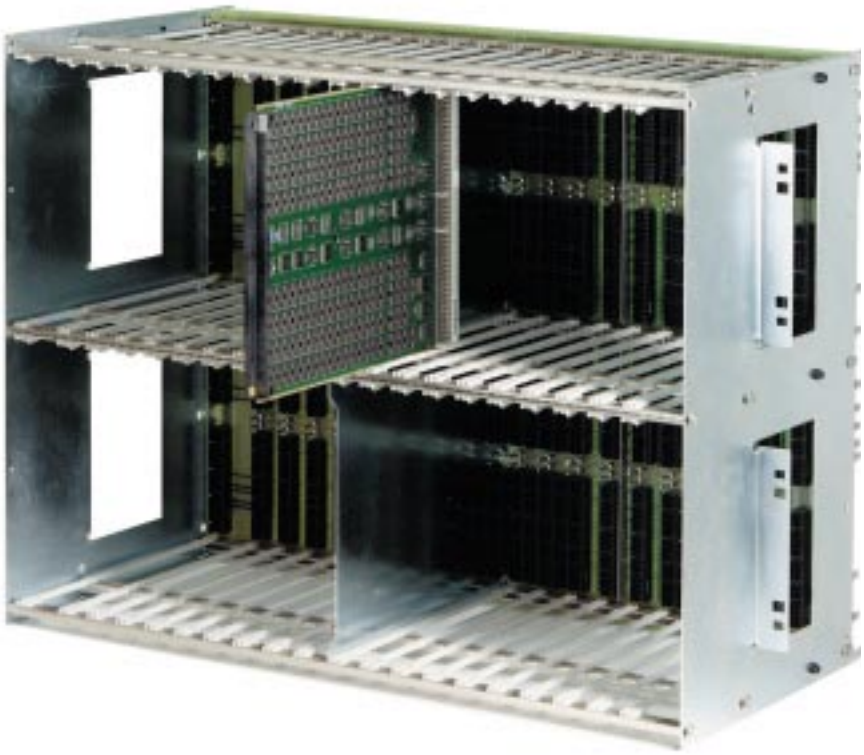
The racks are assembled alongside each other in **rack rows**. Simple snap-in connections provide the contact between the individual racks and ensure a safe ground connection.

The rack rows can be assembled directly on the floor of the switching room or on a special raised floor. A raised floor provides for underground cabling. In addition, a cooling fan for the racks can be made available from below. In case of construction without a raised floor, a planar cable grid is provided above the racks for cabling purposes.

The racks hold the **module frames** and other system parts such as, for example, air-circulator panels, power supply and fuses.

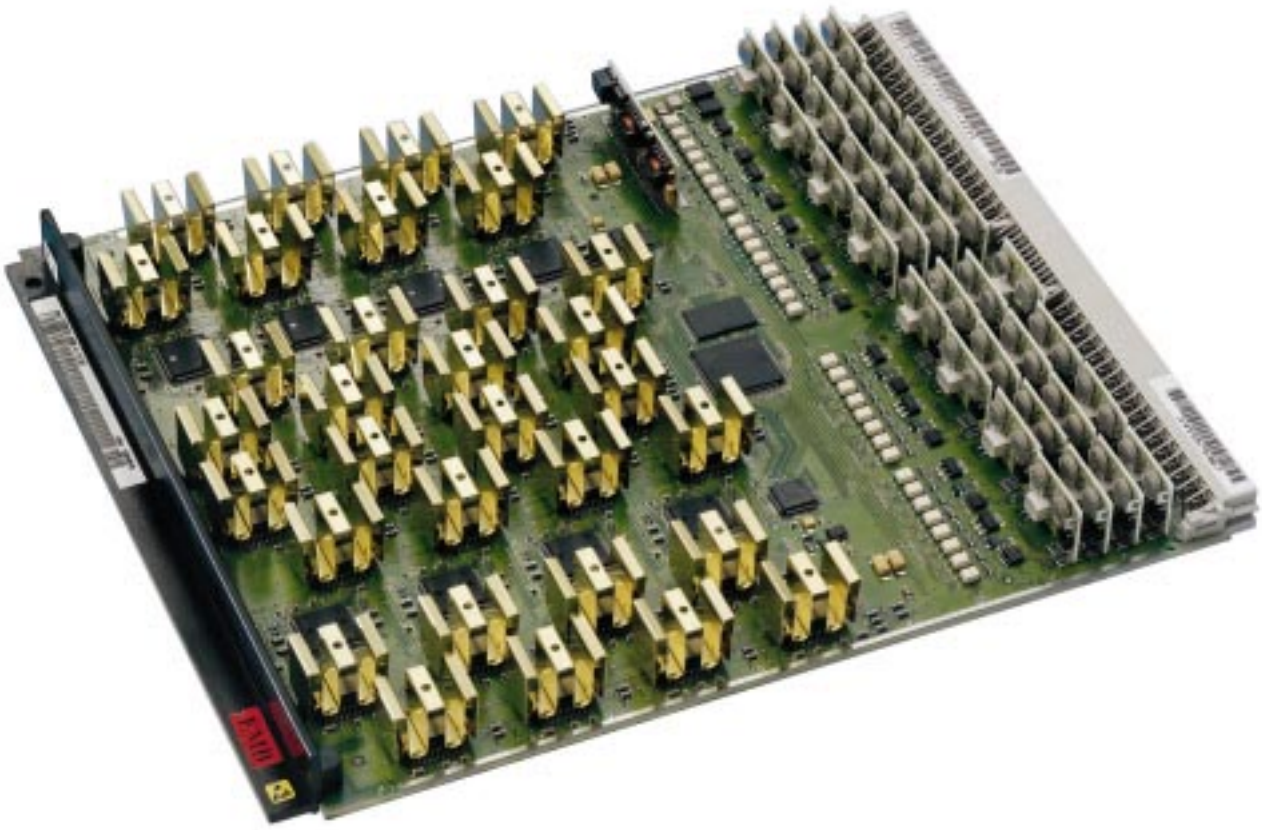
The module frames form both physical as well as wiring units. In principle, each module frame consists of assembly rails, side sections and guides for the modules, as well as a multilayer wiring board. In order to ensure complete electromagnetic shielding, a module frame may be provided with top and bottom sheets as well as a contacting front cover.

The wiring board provides the electrical connections for the module frame. Blade-connector strips pressed into the wiring board form the interface to the modules. If necessary, the connectors of the blade contact strips are made long enough for the cable connectors to be plugged in at the back. Corresponding centering strips or "cages" make sure that the cable connectors are centered and then locked in the correct position.



The module frames hold the actual **modules**. The modules are all of the same format. On the front of each module is a faceplate, which may contain display elements, switches and front-facing connectors. The spring contact strips on the back edge of the module form the mating part of the blade-connector strips in the module frame.

The printed circuit boards of the modules are designed according to the multilayer technique. They are predominantly equipped with components in keeping with surface-mounting technology (SMD technology). SMD technology saves space and is particularly suited to automatic production.

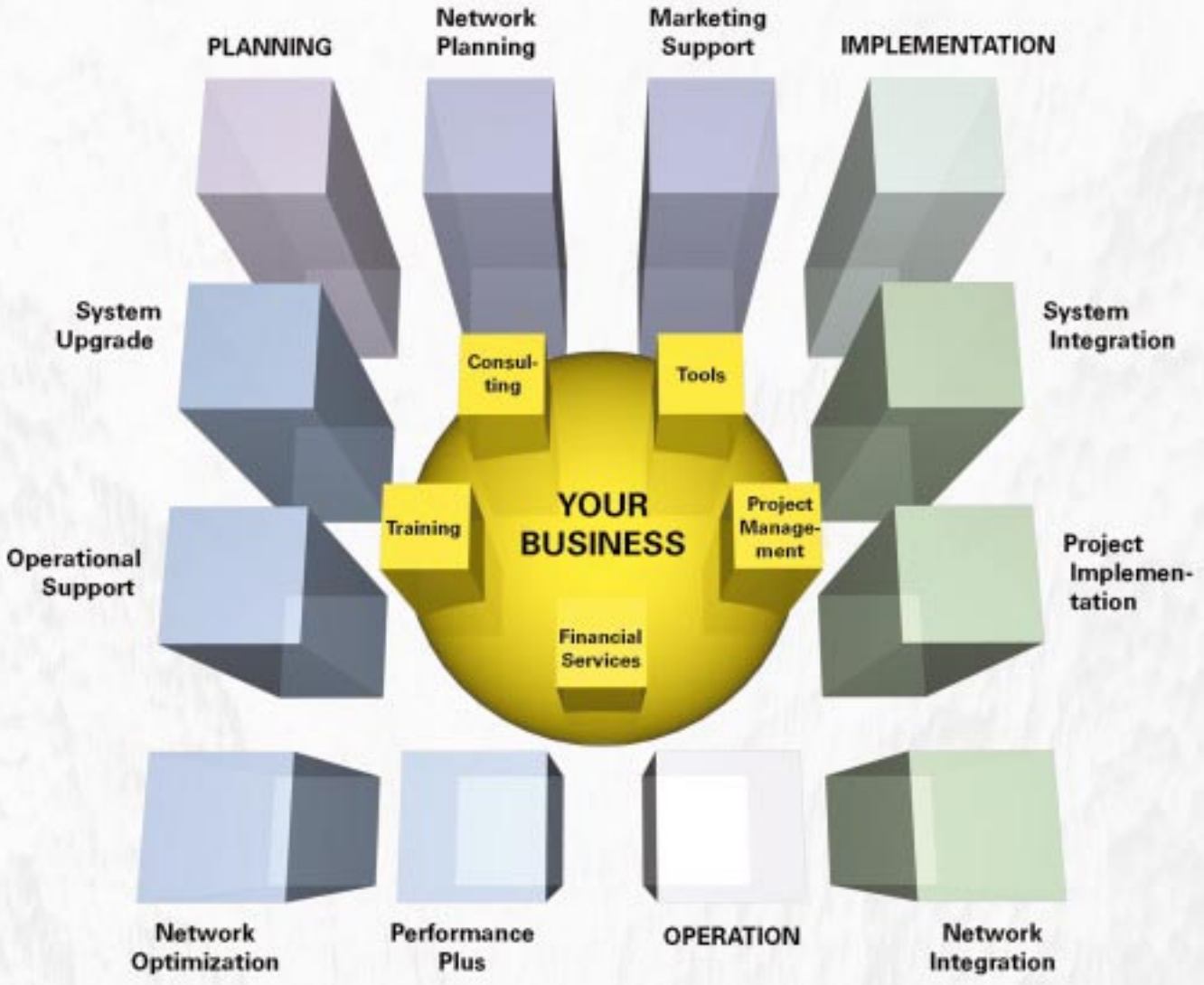


EWSD
From Planning to Operation

Technological progress, growing customer demands, and a marketplace that calls for innovation are forcing network operators to modernize their telecommunication networks constantly. This may affect individual network elements, the entire network, hardware, software, as well as operational and maintenance strategies.

Each modernization measure has its own peculiarities. On the basis of its many years of experience, Siemens can support network operators in their decision-making and in the implementation of modernization processes.

Siemens' modular service concept features a complete portfolio of service packages that can be combined and customized to suit each individual customer's requirements. The aim at all times is to maximize the network operators' income while ensuring the greatest possible degree of customer satisfaction.



Project implementation

Siemens implements new network components or complete networks, including all tasks from the survey to acceptance. Lower outlay on equipment and personnel, and a reliable implementation schedule, are the result of efficient project planning.

This service package includes:

- Survey
- Site Preparation: Site Acquisition
- Site Preparation: Civil Works
- Site Preparation: Infrastrucutre
- Network Configuration Planning
- Installation
- Commissioning
- System Acceptance Support
- Field Acceptance Support

Network Integration

The network integration service package includes the integration of network components, integration of features, expert technical advice, and compatibility testing of different networks.

Siemens integrates individual network components to form a fully operational network according to specific requirements. Network growth is already taken into account at the planning stage, so that later expansions do not present a problem.

New features are the most convincing argument in competition. The objective of feature integration is to incorporate the new features smoothly into the network.

WIth its interconnection service, Siemens offers expert technical advice, interconnection procedures for checking the compatibility of different networks, and the entire equipment with measuring and testing devices for performing interoperability tests.

PerformancePlus

Siemens offers a comprehensive portfolio of customized after-sales services. The PerformancePlus program from Siemens focuses on improved availability and increasing revenue opportunities. The PerformancePlus program comprises:

- Emergency Service
- On-call Support
- Fault Report Processing
- Software and Hardware Update
- Field Service
- System Quality Monitoring
- Repair and Replacement Service

Operational Support

Operational Support is called upon

- when temporary operational assistance is required

It allows network operators to start commercial operation immediately with experienced network administrators and to train their own qualified personnel.

- when network operation is to be outsourced

Network operators pursuing a strategy of outsourcing of network operation profit from a cost reduction.

- Network Surveillance
- Maintenance Management

Network Optimization

Modern communication networks are extremely complex and dynamic, with the result that they have to be optimized repeatedly throughout their lifetime.

This service package guarantees network operators efficient use of their system resources and maximum yield throughout the dynamic life of their networks. This gives the operators the assurance that they are always one step ahead of their competitors.

Network optimization comprises:

- Technical analysis of the network and its environment
- Optimization concept including
  Network planning
  Update and upgrade strategy
  Expansion strategy
  Modification of network elements (e.g. database)
  Roll-out plan
- Concept implementation

Marketing Support & Consulting

Siemens' Marketing Support & Consulting portfolio includes many attractive services that help operators to maximize their revenue and ensure continued business success.

Marketing Support is available for:

- making use of existing services
- improving competitiveness
- generation of new business

Siemens supports network operators in:

- customized studies
- workshops and tutorials
- consulting projects

System Upgrade

Success in the marketplace depends on a modern network. The system upgrade service package supports network operators in the modular upgrading of their networks. It guarantees regular system upgrades throughout the entire lifetime of the product.

The service package comprises:

- customized upgrade procedures
- upgrade kits
- upgrade tests
- system upgrade support
- upgrade emergency service

These services include procedural and personnel support and cover hardware and software upgrades both for individual components and for the network as a whole.

Project Management

Siemens also takes over the management of complete projects. In such cases, network operators do not need to set up their own project organization. The project management service package covers the entire responsibility for reliable, fast and economical implementation of the project.

This includes:

- Surveys
- Scope of work
- Materials purchasing and logistics
- Subcontracting
- Risk management
- Quality standards
- Financial issues

Network Planning

This service can be used for both new and existing networks. The service includes:

- Consolidation of investment decisions
- Economic feasibility evaluation
- Creation of competitive advantages
- Process optimization
- Business protection

The most important steps in a network planning process are:

- Network analysis
- Network design
- Telco security services
- Network evolution

Training

Well-trained staff improve a company's efficiency and guarantee customer satisfaction.

As one of the oldest and most experienced companies in the communications sector, Siemens has had state-of-the-art training facilities and its own highly-qualified training staff for more than 45 years. The training staff pass on their wide knowledge and experience of the complex technical installations.

Network operators benefit from the special training of all employees, such as operators, OA&M technicians, OA&M specialists or network integration specialists, in the form of optimum network availability and fast introduction of new features.

The training service package contains:

- Product-oriented training
- Network-oriented training
- Basic technology training
- Multimedia learn packages
- Performance integrator
- Business planning training
- Training documentation support
- Training assistance
- Training center certification

Siemens also offers special customized training, such as "Train the Trainer."


EWSD
MML
Operation
Maintenance
Service
Emergency
Nonstandard Maintenance
Information
Documentation overview
ADSS
ISDN
GeoCENTREX
EWSD InterNode
IN
ADMOSS
Charging
Routing, Numbering
Signaling
Traffic Data Administration
Voice Processing
System Software
Periphery System Hardware
Central System Hardware
OA&M
Network Node

EWSD
Documentation to Meet all Needs

In accordance with the functions for operating the EWSD system, the operating documentation is divided into the areas of Information, Operation, Maintenance/Nonstandard Maintenance, Emergency and Service. The documentation consists of informational sections (Descriptions) and instructional sections (Manuals). The command language MML is the user interface of EWSD.

The descriptions and manuals are written with respect to specific target groups. The contents of each are based on the area of utilization and the task to be performed. The degree of detail in each case is determined with respect to the needs of the intended user.

International standards

The EWSD operating documentation is drawn up in accordance with the following international standards:

- ITU-T, series B, in particular B.10 and B.17 (Blue Book I.3)
- ETSI ETS 300 834, ETR 313, EG 201 103 (Retrieval)
- ETS 300 498-1, ETS 300 498-2, ETR 081 (for Open Documentation Architecture)
- SGML standard (ISO 8897, 1986) Common Telecom Documentation Type Definition (DTD) CTDV1.0 as EFTI recommendation

Languages

The EWSD operating documentation is available as standard in German, English and Spanish. However, the documentation can be translated into other languages, such as French, Portuguese and Russian, on the basis of a customer-specific agreement.

The MML command language exists in German, English and Spanish.

Formats

The EWSD operating documentation can be provided in the following formats:

- SGML
  SGML (standard generalized markup language) is the most powerful platform-independent documentation format that exists today. The advantage of having EWSD documentation in SGML format is that it can be integrated together with the operating documentation for other products into a single set of SGML documentation. Through the use of suitable style-sheets, an operator-specific layout can be defined for all providers.
- HTML / HTML + JAVA
  HTML is the format currently used for the dissemination of documentation via the Internet. It is derived from SGML with tool support. HTML + JAVA has some additional functions with respect to HTML (bookmarks, multiple windows).
- PDF
  PDF is a platform-independent format. It is derived from the PostScript format and therefore is still based to a large extent on the hard-copy display.
  PDF is also suitable for displaying information on a screen, offering functions such as hyperlink and retrieval.
- PostScript
  The PostScript format is derived directly from the editor function of the publishing system of the same name. PostScript is the electronic stage before the paper printout.
- Paper
  Documentation on paper still has its specific uses. The EWSD documentation is also available on paper.

Documentation platforms

The EWSD operating documentation is primarily designed for electronic utilization.
The presentation platforms used the EWSD NetManager.

The documentation is provided on a CD-ROM. A CD-ROM containing the entire operating documentation is prepared for each project.

C E R T I F I C A T E

DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen mbH
Qualitäts- und Umweltgutachter

hereby certifies that the company

Siemens AG
Public Communication Networks Group
Business Unit Narrowband Switching Networks

Hofmannstraße 51
D - 81379 München

has implemented and maintains a

quality system

A quality audit has verified that this system fulfil the requirements of the following standard:

DIN EN ISO 9001
issue August 1994

First issue (DIN ISO 9001):	May 1993
This certificate is valid until	May 5, 1999
Certificate Registration No.:	4501 - 02
Berlin/Frankfurt am Main,	May 6, 1996

This certificate is based on a quality audit in cooperation with the VDE Prüf- und Zertifizierungsinstitut - VDE Verband Deutscher Elektrotechniker e.V. and the Bundesamt für Zulassungen in der Telekommunikation (BZT), the Federal Approvals Office for Telecommunications. It was verified by the BZT that the supplementary requirements of the European Council Directive 91/263/EEC, Annex IV, of the regulations for registration are fulfilled.

PRESIDENT
Dr.-Ing. W. Hansen

MANAGING DIRECTOR
Dr.-Ing. K. Pietzsch

Federal Approvals Office for Telecommunications

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D-10787 Berlin, Burggrafenstraße 6

EQNet

TGA-ZQ-81003

EWSD
Quality for the Entire Life Cycle

One of the most important corporate goals of Siemens is to market products and services that offer the customer the greatest possible benefit with the highest possible quality.

EWSD attains its acclaimed high standard of quality by incorporating all the processes involved in development, production, sales and service into quality-assuring measures. Quality management, applied throughout the world, is based on the ISO 9000 (and subsequent) standards, which are identical to the EN 29000 (and subsequent) standards.

All work processes follow a set of documented rules, guidelines and regulations, which are certified by independent organizations. Their application and observance is monitored by means of audits performed at regular intervals.

The audits refer to

- the quality system itself
- the process used and
- the product.

The results of the audit give an indication of how efficient the quality-assuring measures actually are. They form part of an ongoing process to introduce additional specific quality improvements and to check their implementation.

All of the measures taken in quality assurance – from drawing up the regulations, specifying the quality-assuring processes and performing the quality audits – form part of what is known as Top Quality Management.

DQS, the German society for the certification of quality management systems, has confirmed through its on-site visits that the quality management system at the Siemens Information and Communication Networks Group has been implemented on the basis of the DIN ISO 9000 series. DQS has therefore awarded its certificates to this Group in recognition of its achievement.

Technical Data

General system data

4,000,000 busy hour call attempts (BHCA), according to ITU-T recommendation Q.543 (depending on the features, the traffic distribution and the call mix)

Performance and reliability in accordance with ITU-T recommendations Q.541 and Q.543

Transmission characteristics in accordance with ITU-T recommendation Q.551

Earthquake immunity in accordance with Bellcore TR-NWT-000063 (NEBS), Earthquake Zone 4

Lightning protection in accordance with ITU-T recommendation K.20

Human safety, protection of property, electromagnetic compatibility (EMC), etc. in accordance with international standards (EN60950 / IEC60950)

Compliance with the standards is confirmed by the **CE label** on each rack

Network interworking via internationally standardized system-integrated interfaces to other networks

Clock accuracy, maximum relative frequency deviation plesiochronous 10^{-9}, synchronous 10^{-11}

Power dissipation in the busy hour < 1 Watt per line unit, depending on the size and configuration of the network node

Operating voltage – 48 V or – 60 V dc voltage

EWSD PowerNode

600,000 subscriber lines

240,000 trunks

100,000 erlangs traffic capacity

RSU

50 000 subscriber lines

Line spectrum: analog subscriber lines (POTS), ISDN basic access (ISDN-BA), ISDN primary rate access (ISDN-PA), high bit-rate lines (UDSL, SDSL), 2-Mbit/s leased line, Internet access, V5.1 interface, V5.2 interface.

Internal traffic

Inter-RSU traffic with RSUs connected to the same controlling EWSD network node

Traffic with other network nodes

Stand-alone operation

DLU

32-port subscriber line module

2000 subscribers per DLU (0.1 Erl.)

1550 subscribers per DLU (0.25 Erl.)

Line spectrum: analog subscriber lines (POTS), ISDN basic access (ISDN-BA), V5.1interface, high bit-rate lines (UDSL, SDSL), 2-Mbit/s leased line.

16 PCM30 systems

390 erlangs traffic capacity

Stand-alone operation

LTG

Line spectrum:

- up to four digital transmission links (PDC) with transmission rates of 1544 kbit/s or 2048 kbit/s (for trunks, remote DLUs or primary rate access)
- up to two digital transmission links with transmission rates of 4096 kbit/s (for local DLUs)
- access network via V5.2 interface (for up to four V5 links)
- integrated SDH (STM1) interface

UI-LTG

Each UI-LTG provides 31 ports, i.e. 31 simultaneous user dialogs are possible.

Each UI-LTG consists of 1 OCANEQ module and 4 SCR modules.

Each UI-LTG supports up to four languages.
Additional languages are possible.

SN

240,000 ports

2016 LTGs

100,000 erlangs traffic capacity

single-stage, non-blocking

n x 64 kbit/s

MB

2016 LTGs

ATM-based communication bypass

SSNC

1500 SS7 links

100,000 message signaling units per second (MSU/s)

> 4000 global title translations per second (GTT/s)

2 Mbit/s, 1.5-Mbit/s high bit-rate links
STM/ATM signaling interworking between narrowband networks and broadband networks

Stand-alone STP

CP

4,000,000 busy hour call attempts (BHCA) dynamic load

10 call processors

10 Mbit/s LAN interface

EWSCountry

RSDLU

150, 400, 700 subscribers

OFDC

848 subscribers

Optical fiber ring, maximum length 1000 kilometers

Subscriber groups per line loop, max. of 63 (via remote terminal)

For each subscriber group, up to 64 ISDN subscribers oder 80 analog subscribers

CDE

15,000 subscriber lines

3700 trunks

SDE

3400 subscriber lines

960 trunks

RCU

5664 subscribers with up to 6 DLUs

Remote DLU

1920 subscribers (in the rack)

680 subscribers (in the shelter)

Container Network Node

17,280 subscribers in the 12,192 mm (40 foot) container

7680 subscribers in the 6058 mm (20 foot) container

1920 subscribers in the 2991 mm (10 foot) container

Trunks

Analog trunks with different loop and shunt resistance values possible

Digital trunks via 1544 kbit/s or 2048 kbit/s multiplex lines

All standard signaling systems, e.g. R1, R2, No. 5, SS7, as per ITU-T recommendation

All standard transmission systems, e.g. dc, ac, inband, outband, multifrequency code, channel associated signaling (CAS), common channel signaling (CCS)

Analog subscriber lines

Different loop and shunt resistance values possible

Pulse method with 5 to 22 pulses per second

Multifrequency dialing as per ITU-T recommendation Q.23

ISDN lines

Basic access with 144 kbit/s (2 B channels with 64 kbit/s each, 1 D channel with 16 kbit/s, synchronization)

Primary rate access with 2048 kbit/s (30 B channels with 64 kbit/s each, 1 D channel with 64 kbit/s, synchronization) or 1544 kbit/s (23 B channels with 64 kbit/s each, 1 D channel with 64 kbit/s, synchronization)

Signaling in the D channel (transmission of signaling has priority over other packet data)

Call charge registration

All standard methods such as time pulse metering, automatic message accounting (AMA), interadministrative charging and statistics (IACHASTA)

512 tariffs

6 tariffs per zone

Tariff switchover possible at 15-minute intervals

Local storage of charges in the CP

Automatic backup of charges 8 times per day (more frequently for AMA data)

Output for postprocessing via file transfer

Mechanical design

Rack

Height: 2450 mm (8 feet) or 2130 mm (7 feet)

Depth: 500 mm (standard), 880 mm (optimized rack)

Width: 770 mm (standard), 600 mm (optimized rack)

Height including overhead cable shelf: 2655 mm or 2428 mm

Rack rows

Spacing: at least 1200 mm (from front edge to front edge) with an aisle width of 700 mm

Aisle width between rack rows in a container: 560 mm

Raised floor

Grid: 600 mm x 600 mm

Height: at least 300 mm from top edge of floor to top edge of raised floor

Point load per tile: 5000 N/m^2 (500 kg/m^2)

Permissible load capacity: 10 000 N/m^2 (1000 kg/m^2)

Space requirements

Local network node: approx. 27 m^2 (10,000 subscribers)

Transit network node: approx. 22 m^2 (10,000 trunks)

Permissible environmental conditions

In accordance with international standard ETS 300_019-1-3, Class 3.1, Operation in Central Office

Room temperature: +5° Centigrade to +40 ° Centigrade

Relative humidity: 10% to 80%

Abbreviations

A

AC authentication center
ACC automatic congestion control
ACD automatic call distribution
ADMOSS advanced multifunctional operator service system
ADSS advanced subscriber services
ALINA administration of language data for Individual announcements
AMA automatic message accounting
ATM asynchrous transfer mode

B

BA basis access

C

CAS channel associated signaling
CCG central clock generator
CDE compact digital exchange
CP coordination processor
CT craft terminal

D

DCN data communication network
DECT digital European cordless telephone
DLU digital line unit
DLUG digital line unit G
DSL digital subscriber loop
DTMF dual tone multifrequency

E

ETSI European Telecommunications Standards Institute
EWSD digital electronic switching system

F

FTAM file transfer, access and management
FR frame relay

G

GeoCENTREX Central Office Exchange Service
GUI graphical user interface
GTT global title translation

H

HDSL high bit-rate digital subscriber line
HTI host timeslot interchange
HTRC hard to reach control

I

ILTF	integrated line test function
ILMP	integrated line maintenance position
IN	intelligent network
INDAS	individual digital announcement system
INAP	IN application part
IP	intelligent peripheral
IP	internet protokoll
IPI	ISUP preference indicator
ISDN	integrated services digital network
ISDN-BA	ISDN basic access
ISDN-PA	ISDN primary rate access
ISUP	ISDN user part
ITU-T	telecommunication standardization sector of the International Telecommunication Union
IVPS	Integrated Voice Processing System
IPoP	integrated point of presence

L

LTG	line/trunk group

M

MAC	multifunctional attendant console
MB	message buffer
MIS	management information system
MSB	multifunctional switch board
MSC	mobile services switching center
MSP	multi service platform
MTP	message transfer part

N

NT	network termination

O

OA&M	operation, administration and maintenance
OCANEQ	operationally controlled equipment for announcement
OFDC	optical fiber distributed concentrator
OMAP	operation, maintenance and application part
OSI	open system interconnection

P

PA	primary rate access
PAT	periodic access test
PBX	private branch exchange
PC-CAPE	cutting and programming equipment
PCM	pulse code modulation
PCT	post call time
PDC	primary digital carrier
PDH	plesiochronous digital hierarchy
PHUB	packet HUB
PoP	point of presence
POTS	plain old telephone service
PPM	periodic pulse metering
PSTN	public switched telephone network
PTN	private telecommunication network

Q

QSIG	standardized signaling system (reference point Q)

R

RAS	Remot access server
RBS	radio base station
RDU	radio distribution unit
RSDLU	remote shelter DLU
RSU	remote switching unit
RT	remote terminal
RTI	remote timeslot interchange

S

SCP	service control point
SCR	speech recognition and code receiver
SDE	small digital exchange
SDH	synchronous digital hierarchy
SDSL	symmetrical digital subscriber line
SLM	subscriber line module
SMD	surface-mounting technology
SMP	service management point
SN	switching network
SS7	signaling system no. 7
SSNC	signaling system network control
SSP	service switching point
SSS	switching subsystem
STP	signaling transfer point

T

TC	transaction capabilities
TCAP	transaction capability application part
TMN	telecommunications management network
TSC	Technical Service Center

U

UDSL	universal digital subscriber line
UI-LTG	user interaction LTG

V

VLR	visitor location register

Contact us!

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http://www.siemens.com/ic/networks/

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