Introduction to AXE

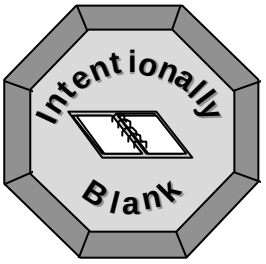
Chapter 5

This chapter is designed to provide the student with an overview of the AXE switching system. It describes basic AXE principles, lists the main components and outlines the main features.

OBJECTIVES:

Upon completion of this chapter the student will be able to:

- Describe briefly the function of APT and APZ
- Describe the different functions that can be implemented using AXE platform modularity
- Explain how the group switch switches calls
- Describe the structure of a PCM link
- Describe the AXE 810 hardware structure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5 Introduction to AXE

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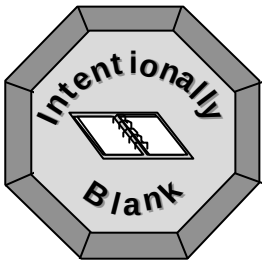
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INTRODUCTION

☞ Did you know?

AXE was introduced to the market in 1975.

AXE is a multi-application, open-ended digital switching product for public telecommunications networks. It has real-time processing capacity and can handle high volumes of traffic. AXE is based on a model in which all functionality (switching, subscriber and network access, operation and maintenance, traffic control, charging control) is handled by each node in the network.

AXE AS A MULTI-APPLICATION PLATFORM

When AXE was first introduced into the market it supported only the major telecommunications application, PSTN. Since then AXE has been continuously developed and now supports a wide range of applications in addition to PSTN:

- ISDN
- PLMN
- Business Communications

Overlaying these networks are Intelligent Networks (IN) and signaling networks, which AXE also supports. AXE provides functionality at different levels in these networks.

AXE in Ericsson's GSM Systems

Ericsson's GSM systems are based on AXE. This means that the features and services built into AXE can be provided as standard within CME 20/CMS 40. It also means that Ericsson's GSM systems will benefit from the future development of AXE. The AXE-based nodes in Ericsson's GSM [1]systems are:

- MSC/VLR
- GMSC
- HLR
- ILR
- SSP
- SCP
- TRC
- BSC

[1] Each of these is referred to as a Product Line.

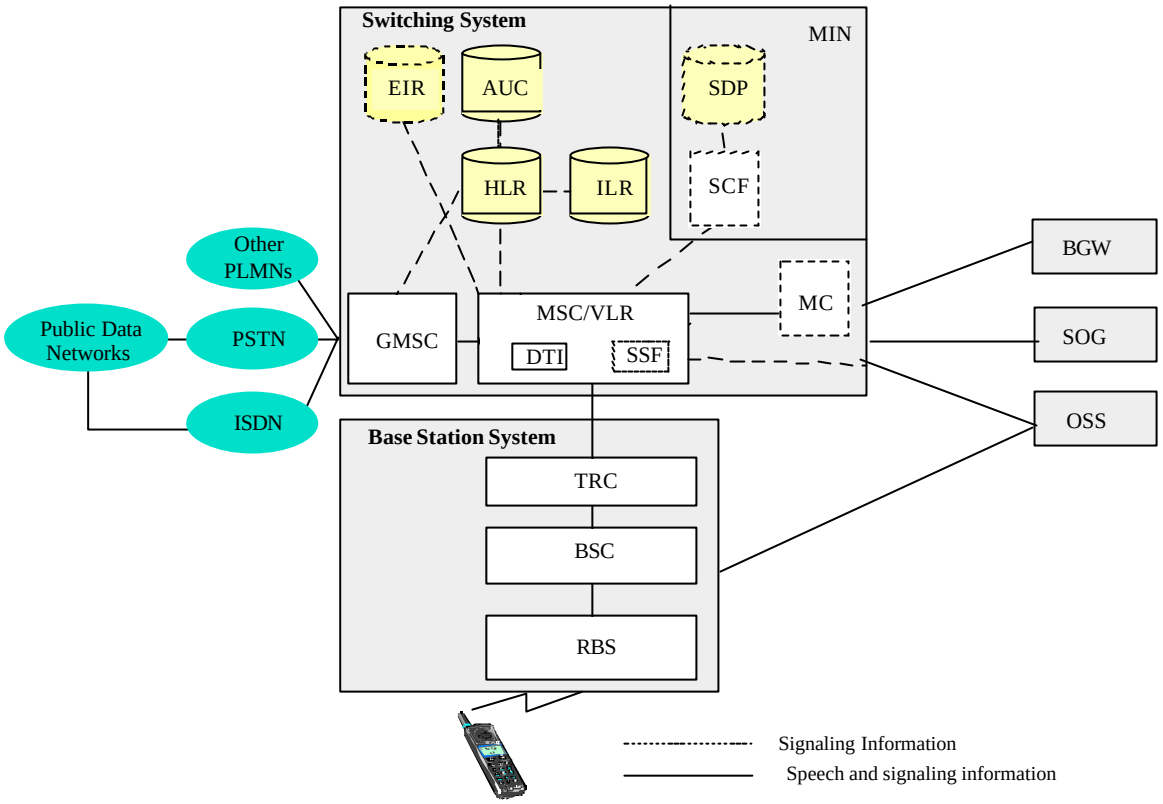


Figure 5-1 CME 20/CMS 40 network

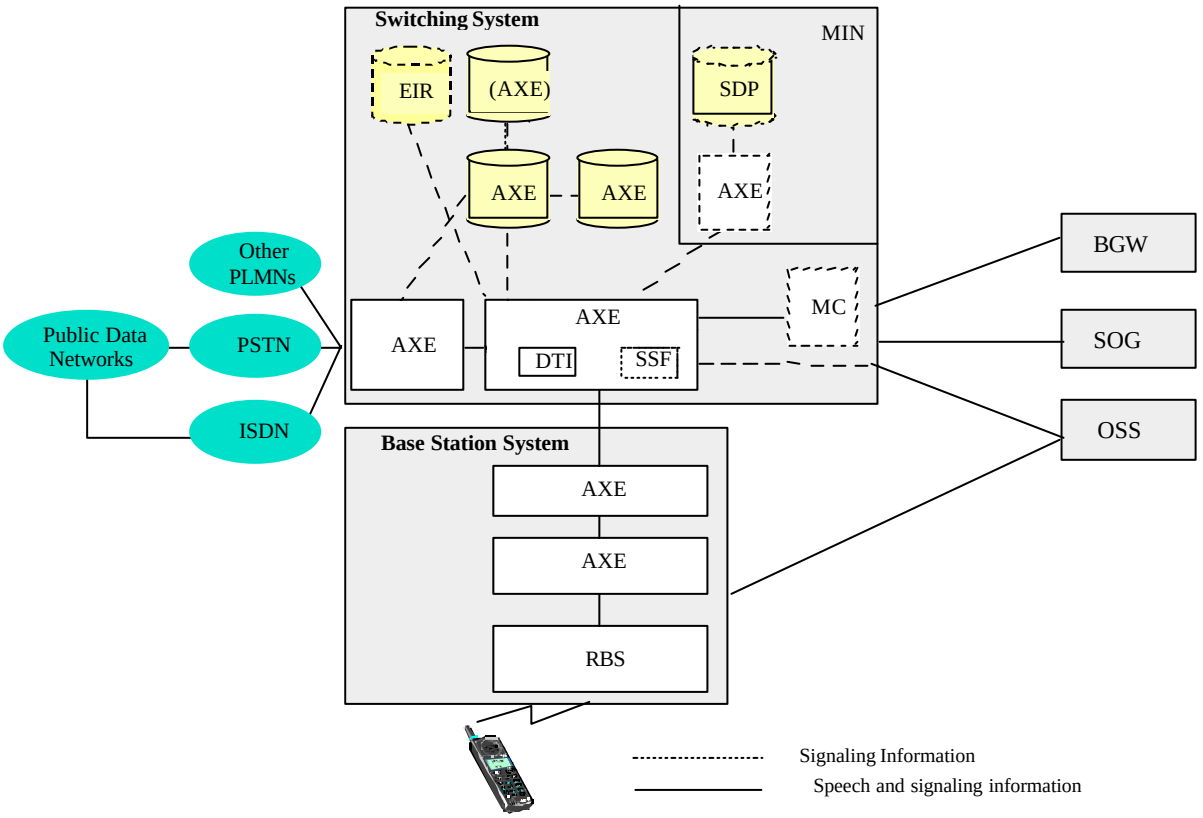


Figure 5-2 AXE Deployment in a CME 20/CMS 40 Network

AXE SYSTEM ARCHITECTURE

☞ Did you know?

The modularity of AXE is such that the following node configuration is possible (though not recommended): GMSC/VLR/HLR/AUC /DTI/BSC/TRC/SSP/SCP.

The key to the success of AXE is its unique flexibility and modularity. Modularity allows AXE to readily adapt to the changing requirements of networks and of end-users. This modularity means ease of handling which leads to reduced costs and the flexibility to adapt to the changing world of telecommunications.

Modularity is implemented in a number of ways in AXE. These are described below.

Functional Modularity

AXE is designed in such a way that nodes with different functions can be generated from the same system. For example, an AXE can act as an MSC/VLR or as a HLR. This can be achieved due to software and hardware modularity.

Software Modularity

AXE consists of a set of independent building blocks (known as function blocks), each performing a specific function and communicating with each other by means of defined signals and interfaces. Software modularity means that function blocks can be added, deleted or modified without requiring changes or redesign of other parts of the system.

Hardware Modularity

The physical packaging of AXE offers a high degree of flexibility and is based on industry-standard specifications. The packaging system contributes to ease of handling during design, manufacturing, installation and operation and maintenance. The basic building blocks of the packaging system are the plug-in units and the containers for these units, subracks. Plug-in units can be replaced or removed without disturbing other equipment.

Technological Modularity

AXE is an open-ended switching platform. This allows new technologies and functions to be added, enabling the continuous development of AXE. For example, AXE was not originally conceived for mobile applications, but when mobile was being developed, AXE proved to be the most suitable platform.

AXE STRUCTURE

There are currently two basic types of structure for AXE:

- Non-Application Modularity based AXE systems (AXE 105)
- Application modularity based AXE systems (AXE 106)

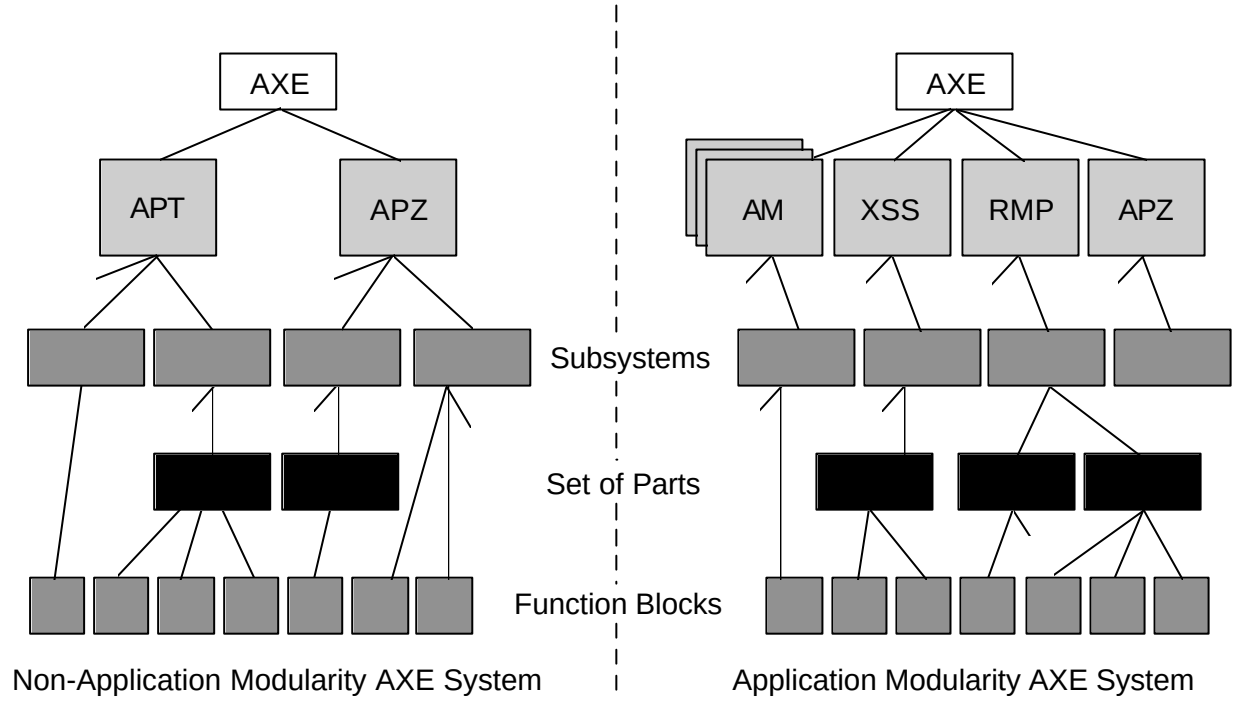


Figure 5-3 AXE system structures

Non-Application Modularity based AXE Systems

An example of an AXE node, which is implemented without using Application Modularity, is the BSC.

System Level 1

System Level 1 is the AXE 105 system itself and is a combination of System Level 2 systems.

System Level 2

At System Level 2, AXE 105 is divided into two:

- **APT:** this is the switching and telecommunications applications part of AXE
- **APZ:** this is the control or operating system part of AXE

Subsystem Level

Every AXE is a combination of APT and APZ subsystems. Similar functions (e.g. charging functions) are grouped together in one subsystem.

Set of Parts

If required, a set of parts can be used between the subsystem level and function block level. This groups a set of function blocks which perform tasks relating to a similar function.

Function Block Level

The tasks allocated to a certain subsystem are further divided into individual function blocks. Each function block constitutes a well-defined unit with its own data and with standardized signal interworking.

Function Unit Level

Every function block consists of function units. There are 3 types of function units:

- A hardware unit
- A regional software unit which deals with routine work such as the scanning of hardware devices
- A central software unit which is responsible for the more complex analysis functions required, e.g. call set-up

A function block may consist of all three together or central software only.

Application Modularity based AXE Systems

Application modularity is a set of well-defined principles for building and implementing AXE software applications. An example of an AXE node, which is implemented using Application Modularity, is an MSC/VLR.

The Application Modularity structure is based on the principles used in telecommunications networks. For example, to provide services to end-users, network nodes must be capable of interworking with each other. This interworking is achieved by using common protocols and interfaces. Similarly, each Application Module (AM) is a self-contained product and is effectively decoupled from other AMs. For communication between AMs there are well-defined protocols and interfaces. AMs can be introduced, removed or upgraded without affecting other associated applications.

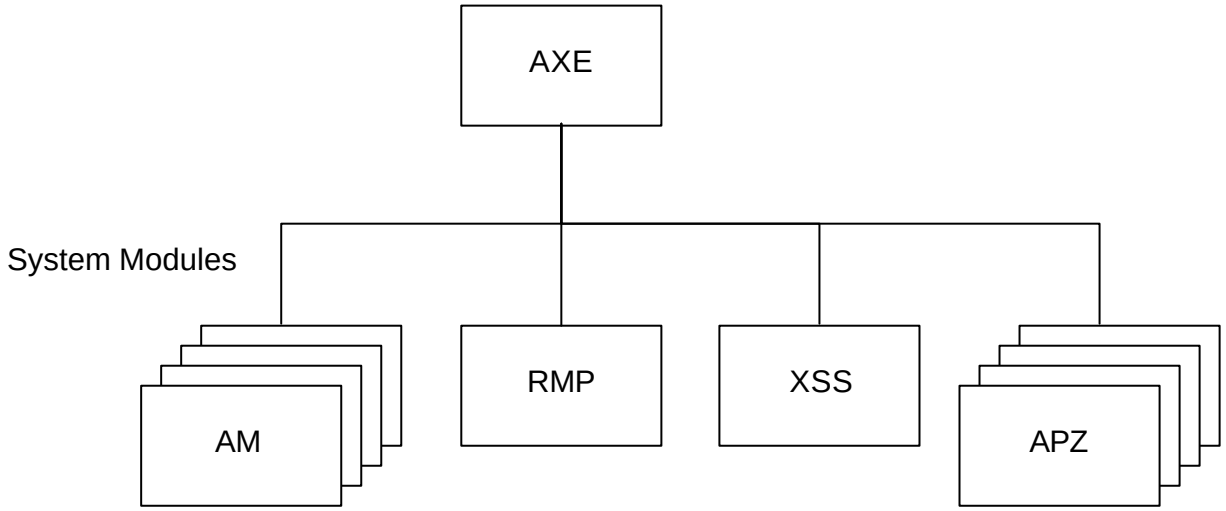


Figure 5-4 AXE 106 system structure

System Level 1

System Level 1 is the AXE 106 system itself and is a combination of System Modules.

System Modules

AXE 106 contains the following System Modules:

- APZ
- eXisting Source System (XSS)
- Resource Module Platform (RMP)
- Application Modules (AMs)

APZ

APZ is the control or operating system of AXE. It is responsible for operating system functions, I/O functions, service functions, etc.

eXisting Source System (XSS)

The XSS is an APT adapted for use in an Application Modularity based AXE. The XSS is divided into two main parts:

- **Core APT (C/APT):** this contains the functionality which is common to all mobile systems offered by Ericsson (i.e. CME 20, CMS 40, CMS 30, CMS 8800).
- **1/APT:** this contains the functionality, which is specific to Ericsson's GSM systems (CME 20 and CMS 40).

Resource Module Platform (RMP)

This co-ordinates the system for the application modules. All hardware required by AMs is provided to them by the RMP. This hardware may be located in either the RMP or in the XSS.

Application Modules (AMs)

An AM is used to model and implement application oriented functions. An example is the Service Control Function AM (SCFAM) which implements MIN functions. AMs, which are available in Ericsson's GSM systems, are listed in the following table. An AM consists of subsystems and function blocks.

Title	Function Description
Home Location Register AM (HLRAM)	This AM is responsible for the storage and handling of subscription data in the HLR
Formatting and Output AM (FOAM)	FOAM is responsible for the formatting and output of charging information. The charging data is collected by the charging service in the RMP. FOAM retrieves this and formats it according to the network operator's requirements. By separating the formatting and output of charging information from the generation of charging data, market-specific aspects of charging can be handled more effectively
Service Switching Function AM (SSFAM)	This AM provides MIN service switching functionality
Service Control Function AM (SCFAM)	This AM provides MIN service control functionality.
SYStem Operation and Maintenance AM (SYSOMAM)	This is responsible for system-wide operation and maintenance functions
Digital Access Services AM (DASAM)	This AM is responsible for providing both Primary Rate Access (PRA) and Basic rate Access (BA) in an MSC/VLR which includes such ISDN services
ISDN User Services AM (IUSAM)	IUSAM implements ISDN subscriber services
ISDN Operation and Maintenance AM (ISOMAM)	This AM implements operation and maintenance activities for the ISDN application within an MSC/VLR
Direct Access Gateway AM (DAGAM)	Provides direct access to Internet services in an MSC/VLR which includes such capabilities

Table 5-1 Available Application Modules

Application Platform Services Interface (APSI)

The Application Platform Services Interface (APSI) is a system interface which offers client-server type services to other applications (the clients). The services of the APSI are either implemented in the RMP or XSS. The services of APSI are needed to co-ordinate the use of common resources between the different AMs. One example of such a service is the central switching part of AXE called the Group Switch (GS).

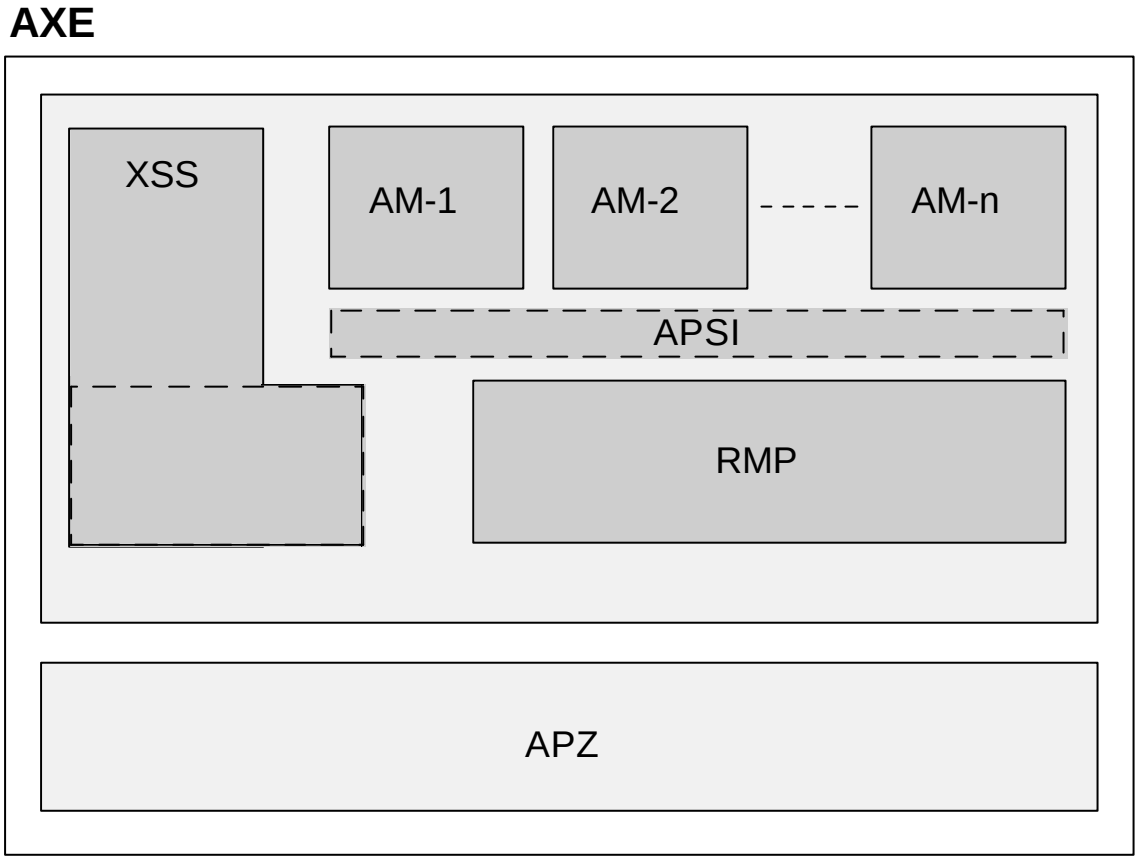


Figure 5-5 AXE system structure showing APSI

CONTROL SYSTEM ARCHITECTURE

Another important factor behind the flexibility of AXE is the control system architecture. AXE is a Stored Program Control (SPC) exchange. That is, software programs stored in the AXE computer control the operation of the AXE switching equipment. This is a two level system with both central and distributed control. This approach offers reliability and call handling efficiency.

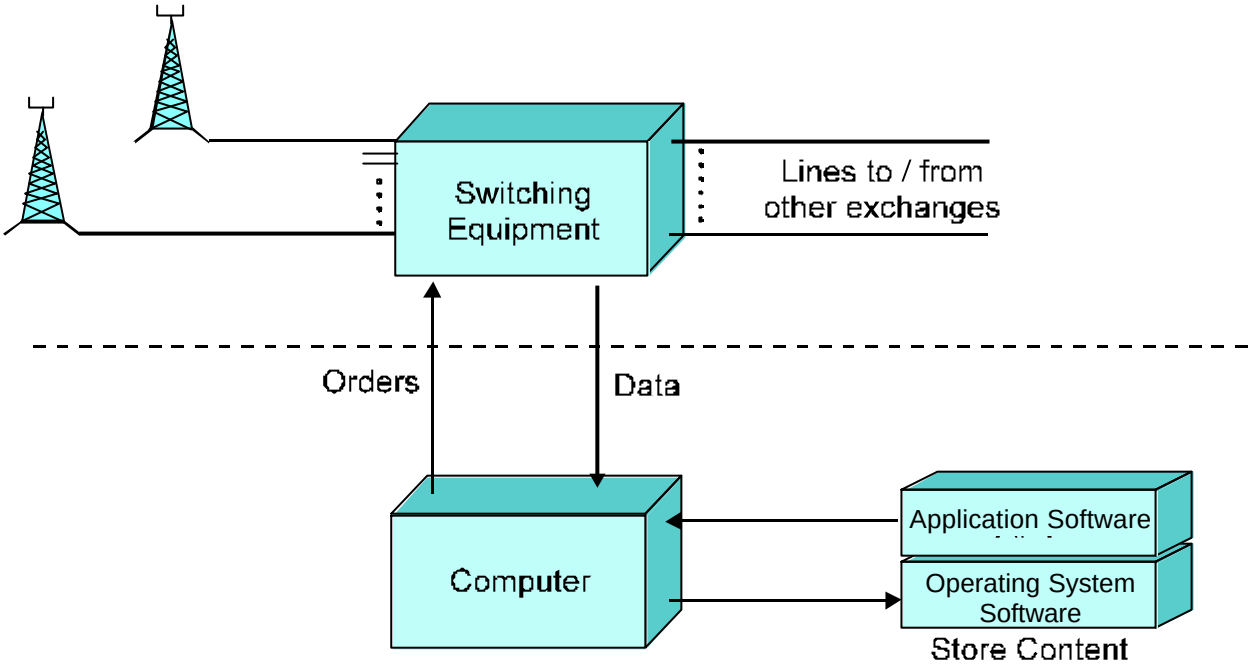


Figure 5-6 An SPC Exchange

The control system, APZ, is a two-level system with centralized and distributed logic. The central processing level consists of a duplicated Central Processor (CP) working in parallel synchronous mode. At the distributed level there are a number of Regional Processors (RP) working in pairs.

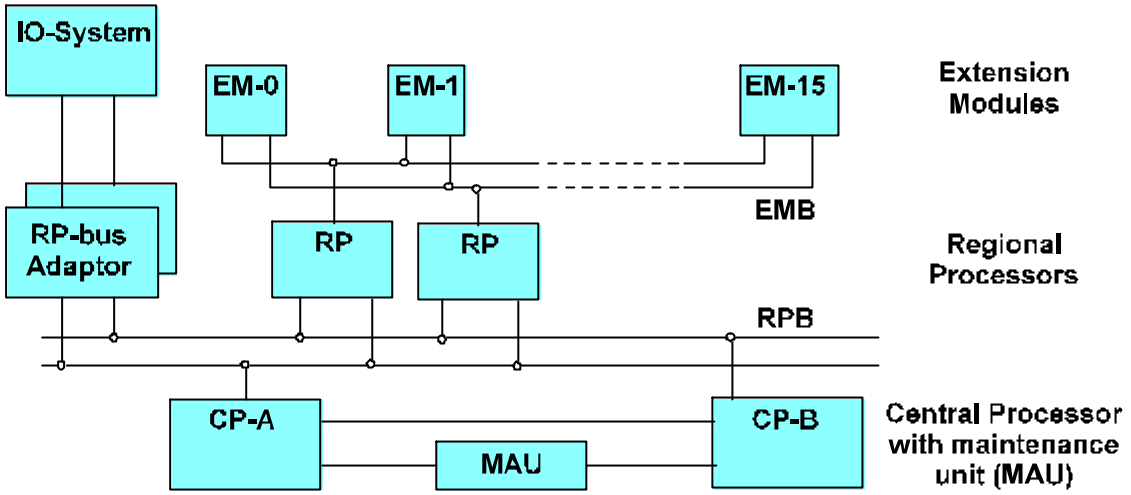


Figure 5-7 Hardware architecture, AXE

The RPs control hardware units called Extension Modules (EM). One RP-pair can control up to 16 EMs. The number of EMs connected to one RP-pair depends on the complexity of the tasks to be performed. The more RP capacity required, the fewer EMs can be connected. Two RPs in a pair share the workload of controlling the EMs.

The Input/Output (I/O) system provides connections with I/O devices such as terminals, printers, alarm displays, data links, flexible disks, hard disks and magnetic tapes. The I/O system performs all input/output functions and processes various maintenance, administrative, performance and call-related data.

TELECOMMUNICATIONS APPLICATIONS SUBSYSTEMS

The following table provides a brief overview of some basic telecommunications applications AXE subsystems, APT. Some of these are described in more detail following the table.

Subsystem	Name	Function	Product Line
CCS	Common Channel signaling Subsystem	Handles SS7 signaling	All AXE nodes
CHS	CHarging Subsystem	Provides charging and accounting functions	MSC/VLR, GMSC
CHSS	CHarging Services Subsystem	Co-ordinates charging in an AXE 106 system.	MSC/VLR, GMSC
DTS	Data Transmission Subsystem	Provides packet mode services for ISDN basic access D-channel traffic	MSC/VLR, GMSC
ESS	Extended Switching Subsystem	Provides multiple connections and messages	MSC/VLR, GMSC
GSS	Group Switching Subsystem	Sets up, supervises and clears connections through the Group Switch. Provides synchronization	MSC/VLR, GMSC, TRC, BSC
HRS	Home location Register Subsystem	Stores mobile subscriber subscriptions	HLR
MDS	Mobile Data Subsystem	Administers VLR data	MSC/VLR, GMSC
MMS	Mobile Mobility and radio Subsystem	Handles the radio network and the connection towards the MSs	MSC/VLR, GMSC
MSS	Mobile Switching Subsystem	Handles traffic to and from mobile subscribers	MSC/VLR, GMSC
NMS	Network Management Subsystem	Assists management of the network by provision of statistics and controls traffic flow	MSC/VLR, GMSC
OMS	Operation & Maintenance Subsystem	Provides exchange maintenance and supervision	MSC/VLR, GMSC, HLR
RCS	Radio Control Subsystem	Controls the cell network including cell parameters	BSC, TRC
RMS	Remote Measurement Subsystem	Enables remote testing of trunks between exchanges	MSC/VLR
ROS	Radio Operation and maintenance Subsystem	Responsible for transmission interfaces to BTS/TRC	BSC
RTS	Radio Transmission and transport Subsystem	Controls transmission functions to/within the BSC	BSC, TRC
SHS	Short message Handling Subsystem	Handles all aspects of the SMS	MSC/VLR
SOMS	System-wide Operation and Maintenance Subsystem	Provides maintenance and supervision functions in an AXE 106 system	MSC/VLR, GMSC, HLR
SSS	Subscriber Switching Subsystem	Provides subscriber access switching functions	MSC/VLR
STS	Statistics and Traffic measurement Subsystem	Provides data collection and processing for all types of traffic handling	MSC/VLR, GMSC, HLR

TAS	Transceiver Administration Subsystem	Responsible for BTS operation and maintenance	BSC, TRC
TCS	Traffic Control Subsystem	Responsible for call set-up, supervision and clearing	MSC/VLR, GMSC
TSS	Trunk and Signaling Subsystem	Provides trunk links to other exchanges and signaling resources	MSC/VLR, GMSC

Table 5-2 Application Subsystems

TRAFFIC CONTROL SUBSYSTEM (TCS)

The Traffic Control Subsystem (TCS) consists of several function blocks and is comprised of software only. Its basic functions are:

- Set-up, supervision and clearing of calls
- Analysis of incoming digits
- Selection of outgoing routes

REgister function (RE): This block stores the incoming digits and co-ordinates the call set-up procedure.

CaLl supervision & Co-ordination Of Functions (CLCOF): This block takes over from RE when the call has been set up. It supervises and clears the call.

Digit Analysis (DA): This block contains tables for digit analysis. The action of analyzing digits in DA is called B-number analysis.

Route Analysis (RA): This block contains tables for selecting outgoing routes (including alternative routes).

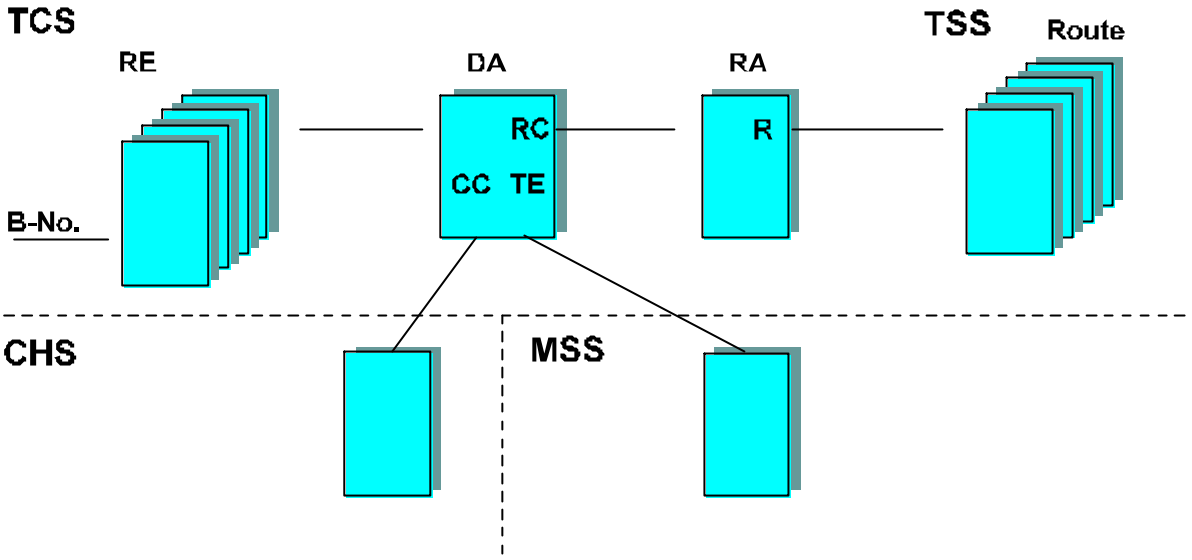


Figure 5-8 TCS, example of operation

An Example OF Interworking Involving Different Blocks in TCS

1. The received B-subscriber number will be stored in RE.
2. The digits will be sent to DA, one by one, for analysis. DA will ask for digits until the results below are obtained.
3. A Charging Case (CC) which will be sent to Charging Analysis (CA) in the charging subsystem.
4. Routing information, which will be one of the following:

- **An outgoing call:** The result will be a Routing Case (RC) which will point out an outgoing route in TSS.
- **An internal call:** The result will be a Terminated Call (TE) which will give a reference to MSS for a call to a mobile subscriber.

TRUNK AND SIGNALING SUBSYSTEM (TSS)

The Trunk and Signaling Subsystem (TSS) comprises both software and hardware. It handles signaling and the supervision of connections to other exchanges.

Trunk interfaces

Trunk lines to other network nodes are handled by Exchange Terminal Circuits (ETCs), which provide hardware interfaces to the group switch. Data rates on trunk lines can be either 2.048Mbits/s or 1.544Mbits/s, each using different ETC types.

Transmission interface towards the Radio Base Stations

The transmission towards the base station uses either a 2.048 Mbits/s or 1.544 Mbits/s digital interface. The connection between the MSC/VLR and the BS is described in later chapters.

Echo Canceller in POOL (ECPOOL)

In all telephony networks there are different sources of echo. In fixed networks, echo may be noticed if satellite links are used to transfer speech (due to the length of the transmission path to/from the satellite). In digital cellular systems delay is introduced in the speech/channel coding mechanisms. Echo cancellers are used to minimize echo. The echo-canceller used by Ericsson is called ECPOOL and is placed in the MSC/VLR.

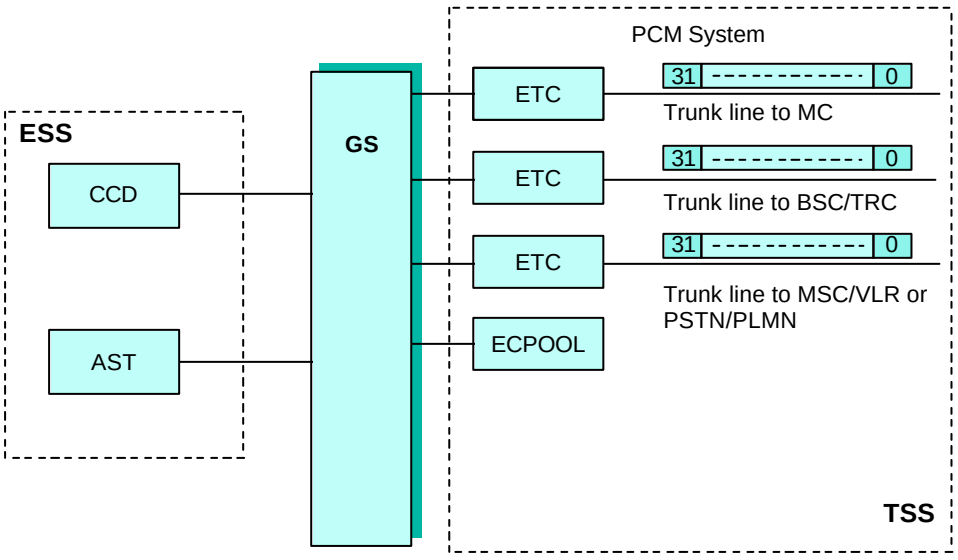


Figure 5-9 TSS hardware

COMMON CHANNEL SIGNALING SUBSYSTEM (CCS)

The Common Channel Signaling subsystem (CCS) consists of both software and hardware. It contains functions for signaling, routing, supervision and correction of messages sent in accordance with Signaling System No. 7 (SS7).

Signaling terminals in CCS

Signaling terminals (C7ST) for signaling according to SS7 are connected directly to the signaling network link. The signaling terminal is implemented on one circuit board and each magazine holds two boards.

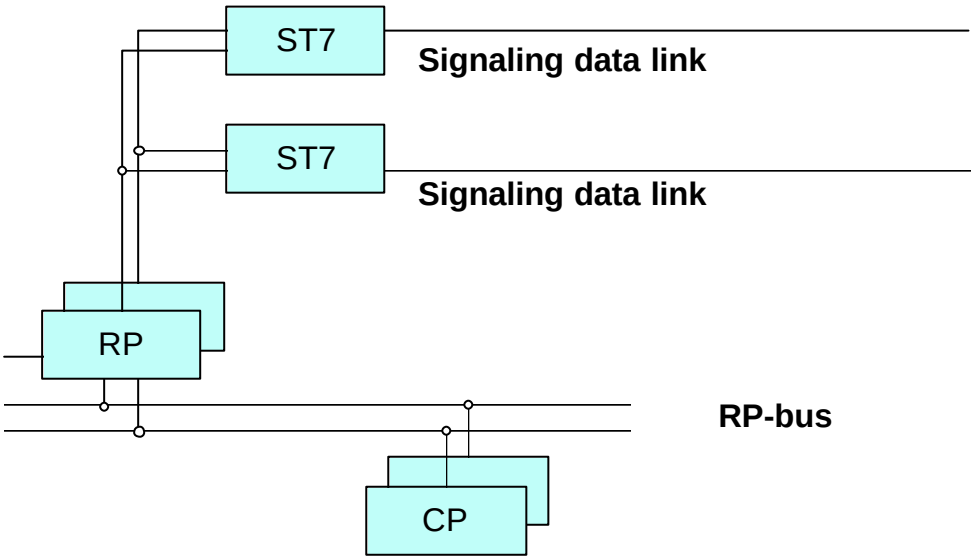


Figure 5-10 Signaling terminals

GROUP SWITCHING SUBSYSTEM (GSS)

The Group Switching Subsystem (GSS) consists of switching and network synchronization functions. GSS is mainly responsible for selection, connection and disconnection of speech or signal paths through the Group Switch (GS).

Switching

The digital group switch is a Time-Space-Time (T-S-T) switch. The Time Switch Module (TSM) consists of buffer memories and the Space Switch Module (SPM) of digital cross-point matrices. For reliability reasons, the switching network as a whole is duplicated in two separate planes working synchronously.

Up to 16 Pulse Code Modulation (PCM) links, each one containing 32 time slots, can be connected to one TSM. A TSM is built up of 512 multiple positions (16x32=512).

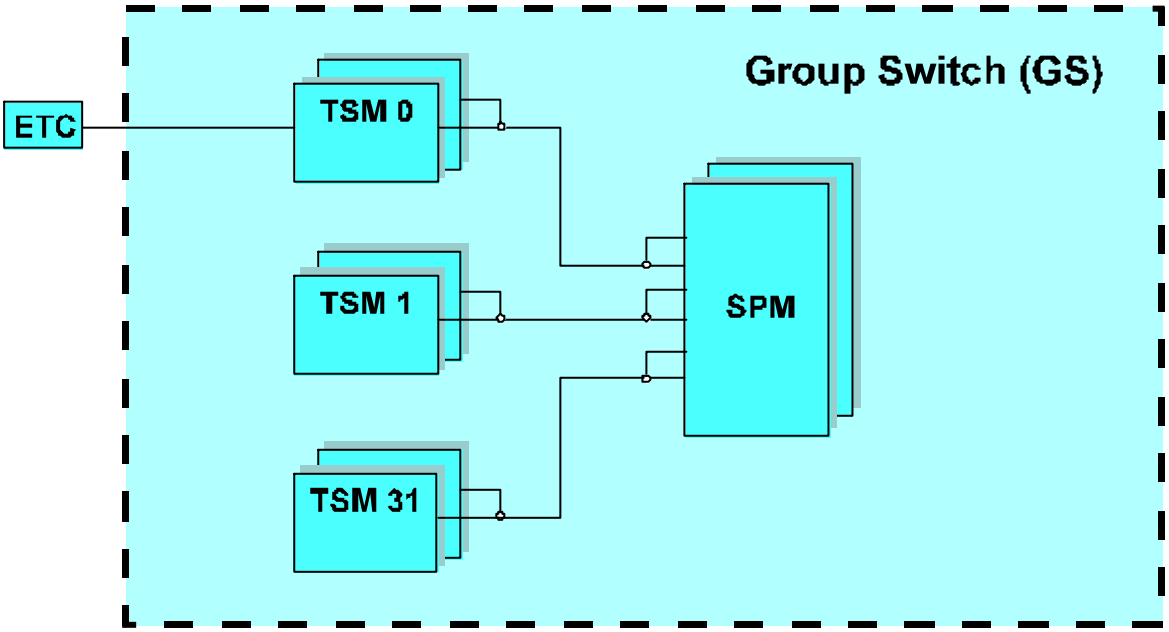


Figure 5-11 Group switch hardware

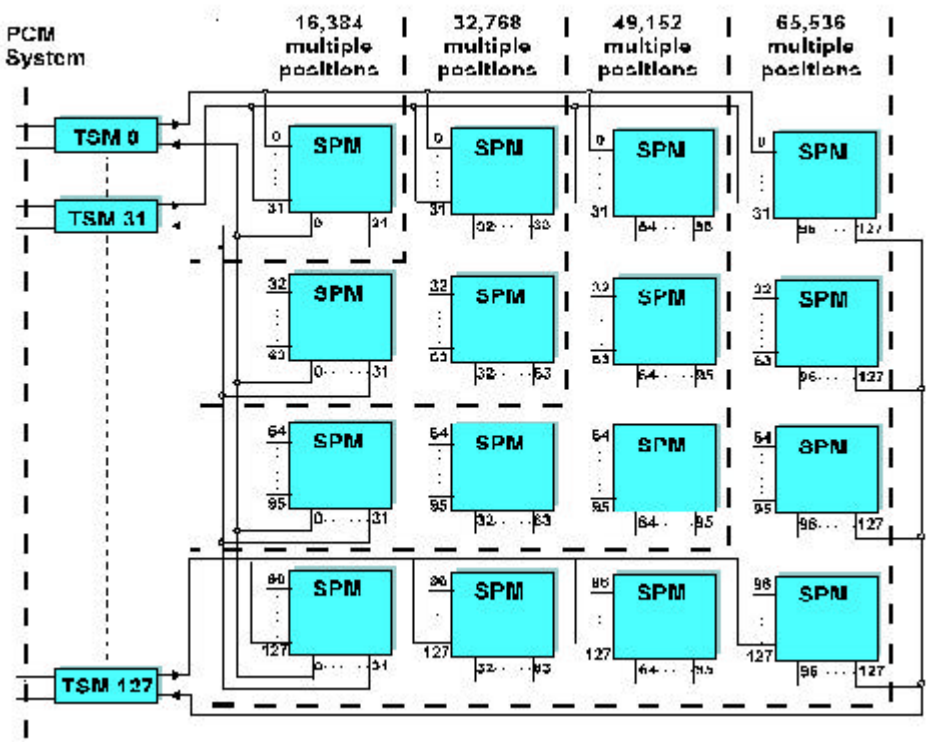
If 24-channel PCM systems are used, special ETCs adapt the rate from 1544 kbits/s to 2048 kbits/s.

One PCM time slot is always connected to the same memory position (multiple point) in TSM. The incoming digital information,

that is, PCM time slot (8 bits), is written into the TSM. It is then read out from the TSM, switched in the SPM, written into another (or to the same) TSM and sent out on the PCM time slot to the destination.

This procedure is repeated 8000 times/second for each time slot in each direction. The internal clocking rate in TSM/SPM is higher than that because there are 16 PCM systems to take care of in the same time. This clocking rate amounts to 4.096 MHz (8 kHz X 16 PCM systems x 32 time slots = 4.096 MHz).

The size of the group switch can be extended as necessary. Several SPMs can be interconnected to form a large matrix. This gives a maximum switch capacity of 64 K multiple positions - the 64 K Group Switch.



TSM Time Switching Module

SPM Space Switching Module

Figure 5-12 A fully equipped group switch

Network Synchronization (NS)

The Group Switch requires clocking. The clock rate determines the rate at which samples are read from or written into the speech stores in the TSMs. Network synchronization contains Clock Modules (CLM), triplicated for reliability, and reference clocks (not shown in the figure below).

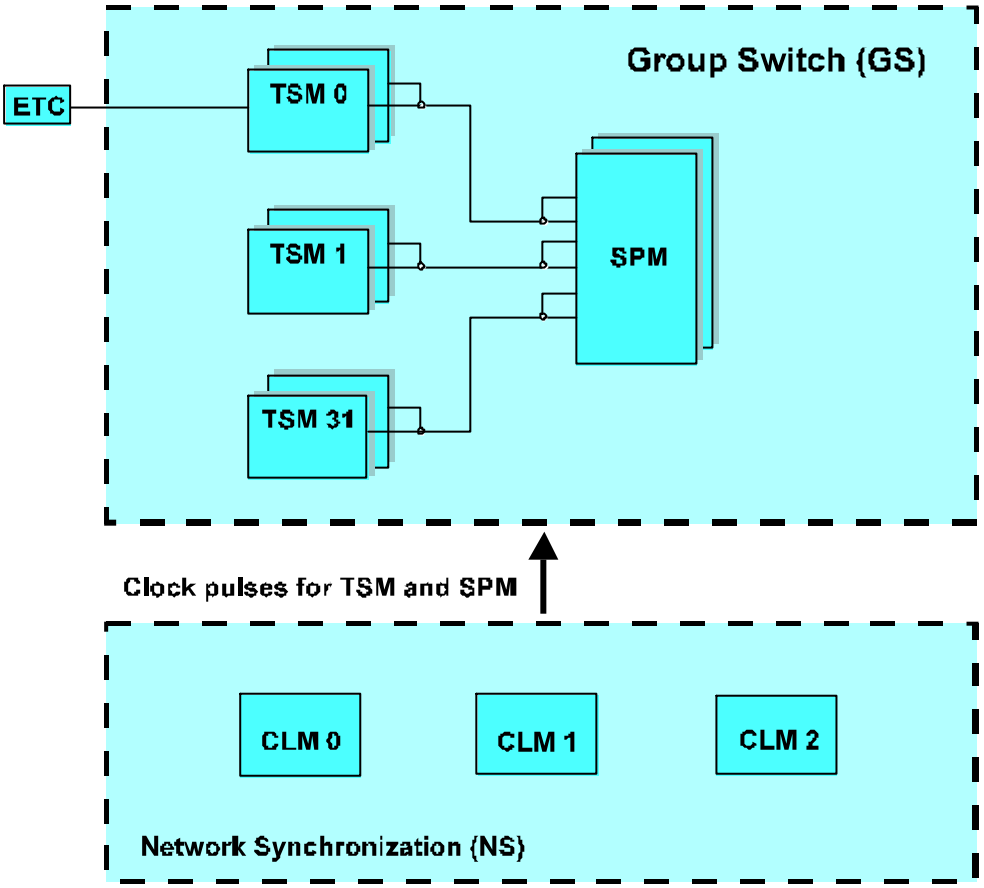


Figure 5-13 Clock modules to synchronize the group switch

CHARGING SUBSYSTEM (CHS)

The CHarging Subsystem (CHS), which consists of software only, is used for charging of the mobile subscribers. The charging function makes it possible to collect and output data concerning calls, supplementary services and invocation of such services.

The calls are charged by means of Charging Data Recording (CDR). This means that data about each call, such as calling party number, called party number, date, time, call duration, etc., is recorded and stored on magnetic disk or tape.

The collection and output of data can be performed in the originating MSC/VLR, the GMSC or the terminating MSC/VLR depending on the result of the charging analysis.

The data is stored in records known as Call Data Records (CDRs) which are stored on the hard disk of the AXE. When the data is needed at the billing center it is output through X.25 data links.

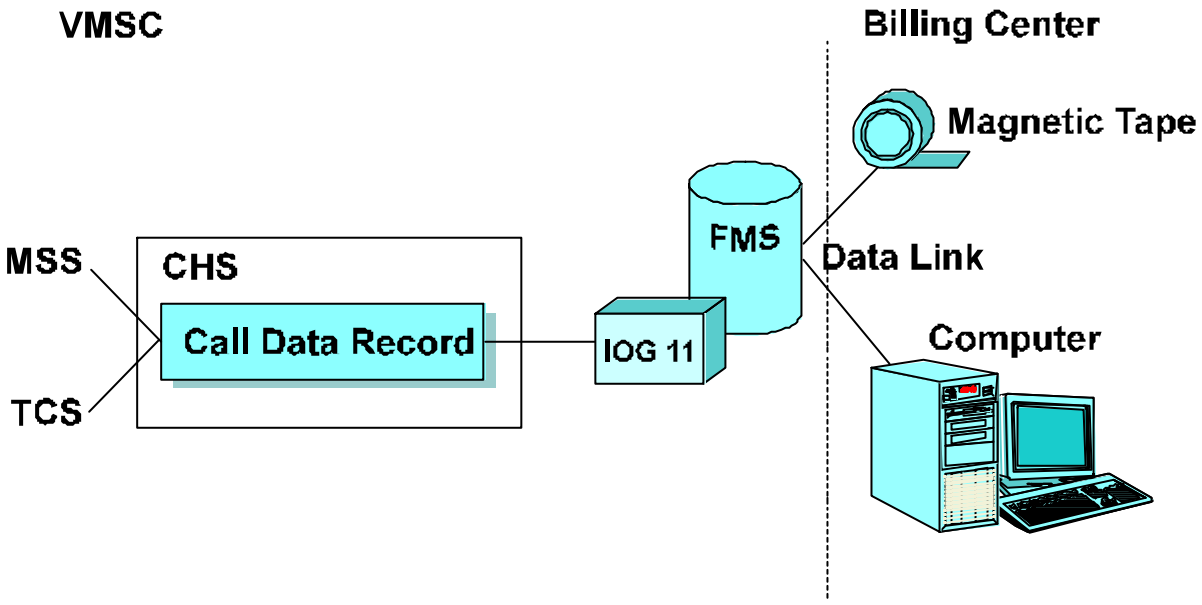


Figure 5-14 Charging in AXE

OPERATION AND MAINTENANCE SUBSYSTEM (OMS)

Operation and maintenance functions common to various subsystems in the switching system, APT, have been collected to form the Operation and Maintenance Subsystem (OMS).

An example of an OMS function is the maintenance of trunk circuits, involving supervision functions such as:

- Blocking supervision
- Seizure supervision
- Disturbance supervision

Among other functions, OMS is responsible for making sure that the processor is not overloaded.

Operation and maintenance functions related to a specific subsystem, e.g. GSS or MSS, are implemented in the respective subsystem. A version of OMS adapted for use in the RMP is called the OMS-R.

NETWORK MANAGEMENT SUBSYSTEM (NMS)

The Network Management Subsystem (NMS) consists of software only. The subsystem contains functions for supervising the traffic flow through the exchange, and for introducing temporary changes in that flow. This may occur for example, if there was an overload of traffic on a particular route.

STATISTIC AND TRAFFIC MEASUREMENT SUBSYSTEM (STS)

The Statistic and Traffic measurement Subsystem (STS) is a general system for collecting, storing, processing and presenting statistical data for all types of traffic handling and maintenance applications in Ericsson's GSM systems. STS consists of software only.

CONTROL SYSTEMS SUBSYSTEMS

APZ is composed of the subsystems in the following table. Some of these subsystems are now discussed in further detail following the table.

Subsystem	Name	Function	Product Line
CPS	Central Processor Subsystem	Includes the duplicated processor and performs the high level processing functions and data handling	All
DBS	DataBase management Subsystem	Provides a semi-relational database system with extensions to support real-time system requirements	All
DCS	Data Communications Subsystem	Provides physical interfaces and data communication protocols for communication with AXE	All applications requiring I/O functions
FMS	File Management Subsystem	Manages the AXE mass storage devices. The FMS stores files of magnetic tape, flexible disks, hard disks and optical disks	All applications requiring I/O functions
MAS	MAintenance Subsystem	Supervises the operation of the CP and takes appropriate action if a fault occurs	All
MCS	Man-machine Communication Subsystem	Provides functions for the communication between the staff and the AXE by means of alphanumeric terminals and alarm panels	All applications requiring I/O functions
OCS	Open Communications Subsystem	Provides standard data communications between applications in AXE and external computer systems	All
RPS	Regional Processor Subsystem	Includes the Regional processors which perform the basic routine tasks for the CP or act as an interface to the hardware	All
SPS	Support Processor Subsystem	Includes the Support Processors for I/O communication. SPS provides the operating system with alarms and interfaces, internal communication and supervisory functions for SP	All applications requiring I/O functions

Table 5-3 APZ Subsystems

CENTRAL PROCESSOR SUBSYSTEM (CPS)

The Central Processor Subsystem (CPS) contains both software and hardware and performs functions such as job administration, store handling, loading and changing of programs. For reliability, CPS contains 2 Central Processors (CPs) which operate in an executive/stand-by relationship. In the event of failure of the executive CP, the stand-by CP will take control without loss of service.

MAINTENANCE SUBSYSTEM (MAS)

MAintenance Subsystem (MAS) contains both software and hardware. MAS's function is to locate hardware faults and software errors, and to minimize the effects of such faults/errors.

REGIONAL PROCESSOR SUBSYSTEM (RPS)

The Regional Processor Subsystem (RPS) contains both software and hardware. The hardware is in the form of regional processors (RPs), while the software consists of administrative programs located in the RPs. RPs are controlled by the CP.

SUPPORT PROCESSOR SUBSYSTEM (SPS)

The Support Processor Subsystem (SPS) includes a Support Processor (SP) for communication with all Input/Output (I/O) devices. SPS has functions for blocking, deblocking and supervising of I/O devices. The SP is controlled by the CP.

FILE MANAGEMENT SUBSYSTEM (FMS)

The File Management Subsystem (FMS) handles all types of files used in AXE. The term "file" denotes all data stored on tape, floppy disks and magnetic disks. The data blocks of the AXE must always consult FMS before information is stored in external storage media (output of charging data, etc.).

MAN-MACHINE COMMUNICATION SUBSYSTEM (MCS)

The Man-Machine Communication Subsystem (MCS) handles communication between the I/O devices and the rest of the system.

The I/O devices can be in the form of display units, printers, alarm panels, or the OSS system.

DATA COMMUNICATION SUBSYSTEM (DCS)

The Data Communication Subsystem (DCS) handles communication between blocks in the CP and the SP. The subsystem structure is in accordance with international standards for I/O systems: Open Systems Interconnection (OSI). DCS also handles communication over data links according to standardized data protocols X.25, X.75 and X.28. For example, charging data records are sent over a data link from DCS to a billing center.

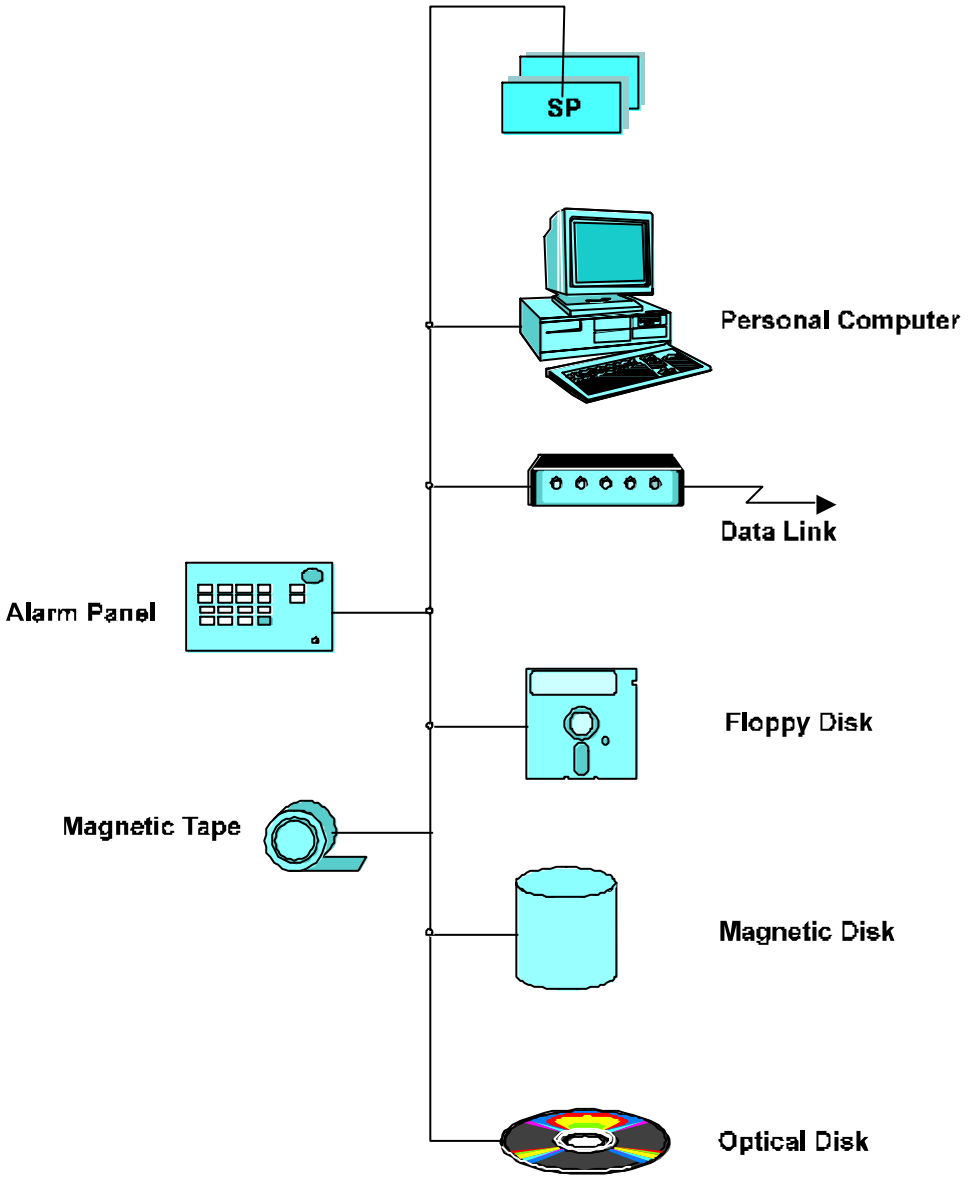


Figure 5-15 I/O System hardware

SUBSYSTEMS IN ERICSSON'S GSM PRODUCT LINES

The figures below summarize the subsystems particular to each product line in Ericsson's GSM systems.

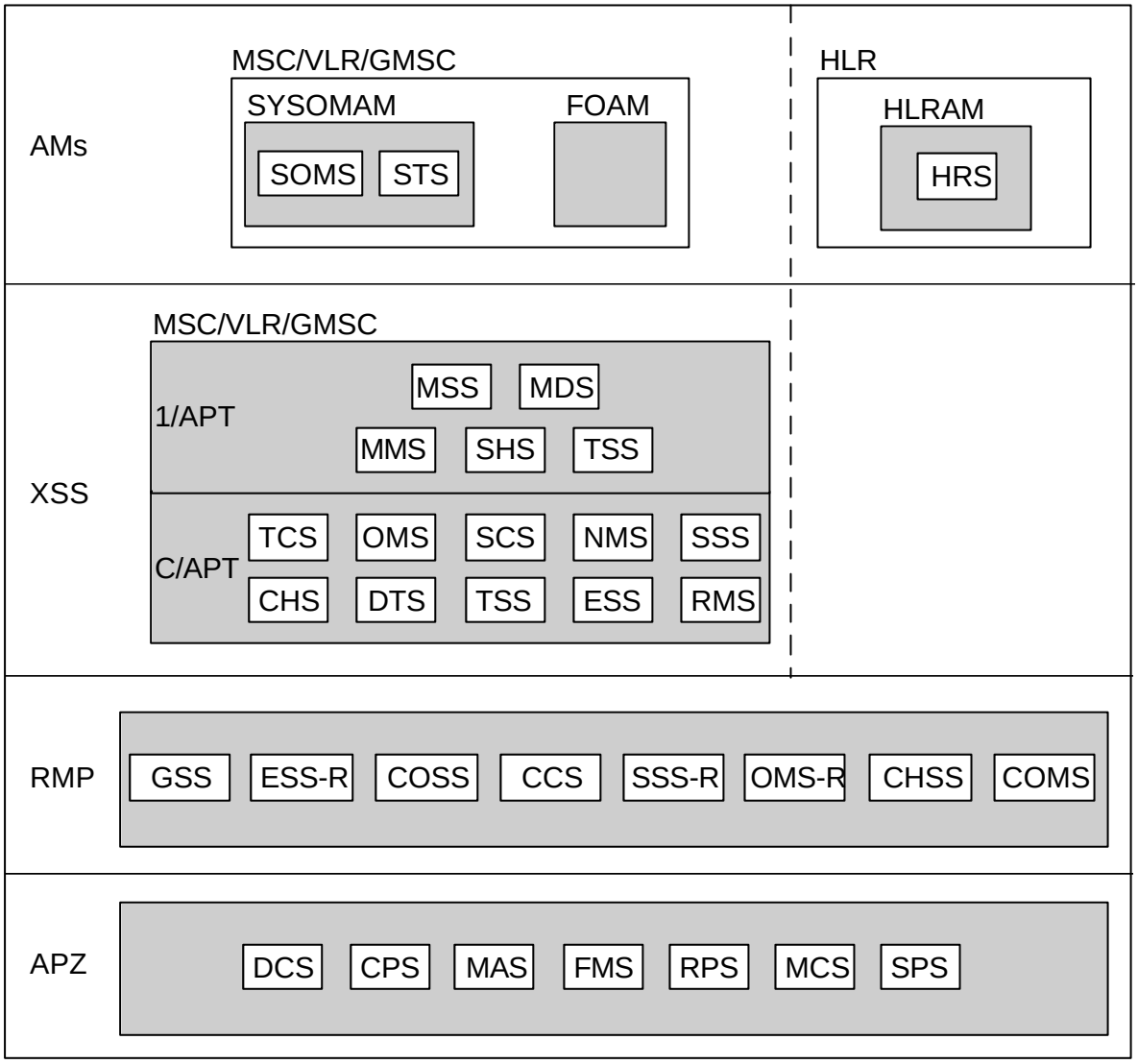


Figure 5-16 CME 20/CMS 40 Product Lines: Application Modularity based Products (possible additional AMs are not shown here)

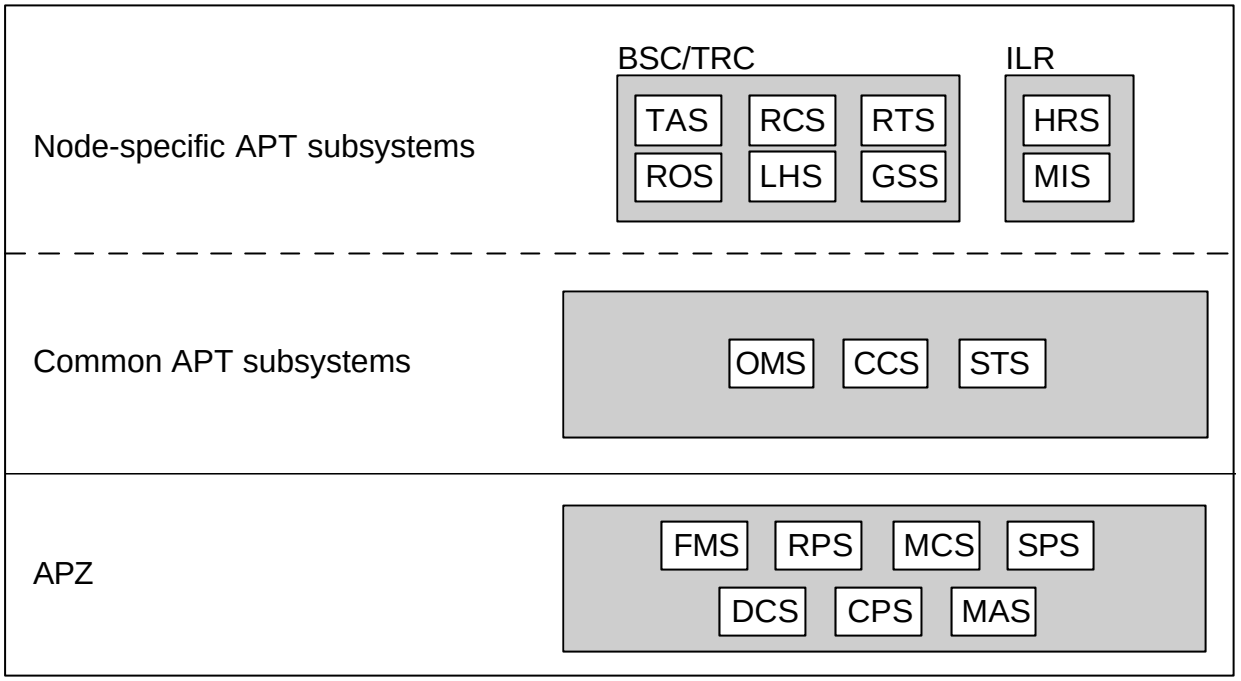


Figure 5-17 CME 20/CMS 40 Product Lines: Non-Application Modularity based Products

AXE HARDWARE

From its inception, the AXE system was designed to accommodate continuous change. Through the years, new applications have been introduced, the range of functions has grown, and the hardware has been steadily updated.

The latest advances in hardware technology have been brought into the system, thereby dramatically improving such characteristics as floor space, power consumption, system handling and cost of ownership.

BUILDING PRACTICE BYB 501

Ericsson's cabinet based equipment is called BYB 501 which replaced BYB 202, the older AXE hardware structure. BYB 501 complies with the metric standards for IEC (International Electrotechnical Commission) and ETSI (European Telecommunications Standards Institute) and has excellent EMC (Electromagnetic Compatibility) offering important advantages compared to other equipment practices. For example, the BYB 501 easily accommodates other standardized products. BYB 501 subracks can accommodate a mix of full size and half size plug-in units.

The Regional Processor (RP2) has decreased to only 3 boards (RP3) and further reduces to one (RP4) when the Serial RP-Bus (RPB-S) is realized. Since the RP-EM is a single board there is no need to have a separate magazine for RPs. This has led to the production of a new Generic EM Magazine referred to as GEMM. GEMM comes in two generations: GEMM1 is for BYB 202 and GDM for BYB 501. GDM is in two versions, GDM-H half height and GDM-F full height

BYB 501 can contain non-modernized products in either wide 1200mm or narrow version 720mm. A compact version of APT 212 20 uses a narrow BYB 501 cabinet.

The BYB 501 Group Switch subsystem requires only half as many plug-in units as before, the footprint is between 80% and 95% smaller in large configurations, and power has been reduced by similar amounts. This has been achieved by improvements such as combining all TSM functions on one plug-in unit.

SUPPORT OF AXE 810 / APT 1.5 / APG 40

The latest hardware in the BSC and BSC/TRC nodes is the AXE 810 with APT 1.5. The most important components of the new hardware are:

- Generic Ericsson Magazine (GEM). This is a full height magazine which houses a pair of maintenance processors and duplicate 16k group switch (GS 890) boards, A and B plane. These boards are mandatory. There are a further 22 generic device positions which can be used to house any type of board adapted to the GEM size and backplane. This creates a flexible solution with many alternatives. Some of the device boards which can currently be housed in the GEM magazine are the TRA R6, DLEB and ECP-5.

- TRA R6. This is the new version of transcoder board, which can be loaded with software of any codec type. (Note: this board is required in order to implement AMR)

- Digital Link multiplexer for Existing equipment Board (DLEB) will enable GDM subracks (DL3 interface) to connect to the new DL34 interface within the GEM.

- ECP-5. The 5th generation echo canceller in a Pool.

- RPG3. This is the new version in the RPG series.

- APG40. The optional IO for IOG20.

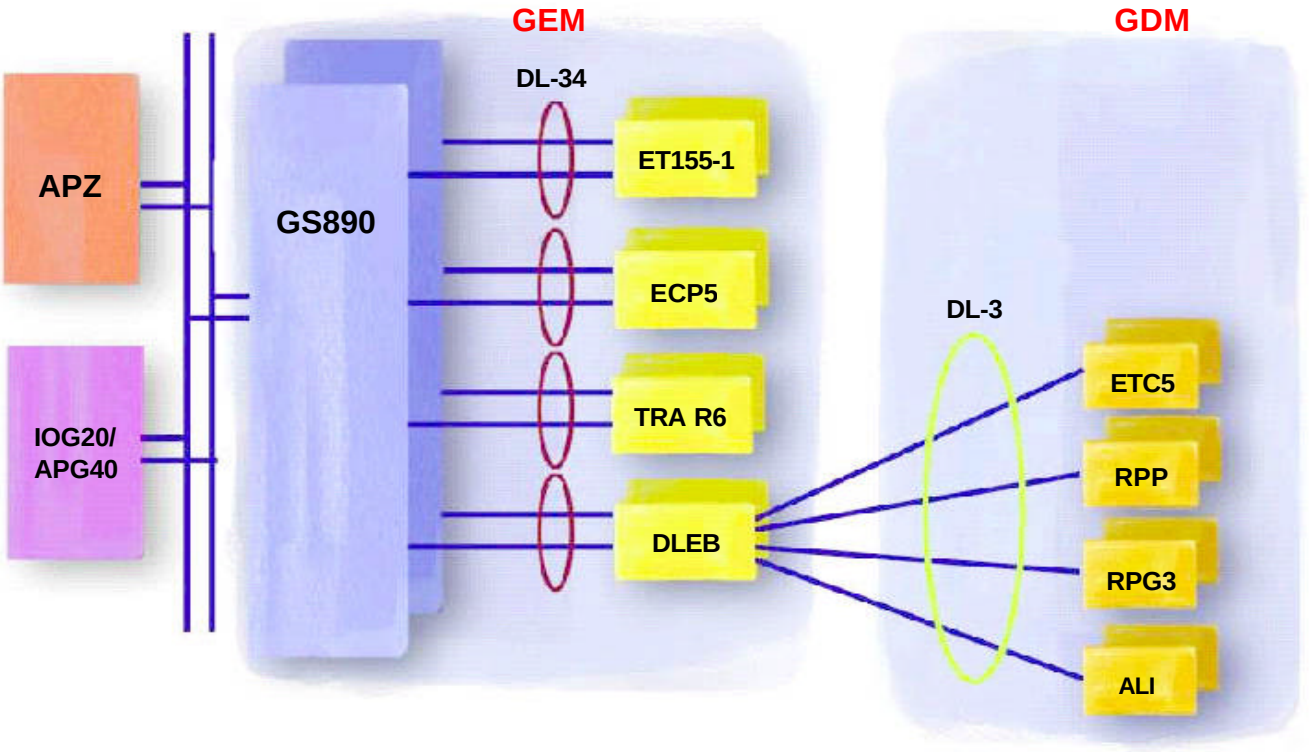


Figure 5-18 AXE 810 Main Components

MAJOR ADVANTAGES

The following are the primary advantages provided by the APT 1.5 product family, compared to previous BYB 501 versions.

- Average reduction in footprint of 50%.
- Average reduction in power consumption of 30%.
- Lower cost of ownership as 50% reduction in board types.
- Increased switching capacity, up to a theoretical 512K
- Ease of installation with less cabling.
- Old hardware versions, BYB 501, can be connected to the new hardware.

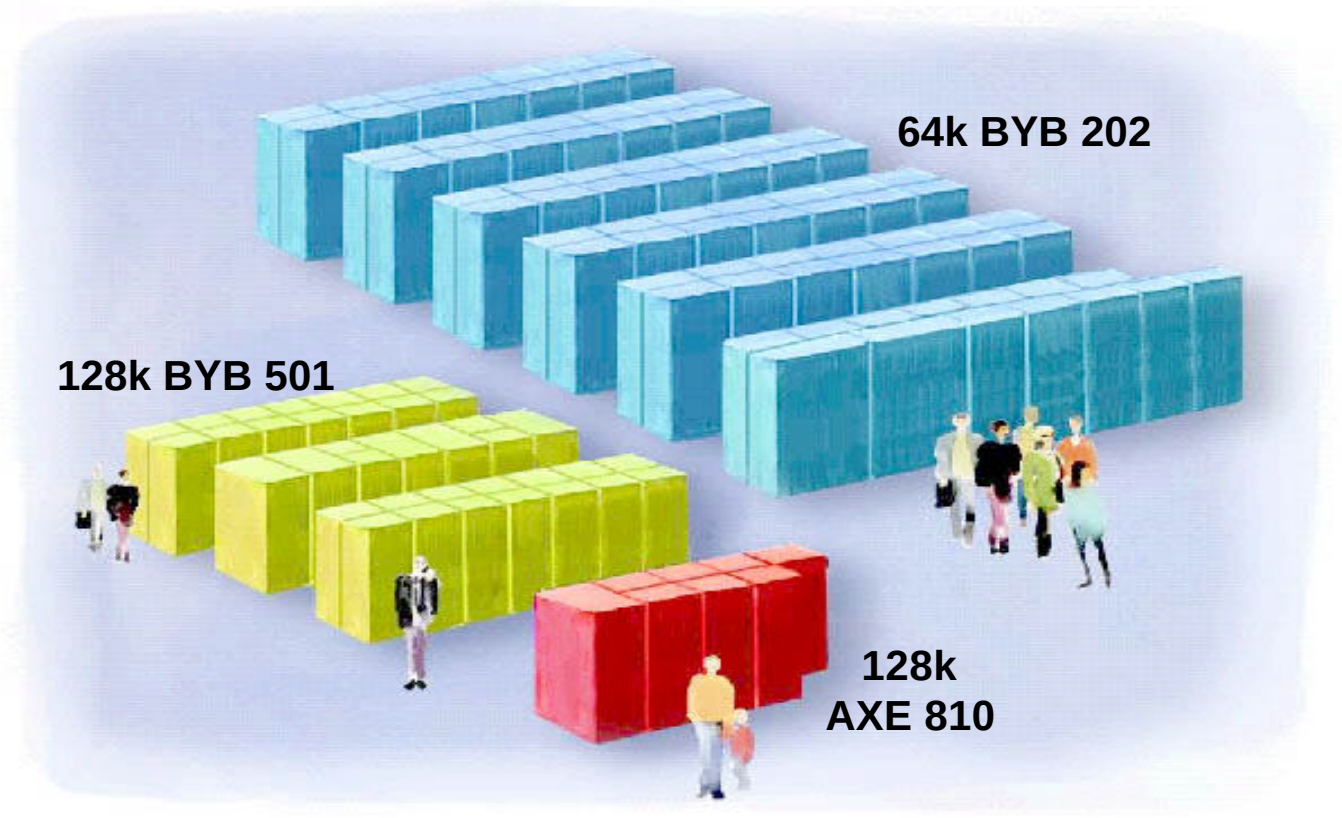


Figure 5-19 AXE 810 Benefits – Decreased Cost of Ownership and decreased Footprint

COMPATIBILITY

The APT 1.5 includes all functionality developed for APT 1.3 and 1.4. Furthermore devices from APT 1.3 and 1.4, the BYB 501 Generic Device Magazine (GDM) generation can be easily reused and connected to the new GS 890 Group Switch. The extension of previous APT versions is possible by using Network Node Renewal Processes (NNRP):

THE NEW GROUP SWITCH

The new group switch in the AXE 810 is the GS890. This is a completely new switch design with the following main features:

- Distributed architecture. The switch is located in every GEM subrack.

- Time-Space architecture. The old AXE group switch had a time-space-time (TST) architecture. The GS890 has a timespace TS) architecture creating better characteristics.

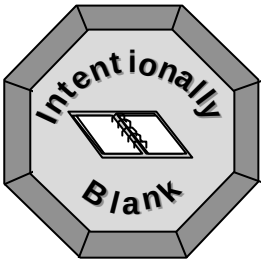
- Maximum size of Group Switch is now 512K. The switch can be scaled up to 512K multiple positions (64 kbit/s channels). This means that the switch can have more than 250 000 calls established at the same time (theoretically). In BSC applications, the maximum size of the Group Switch is 64K.

APG 40

APG40 is the name of the new I/O system in AXE. It will replace the existing IOG20. The main driver behind the development of a new I/O platform is increased capacity demands and standardization of operating system and hardware, the latter giving access to standard software and functions developed by 3rd party suppliers and system integrators. The main building blocks of APG40 are:

- New microprocessors based upon Intel processors. The first release will be based upon a 333 MHz processor while second generation will have a processor with 500 MHz.

- New operating system based upon Windows NT 4.0 Enterprise Edition. This simplifies design of software and sourced software can easily be integrated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