

Lecture – 5 (Dt. 7th April 2020)

Electronic Switching (EC- 8th Sem)

Computer Controlled Switching System (Contd.)

Switching System Software Organization

References :

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SWITCHING SYSTEM SOFTWARE ORGANIZATION

In last section, three levels of controls of hardware architectures were discussed for a general digital switching system. For effective processing of a call, to perform various functions of subsystems and to interface with the other subsystems, software plays a vital role. The software programs enables any digital switching system input data, to give outputs in a fraction of seconds, concurrent processing of many calls in real time and performs many features other than simple path set between subscribers for conversation. In this section, the need for software, the software classification, basic software architecture, the involvement of software in various levels of hardware architecture, interfacing between subsystems through software and software presently used in various digital switching system are described.

Need for Software

Other than call processing, any exchange is to serve the subscriber various facilities and many administrative tasks. Fig. shows various activities of a switching system. To carry out these activities efficiently and effectively, the use of software is unavoidable.

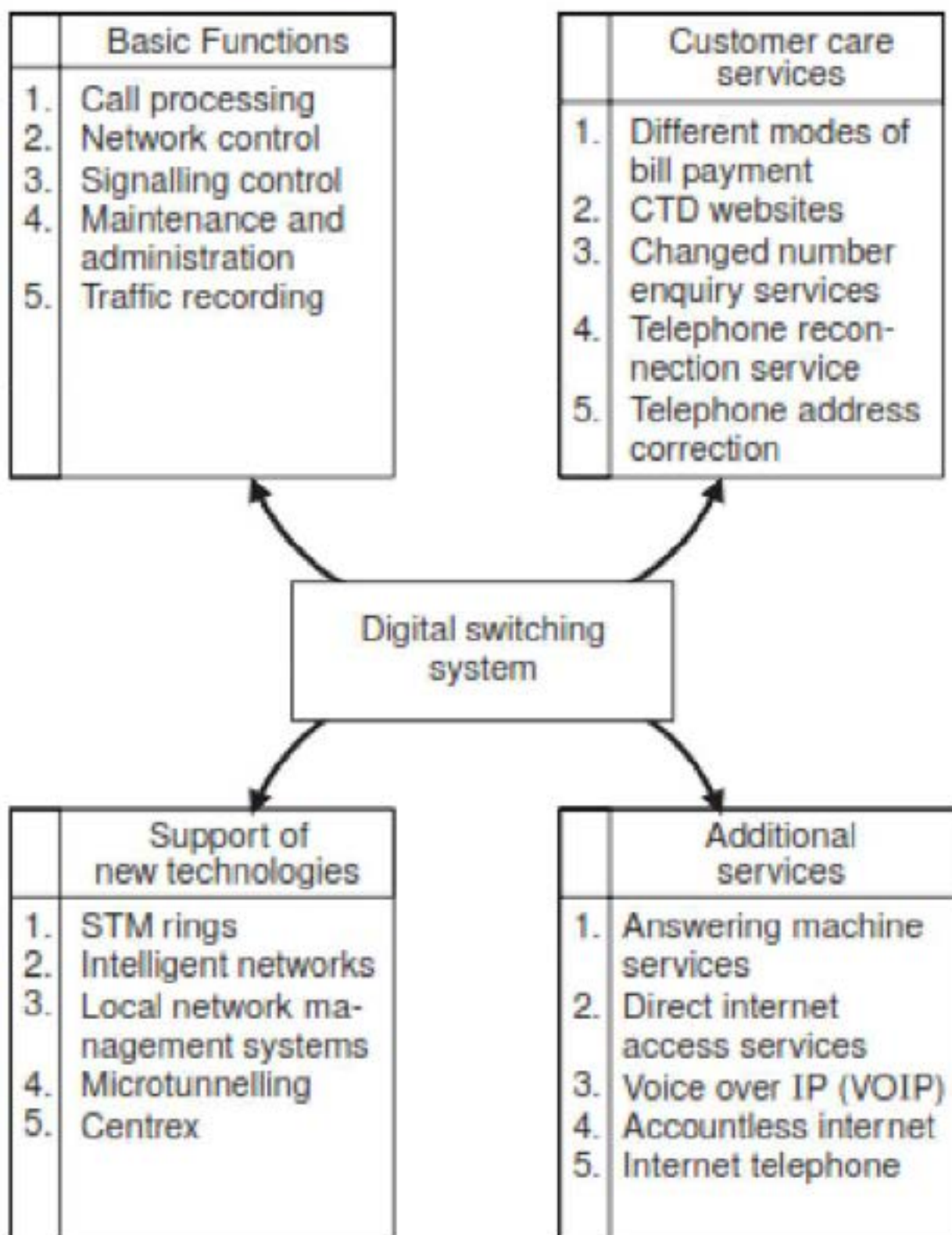


Fig. Activities of switching system.

To perform the above tasks, a large amount of software is required. However, the software for basic functions are must and remaining services are optional and requires software depends on the location of switching systems. Approximately 70% of the total software is used to perform basic functions. Only 0.1% of the total processing time is used by the 30% of the remaining service oriented software packages.

Software Classification and Interfacing

Classification. At various levels of hardware architecture, the software are used. Thus, many digital switching systems employ some system level software. Basic software systems are classified as:

1. Maintenance software
2. Call processing software
3. Database/Administration software
4. Feature software.

Above software packages are divided into program modules. Each module dealing with specific task. Several modules are grouped together to form functional units. Various factors are associated with the development of software product. These factors include the requirements of the business, the location of telephone exchanges, customer needs, internal requirements, and parameterised design. The parameterised design includes hardware

parameter and software parameters. The hardware parameter are based on the hardware used in the central office or exchanges. They are number of network control processors, number of line controllers, number of subscribers to be serviced, number of trunks for which the exchange is engineered etc. Some examples of software parameters are the registers associated with number and size of automatic message accounting (AMA) registers, number and size of buffers for various telephony function and various features to be included for that particular exchanges. Thus, the parameterised design helps in designing software common to the similar types of exchanges.

Maintenance software

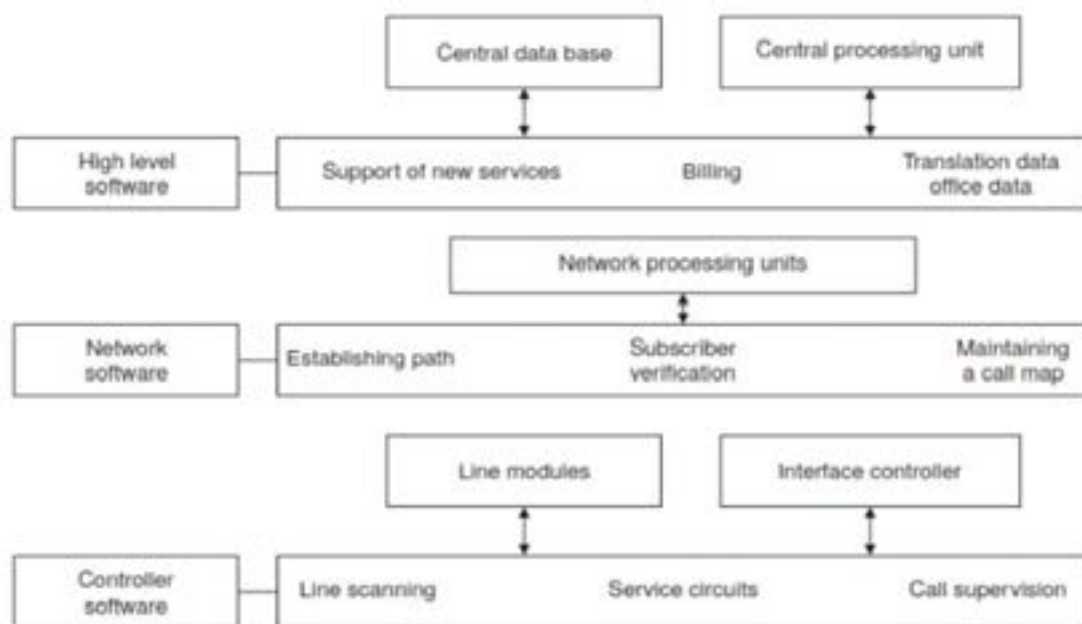
There are various activities and tests involved to maintain a switching system. Some of them are :

1. Supervision of the proper functioning of the exchange equipment, trunks and subscriber lines.
2. Monitoring the database of line and trunk assignments.
3. Efforts for the system recovery in case of failure.
4. Automatic line tests, which permits maintenance persons to attend several exchanges from one control location.
5. Effective diagnostic programs and maintenance strategies used to reduce the maintenance cost.

The root cause of the failure of any digital switching system is related to the software bugs which affects the memory and program loops, hardware failures, failure to identify the exact problem of failure and at least but not least the human error. Thus, the first step in software build is to select the appropriate program modules which is suitable for the switching system. The points to be considered are types of lines, location of switching system, signalling systems, availability of skilled person. Preventive maintenance programs are activated during the normal traffic. If a fault occurs, the OS activates the maintenance program to recover the system. Effective preventive and maintenance programs and strategies helps in proper maintenance of digital switching system with reduced maintenance cost.

Call processing software. The call processing functions are controlled by a central processor. Other functions carried out by the central processor are maintenance and administration,

signalling, network control. Thus, the call processing programs are usually responsible for call processing and to interface with the translation data, office data, and automatic message accounting and maintenance programs. The translation data is the type of data generated by telephone companies related to subscriber. The office data is related to a particular digital switch. The call processing programs can be derived from state-transition diagrams in specification and description language (SDL). The SDL description in text form, is machine read and stored in memory in the form of data structures and linked lists and translation tables. An interpreter programs is written to access the lists and tables and to process the call by interpreting the data within them. Fig. shows three levels of call processing program. But it varies depends on the digital switching system.



Data base/Administration software

For administration and data base management, large amount of software required. But these tasks are performed infrequently, it uses less than 5% of the total processing time. The administration tasks includes

1. Alarm processing
2. Traffic recording
3. Change of numbers or area codes corresponding to the change in subscriber rate and Government policy.
4. Changing routing and routing codes. This decisions made on the traffic intensity of a particular exchange.

5. Generation of exchange management statistics.

Most digital switching system employ a data base system to:

1. Record office information
2. Billing information
3. Software and hardware parameters
4. System recovery parameters
5. System diagnostics.

Feature Software.

Most of the present day digital switching systems uses all packages.

Switching software. Software for digital switching systems are written in high level languages. Early electronic switching systems used assembly language programmes. In 1980, Plenary Assembly, CCITT approved the definition of a high level language as Recommendations-200. This language is known as CCITT high level language (CHILL). It has three major features as data structure, program structure and action statements. It is designed for the various SPC modules discussed earlier. Software codes for digital switching systems are also written in high level programming languages such as C, C ++, PASCAL.

Interfacing. The line control programs scan the status of lines and reports the status to the network status program. The network status programs works with network control programs. To provide dial tone, ringing, message to caller for invalid number, status of the subscriber and to receive dialled digits, and to clear signals from the subscriber, the line control programs interface with the network control programs. The call processing software which is responsible for call processing and in addition interfaces with accounting and maintenance programs for billing, recording and to identify the fault in lines. The call processing software also interfaces with feature programs to serve the customers need. The trunk modules interface different types of trunks to the digital switching system. Most digital switching systems employ special modules to connect ISDN and other digital services to the switch. Some specialized module interfaces are used to provide enhanced services such as **AIN** and packet switching.