Digital Switching System Software Classification

A conceptual diagram of typical digital switching system software is shown in Fig. 6.2. The basic software functionality of a digital switching system can be divided into five basic elements, and other functions can be derived from these basic elements:

- Switching software
- Maintenance software
- Office data
- Translation data
- Feature software

Switching Software.
The most important layer of software for a digital switching system usually comprises

- Call processing software
- Switching fabric control software
- Network control software
- Periphery control software

Switch Maintenance Software.
This set of programs is used to maintain digital switch software and hardware. Examples of these types of programs include digital switch diagnostics, automatic line tests, system recovery, patching, and trunk tests.
The recovery software of a modern digital switching system is usually distributed among its subsystems, since most digital switches have a quasi distributed architecture. This strategy allows the system to recover more efficiently. In earlier SPC systems, the recovery scheme required the entire switching system to go down before it could be reinitialized to a working configuration.

A digital switching system may employ a large number of programs that are external to the operation of the digital switch, such as operational support systems (OSSs), operator position support, and advanced features (e.g., ISDN/SCP AIN). These are not shown in Fig. 5.2 as separate items since they can be external to a digital switching system or may be implemented as a supported feature. Some parts of OSSs can even be viewed as part of digital switching system maintenance software.

The objective of Fig. 5.2 is to provide the analyst with a clear picture of the digital switch software. The objective of this chapter is to help the analyst better understand the software environment of a digital switch without getting distracted by functions that may not directly impact the reliability assessment of a class 5 digital switch. The importance of software tools such as compilers, assemblers, computer-aided software engineering tools, and methodologies that are needed to develop produce, and maintain digital switching system software should not be ignored. They can impact the quality of software.

**Office Data.**

The generic program, as described earlier, requires information that is specific to a particular digital switch to operate properly. Digital switching systems have suffered outages due to wrong
or improperly defined office data. The easiest way to visualize office data is by comparing them to your personal computer (PC). For the PC to operate properly, the OS has to know what type of color monitor the PC is equipped with, so that correct drivers are installed; the size and type of hard disk installed so that it can access it correctly; types of floppy disks/mouse; and CD ROM. Similarly, the office data of a digital switching system describe the extent of a central office (CO) to the generic program. However, the office data are much more involved and also define software parameters along with hardware equipment. Some common hardware parameters are

- Number of NCP pairs in the CO
- Number of line controllers in the CO
- Maximum number of lines for which the CO is engineered
- Total number of line equipment in the CO
- Maximum number of trunks and types of trunks for which the CO is engineered
- Total number of trunks of each type in the CO
- Total number and types of service circuits in the CO such as ringing units, multifrequency (MF) receivers and transmitters, and dial-pulse (DP) receivers and transmitters

These are some examples of software parameters:

- Size of automatic message accounting (AMA) registers
- Number of AMA registers
- Number and types of traffic registers
- Size of buffers for various telephony functions
- Names and types of features supported

These types of parameters are digital switching system-specific and CO-specific. The parameters can literally number in the hundreds and are generated from engineering specifications of a CO.
Translation Data.

The translation data, also referred to as subscriber data, are subscriber-specific and are required for each subscriber. This type of data is generally generated by the telephone companies and not by the suppliers. In some cases, the suppliers may input translation data supplied by the telephone companies. However, the database and entry system for the translation data is supplied as part of the digital switching system software. Typical translation data may consist of:

- Assignment of directory number to a line equipment number

- Features subscribed to by a particular customer, such as call waiting, three-way calling, and call forwarding, etc.

- Restrictions for a particular customer, such as incoming calls only, no long-distance calls, certain calls blocked

- Three-digit translators that route the call based on the first three digits dialed

- Area-code translators that translate the call to a tandem office for 1+ call, which is followed by 10 digits

- International call translators that route the call to international gateway offices based on the country code dialed

Again, literally hundreds of translation tables are built for a CO before it can become functional. If the CO is a new installation, much of the information is provided by the traffic department of a telephone company. The data tables are generated in conjunction with the specification of a new CO. However, if the CO is a replacement for an earlier CO then all existing data may be required to be regenerated in a different format for the new CO.

Feature Software.

As mentioned earlier, most features implemented in modern digital switching systems are offered through feature packages. Some of the feature packages are put in a feature group and are offered in a certain market or to a group of telephone companies. These features may be included in the base package of a generic release or, offered as an optional package. In either case, most of the features are considered to be applications for a digital switch. They are engineered to be modular and can be added to a digital switch according to the requirements of
the telephone company and associated CO. Some examples of feature packages are

- Operator services b Centrex feature
- ISDN basic rate « STP extensions
- SCP database

Depending on the digital switching system, these feature packages can be extensive and large. The analyst of digital switch software should assess the extent of the feature package and its compliance with the requirements of telephone companies.

**Software Dependencies.**

Most telephony features of digital switching systems require specific office data and translation data for their operation. They depend on the generation of feature specific office data and/or translation data. These dependencies are, of course, design-specific. Similarly, the maintenance programs may require a set of specialized office data and/or translation data for testing various functionalities of a digital switching system. These relationships are shown as a software dependency in Fig. 6.2, and direct interactions of a generic program are shown as solid arrows.