7.7 Uplink

Ground stations that provide the uplink signals to the satellites in a DBS system are highly complex systems in themselves, utilizing a wide range of receiving, recording, encoding, and transmission equipment. Signals will originate from many sources. Some will be analog TV received from satellite broadcasts. Others will originate in a studio, others from video cassette recordings, and some will be brought in on cable or optical fiber. Data signals and audio broadcast material also may be included. All of these must be converted to a uniform digital format, compressed, and time-division multiplexed (TDM). Necessary service additions which must be part of the multiplexed stream are the program guide and conditional access. Forward error correction (FEC) is added to the bit stream, which is then used to QPSK modulate the carrier for a given transponder. The whole process, of course, is duplicated for each transponder carrier. Because of the complexity, the uplink facilities are concentrated at single locations specific to each broadcast company.

8.1 Mobile Satellite System Architecture

A mobile satellite system (MSS) is a system that provides radio communication services between
1. Mobile earth stations and one or more satellite stations
2. Mobile earth stations by means of one or more satellites
3. Satellites.

Figure 8.1 shows the basic architecture of a mobile satellite system (MSS) with a land-based digital switched network (LDSN) and inter-satellite cross link. Assuming that a new-generation mobile satellite is being designed for Fig. 8.1, the total spacecraft system such as power, guidance and control, and data handling would have advanced-technology components. The satellite would contain onboard digital signal processors (DSP) and memory for onboard data processing capability and onboard fast packet switches. The onboard fast packet switches would be capable of supporting space-optimized traffic from multiple earth stations.

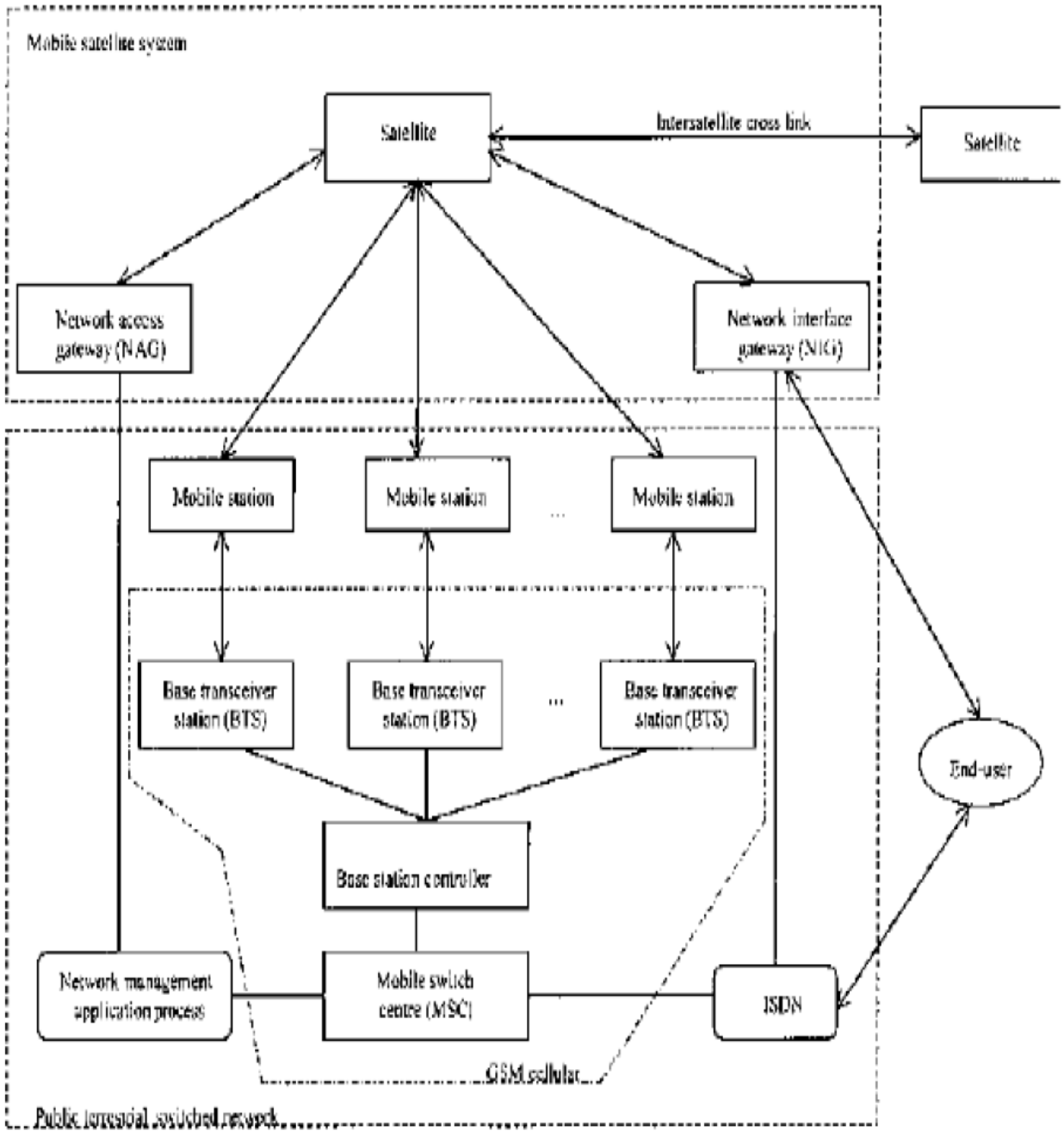

FIG 8.1 Block diagram of a mobile satellite system with terrestrial switched network and Inter-satellite cross link.

The DSP will be responsible for resource management and control including encryption/decryption, channelization, demodulation, and decoding/encoding. This functionality has been discussed in the previous chapters. As stated earlier, since most, if not all, of the services covered by the MSS are, in principle, provided by terrestrial switched digital networks

(e.g. ISDN) we will attempt to explain some the concepts applicable to ISDN that have not been previously dealt with in previous chapters.
The network routers (gateways) allow:
Seamless inter-satellite cross link; that is, direct data transfers from one satellite to another,
Seamless connectivity for users anywhere in the world through mobile=fixed earth stations and public-switched digital networks
Traffic shaping, resource accounting, cache for traffic redirection and load sharing, and integrated network management to support a myriad of simultaneous connections per satellite

Any mobile station registered on the mobile satellite network is interconnected to any available channel of the network interface gateway (NIG) through proper channel assignments issued by the network access gateway (NAG).
When the satellite illuminates a particular area or region, the mobile satellite system routes intended messages (e.g., telephone calls, data, etc.) through the ground networks (e.g., ISDN), ground stations, or directly to the user terminals. User terminals can be personal terminals for individual subscribers or multiuser terminals for corporate (e.g., Internet providers, communication resellers, etc) and communal residential subscribers.
The public terrestrial switched networks, called in this text Land-based Digital Switched Network (LDSN), contain the integrated services digital network (ISDN) and mobile communications systems to provide end users with efficient communication services between fixed and fixed terminals, fixed and mobile terminals, and mobile and mobile terminals. In the network arrangement shown in Fig. 8.1, any mobile stations using the services of PLSN can communicate both signaling and bearer traffic to the base transceiver station (BTS) that provides the most favorable radiofrequency (RF) signal. This establishes an association between the mobile station's geographic location and the closest BTS. As the mobile station moves from the coverage area of one BTS to another, the first association is released and a new one is formed. This procedure is called handover. The base station controller (BSC) and mobile switching center (MSC) manage radio resources, channel assignments, and handover services. A single BSC can control multiple BTS's. A single MSC can control multiple BSCs. Multiple MSCs may reside within a single LDSN. The network management application process (MAP) defines services for signaling among several MSCs. In principle, all the services MAP defines and provides are applicable to the MSS.