In digital television, video and audio signals are acquired, transmitted and presented as a sequence of numerical values. The techniques in processing the stream of digital data in the various components of the transmission chain have been described in the previous chapters. However, only the distribution of digital signals from the broadcasting service provider to the user, i.e. in one direction has been considered so far. With the increasing availability of digital transmission systems a desire emerged to augment classical broadcasting services with services providing a certain level of interactivity. The user would be able to react to information presented by the service provider or even to contribute to the information exchange. To achieve interactivity, a return channel needs to be added to the transmission system enabling data to travel from the user back to the service provider.

The solution for interactive services proposed by the DVB Project is presented in this chapter. It consists of a whole set of specifications describing protocols, and interfaces for all kinds of transmission media and network scenarios. After a short description of the service environment, protocols common to all types of interaction channels are explained in detail. In the following sections the interaction channels for individual types of networks are analysed. Two groups of networks have been identified that are able to provide interaction channel services. The first section is concerned with telecommunication networks used to enhance broadcasting networks with an interaction channel. In the second section, interaction channels specific to the various types of broadcasting networks are described.

13.1 Interactive Services

The term 'interactive services' may describe a whole range of different types of service offerings that require a varying level of interaction between the user and the service provider or the network operator. The most basic form of interactivity called 'local interactivity' can be achieved within the user terminal. For local interactivity, data belonging to certain interactive services is transmitted and stored in the terminal. That terminal can react to the
inputs of the user without requiring further exchange of data across the network. This basic form of interactivity is not covered in this chapter.

The requirement of providing an interaction channel across the transmission network was established by the desire to enable the user to respond in some way to the interactive service and by the necessity of the service provider or network operator to listen and possibly react to that response. The user's response may take the form of some simple commands, like in 'voting' in favour of a particular participant in a game show or for 'purchasing' goods advertised in a shopping programme. In that case, it may be sufficient for the interaction channel to consist of a one-way, narrow-band path from the user to the service provider.

With a higher level of interactivity the user, who has made a response to an interactive service, will expect an acknowledgement. This may be the case if for example the 'purchase' involves a credit card transaction that must be accepted by the service provider. The consumer will require to receive notice of the result of the transaction. To transmit the acceptance note it will be necessary for the interaction channel to include a narrow-band path in the forward direction from the service provider to the individual user. The broadcast channel will not be sufficient since a single user is not individually addressable.

If the information expected or requested by the user of the interactive service is more complex or requires high transmission capacity, a further level of interactivity is reached. The shopping programme may for instance offer to provide upon request an additional presentation of a particular product. In this case, the forward interaction channel will need to be broadband. Applications are conceivable where even the user contributes to the interactive service with content that requires a broadband reverse path. At this point, the interactive service resembles two-way communication with similar requirements for transmission capacity and transmission quality in the forward as well as in the return channel.

Adding interactivity to the DVB infrastructure requires the system set-up to be extended by components providing communication means between the end user and the provider of the interactive service. The interactive service provider can be related to the broadcast service provider or even be the same organisation. In any case, it can make use of the high bit-rate DVB broadcast channels in delivering information to the user of the interactive service at typical rates of up to 20 Mbit/s per channel in terrestrial broadcast networks, and up to 38 Mbit/s per channel in broadcast networks via satellite or cable. The transmission capacity of the interaction channel depends largely on the type of network that is used. It may range from a few kbit/s if a simple telephone modem is used (DVB-RCP) to 12 Mbit/s via the CATV interaction channel (DVB-RCC).