Transmission and storage are core parts of multimedia communication systems. Before multimedia content can be consumed, it has to be made available to the user either via a transmission network or locally from a storage medium. Digital techniques firstly are advantageous compared to traditional (analog) solutions, as they can provide better quality, consuming less transmission channel bandwidth. In contrast to analog technology, where transmission channels and storage media were designed for monolithic media types such as video or speech signals, digital representation enables conveying multimedia content by any transmission and storage medium, provided that sufficient channel capacity is made available. This chapter introduces solutions for digital media transmission and storage in scenarios where traditional services are being replaced, and also where new services are evolving, like internet streaming and mobile access to media sources. Traditional monolithic-media systems are more and more superseded by heterogeneous network environments and diversified presentation devices (terminals) for different situations. This includes mobile access, home access etc., such that requirements for flexible media adaptation are becoming ever more important.

9.1 Digital multimedia services

Digital representation, transmission and storage has enabled a mass dissemination of multimedia signals. A driving force of this development is the convergence of traditionally separate sectors of telecommunications, computers, audiovisual entertainment, and personal photography/video. Mobile devices have come into everyday use, allowing access to multimedia information everywhere, or to capture and send videos, photos and audio recordings to other people. Digital techniques using compressed formats for storage and transmission have a number of advantages over traditional analog media:

1 The term ‘traditional analog’ covers recording and transmission of audiovisual signals on canvas, paper, film, magnetic tapes, records etc. in a very wide sense.
- Copying of bit streams/files without quality loss, no physical/chemical ageing of media representation on backup copies;
- Less bandwidth consumption in transmission when efficient compression schemes are used; by which e.g. personalized transmission of multimedia signals over wireless channels is enabled;
- Simple integration of different media for usage in multi-functional devices;
- Simple transformation from one format into another;
- Lower susceptibility against losses in storage and transmission, when optimized accordingly;
- Augmentation by additional information (metadata) simplifies management and search; digital signal processing also allows analysis for content recognition and characterization;
- Easier usage of random-access storage, recording and playback media; by tendency, digital storage (as well as the transmission) is becoming increasingly cheaper.

On contrary, disadvantages are:
- If the channel quality largely degrades, digital transmission often shows a ‘threshold breakdown’ of quality; achieving ‘graceful degradation’ in case of severe losses requires more effort (sophisticated combination of source and channel coding) than for some analog transmission methods;
- Due to continuous innovations, digital technology appears to outdate quickly, ‘ageing’ of formats and devices can be observed. In this context, also transcoding into new formats can become necessary in order to make them replayed by a new type of device. Beyond the computational effort, transcoding is often a lossy process that could degrade the quality unless designed carefully.
- Due to the simplicity of acquiring and managing digital media data, unauthorised distribution, copy and access have become easier than for analog media. Even though it may be argued whether this is a real disadvantage, traditional business models which were associated with media like movies, video, audio have become obsolete and needed to be replaced by new models eventually including access restrictions which are not always user friendly.

In short, the following main reasons can be identified for digital multimedia representations to take over the previous analog-dominated domains: They are cheaper and they provide more flexibility and functionality. However, audiovisual media are intended for business, where the simplified universal access to multimedia sources makes dissemination harder to be controlled. Beyond that, no security mechanism is prone against cracking by the long term.

Mobility, personalization, interactivity and spatialization are central new functionality aspects, which elevate digital media over preceding analog techniques. Mobile networks enable ubiquitous multimedia access and dissemination, providing usage for personalized purposes from anywhere. In the context of mobility, further integration of traffic systems (vehicles, intelligent traffic analysis and routing systems) with multimedia systems can be expected. On the other hand, digital multimedia systems enable virtual mobility, where by interactivity and