

2 Definitions and Related Work

After having introduced to the topic and methodology of this book, this section will provide fundamental information about targeted advertising and theoretical basics that will be relevant in the context of the further analysis. First, targeted advertising and basic types of targeting will be defined, before an introduction to the business environment and typical advertising value chains is given. This is followed by a short subsection about the basics of use case modeling. In the next step, the basic technologies of IPTV and mobile networks will be described, which are necessary for understanding the technological use case analyses in section 1. After this technology part, standardization organizations that are relevant in the context of targeted advertising as well as their key activities are listed. The section is closed with an introduction to the most important advertising formats in the context of Web, IPTV, and mobile advertising.

2.1 Foundations of Targeted Advertising

Before starting to describe and analyze use cases, the actual meaning of targeted advertising must be defined. A closer look at the term itself discloses that targeted advertising, from a business perspective, is a marketing concept aimed at addressing a specific target group. Targeted advertising falls under the umbrella of personalization strategies in Electronic Customer Relationship Management (E-CRM) whose goal is a differentiated alignment of marketing instruments towards the individual customer. The basic idea of individual marketing is the recognition of individual preferences and based on that the offering of personalized, customer individual services. The terms “E-CRM” and “Web personalization” have first been discussed in 1999/2000. However first personalization attempts failed due to a lack in efficient technologies and in the intensity of Internet usage that is required to analyze user behavior [12, 143, 72].

To avoid misunderstandings and confusion that may arise in the terminology complex concerning personalization and targeted advertising, it is useful to take notice of the following correlation: Personalization comprises targeted advertising on the one hand, but also content targeting methods and product recommendations on the other. Albeit this book focuses on targeted advertising, many of the concepts and technologies analyzed below are also valid for personalization in general. Moreover, attention should be paid to the fact that in marketing language the term personalization is often used in a narrower sense to describe one-to-one-

marketing constellations where the user is known by her name (see section 2.1.2). The next section will introduce the generic personalization process with a specific focus on targeted advertising.

2.1.1 Targeted Advertising as Part of the Personalization Process

From a process-oriented perspective the activities required to realize personalization strategies can be divided up into the steps: tracking (data acquisition), profiling (data analysis), matching (individualization). Tracking implies the integrated acquisition of data by logging relevant user activity, collecting data entered by the user, and inclusion of data provided by other systems or purchased from external suppliers. In the profiling phase, the collected data is processed and analyzed. This includes filtering tools that organize and structure the data according to their applicability. Then, the profiling engine analyzes the data for interest and behavioral patterns in order to generate segmented user profiles. This may mean that predefined categories (e.g. sports, lifestyle,...) are assigned to the user. In the subsequent matching process, a recommender system compares the user interests to given target group specifications and recommends which groups fit best to the user profile. This recommendation is then applied to assign matching advertisements, content, or products. In advance, the advertisements, content, or products have to be categorized themselves to define which target groups will receive which advertisements, content or product recommendation [73].

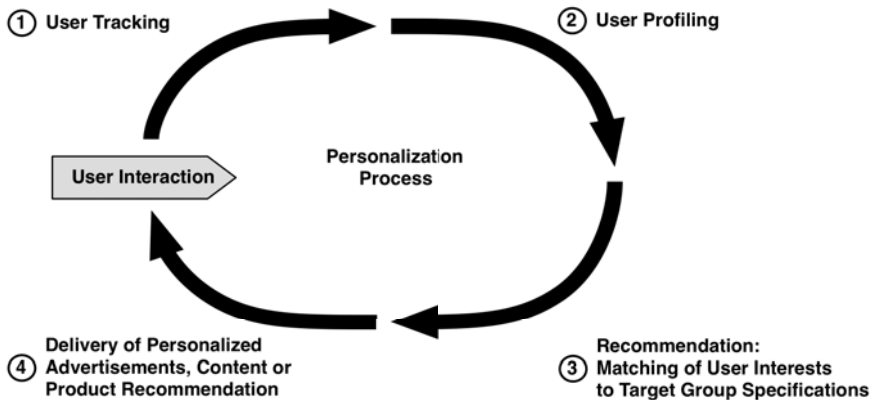


Figure 1: Generic personalization process (source: own illustration based on [143])

The concrete implementation of the matching process varies depending on the involved systems and on the personalization discipline (targeted advertising, content personalization, or product recommendations). In the case of targeted advertising the target group recommendations are sent to a campaign management that eventually initiates the delivery of the ads by an ad server according to the campaign policies booked by the advertiser. These may include time and content targeting as well as individual user targeting based on the target group recommendation of the recommender system. This means that the advertiser or ad agency determines which users shall be targeted by an ad campaign and according to these guidelines ads are matched to the user. In the case of content and product recommendations it may make more sense to not predefine the target group categories that are assigned to the content or product. They should rather undergo a similar profiling process like the user data that assigns attributes and thus categorizes the content or product.

2.1.2 Definition and Types of Targeting

In this subsection the term “targeting” will be defined and first implications for the use case development will be examined. This is followed by an overview of the most prevalent targeting methods.

Definition

Targeting can generally be defined as the automated and specific alignment of any advertising media according to different parameters. It enables the optimized delivery of digital advertising at defined audiences i.e. target groups minimizing losses due to waste coverage. Targeting increases the efficiency of advertising campaigns, while at the same time delivering more relevant ads to the customers [54, 155].

Targeting vs. Personalization

From a marketing perspective targeting must not be confused with one-to-one marketing respectively personalization in a narrower sense. While the latter comprises the individual delivery of personalized ad messages to one defined customer (e.g. Mrs. Schmitt, Hamburg), targeting addresses users anonymously via a target group they belong to (e.g. women, age 20-49) [155]. Ad agencies will not ask an ad marketer to target Mrs. Schmitt personally. It rather works the way that a specific target group profile for a product will be defined in order to find similar customers. This has important consequences for the technical realization of targeted advertising as it implies that the ad recommendation and selection process is usually split up between one system that targets the user and one system that manages the ad campaigns and assigns matching ads. The recommendation that is made by the targeting system usually does not include a direct associa-

tion to an ad but to a target group that is then used to select matching ads from possible campaigns (see section 5.1 for a detailed description on the targeting process). However, it has to be pointed out that the above conclusions are not correlated with the possible targeting granularity that can be technically achieved in a distinct scenario. The target groups used in the recommendation process to represent special types of users must not be confused with the technical ability to create (anonymized) individual profiles.

Types of Targeted Advertising

The use cases that will be discussed in the next sections describe scenarios in different ICT channels thus covering a broad range of medium-specific technological subtleties. The determination of a target depends largely on the capabilities, processes and systems prevalent in the respective environments. However, in the following a general non medium-specific overview of possible targeting methods shall be given [39].

First of all, it has to be emphasized that the term targeting is more comprehensive than one might think at first sight. Actually each ad campaign is to some extent optimized in order to reach the right audience for a product. Targeting thus starts already with placing a sports-related billboard advertisement aside a soccer stadium or displaying an airline banner ad on a travel portal in the Web. Certainly, this book focuses on targeting opportunities and methods opened up when applying cutting-edge ICT technologies.

Content and Contextual Targeting

The basic and most simple targeting method is content targeting. One example for this method is the already above mentioned scenario of displaying banner ads in a website according to the category of the content the page is about. It is very common that marketers of a Web presence offer to book a distinct advertising space within a site of a special content category. The concept of this targeting method can also be applied to other advertising media beyond the Web. For example, an article about buying homes serves up an insurance ad, or a documentary film on animals provides a good place to inject a public service ad for animal protection [39].

Many sources call this targeting method contextual targeting as it matches the ad to characteristics of the content actually being consumed [222, 143, 39]. This is obviously a very narrow interpretation and the meaning of the term context goes far beyond this aspect. Instead of the content it can also be the context of the user herself that shall be targeted. In this case a differentiation between static and dynamic context information can be made. While the static context includes user “properties” like gender, age group, ZIP code,... that can be permanently stored in a user profile, the dynamic user context comprises the current situation of a user

that may change at any time like e.g. the speed someone travels in a car or her current location. Eventually, from a technical point of view there will not be one single targeting technique that helps figuring out the user context. It is rather an aggregation of the results of the targeting technologies described here. As these thoughts reveal, one should pay attention to a clear usage of the terminology in order to avoid ambiguities.

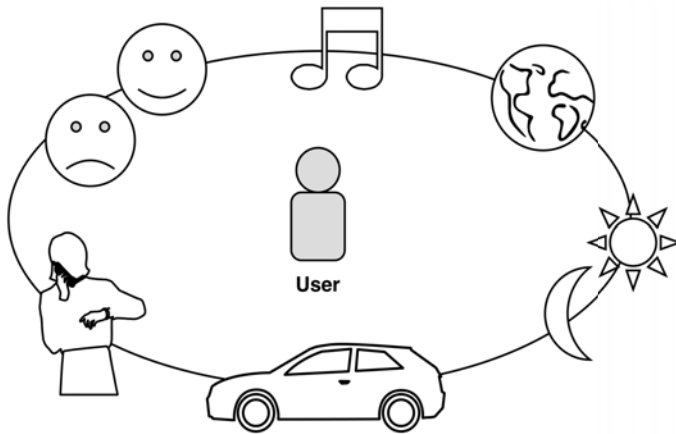


Figure 2: Aspects of dynamic changes in the user environment (source: own illustration)

Content/contextual targeting is closely related to what is known under the label language based targeting, which focuses on the occurrence of terms especially in the context of a Web page (compare Google AdSense). Language based targeting further comprises the two sub-categories keyword and semantic targeting. Keyword targeting uses terms a user enters in a search field on a website for selecting appropriate ads. Semantic advertising enhances the language based concept by analyzing the whole text of a website. This allows deriving the true meaning of ambiguous words (e.g. “Golf” can be a car or a sport) further improving the targeting results [155].

Technical Targeting

Technical targeting means that the user receives advertising that is tailored to her software and hardware environment [155]. This includes for example targeting according to the available bandwidth, which may be relevant in mobile and regular Web scenarios for users whose Internet connection is limited. Then, the ad delivery system can be instructed to avoid heavy ads that would lead to long

loading times. In addition, other technical characteristics like the device type (e.g. Set-Top-Box (STB) type, mobile phone type) or the browser type can be incorporated into the targeting process in order to only deliver ads that can be displayed correctly (ads must fit to the screen size and resolution). Finally, technical targeting can also be applied to target users with ads that fit to the technology they use (e.g. iPod ads for Safari users). Technical targeting requires the implementation of methods that allow detecting technical details about the user's hardware and software equipment.

Time Targeting

Time targeting enables the delivery of digital advertisements according to given time windows [155]. This method focuses especially on people's work and lifestyle schedules, such as serving ads to commuters between 7 to 10 am. It can also be used to perform so-called "roadblock" campaigns for upcoming product releases or events. Roadblocking in this case means that e.g. one and the same TV commercial is played out through all channels at the same time. Time targeting is mostly combined with other targeting approaches to refine the consumers being targeted (e.g. outdoor sports-related advertising on a sports portal while the Bundesliga plays i.e. on Saturdays between 3 and 6 pm). Time targeting also comprises a broader time-context beyond daypart related scenarios as for example seasonal targeting [39].

Sociodemographic Targeting

Sociodemographic targeting is based on user characteristics that stem from the field of social research, such as age, gender, income, nationality, ethnicity,... [143, 39]. An example for sociodemographic targeting would be to deliver specific ads to female users at an age of 20-29. Usually, these data are explicitly declared by the user herself when she registers for a newsletter or a community. Additional sociodemographic data input can be provided by predictive behavioral targeting methods [155]. Sociodemographic targeting may overlap with geographical targeting if the data includes e.g. the ZIP code of a user.

Geographical and Location-Based Targeting

Geographical or regional targeting includes the delivery of advertising based on geographical target areas. In classic Web or in IPTV scenarios the location of a user can be mined from the IP address [39, 155]. Location data may also be derived from existing user profiles that have been explicitly declared by the user (e.g. in communities) or provided through the integration of Customer Relationship Management (CRM) data into the profiling process. These sources usually deliver static location data as for example residence information in form of ZIP codes. The granularity of the geographical information (national, regional, single user location) may be limited due to technological constraints (e.g. the position of an ad insertion point in the IPTV network). Static location information may be

stored in one user profile like behavior originated interest data thus allowing to consider this additional target group information in the same recommendation process.

Increasingly, so-called Location-Based Services (LBS) on mobile devices gain importance. The targeting concept is the same as described above. But the fact that mobile devices travel with their users leads to dynamic changes in the location information. Technically this data can be tracked using location area and cell information from mobile operators or based on Global Positioning System (GPS) receivers implemented in the handset [196]. However the integration of such dynamic changes in the context of a user (compare contextual targeting above) poses a challenge for the recommendation process, as the data cannot be stored in static profiles (see section 5.3.5 for more details on context-aware recommendation).

In either case the approach to incorporate geographical information into the targeting process offers powerful new advertising opportunities for regional and local businesses. Geographical and location-based targeting are thus especially valuable for promotional and impulse buys (e.g. induced through Short Message (SMS) couponing). In addition, it helps to reduce waste coverage (e.g. no advertising for an event in Munich if the user lives or currently stays in Berlin) [39, 155].

Behavioral Targeting

Behavioral targeting works by tracking the actions (e.g. Web browsing behavior, channel switching in IPTV) of users. Data mining methods help to detect patterns in the past user behavior that are aggregated to user interest profiles which become the basis of targeting. For example, if a user frequently browses websites with car-related content the targeting system may conclude that he is into automobile topics and thus recommends car related ads even after the consumer continues on to a non-auto related site. Behavioral targeting often includes tracking of interaction and transaction data meaning that the system tracks the purchase history of users to establish trends. People who bought one brand's shoes might for example be interested in more of the same, or those from another brand. It can also comprise retargeting methods that aim at locating users who already were on the way to buy an article but dropped off during the purchasing process [143, 39, 155].

The major benefit of behavioral targeting is that it allows to book advertising for specific interest target groups independent of the respective environment or content. At the same time the user is presented with advertising he is most likely interested in due to his past consumption behavior [155]. Behavioral targeting is

one of the hottest topics in targeted advertising as the concept is leveraged by the tracking opportunities of modern bidirectional IP-based communication.

Predictive Behavioral Targeting

Predictive behavioral targeting enables the delivery of advertising to user groups whose profiles have been enriched using statistical predictions. These may be based on past behavior, questionnaires, and external data and may include attributes like sociodemographic and psychographic data or product and buying interests. Predictive behavioral targeting allows filling existing gaps in user profiles. Moreover, it increases the reach of campaigns as it allows to identify e.g. a potential interest in cars even if the user has not visited a car-related webpage before [155].

2.1.3 The Business Environment of Targeted Advertising

In the previous subsections targeted advertising has been identified to be part of the personalization process that aims at better addressing customers in order to increase advertising efficiency. A basic definition of targeted advertising and possible targeting methods has been given. On the way to develop the most promising targeted advertising scenarios in the ICT space, it is necessary to analyze the business environment in which advertising shall take place. Therefore, in this subsection the business model of targeted advertising will be classified in the context of recent developments in the ICT space in order to give an overview of the “big picture”. Finally, the advertising value chains in TV and mobile will be introduced giving an impression of potential stakeholders.

2.1.3.1 Classification of the Targeted Advertising Business Model

Generically, targeted advertising can be considered as part of the two-sided business model concept recently emerging in the telecom industry. So far, operators mainly focused on delivering network infrastructure and related services to their customers. Expansion efforts were basically directed to replicate this business model in adjacent markets. For example fixed network operators moved into mobile markets or mobile players started offering fixed broadband services. Some launched content delivery services like IPTV and mobile TV. However, with more and more businesses making money with Internet-based services carriers run the risk of being degraded to pure “bit pipes” [129]. The idea of the two-sided telecom market, sometimes called “Telco 2.0”, is to provide platforms through which two sides can interact or transact, meaning to build capabilities that support 3rd parties in interacting with the Telco user base. This includes the transformation towards an integrated services, content and data pipe provider that connects

upstream (e.g. developers, retailers, media content providers, advertisers) and downstream customers (consumers and business customers in various segments) via advanced platform services. With the data operators hold on customers, and the ability to reach them through many different channels (e.g. email, SMS, IPTV, Web portals) operators own the necessary core assets. Targeted advertising is one example of these new business opportunities for operators. Other possible services include content delivery scenarios (music, TV, video, games), identity, authentication, and security management services, marketing and advertising, or billing and payments services [197].

The concept of two-sided markets originally stems from economics where the term describes market constellations in which one or several platforms enable interactions between end users, and try to get the two or multiple sides “on board” by appropriately charging each side. The theory of two-sided markets is closely related to the theory of network externalities. Classic examples of two-sided markets include TV networks and newspapers competing for advertisers as well as “eyeballs”, or videogame platforms that need to attract gamers on the one hand and game developers on the other. Further reading on the theory of two-sided markets is e.g. provided by [169].

2.1.3.2 The TV Advertising Environment

Several stakeholders are involved in the delivery of TV advertising. The below depicted value chain shows the relation of these interest groups and how they act together in order to deliver an ad to the customer. The TV advertising value chain strongly depends on the structure of the TV industry in each country. The below overview is aggregated from a recent study of the IPTV advertising environment [111] and insights from the conducted expert interviews.

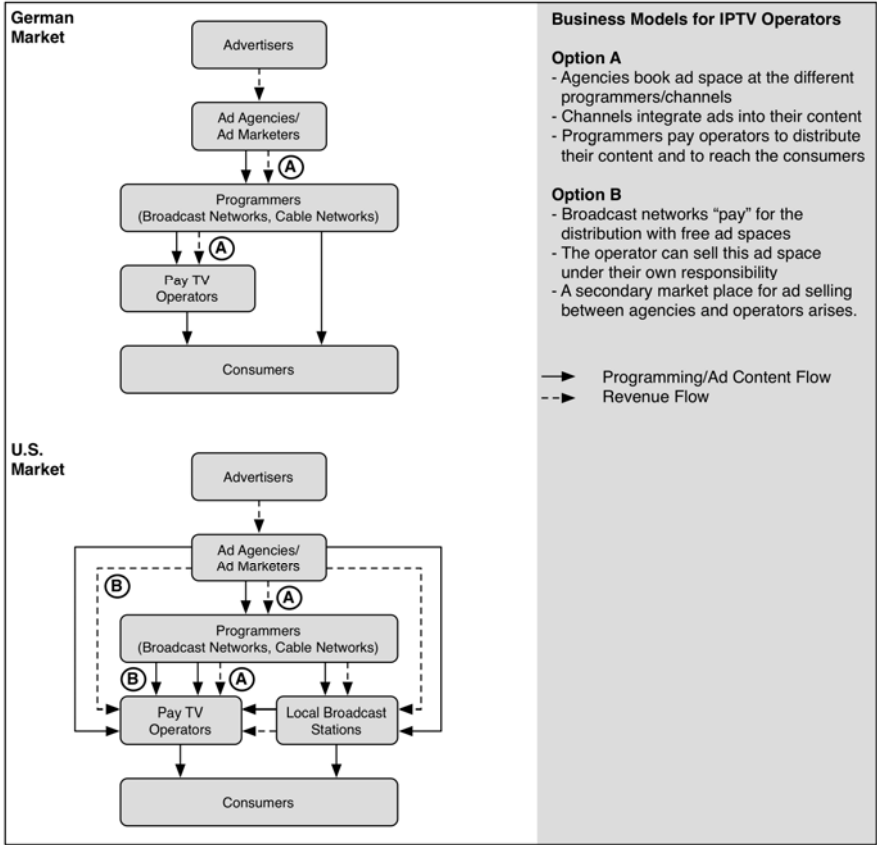


Figure 3: The TV advertising value chain (source: own illustration based on [111])

Advertisers

Advertisers finance the whole value chain. This comprises the costs of conceptualizing, creation, distribution and finally measuring the success of a TV commercial. Important for programmers and pay TV providers, they subsidize the cost of TV programming. Without the advertising money other revenue sources would need to be opened up or developed leading to an increasingly subscription or license fee based financing.

Ad Agencies

Ad agencies are hired by advertisers to develop the brand for the consumer product. They develop the creative guidelines and scripts for commercial production that is subcontracted to professional producers. Ad agencies organize the purchase of slots within a TV network's schedule to insert the commercials.

Ad Marketers/Media Buyers

The buying process of ad opportunities is usually performed or optimized by ad marketers that act as brokers selling the ad slots for the TV networks. Ads are usually sold on a Cost Per Mille (CPM) basis. Thus, the rate for a commercial is based on the number of viewers that the show can deliver. The price for ad slots depends on the format (e.g. 30-second commercials) and the advertising time.

Programmers

Programmers have different interests and a different focus of operation across different regions in the world. In the United States of America (U.S.) they typically fall into the two categories of broadcast networks and cable networks both offering single channels or a group of channels. Some premium subscription channels may be ad free. In Western Europe the industry structure is different. Here a differentiation must rather be made between commercial TV stations and public channels offering limited advertising opportunities depending on the day-time.

Broadcast Stations

Here again the industry is varying in different countries. In the U.S. broadcast networks are distributed nationally using a network of local broadcast stations that may be affiliated to retransmit the networks' shows. Local stations are provided with "avails" for regionally inserted advertising (see especially section 4.2.4.1). In Germany like most other European countries, this business of selling inventory for ad insertion is yet undeveloped because there are usually no networks selling their content to local broadcast stations. In addition, legal constraints may forbid touching the stream of the TV channels (see section 6.2.4). However, ad insertion is an opportunity for IPTV operators to become part of the TV advertising value chain.

Pay TV Operators

In the U.S. pay TV is more developed and accepted than in Europe. In addition to pay TV assets that are provided ad-free U.S. pay TV operators partly receive content from cable networks including avails for regional ad insertion. In Western Europe some pay TV operators are slowly starting to incorporate this component of the advertising business into their carriage deals. IPTV operators can be considered as a special kind of pay TV operators presenting a potential point of entry into the TV advertising market.

2.1.3.3 The Mobile Advertising Environment

Like above in IPTV environment several players are involved with the mobile advertising value chain. Many of the stakeholders are the same as in the Web environment. Their respective roles concerning the way mobile advertising is delivered to the customer is discussed below. The input for this overview is again derived from expert interviews and also taken from a recent study of the mobile advertising environment [112].

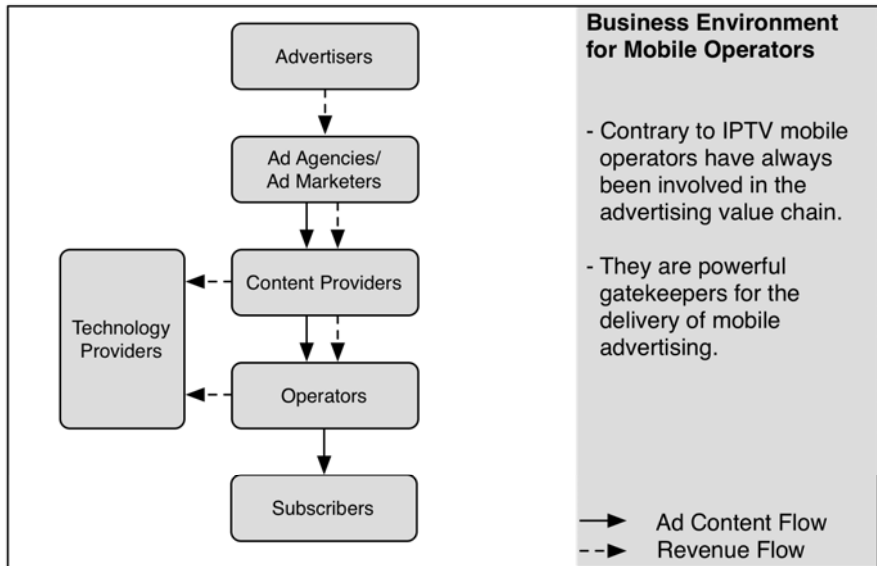


Figure 4: The mobile advertising value chain (source: own illustration based on [112] and [149])

Advertisers

Major brands are starting to recognize some of the opportunities of mobile services. Their initial interest is often to use mobile as a complement of multimedia campaigns integrating the mobile platform with TV or print campaigns. This may include messaging with interaction capabilities (“call-to-action”) and for promotion purposes (e.g. through mobile coupons).

Ad Agencies

Large ad agencies that already operate in the Web business start to look at mobile advertising but are waiting to see clear evidence of revenues. Meanwhile some small agencies are specialized on serving the mobile ad space, thus some acquisition activity is likely in the close future is likely.

Ad Marketers/Ad Networks/Ad Aggregators

Like in the online world ad networks work with mobile content owners/publishers in order to sell inventory. In the mobile Web the inventory typically consists of banner ads and rich media adapted to mobile requirements. Often the deal enables ad marketers to sell the whole inventory of a publisher's mobile website. Advertising is typically sold on a CPM basis, but Cost Per Action (CPA) and Cost Per Click (CPC) models are also used. The network/marketer then shares the ad revenue with the publisher.

In the case of message advertising the value chain is a little simpler as there are no actual publishers. Here ad marketing is usually realized through aggregators that have relationships with multiple carriers and can deliver the message across their mobile networks. SMS are sold on a per-message basis.

The actual ad delivery process is realized through campaign management technology and ad serving equipment. The campaign management is usually a software suite that enables the publisher or carrier to track ad inventory and manage the sales process. Ad servers store and serve advertising including the targeted delivery of advertising. Campaign management and ad serving build an interface function between content publishers, ad networks, and carriers. They may be operated by an ad marketer or by the carrier himself as technology vendors increasingly offer such solutions for integration directly into the carriers' networks.

Content Providers/Publishers

With growing 3G penetration and improved multimedia capabilities of mobile phones, content is more and more made available to mobile devices. This includes optimization of content and advertising for mobile viewing enabled through guidelines and standards e.g. developed by the Mobile Marketing Association (MMA, see below section 2.5). The iPhone and other cutting-edge smartphones are major drivers in this context as on the one hand they make regular Hypertext Markup Language (HTML) content available and on the other hand offer extended marketing opportunities through the emerging app concept (app = mobile application, e.g. made available through the Apple App Store or the Google Android App Market).

Operators/Carriers

The mobile carrier operates the mobile network thus enabling data and messaging services including advertising on it. One of the most important opportunities for operators to take part in the mobile advertising value chain are mobile portals through which users get access to the mobile Web. As the operator has access to subscriber data these central starting points to the Web offer excellent targeting possibilities. Another opportunity for operators to participate in the advertising value chain are advertising solutions that require network-based ad insertion (e.g. in message advertising or mobile TV advertising).

Technology Vendors/Mobile Content Optimizers

Technology vendors have a significant presence on a carrier's network through the already deployed network infrastructure. Content and ad management capabilities can thus be offered as extensions for existing solutions. Most carriers will first contact their existing business partners for such integrated solutions. Some technology vendors specialize in the delivery of rich media/video content over the mobile network. Their solutions often include tracking and targeting engines that allow carriers to develop consumer profiles in order to enable targeted ad delivery thus taking over campaign management and ad serving tasks.

2.2 Use Case Basics

As described in the methodology section, this work is based on a use-case driven approach. This means that in the next chapters typical targeted advertising scenarios in the ICT space will be identified. These scenarios will be basically described from a user perspective. Subsequently each use case will be analyzed in detail from a technical perspective delivering comprehensive results for a potential implementation. Hence, this subsection will give a short overview on use case modeling, in order to provide the reader with a basic understanding of the subject.

Use cases are important tools for the requirements analysis in software and systems engineering. They describe a system's behavior when interacting with the outside world [47].

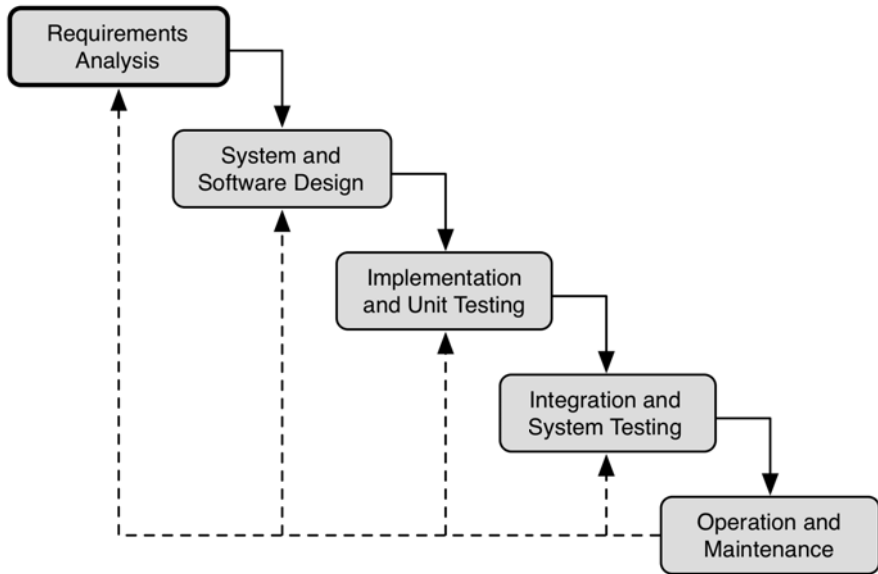


Figure 5: “Waterfall” model of software engineering (source: own illustration based on [172, 194])

In most cases the requirement engineering process begins with a feasibility study that serves as a basis for decision-making if the software or system should be developed or not. In case of a positive feasibility report the actual requirements analysis can begin. The first step in the requirements analysis is a requirements elicitation aimed at identifying the needs and features of the system. This can be accomplished by modeling typical use cases that cover the desired system functions in form of exemplary process flows [21].

Based on a requirements specification or textual descriptions the functions of a system are described using concrete usage scenarios. Related scenarios can be aggregated to form use cases that describe the system’s behavior under various conditions as the system responds to requests from stakeholders of the system. Use cases may fundamentally be written in text form but they can be depicted using flow charts or sequence charts. The results of the requirements analysis are the basis for system design and implementation, which are the next steps in systems engineering [21, 116].

The use case technique was first introduced by [104]. Use cases are a fundamental feature of the Unified Modeling Language (UML) notation for describing object-oriented system models and usually depicted in form of UML use case diagrams. The UML is a de facto standard for object-oriented modeling [194].

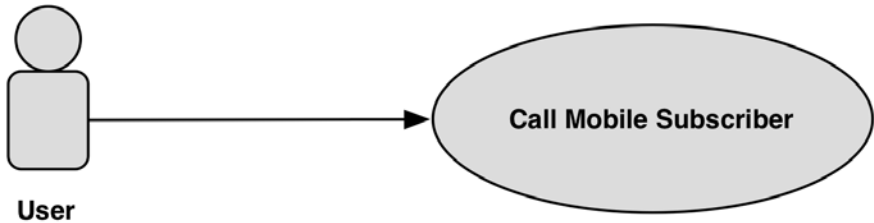


Figure 6: Simple UML use case diagram mobile call initiation (source: own illustration)

In addition to the above-cited references, further reading on software and systems engineering, UML and use case design is for example provided by [48, 198, 74].

2.3 Basic Technology

As this book focuses especially on targeted advertising in ICT scenarios beyond the classic Web a short introduction to the underlying technologies shall be given. This comprises especially the basic IPTV and mobile communication architecture and respective data transmission modalities.

2.3.1 IPTV Basics

Internet Protocol Television (IPTV) is the transmission of digital video and audio signals through data networks, usually through the Internet in contrast to traditional radio frequency broadcast, satellite signal, and Cable Television (CATV) formats [84]. Historically, the usage of the term IPTV has often been heterogeneous. However, IPTV in the sense of this book must be distinguished from general Internet-based or Web-based multimedia services (Web TV, TV over Web/TVoW). IPTV is characterized by deployment scenarios that include the delivery over subscriber-based managed telecommunications networks and require end-user premises like Set-Top-Boxes (STB) for termination. According to the International Telecommunication Union focus group on IPTV (ITU-T FG IPTV) IPTV is defined as “multimedia services such as television/

video/audio/text/graphics/data delivered over IP based networks managed to provide the required level of quality of service and experience, security, interactivity and reliability” [101].

The basic IPTV services include linear/live television, Video/Content on Demand (VoD/CoD), and the Electronic Program Guide (EPG). Linear TV is a television service in which a continuous stream flows in real-time from the service provider to the terminal device and where the user cannot control the temporal order in which contents are viewed. In VoD the subscriber can view video content whenever desired. The content is stored on the provider's VoD server. The subscriber accesses the movie from a library directory, which may include a search engine that accesses movie description and rating. Subscribers typically have the ability to pause, play, rewind, fast forward the content, or even stop viewing it and return to it at a later time when using this service. The third basic service EPG comprises a structured set of data, intended to provide information on available content that may be accessed by end users [101].

These services are usually provided to the user through a STB that adapts the transmitted contents to a format that is accessible by the user [84]. Increasingly, IPTV includes additional interactive services and/or Web applications requiring the STB to possess hybrid functionality (compare section 4.2.5).

IPTV Network Architecture

The IPTV network architecture can be subdivided into the network components Super Headend, Core Network, Aggregation Network, Access Network, and Home Network. In order to give a basic understanding on how an IPTV network works, the tasks and functions of these components will be outlined in the following. For a more detailed description it can be referred to [216] and [85]. A basic introduction to IPTV is provided by [83].

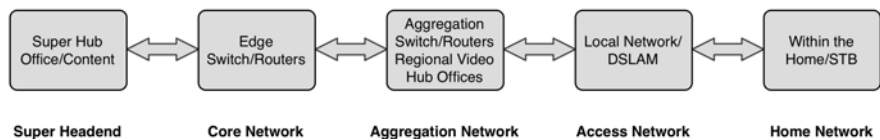


Figure 7: IPTV network architecture (source: own illustration based on [216, 167])

Super Headend: The part of a television network where the broadcast programming and on demand content is captured or ingested into the system. Here, video signals are selected and processed for further delivery through a distribution network. A variety of equipment is used at the headend, including satellite dishes to

receive signals, decoding and encoding units, the VoD server management, the digital rights management, the middleware server, the EPG server, further application servers, and also ad insertion systems for ad replacement on national/operator level [84, 216].

Core Network: The central network component that provides interconnection and transfer between edge networks and transports all of the system's content. The core network is the "backbone" for the IPTV broadcast system [84, 216]. Actually, to save bandwidth the programs in IPTV are not broadcasted to the users like in terrestrial, satellite or cable TV. Broadcasting means that all programs are simultaneously transmitted to each user no matter which show she is effectively watching. In IPTV, channels are exclusively transmitted directly to specific viewers (unicast) or they are simultaneously sent to multiple users that are watching the same channel (multicast). Unicast transmission is used for delivering on demand services. Linear TV is usually transmitted via multicast, which helps to save bandwidth compared to the unicast method [83].

Aggregation Network: The aggregation network carries the broadcast content from the regional video headends to the access network that distributes it to the subscribers. Regional video hub offices can be equipped with VoD servers, broadcast servers for regional live TV content and ad insertion technology for regionally targeted advertising (see section 4.2.4.1).

Access Network: The "last mile" that connects individual subscribers or devices to the IPTV network. It provides a network translation from switched network technology used in the aggregation and core network to Digital Subscriber Line (DSL) technology. Digital Subscriber Line Access Multiplexers (DSLAMs) transfer the signals from optical fiber to copper wire for DSL delivery [216]. The DSLAM is usually the multicast-endpoint in the IPTV transmission. If an operator wants to realize one-to-one targeted ad insertion he must place his insertion unit here (see section 4.2.4.1).

Home Network: The home network starts where the IPTV service enters the user's site. This point is called the "residential gateway" and consists of a broadband/DSL modem plus a router. If the subscription includes a fixed-line phone connection a splitter is needed to filter the voice data out of the data stream. The DSL modem translates the modulation protocol of the access network into a standard home networking technology (e.g. Ethernet or powerline). Finally, the IPTV data will be delivered to the television via an STB, potential Internet data to computers within the home [84, 216].

The graph below depicts an exemplary IPTV network including typical components at the super headend, the regional headend, and the customer's site.

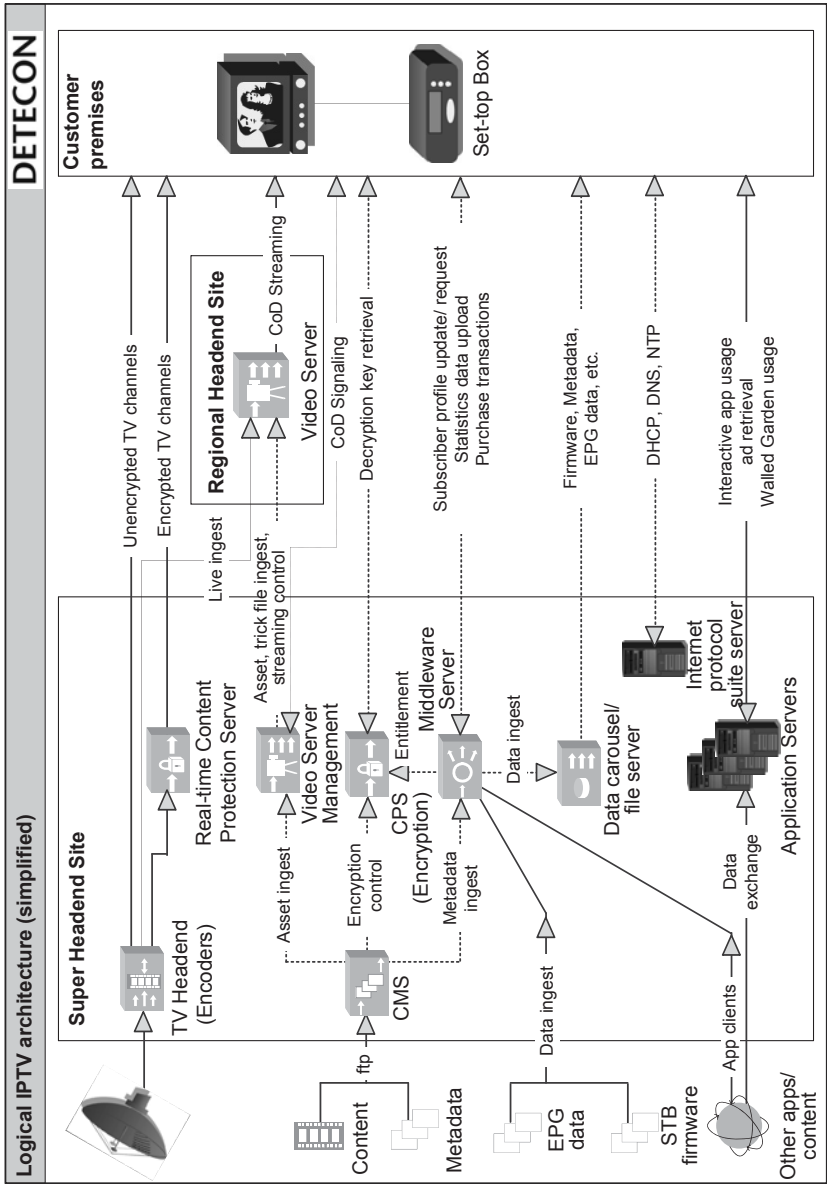


Figure 8: Simplified IPTV architecture (source: Detecon)

IPTV Technology and Standardization

As mentioned above video content that shall be delivered to the customer must be encoded in the headend. Usually the content data is compressed using Moving Picture Experts Group (MPEG) standards like MPEG-2, the newer MPEG-4 Advanced Video Coding (AVC)/H.264, or proprietary standards like the Microsoft Windows Media Video 9 (WMV9) and then sent in an MPEG transport stream. The transmission can be effectuated using DVB-IPTV/DVB-IP [67], an open Digital Video Broadcasting Project (DVB) standard that enables audio/video services to be delivered via Internet Protocol networking or based on proprietary solutions like the Microsoft Mediaroom² (e.g. T-Home, AT&T U-verse) or the OpenTV³ (e.g. BSkyB, Sky Italia) platforms. More information about IPTV encoding and transmission technology can for example be found in [27].

Concerning the underlying architecture standardization efforts on the use of the 3GPP IP Multimedia Subsystem (IMS) [5] are in progress. The IMS enables carriers to offer integrated voice and IPTV services over the same core infrastructure. This will allow the implementation of services that combine TV services with telephony and Web features (e.g. caller identity (ID) on the TV screen, chatting functionality integrated in the STB middleware) and particularly improve personalization and targeted advertising opportunities through integrated identity and profile management. Both the International Telecommunication Union (ITU-T) [102] and the European Telecommunications Standards Institute (ETSI) [69] are working on IMS-based IPTV standards for supporting IPTV services in carriers' networks. The Open IPTV Forum, a pan-industry initiative of major technology vendors and carriers, has released the second version of their IMS-based IPTV architecture [147]. Reference implementations of IMS-based IPTV services including targeted advertising approaches are described in [11] and [135]. A general introduction to the IMS is provided by [44] and [162].

2.3.2 Mobile Communication Basics

The mobile targeted advertising scenarios that will be analyzed in this book concern rather the data transmission part of mobile networks than voice communication opportunities. Below, a short of overview of the basic architecture of today's mobile communication networks will be given focusing on mobile Web and SMS technologies.

² <http://www.microsoft.com/mediaroom/>

³ <http://www.opentv.com/>. Since 2010 OpenTV is part of the NAGRA Kudelski Group.

GSM Network Architecture

The Global System for Mobile communication (GSM) is a globally accepted standard for digital cellular communication. The GSM standardization group (at that time called Groupe Spécial Mobile) was established in 1982 by the European Conference of Postal and Telecommunications Administrations (CEPT) to create a common European mobile telephone standard. The GSM responsibility was later transferred to the ETSI and phase 1 of the GSM specifications were published in 1990 [93, 94, 68].

A GSM network is divided into three major systems: the Network and Switching Subsystem (NSS), with the Operation and Support System (OSS), and the Radio Subsystem (RSS). The basic architecture of a conventional GSM network can be depicted as follows.

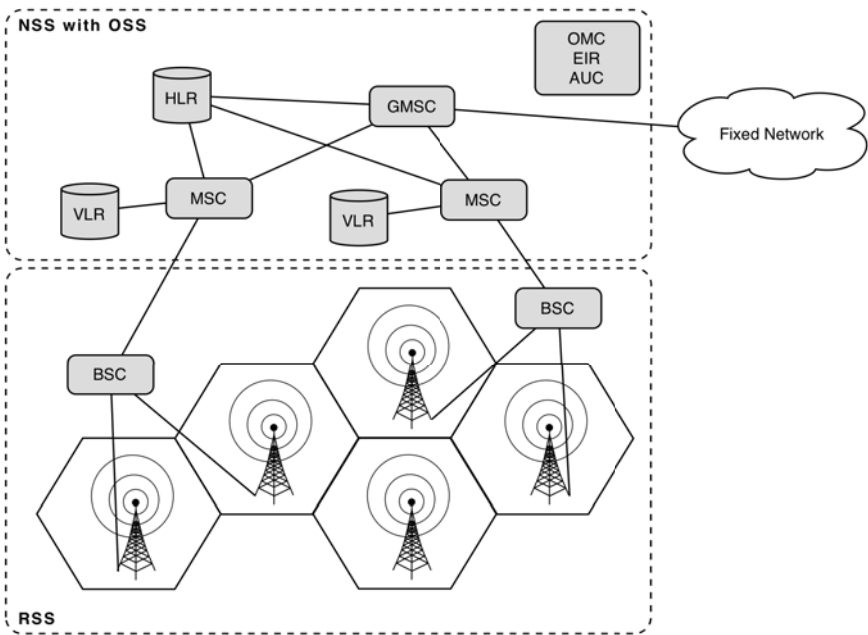


Figure 9: Architecture of the GSM system (source: own illustration based on [183])

The NSS performs call processing and subscriber-related functions consisting of several core components that will be of importance in the context of mobile tar-

geting. One of these is the Home Location Register (HLR), which is a database used for management and permanent storage of subscription data. This comprises a subscriber's service profile, location information, and activity status. In contrast, the Visitor Location Register (VLR) contains only temporary information about visiting subscribers. Telephony switching and controlling calls to and from other telephone and data systems are handled by the Mobile Services Switching Center (MSC). The VLR and the MSC are always integrated. When a user roams into its MSC area the VLR requests the respective subscriber data from the HLR. Finally, the Gateway Mobile Services Switching Center (GMSC) connects the GSM network to the Public Switched Telephone Network (PSTN) being often implemented in an MSC. Operation support and management of the GSM subsystems is realized by the OSS consisting of the Authentication Center (AUC), the Equipment Identity Register (EIR), and the Operation and Maintenance Center (OMC) [182, 93, 183].

The RSS comprises the cellular mobile network up to the switching centers including the Base Station Subsystem (BSS) and the Mobile Stations (MS). The BSS further consists of Base Station Controllers (BSCs) and Base Transceiver Stations (BTSS). The task of a BSC is to provide control functions and physical links between the MSC and the BTSSs, which actually handle the radio components including sender, receiver, and antenna. One BSC controls a group of BTSSs and also manages the switching/handover between different BTSSs. In terms of mobile targeting, it is useful to know that one BTSS can cover several cells [182, 93, 183].

In addition to voice communication a GSM network provides various additional services to the customer including Short/Multimedia Messaging Services (SMS/MMS) and the packet-oriented General Packet Radio Service (GPRS) that enables Internet connections. These services are of a special interest for the realization of mobile advertising and will be introduced shortly.

Short and Multimedia Messaging Services (SMS and MMS)

The signaling paths of the GSM system can be used to transmit packet-oriented data from and to the MS. The telephony traffic in the GSM network is controlled using the Signaling System #7 (SS7). Whenever no signaling traffic exists the signaling paths can be used for the packet-oriented transport of short messages consisting of a maximum of 160 alphanumeric characters from or to a MS. The basic SMS network infrastructure can be depicted as follows.

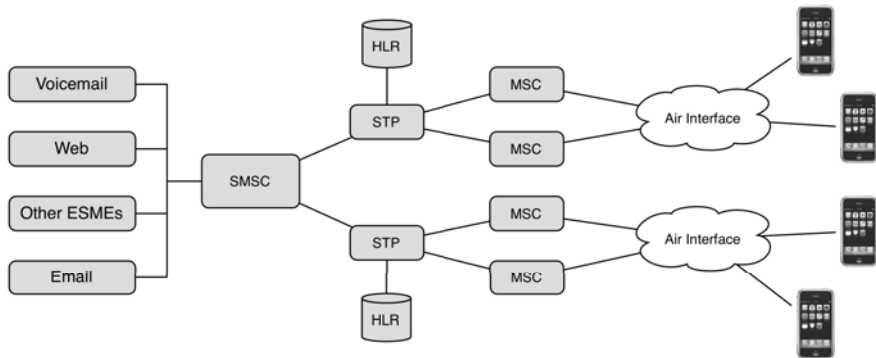


Figure 10: Basic SMS network architecture (source: own illustration based on [95])

The network infrastructure and basic components used in the SMS delivery process are the same as already described above. SMS are transmitted by a Short Message Service Center (SMSC) operating in a store-and-forward-mode that relays messages when the MS is powered off and try again when the device is on again. The signaling interconnection is enabled by Signal Transfer Points (STPs) that act as a router for SS7 messages and link the network elements [95, 210].

SMS comprises two basic point-to-point services. Mobile-Originated (MO) short messages are transported from the MO-capable handset to the SMSC and can be destined to other mobile subscribers or external short messaging entities including Internet hubs or e-mail receivers. Mobile-Terminated (MT) short messages are transported from the SMSC to the handset. The source can be other mobile subscribers via Mobile-Originated Short Messages (MO-SM) or External Short Messaging Entities (ESME) as depicted in the illustration [95, 210].

The Multimedia Messaging Service (MMS) is part of the GSM phase 2+ and as such uses the GPRS network for data transmission. MMS is not based on SMS technology thus enabling larger messages with multimedia content. However, the MMS delivery is also managed by a store-and-forward unit called Multimedia Messaging Service Center (MMSC) that is connected to the GPRS network. More information on MMS can be found in [210] and [182].

Packet-Switched Mobile Communication

When GSM phase 1 was completed the standard included circuit-switched data transmission up to 9.6 kbit/s. In 1995 phase 2 incorporated a large variety of supplemental services that are comparable to Integrated Services Digital Network

(ISDN) standards but no enhanced data speed. Such improvements came with GSM phase 2+ standardized in 1998 that introduced the general packet radio service (GPRS). GPRS enables packet-switched data transfer in the GSM network thus allowing for direct access to Packet Data Networks (PDNs) like the Internet.

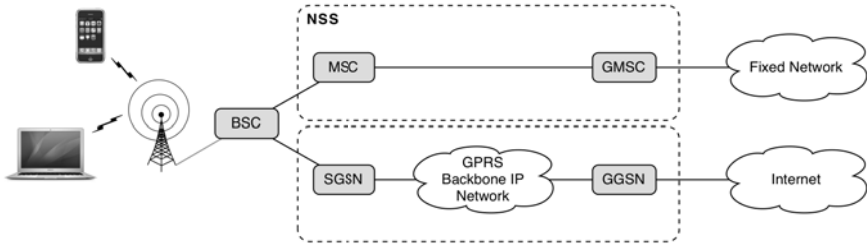


Figure 11: Circuit- (NSS) and packet-switched (GPRS Core) GSM subsystems (source: own illustration based on [36])

In order to provide these packet-switched services the operator must build a new GPRS core network including the so-called GPRS support nodes (GSN). The Serving GPRS Support Node (SGSN) resides at the same hierarchical level as a visited MSC/VLR and therefore performs comparable functions such as routing and mobility management. It is basically a switching center for routing data packets to a defined exit node. The Gateway GPRS Support Node (GGSN) provides gateway functionality comparable to a GMSC. It coordinates the data traffic between external PDNs (e.g. the Internet) and the GPRS core network [94, 210].

From the MS to the BTS data packets and voice traffic are transmitted basically using the same network infrastructure. The connection from the SGSN to the RSS is implemented through a Packet Control Unit (PCU) that is attached to the BSC [210].

Increasingly mobile Internet access is realized based on the Universal Mobile Telecommunication System (UMTS) that can be considered as the 3G GSM successor standard and is downward compatible with GSM, using the GSM Phase 2+ enhanced core network. However, UMTS requires a new Radio Access Network (RAN) called UMTS Terrestrial Radio Access Network (UTRAN) that is used instead of the GSM RSS. Existing network elements in the NSS and the GPRS core network, such as MSC, SGSN, and HLR can be extended to adopt the UMTS requirements [94]. In modern GPRS networks that integrate Enhanced Data Rates for Global/GSM Evolution (EDGE) technology a transmission speed

of up to 384 kbit/s is possible. Using High-Speed Downlink Packet Access (HSDPA) UMTS allows a download rate of up to 7.2 Mbit/s [183]. For more information on the core architecture and components of GSM, GPRS, and UMTS networks it can be referred to [182] or [210].

Mobile TV Technology

UMTS provides unprecedented opportunities for mobile data transmission especially in the context of mobile Web usage. Likewise, the mobile network can be used to deliver mobile TV and video services. This usually requires a point-to-point connection between a content server and the user. As a consequence, the content server must establish and maintain a distinct connection for each recipient. This works well for on demand services, as subscriber requests are asynchronous and the load is thus rather distributed over time. However, in the case of live TV simultaneous usage is inherent and with increasing numbers of subscribers scaling problems emerge. Real-time service requires content servers to deliver content to several users at a time generating a tremendous amount of outbound traffic. In addition, the radio access network can easily become a bottleneck, if multiple recipients stay in the same mobile cell. Then, simultaneous streaming of multiple video streams rapidly congests the (limited) bandwidth of a cell making continuous TV reception impossible. This lack of scalability reduces the quality in true real-time scenarios (e.g. transmission of a live event like soccer) making it uncomfortable to use for subscribers. Hence, point-to-point based mobile live TV is technically possible, but extremely limited and economically almost unfeasible. As a result, mobile TV services using this technology (e.g. Deutsche Telekom MobileTV⁴ and Vodafone MobileTV⁵) still cannot really succeed. Therefore, mobile live TV consumption on a mass basis requires point-to-multipoint radio bearers capable of transmitting data packets simultaneously from a single source to multiple destinations in a broadcast manner [20]. This can basically be realized based on two different technology approaches.

One option is to extend the existing mobile network infrastructure by implementing the Multimedia Broadcast and Multicast Service (MBMS) first specified in 3GPP Release 6 in 2004 [3]. MBMS is an IP datacast type of service that can be offered via existing GSM and UMTS networks. The infrastructure provides the possibility to use an uplink channel for interactions between the service and the user, which is an advantage compared to broadcast networks. MBMS has basically two modes of operation: the broadcast mode and the multicast mode. While broadcast refers to the ability to deliver content to all users (e.g. terrestrial or satellite TV services) in a push type service, multicast services are delivered to

⁴ <http://www.t-mobile.de/mobiletv/>

⁵ <http://www.vodafonelive.de/cp/portal/tv-video/mobiletv/>

users who have joined a particular multicast group (e.g. IPTV, see section 2.3.1). The broadcast mode hence allows a point-to-multipoint transmission of multimedia data (e.g. text, audio, picture, video) from a single source to all subscribers. In contrast, the multicast mode provides a point-to-multipoint service in which data is transmitted from a single source to a specific multicast group. This means that only users who are subscribed to the specific multicast service and have joined the multicast group associated with the service can receive the multicast transmission. The implementation of MBMS in mobile networks affects nodes in the mobile core and access networks, but it does not interfere with already existing GSM and UMTS services. This means that mobile devices not supporting MBMS will still work in networks that offer MBMS services [202, 77]. In addition, MBMS requires a new network component, the Broadcast Multicast Service Center (BM-SC), which is responsible for providing and delivering mobile broadcast services. It serves as an entry point for content-delivery services that want to use MBMS. It sets up and controls MBMS transport bearers to the mobile core network and can be used to schedule and deliver MBMS transmissions. MBMS features defining broadcast and multicast services for specific geographical areas at a granularity down to the size of individual radio cells enabling for example special transmissions to accompany local live events (e.g. soccer games, music festivals). The geographical broadcast or multicast service area is defined through an MBMS service area. Each node in the core network holds a list of downstream nodes to determine to which nodes service data has to be forwarded. Multicast services are managed by a dynamic distribution tree keeping track of users currently registered to the service, respectively tuned in to a channel. Compared to conventional point-to-point type streaming in GSM or UMTS networks MBMS can yield performance gains. Using MBMS, the content server providing the TV signal delivers just one stream per channel to BM-SC. Further on, the data flow for each channel in the core and the radio access network is solely replicated when necessary [20]. The figure below illustrates the performance advantages of MBMS over common point-to-point transmission.

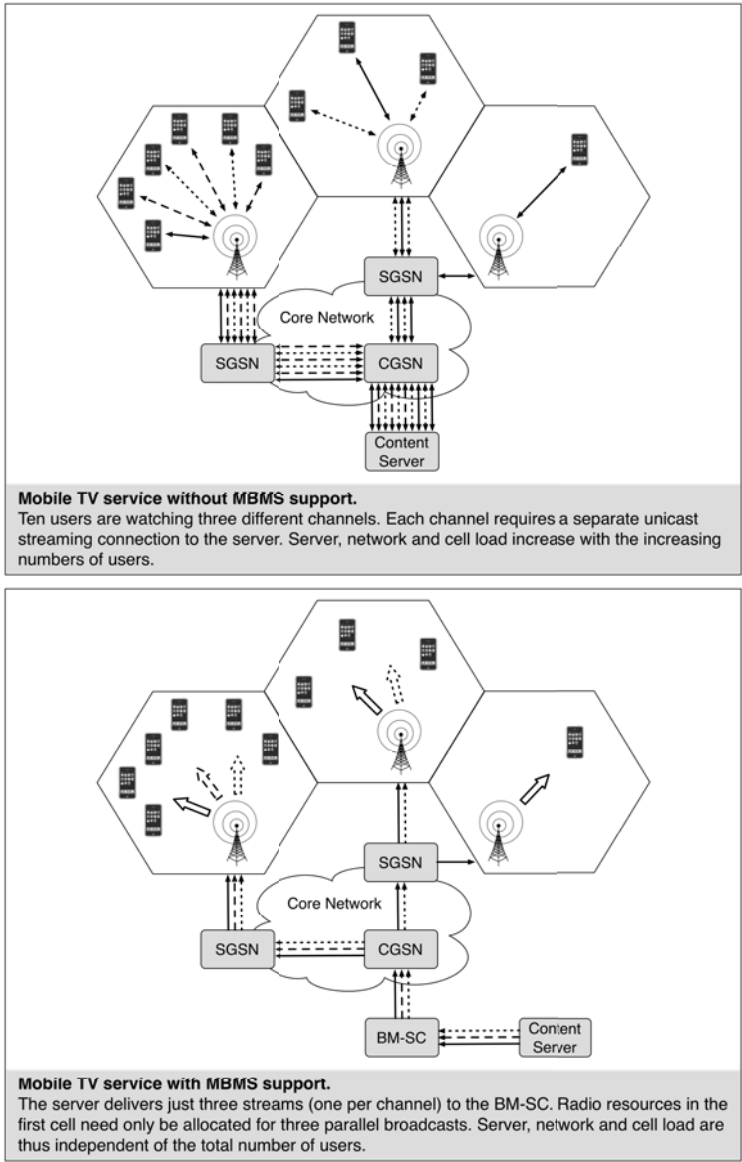


Figure 12: GSM/UMTS based mobile TV service with vs. without MBMS (own illustration based on [20])

As a second option, mobile broadcast TV can be realized through “non-mobile” broadcasting services over distinct networks comparable to other terrestrial broadcast formats like e.g. Digital Video Broadcasting – Terrestrial (DVB-T). This means that all linear TV channels are aired simultaneously and the user just tunes in to the one she wants to watch. This allows providing mobile TV services without congesting the mobile network, albeit it requires new handsets integrating special receivers. The most prevalent mobile TV formats include Digital Video Broadcasting – Handheld (DVB-H), Digital Multimedia Broadcast (DMB). DVB-H is a DVB sub-standard tailored towards the needs of devices with low power consumption. DVB-H uses the same frequencies as Digital Video Broadcasting – Terrestrial (DVB-T) and can coexist with it in the same multiplex allowing to benefit from possibly existing network infrastructure [63]. DVB-H was standardized by ETSI in 2004 [64]. The first and by now one of the most successful DVB-H services was implemented by Three in Italia in 2006 [58]. Since 2007 the European Union encourages the use of DVB-H as the single European standard for mobile TV [70]. The main competing broadcasting standard for mobile devices is DMB, which is part of the same family of standards as Digital Audio Broadcasting (DAB) [62]. It was standardized by ETSI in 2005⁶ [65] and was first implemented in South Korea in the same year. In Germany Mobiles Fernsehen Deutschland (MFD) and Neva Media launched the commercial DMB service “Watcha” in June 2006 during the Soccer World Cup 2006. However, the service was stopped in 2008 as MFD and Neva Media founded a new consortium called “Mobile 3.0” then favoring DVB-H [34]. However, the DVB-H trial was also stopped at the end of 2008 before entering the commercial phase with Mobile 3.0 returning their licenses [49].

To date, the mobile TV market has not taken off yet, even though it is said to gain steam in the next years. While first DMB and DVB-H implementations in Korea and Italy took off rapidly, streaming over cellular networks suffered from the inherent limits of point-to-point transmission not able to gain significant user numbers. First MBMS trial implementations were performed among others by Hutchison Three in Australia in 2007 [128] and by Orange/ T-Mobile UK in 2008 [35], but did not go commercial. DMB and DVB-H seemed to make the race against UMTS based streaming solutions. However, today many DVB-H services across Europe have already been shut down again. They could not gain traction and suffered from the small number of available devices [193]. Even in Korea, where several DMB services were quite successful for a time, operators do not manage to make the services profitable [224]. Hence, it is still not clear which mobile phone TV standard will dominate the industry in future. DMB and DVB-

⁶ Latest version dates from 2009 [66].

H still hold a time to market advantage over MBMS technologies, though MBMS is continuously being enhanced by the 3GPP [92]. It is also part of the next generation mobile network standard Long Term Evolution (LTE), which due to its increased bandwidth might MBMS based mobile TV and other MBMS data casting (e.g. news, traffic info) services help to break through [134].

2.3.3 Implications for the Use Case Development

The above-depicted IPTV network structure reveals that targeted ads can be integrated with the IPTV content stream either at some network node from the headend to the access network or within the STB. In case of network-based targeted advertising technologies like the already mentioned local ad replacement the granularity of targeting will depend on the location of ad insertion technology inside the IPTV network. Concerning the use case development for STB-based methods the capabilities and restrictions of these devices must be considered. As mentioned the different tasks of an STB make it a complex hybrid device offering various services (linear TV, VoD, EPG,...) that can be starting points for targeted advertising scenarios. On the other hand the computing power of STBs is very limited compared to network-based solutions.


As can be concluded from the above explanations on mobile network technologies mobile targeted advertising mainly affects the areas of messaging and mobile Web related services. In the case of message advertising use case development will have to consider how the GSM infrastructure can be used to realize targeted advertising and to what extent additional system units must be integrated. Special attention must be paid to the fact that with the HLR, information about the user's location is inherently available and can be exploited for location-based services. Aside from messaging the spread of packet-switched mobile network infrastructure especially of 3G technologies and the enhanced capabilities of modern smartphones drive the development of targeted advertising use cases in the mobile Web. Due to the increasing user numbers mobile Web scenarios provide increasingly excellent targeting opportunities. Despite these new possibilities enabled by cutting-edge mobile technology, the use case development must take into account the inherent limitations of mobile devices for example in terms of form factors and screen sizes. Further limitations are caused by the diversity of mobile operating systems and platforms and with regard to mobile TV and video also due to possible bottlenecks concerning the network infrastructure.



2.4 Standardization Efforts in the Environment of Targeted Advertising

According to NSN [129] the development of targeted advertising related technologies in the ICT space is not driven by standards bodies. There are no consortia focusing exclusively on targeted advertising in this area. However some standards bodies’ efforts concern specific technologies that are also relevant within the scope of targeted advertising in the ICT space. This concerns for example the standards developments in the U.S. cable industry that can be partly adopted for the IPTV world (e.g. ad insertion technologies). Another driver are the advertising related standards and technologies originating from the Web and recently mobile world that can be consulted to derive implications for the ICT space. The following list provides an overview of relevant standards organizations.


Table 2: Standards organizations in the context of targeted advertising



Network-Related Standards

Standards Body/ Consortium	Description
	<p>The Digital Video Broadcasting Project (DVB) is an industry-led consortium of over 250 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others in over 35 countries committed to designing open technical standards for the global delivery of digital television and data services. Currently, more than 500 million DVB receivers are deployed worldwide.</p> <p>http://www.dvb.org/</p> <p><i>Targeted advertising related standardization activities:</i></p> <p>Multimedia Home Platform (MHP): The MHP defines a generic interface between Java based interactive digital applications and hardware on which those applications execute.</p>

Standards Body/ Consortium	Description
	<p>The original scope of 3rd Generation Partnership Project (3GPP) was to produce Technical Specifications and Technical Reports for a 3G Mobile System based on evolved GSM core networks and the radio access technologies that they support. The scope was subsequently amended to include the maintenance and development of GSM Technical Specifications and Technical Reports including evolved radio access technologies (e.g. GPRS, EDGE) and the IMS, therefore heavily relating to future converged services.</p> <p>http://www.3gpp.org/</p>
	<p>Being the successor of the WAP Forum, the Open Mobile Alliance (OMA) is a consortium of wireless industry players. The mission of the OMA is to facilitate global user adoption of mobile data services by specifying market driven mobile service enablers that ensure service interoperability across devices, geographies, service providers, operators, and networks while also keep focusing on business aspects.</p> <p>http://www.openmobilealliance.org/</p> <p><i>Targeted advertising related standardization activities:</i> OMA Mobile Advertising V1.0: The MobAd Enabler specifies an enabling architecture allowing to implement mobile targeted advertising services.</p>


Cable Industry Standards

Standards Body/ Consortium	Description
	<p>The Society of Cable Telecommunications Engineers (SCTE) is a non-profit professional association providing technical leadership for the telecommunications industry and serves its members through professional development, standards, certification and information.</p>

Standards Body/ Consortium	Description
	<p>http://www.scte.org/</p> <p><i>Targeted advertising related standardization activities:</i></p> <ul style="list-style-type: none"> · SCTE 30: Digital Program Insertion Splicing API · SCTE 35: Digital Program Insertion Cueing Messages · SCTE 130: Digital Program Insertion Interface
	<p>Canoe Ventures is a venture of leading U.S. cable operators aimed at aggregating the collective capabilities of their digital infrastructure and collaborating with industry leaders in technology, research, programming and more to re-energize TV.</p> <p>http://www.canoe-ventures.com/</p> <p><i>Targeted advertising related standardization activities:</i></p> <p>Canoe Ventures' main focus is the development of advanced advertising products and services for the cable environment.</p>
	<p>Founded in 1988 by cable operating companies, Cable Television Laboratories, Inc. (CableLabs) is a non-profit research and development consortium that is dedicated to pursuing new cable telecommunications technologies and to helping its cable operator members integrate those technical advancements into their business objectives.</p> <p>http://www.cablelabs.com/</p> <p>http://www.advancedadvertising.tv/</p> <p><i>Targeted advertising related standardization activities:</i></p> <ul style="list-style-type: none"> · Participation in SCTE 130 and Enhanced TV (ETV) standards development · OpenCable Application Platform (OCAP): Java based interactive TV standard, which is based on the DVB MHP · Enhanced TV Binary Interchange Format (EBIF): Non-Java based interactive TV standard developed for legacy STBs

Advertising Format Standards

Standards Body/ Consortium	Description
	<p>The Interactive Advertising Bureau (IAB) is comprised of more than 375 leading media and technology companies who are responsible for selling 86% of online advertising (U.S.). The IAB focuses on strengthening the growth of the interactive advertising marketplace. The IAB educates marketers, agencies, media companies and the wider business community about the value of interactive advertising.</p> <p>http://www.iab.net/</p> <p><i>Targeted advertising related standardization activities:</i> Development of ad format standards for the Web (e.g. UAP)</p>
	<p>The Bundesverband Digitale Wirtschaft (BVDW, = German Association for the Digital Economy) e.V. is a German organization representing the interests of companies in the field of interactive marketing, digital content and interactive added value.</p> <p>http://www.bvdw.org/</p>
	<p>The Online-Vermarkterkreis (OVK, = Circle of Online Marketers) is the central body of online marketers in Germany. Twenty-one of the largest German online marketers have come together under the umbrella of the BVDW to raise the profile of online advertising. The circle's primary aims are to increase market transparency and planning reliability as well as standardization and quality assurance measures for the industry.</p> <p>http://www.ovk.de/</p> <p><i>Targeted advertising related standardization activities:</i></p> <ul style="list-style-type: none"> · Definition of ad format standards · Special working group focusing on targeting topics

Standards Body/ Consortium	Description
 <small>MOBILE MARKETING ASSOCIATION</small>	<p>The Mobile Marketing Association (MMA) focuses especially on the growth of mobile marketing and its associated technology. MMA members include agencies, advertisers, hand held device manufacturers, carriers and operators, retailers, software providers and service providers.</p> <p>http://www.mmaglobal.com/</p> <p><i>Targeted advertising related standardization activities:</i> Definition of mobile ad format standards</p>

2.5 Definition of Ad Formats

In the previous subsections basic definitions of targeting and related terms have been given. Basic technologies in IPTV and the mobile environment have been defined. Before in the next section the actual use case development can begin, it is necessary to provide an overview of common ad formats in the relevant ICT channels. As already mentioned targeting technologies from the Web increasingly drive developments in the entire ICT space due to the spread of all-IP networks. Therefore the overview of ad formats starts with the Web environment before subsequently the typical ad formats in TV and the mobile space will be analyzed. This will lead to a comprehensive understanding in terms of which ad formats are most appropriate for each channel. Certainly some ad formats will better apply to one or the other. This will lead to a better understanding of possible advertising scenarios and give a first impression of targeting potentials.

2.5.1 Web Advertising Formats





Targeting and the delivery of personalized ads are today widely established on the Web. Since the relevant media channels for targeted advertising are more and more converging based on IP technology, most of the Web ad formats can likewise be deployed in use case scenarios in the IPTV or mobile space. It thus makes sense to first research on standard display advertising formats in the Web, in order to give an overview of existing standards in this area. Newsletter marketing and other non-display ad formats shall not be subject of this work.

Advertising in the Web is characterized by a diversity of different ad formats in terms of appearance and the underlying technologies. The variety ranges from simple text and banner ads to rich media formats. A basic distinction can be made between in-site/in-page (banner, skyscraper, rectangle) and on-site/on-page (pop-ups, Flash layer) display ad formats. Technologies that are used to enable these advertising forms include GIF/JPG, HTML, DHTML, Flash, and video/audio/streaming.

2.5.1.1 Interactive Advertising Bureau

In 2002 the American Interactive Advertising Bureau (IAB) began a process to reduce the number of ad sizes for the purposes of reducing the costs and inefficiencies associated with the planning, buying and creating of online media [91]. The IAB is an advertising business organization in the U.S. that develops industry standards, conducts research, and provides legal support for the online advertising industry. The result was the Universal Ad Package (UAP), a set of four ad sizes that all compliant member publishers have agreed to support.

Table 3: UAP specifications⁷ (source: [91], images 20% of original size)

Format	Size	Dummy Image	Weight
Medium Rectangle	300x250px		40k
Rectangle	180x150px		40k
Wide Sky-scraper	160x600px		40k
Leaderboard	728x90px		40k

In addition to these basic ad formats, the IAB offers as series of Ad Unit Guidelines with further recommendations on rectangles and pop-ups, banners and buttons, as well as skyscrapers. Moreover, the IAB gives a detailed technical and methodological description of more complex ad formats like Pop-Ups/Pop-Unders, Rich Media Advertisements, and Video Ads [91]:

Pop-Ups/Pop-Unders: Any advertising that utilizes a Web browser initiated additional window to deliver an ad impression either directly above or below the existing browser experience. Each user should be exposed to no more than one Pop-Up ad for each visit to an online site.

⁷ The UAP ad formats are part of the OVK standard forms of online advertising. A textual definition will therefore be given in the next section.

Rich Media Advertisements: Ads with which users can interact (as opposed to solely animation and excluding click-through functionality) in a Web page format. These ads can be used either singularly or in combination with various technologies, including sound, video, or Flash, and with programming languages such as Java, JavaScript, and DHTML. Rich Media Ads can be static (e.g. HTML) and dynamic (e.g. Active Server Pages, ASP) Web pages, and may appear in standard ad formats such as banners and buttons.

Video Ads: The Digital Video Ad Format guidelines contain definitions and recommendations for the most common current in-stream ad formats, including Linear Video Ads, Non-Linear Video Ads and will be discussed in the section about IPTV ad formats below.

The European counterpart of the IAB is the IAB Europe⁸, which represents the interests of companies from the areas of digital and interactive marketing at European level in form of a business association. The IAB Europe is a consortium of 23 country members and maintains own working groups that make recommendations for best practice and voluntary guidelines, which are then ratified by the national members and trade association partners.

2.5.1.2 *Online-Vermarkterkreis (Circle of Online Marketers)*

In Germany, the IAB is represented by the Online-Vermarkterkreis (OVK)⁹ as the body of online marketers in Germany. The OVK consists of 21 of the largest German online marketers and works under the umbrella of the Bundesverband Digitale Wirtschaft e.V. (BVDW, = German Association for the Digital Economy). In addition to the already mentioned targeting working group, the OVK has an Ad Technology Standards working group, which develops online advertisement standards that are constantly extended and adapted to market developments. The OVK's standard forms of online advertising are defined as follows [157]:

⁸ <http://www.iabeurope.eu/>

⁹ <http://www.ovk.de/>

Table 4: OVK standard forms of advertising¹⁰ (source: [157])

Format	Pixel	Weight	Possible formats
Full Banner	468x60	40K	GIF/JPG/Flash
Leaderboard	728x90	40K	GIF/JPG/Flash
Expandable Leaderboard	728x300 (90)	40K	GIF/JPG/Flash
Rectangle	180x150	40K	GIF/JPG/Flash
Medium Rectangle	300x250	40K	GIF/JPG/Flash
Standard Skyscraper	120x600	40K	GIF/JPG/Flash
Wide Skyscraper	160x600	40K	GIF/JPG/Flash
Expandable Skyscraper	420(160)x600	40K	GIF/JPG/Flash
Universal Flash Layer	400x400	40K	Flash
Flash Layer	individual	40K	Flash

Full Banner: The Full Banner (also called a Fullsize Banner) is a classic among the forms of advertising. It is increasingly superseded by the Leaderboard. The Full Banner is generally placed at the top of a page.

Leaderboard: The Leaderboard offers more space than a standard Full Banner. Like the Full Banner, it is placed prominently at the top edge of the site.

Expandable Leaderboard: The Expandable Leaderboard has initially the same format as the Leaderboard. As soon as the user moves the mouse cursor over the banner, it expands to full size. As soon as the mouse cursor moves off the banner, it returns to its original format.

Rectangle/Medium Rectangle: A Rectangle is integrated in the editorial setting of a website and is surrounded on at least three sides by the editorial content.

Standard Skyscraper/Wide Skyscraper: The Skyscraper is a tall ad normally used to the right of the content.

Expandable Skyscraper: As soon as the user moves the mouse cursor over the Expandable Skyscraper, it expands to full size. As soon as the mouse cursor moves off the banner, it returns to its original format.

Flash Layer/Universal Flash Layer: The Flash Layer does not have a fixed format. It is placed directly over the content when an Internet page is opened. The advertisement must be programmed entirely in Flash to this end. Unlike the "standard" Flash Layer, the Universal Flash Layer has a visible area with a standardized size.

¹⁰ The four formats Leaderboard, Rectangle, Medium Rectangle and Wide Skyscraper are analog to the respective formats of the UAP.

2.5.1.3 Vendor Specific Advertising Formats

The standard online advertising formats of the IAB U.S. and the OVK that have been introduced in the two previous sections are kind of a least common denominator in the Web advertising business. As the Internet is a fast developing place that lives from creative ideas, ad marketers and agencies do not restrictively use these standard formats. In addition, they also offer special formats with individual specifications (e.g. Banderole Ad, Tandem Ad, Fireplace,...) [97, 188]. In the context of this book, it is not necessary to give an exhaustive description of all possible ad opportunities. It is sufficient to provide a good overview in order to enable defining of relevant ad formats in terms of technological differences when it comes to targeted ad delivery.

2.5.2 IPTV Advertising Formats

The choice of formats for IPTV advertising is an aggregation of adapted Web advertising formats, established linear TV ad formats, formats that are used in Web TV scenarios, and interactive formats that have originally been introduced in cable TV. In the following these ad formats will be introduced shortly except for the Web advertising formats that have already been described above. Finally, the relevant formats for IPTV will be summarized.

2.5.2.1 Classic TV Ad Formats

In the TV world open standards for ad formats like in the Web are not available but over years some industry standards have developed. TV ad marketers typically provide an inventory of possible ad types that can be booked by advertisers or ad agencies. The available ad formats differ for each ad marketer and TV programmer, however most of them basically differentiate between “classic spots” and “special ads”.


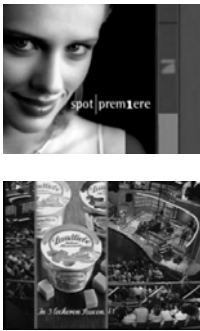

Table 5: Ad formats in linear TV (sources: [99, 188])

	Classic Spot	Special Ads											
Definition	Full-screen ad during commercial break (at least two successive ads) that is legislated by airtime regulation.	Special Ads use an exclusive positioning (outside a commercial break) and/or ad format (often not full-screen) that intends higher ad awareness and response.											
Variants	<ul style="list-style-type: none">· 15"/20"/30" (standard)· Tandem· Direct Response TV (DRTV)¹¹	<ul style="list-style-type: none">· Exclusive positioning· Special creations· Sponsoring											
Example	<table><tr><td>Program [part 1]</td><td>Ad 1</td><td>Ad 2</td><td>Ad 3</td><td>Ad 4</td><td>Program [part 2]</td></tr></table>	Program [part 1]	Ad 1	Ad 2	Ad 3	Ad 4	Program [part 2]	<table><tr><td>Sponsoring</td><td>Program [part 1]</td><td>Special Creation</td><td>Program [part 2]</td><td>Exclusive Positioning</td></tr></table>	Sponsoring	Program [part 1]	Special Creation	Program [part 2]	Exclusive Positioning
Program [part 1]	Ad 1	Ad 2	Ad 3	Ad 4	Program [part 2]								
Sponsoring	Program [part 1]	Special Creation	Program [part 2]	Exclusive Positioning									

Special ads can be further classified into Exclusive Positioning, Special Creations, and Sponsoring. A short overview of these formats is provided in the following table. For further information please visit [99, 188].

¹¹ DRTV describes ad spots that allow the viewer to actively contact the product vendor via service hotlines, telefax, or email.

Table 6: Overview of special ad formats in linear TV (sources: [99, 188])

Exclusive Positioning	Special Creations	Sponsoring
 <p>(source: Kabel1)</p>	 <p>(source: ProSieben)</p>	 <p>(source: ProSieben)</p>
Advertisements with an exclusive positioning outside of a commercial break.	Advertisements that are created especially for the surrounding editorial format.	Advertiser serves as content sponsor. Sometimes also called presentership.
Examples: <ul style="list-style-type: none"> • Single Split • Program Split • Credential Split • Trailer Split • Pre Split • Single Spot • News Countdown • Diary 	Examples: <ul style="list-style-type: none"> • PromoStory/Infomercial • Raffle/Quiz • Spot Premiere • Move Split • Cut In • Crawl 	Examples: <ul style="list-style-type: none"> • Program Sponsoring • Trailer Sponsoring • Title Sponsoring • Rubric Sponsoring • Block Sponsoring

2.5.2.2 Web TV/IAB In-Stream Video Advertising Formats

Advertising in the context of video services is already very common in the Web, be it explicit video/Web TV sites (e.g. YouTube, Hulu¹²) or other websites offering videos as an added value (e.g. on news sites like Spiegel Online). As mentioned in section 2.3.1, IPTV is basically different from Web TV as it is delivered over a distinct managed network. However, in terms of advertising formats the concepts realized in the Web TV environment may also be applied to IPTV espe-

¹² <http://www.hulu.com/>

cially in on demand scenarios. The most common in-stream video ad formats are summarized in the IAB Digital Video In-Stream Ad Format Guidelines & Best Practices and will be introduced below. In-stream video is generally played or viewed from a video player and must be distinguished from in-banner video that is displayed in standard display ad units (see above section 2.5.1).

The IAB Video Ad Guidelines basically distinguish between linear and non-linear video ads in the context of in-stream advertising [90]:

Linear Video Ad: The ad is presented before, in the middle of, or after the video content that is consumed by the user in very much the same way a TV commercial can play before, during or after the chosen program. These three variants are called Pre-, Mid-, and Post-Roll respectively Interstitial Advertising. One of the key characteristics of a Linear Video Ad is that the user watches the ad in addition to the content as the ad takes over the full view of the video. Linear Video Ads may allow the user to interact with an ad message within the video window.

Non-Linear Video Ad: The ad runs concurrently with the video content, so the users see the ad while viewing the content. Non-Linear Video Ads can be delivered as text, graphical ads, or as video overlays shown directly over the content video itself. An Overlay Ad can also be delivered over a linear advertising experience as well in order to animate the user to interact with the ad. Rather than overlaying the content, Non-Linear Ads can also reside outside the live video frame but within the video window. This format is called Invitation Ad and is used when publishers do not wish to overlay the content.



Figure 13: Non-Linear Overlay Ad (bottom), Non-Linear Non-Overlay Invitation Ad (top) (source: YouTube¹³, 2009/10/31)

Both Linear and Non-Linear Video Ad formats have the option of being paired with so-called Companion Ads that are defined by the IAB as follows [90]:

Companion Ads: Commonly text, display ads, rich media, or skins that wrap around the video experience. These ads come in a number of sizes and shapes and typically run alongside or surrounding the video player. Companion Ads may offer click-through interactivity and rich media experiences, such as expansion of the ad, for further engagement opportunities.

¹³ <http://www.youtube.com/>



Figure 14: Linear Pre-Roll Video Ad with Companion Ads (left and below) (source: MSN Video¹⁴, 2009/10/31)

2.5.2.3 Interactive Advertising Formats

The first successful interactive advertising realizations have been implemented in the UK by the BBC and Sky Media in 1999/2000. As will be discussed in later sections there exist some open standards concerning the technology of interactive television systems, but not in terms of ad formats. However some commonly accepted ad formats have evolved that are described in the following. The definitions are aggregated from [153, 26, 190] and information provided through Deutsche Telekom [203]:

Red Button/“Request-For-Information” (RFI): The Red Button is the best-known interactive advertising format. The name is derived from the way a user initiates the interaction with the television system. In case of interaction opportunities an overlay is displayed in a distinct area of the screen (e.g. upper right corner) telling

¹⁴ <http://video.msn.com/>

the user that more information on the current show or ad spot is available when she presses the red button on her Remote Control (RC).



Figure 15: Red Button advertising examples (source [153])

Impulse Response: Basically an enhancement of RFI that enables the advertiser to ask simple questions, such as name, email, phone number, etc. It can also be used to perform surveys and polls. Impulse Response takes the form of overlaying pop-ups that appear in the bottom third of the TV picture. An example might be a cooking show that allows requesting a recipe by first pressing the red button on the RC and then entering the email address. Finally, the recipe will be mailed to the user.

Dedicated Advertiser Location (DAL): An interactive advertisement taking viewers from their programming to an interactive environment they could explore, play games and learn more about the products. DAL's have a customized feeling and can use a variety of rich media including videos, additional audio content, animation, games and others. The DAL may include Impulse Response functionality to report user data back to the advertiser. DAL applications are usually hand-coded and have a high degree of design flexibility.



Figure 16: DAL advertising example (source: [153])

Mini DAL: A variation of the DAL that does not tear away the user from the programming, as the advertising environment covers only about 3/4 of the screen. The Mini DAL can also include Impulse Response functionality through an additional overlay displayed on the screen.

Microsite: Scaled down low bandwidth DALs, authored using a library of pre-formatted templates to save time and cost. Microsites can be built by advertising agencies using approved content creation tools. They are suitable for direct call-to-action, combining the speed of Impulse Response overlays with a “poster” page of additional information and data capture options.

2.5.2.4 Summary of IPTV Relevant Ad Formats

The potential advertising formats for IPTV have been described in the previous subsections. As this book has a clear technological focus it does not make sense to distinguish between all kinds of formats that have been mentioned above. Rather the formats with similar technical characteristics should be aggregated to groups in order to facilitate the use case development. The following groups can be identified:

Display Ad Formats: From a technological point of view it does not make a difference if a banner, a rectangle, a pop-up or an overlay is displayed on the TV screen (overlay in this case only describes the semi-transparent nature of this display ad and not a technology). Even the more complex splitscreen and wallpaper formats that are used in the Web but also in traditional linear TV can be con-

sidered as some kind of display ads. All ad formats that are displayed over or besides the content will therefore be referred to as display ads.

Ad Spots/Commercials: The classic 30-second ad spot as part of an ad block interrupting the content stream.

Interstitials: Advertisements displayed before, after, or as an interruption of streaming content, thus also called pre-, mid-, and post-roll ads.

Interactive Ads: Red Button, DAL, Mini DAL, and Microsite formats as described above.

2.5.3 Mobile Advertising Formats

The Mobile Marketing Association (MMA) regularly releases the Mobile Advertising Guidelines [138] providing recommendations for ad units in mobile advertising and has standardized the Universal Mobile Ad Package (UMAP) [140] defining the most frequently used mobile ad units corresponding to the IAB UAP standard known from the classic Web. The MMA basically differentiates the following mobile media channels: Mobile Web, Messaging, Applications, and Mobile Video and TV. The guidelines recommend ad unit usage best practices, creative technical specifications, as well as guidance on ad insertion and delivery necessary to implement mobile advertising initiatives. In the following, a short introduction containing the most important facts about mobile ad formats shall be given.

2.5.3.1 Mobile Web

The MMA Advertising Guidelines provide recommendations for the most prevalent advertising units on the mobile Web. This includes banner advertising and text links. From these pre-defined formats appropriate ads can be selected that fit best a particular mobile phone's display. The mobile Web features text and graphics optimized to match specific screen solutions and browser capabilities of each user's mobile phone. The recommended ad formats are as follows [138]:

Mobile Banner Ad: A universal color graphics ad unit displayed on a mobile website. It is defined as a still image intended for use in mass-market campaigns aimed at audiences across all mobile phone models, network technologies and data bandwidths.

WAP 1.0 Banner Ad: A supplemental black-and-white graphic for use in campaigns that target older phones.

Text Tagline Ad: A supplemental ad unit displaying only text that may be used in older mobile phones.

The MMA guidelines for mobile banner ads contain a series of specification components, i.e. aspect ratios, media formats, dimensions, and files sizes. The recommended ad formats are given in 4:1 and in 6:1 aspect ratios and in the sizes Small Image Banner, Medium Image Banner, Large Image Banner, and X-Large Image Banner. Publishers should always deliver the whole set of ad units in order to reach as many devices as possible.



Figure 17: Mobile Web Banner Ad units in 6:1 and 4:1 aspect ratio (source: [42])

2.5.3.2 Text Messaging (SMS)

SMS advertising has the same restrictions as regular messaging between mobile phones. SMS is a text-only medium that does not support rich media and the length is restricted to 160 characters. The MMA Mobile Advertising Guidelines distinguish between two kinds of recommended ad units [138]:

Initial SMS Ad (Appended): is a universal text ad unit of variable length appended to the primary non-advertising content of the message. It uses the remaining space after the actual content and can be made available for advertiser usage by the publisher. The content must not be compromised by the ad unit.

Complete SMS Ad (Full Message): is a universal text ad unit with up to 160 characters completely available for advertiser usage. There is no primary, non-advertising content in the message and this ad unit is typically delivered as a reply to an initial SMS ad or “Text (keyword) to (short code)” call-to-action. In addition, these ads may be delivered as part of an ongoing opt-in mobile advertising campaign.

In case of appended SMS advertising a clear separation between the text message content and the ad should be made. This is usually realized through an indicator,

e.g. “**”, “Ad:” or comparable. SMS advertising can also include interactive features like “call-to-action” or links to mobile websites.

2.5.3.3 *Multimedia Messaging (MMS)*

Multimedia Messaging Service (MMS) is a rich media messaging service allowing mobile users to send and receive messages that can include graphics, photos, audio, video and text. As such, it provides marketers with significantly enhanced ad opportunities compared to SMS.

Possible ad units for MMS are: MMS Short Text Ad, MMS Long Text Ad, MMS Banner Ad, MMS Rectangle Ad, MMS Audio Ad, MMS Video Ad, MMS Full Ad. As a consequence of the various form factors and screen sizes of mobile phones, the MMA recommends a series of specification components that are basically aligned to the definitions for the mobile Web [138].



Figure 18: MMS Pre-Roll Ad example (source: [138])

2.5.3.4 *Mobile Video and TV*

The mobile video advertising units defined by the MMA are very similar to the IAB in-stream video advertising formats [138]:

Linear Ad Breaks: take over the full mobile display screen and replace the streamed or downloaded video content for a given period of time. Ad unit formats include Billboard Ads (static image or brand logo), Bumper Ads (short video advertisement or sponsorship), Pre-, Mid-, Post-Roll Ads, Book Ending Ads (Pre-Roll Ad with corresponding Bumper Ad).

Non-Linear Ad Breaks: share the mobile display with the streamed or downloaded video content for a given period of time. Ad unit formats include Overlay Ads and Companion Ads.

Interactive Mobile Video and TV Ads: are advertisements that allow for user interaction including clicking, browsing, zooming. Guidelines for these types of mobile TV and video advertisements are still being researched by the MMA but may include click-to-web, click-to-call, click-to-SMS, click-to-video, click-to-download, click-to-locate, click-to-ad, etc.

2.5.3.5 *Mobile Applications*

The mobile application advertising guidelines address applications installed on the mobile phone that host ads inside the application design and logic. A problem in this context is the wide range of application types comprising managed platforms, virtual machines, native applications and widgets. However the recommended ad units for mobile applications are as follows [138]:

In-App Display Advertising Units: can be further differentiated into Mobile Application Banner Ads and Mobile Application Interstitial Ads. In both cases the above described specifications for Mobile Banner and Mobile Interstitial Ads apply.

Integrated Ad: is an advertisement that is integrated with the application or game experience (also known as product placement) and is formatted to be compatible with the main content type used in the application context.

Branded Mobile Application: many downloadable application advertising campaigns are custom designed to support the needs and expectations of the target audience.

Sponsored Mobile Application: publisher's downloadable application, which features a sponsoring arrangement at various places across the application.

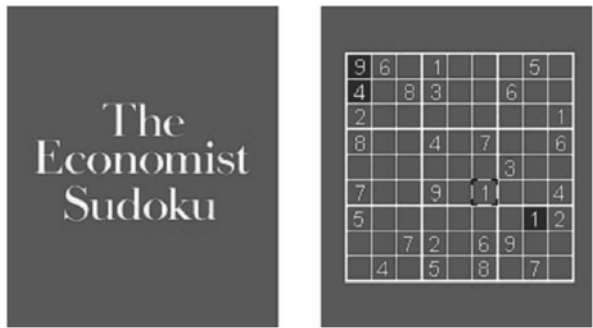


Figure 19: Branded Mobile Application/Game example (source: [138])

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