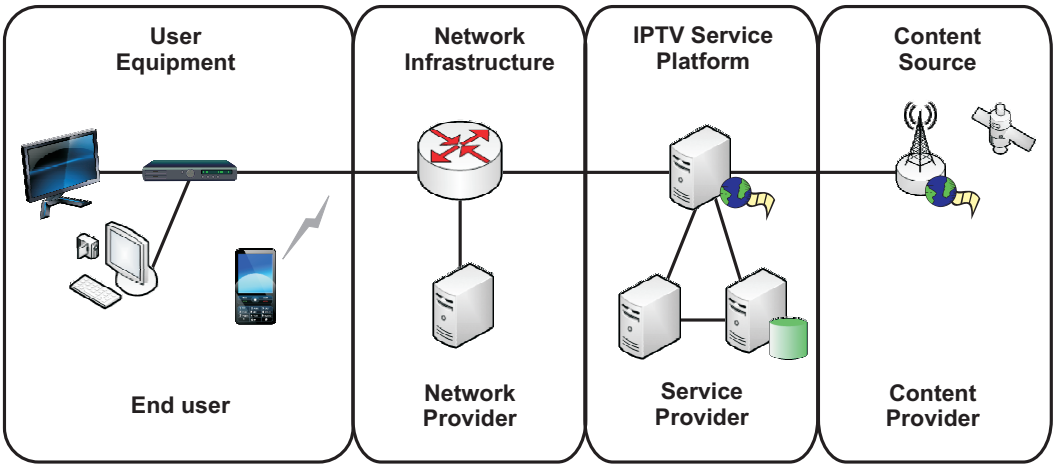
4 IPTV (Internet Protocol Television)

4.1 Introduction

The end user finally percepts the quality and **IPTV** (*Internet Protocol Television*) service portfolio, as well as the usability in order to satisfy his requirements. Several actors are responsible for the delivery of the content from their originators such as TV stations and studios but probably also from other users. In this section the IPTV domains and services are described together with the explanation of how the standardization develops from requirements to architecture.

End to end chain for delivery of the IPTV content to the end user usually contains these 4 main domains that are involved in the provision of an IPTV service (Figure below):

- Content provider,
- Service provider,
- Network provider,
- End-user.



IPTV Domains

The four IPTV domains definitions could be provided by the ITU-T or ETSI TISPAN specification [34], [35], [9]. Most of the standardization bodies follow the same schema to produce end to end solution specifications that apply also to the IPTV. First of all it is necessary to specify all requirements for the service but also from the UE and network capabilities point of view (stage 1). Secondly it is the specification of the functional architecture, functional entities and their task, relevant reference point among the functional entities as well as high level procedures for services (this is done usually in stage 2). In the final stage 3 it is

required to conclude all details needed from the implementation perspective as for example the protocol models and detailed protocol procedures.

There are two main aspects of the IPTV. First one is technological one resulting to the IPTV architecture and second one is the user's perspective aspect which can be seen from the provided IPTV services and user experience.

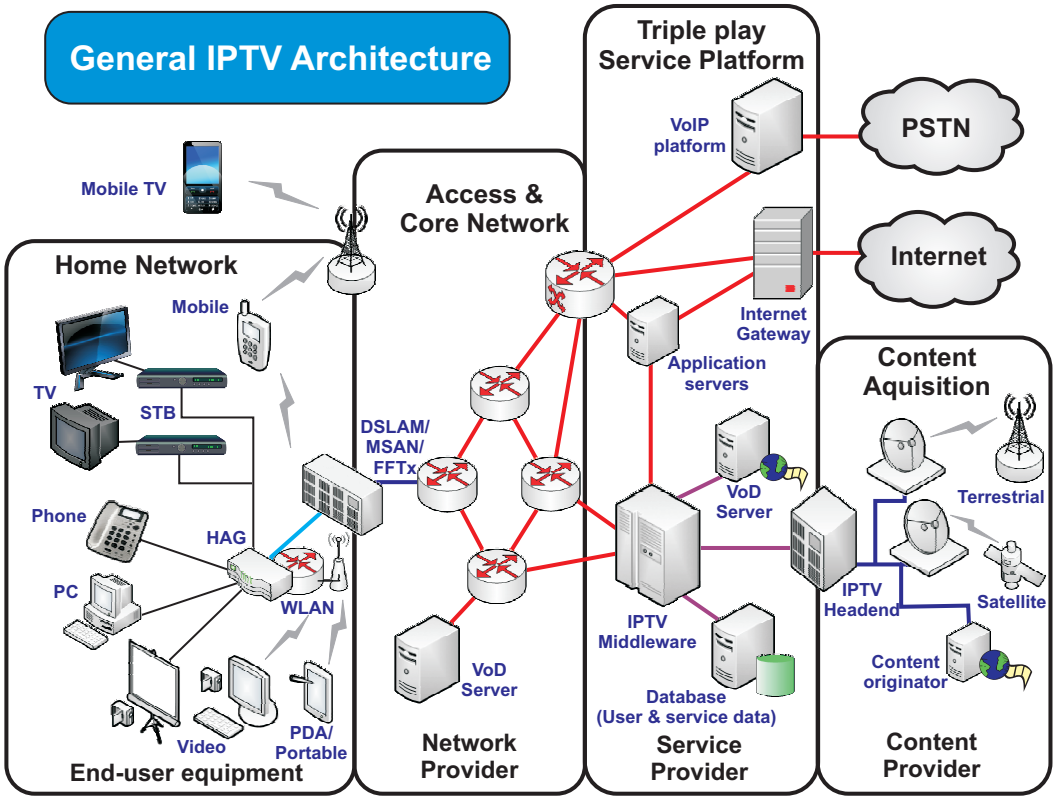
From the user's perspective is not really important what architecture the IPTV service provider selects, but it is surely more important which services are provided. Most of the existing non-NGN solutions provide only basic set of services like linear TV (live TV channels), *video on demand* (**VoD**), and some of them also **PVR** (*Personal Video Recording*).

New NGN based IPTV solution should therefore provide much more services, features but most important also new user experience in watching TV with more interactivity, personalization, mobility and last but not least comfort in consumption of the right content in the right time and right way.

4.2 Architecture of non-NGN Based IPTV

The general Triple Play architecture (Figure below) usually consists of the following parts [4]:

- Service platform domain including IPTV middleware (non-NGN)
- Transport network
- Access network
- Home network and CPEs



General IPTV architecture

The Triple Play service platform usually contains several less independent parts of complex service architecture:

- Content acquisition subsystem which allows to receive, process, and encode content from external sources to defined media coding and encapsulation (receiver and decoders infrastructure, IPTV headend, VoD import and pre-processing).
- Content distribution subsystem responsible for retrieving, protecting, distributing, storing and delivering of the content by preferred way to the end user's system (user equipment).

- IPTV middleware contains the application servers which control and manage the whole IPTV infrastructure (servers, databases, frontend, backend systems, interfaces to external systems e.g. OSS/BSS), users and services. Part of the application platform could also be additional IPTV applications or gateways allowing limited interaction with other systems (e.g. VoIP, NGN).

- Service selection and discovery subsystem which allow the user to browse and find via user TV portal an appropriate content or service information (metadata) which he would like to watch (could be part of IPTV middleware).

- VoD, nPVR or other subsystems – specialized subsystem infrastructure required for dedicated services (Video on Demand or network based personal video recording service).

For the Triple Play contains tree type of services – video, voice, data – the connection to internet services and voice service platform is required (e.g. over VoIP gateway).

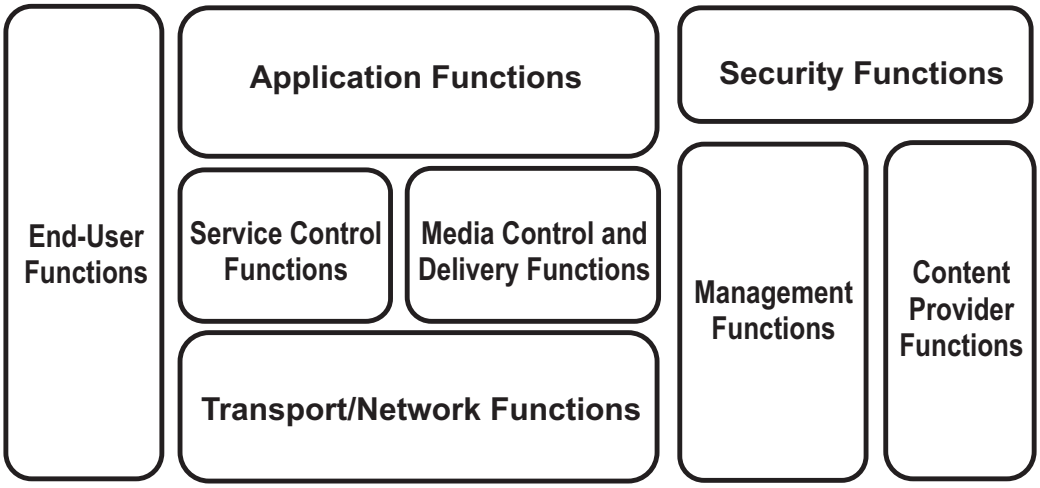
There is no single approach to the IPTV service provisioning. Due to huge costs involved in the network equipment, operators usually follow incremental approaches to network upgrading, always relying on existing premises and procedures. Therefore the way a new NGN service is provisioned, it clearly depends on the history of the operator. Therefore there are a lot of differences from solution to solution and also to operator specific transport, access and home network design.

4.3 Architecture of NGN Based IPTV

The major players in any IPTV delivery chain consist of content providers, service providers, network providers, end-users. Content provider is a source of content as for example TV stations, studios, content aggregators, etc. The IPTV platform usually own by service provider has to provide all functions necessary for control and delivery of IPTV services over network infrastructure (network provider) to end user.

Main blocks NGN based IPTV platforms are following (Figure below):

- Application functions
- Service control functions and User profiles
- Media control and delivery functions
- Supporting, management and security functions
- End user function



High-level architecture of NGN based IPTV functional

Application functions can include several service logics of the IPTV services, mechanisms for service discovery and selection to find right services and content, also help to interact with other application and external systems.

Service Control Functions provides functionality for authentication, authorization of service requests. This function is also responsible for the setup and control of all the IPTV services. It can also reserve resources towards transport control functions.

User Profiles contain user data and user profiles related to user's services.

Media Control and Delivery functions has received content and media streams from content provider and then control and provide media processing, media delivery, content storing, transcoding and relaying of content.

End-User Functions represent home network and user equipment as for example end devices (e.g. TV with set-top-box, mobile, etc.) but also home networking part including Home Access Gateways.

+ The greatest advantage of NGN based IPTV architecture is possibility integrate IPTV services with other NGN services, reused existing NGN capabilities, better utilized resources, personalization of services and mobility.

NGN/IMS function which can be re-used for providing IPTV:

- User registration and authentication,
- User subscription management,
- Session management, routing, service triggering, numbering,
- Interaction with existing NGN service enablers (presence, messaging, group mng.,etc.),
- QoS and bearer control,
- Mobility, FMC capability,
- Charging and billing,
- Security and management mechanisms.

There are IPTV specific functions which have to be additionally described:

- Service discovery & selection, presentation, e.g. EPG,
- Service & Content protection, e.g. DRM and CAS,
- Service & Content management, managing the services and contents in the Content Provider domains and/or the Service Provider domains,
- Content distribution, delivery and locating control,
- Multicast support and control,
- VCR control, e.g. play/pause/fast-forward/rewind.

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- Collect Service and system requirements, service use cases,

- Define functional entities and architecture, reference points, service procedures,
- Specify the implementation, signaling flows, protocols details.

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