IMS based IPTV: ETSI TISPAN standards applied

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ABSTRACT

This paper summarizes IMS based IPTV as defined in ETSI TISPAN Release 2 as well as the potential enhancements being added in Release 3 at the time of writing. After an introduction to the use cases and to TISPAN NGN standardization, the different aspects, such as Service Discovery, User Profiles and the underlying signaling concepts are discussed. Furthermore this paper provides links to other ongoing standardization work of ETSI TISPAN e.g. in the area of Content Delivery Networks, Content Distribution (ETSI MCD) as well as in the area of the evolution of Home Networks. This paper can be considered a guide to the IMS based IPTV as defined in ETSI TISPAN specifications of Releases 2 and 3, a solution that allows service providers to build their service offerings using standardized Network platforms.

General Terms

Standardization

Keywords

IMS, IPTV, ETSI TISPAN, Standardization

1. INTRODUCTION

Next Generation Network (NGN) standards are evolving to enable Service Providers to offer diverse multimedia communication services over an IP-based converged core network, facilitating service interaction, integration, deployment and management. In this paper we focus on ETSI TISPAN NGN standards and provide an overview of its IMS based IPTV specifications for fixed line access networks. IMS based IPTV in itself is a complex service which puts several requirements on the Operator Network in order to satisfy user service expectations:

Consider Mr. Smith watching a football match in High Definition (HD) quality on his IPTV Set. Up to this point – the consumption of video content – several enabling technologies have already been invoked: for user authentication/authorization, for charging, for Quality of Service (QoS, which is especially important for real time media with high bandwidth demands such as HD video content). Let us consider now, that Mr. Smith's neighbor also watches the same match, but for some reasons – be it network conditions or the fact that his neighbor consumes only Standard Definition IPTV requiring less video decoding time – the delay of his neighor's IPTV signals are 0.5 seconds lower than Mr. Smith's. This means that Mr. Smith hears his neighbor celebrating goals before he himself can watch them and as a consequence his service experience is degraded severely. To add on top of that, his multimedia capable IPTV device is able to accept calls, and right now, during his favorite team's most important match of the season, he is interrupted by a Voice over IP call advertising Bath Salts.

This simple use case shows how enabling technologies such as QoS and Multimedia Sessions can be insufficient to achieve an excellent service experience. In the next section we will see that ETSI TISPAN not only offers basic IPTV services with rich multimedia capabilities but is currently also progressing beyond pure IPTV services e.g. by providing means to prevent unsolicited communications and by adding IPTV service features for inter-destination media synchronization in order to synchronize video playouts.

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The remainder of this work is structured as follows: section 2 introduces ETSI TISPAN NGN, the Release 2 and Release 3 specifications of TISPAN IMS based IPTV as well as additional TISPAN work on Content Delivery Network and VoIP Spam prevention. Afterwards, section 3 will introduce the newly founded ETSI MCD group which focuses on another area of the IPTV ecosystem, the content provider. Section 4 concludes this work.

2. IMS based IPTV in ETSI TISPAN

2.1 Introduction of TISPAN

ETSI, the European Telecommunication Standards Institute, defines the Next Generation Networks (NGN) in its TISPAN technical body, with a focus on wireline access networks.

Since the first TISPAN Release, the two cornerstone principles of the TISPAN NGN functional architecture [1] are to separate the transport and the service layer and to use a subsystem oriented approach. These concepts allow abstraction from the transport layer and facilitate adding other subsystems in future work. Furthermore, operators can pick and choose among those complementary subsystems when deploying NGN in their networks, i.e. they can tailor the NGN deployment to match their individual business needs.

In the remainder of this section relevant components of the TISPAN NGN functional architecture depicted in Figure 1 are briefly described. A number of key interfaces are shown and labelled in Figure 2

UE: The User Equipment is the user's access point to invoke and consume services. In TISPAN Release 2, this was further subdivided and decomposed into a Customer Premises Network (CPN) consisting of one or more Customer Network Devices (CNG) and a Customer Network Gateway (CNG).

NASS: The NASS performs access network authentication and configuration. This enables transport layer access and service consumption.

RACS: This sub-system is responsible for realizing QoS by performing admission control on the access network on a per flow basis

IMS: IP Multimedia Sub-system is one of several possible service layer subsystems. Originally defined in 3GPP, TISPAN reused the core components and introduced adaptations for the fixed line ecosystem. According to the so called 'common IMS agreement', 3GPP is taking the lead in advancing IMS specifications while taking TISPAN wireline requirements into account.

The User Profiles are stored in the **UPSF** entity. This is the fixed network equivalent to the Home Subscriber Server (HSS) in 3GPP – with subtle differences e.g. related to the difference in mobility scenarios.

2.2 IMS based IPTV and beyond

2.2.1 TISPAN NGN Release 2

In Release 2 the focus lay on introducing an IPTV framework in TISPAN NGN, and therefore only basic IPTV service components were addressed: Service Discovery / Service Selection, Content on Demand, Linear TV, Network PVR (Personal Video Recorder) services. By combinations of those however, also more complex service experiences such as Linear

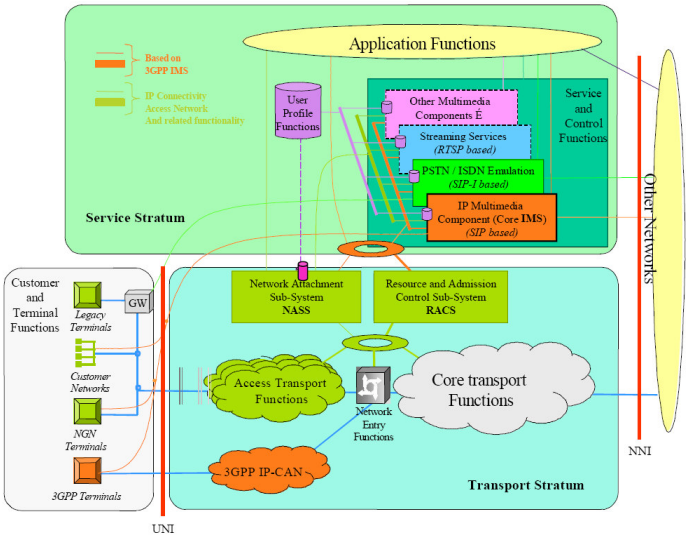

Figure 1: TISPAN NGN Release 1 Functional Architecture [1]

TV with trick play mode and/or time-shifting can be realized.

Before a subscriber can use TISPAN's IMS-based IPTV, his access line needs to be authenticated and his device has to be registered with the IMS. These mechanisms have long been standard and are assumed to be well known to the reader.

Subsequently, the user's device needs to discover the IPTV services offered by the provider. Discovery is done through a SIP application server called Service Discovery Function (SDF). It can be realized by a SIP SUBSCRIBE/NOTIFY mechanism or through an unsolicited SIP MESSAGE delivered by the SDF upon successful registration. Using either mechanism, the UE receives a list of Service Selection Functions (SSF) which offer an Electronic Program Guide containing a list of IPTV services and the content available to the UE.

After service selection, the subscriber's UE invokes another SIP Application Server called Service Control Function (SCF). This server checks user subscriptions and service logic, does charging and locates content. Then, it forwards the UE's SIP requests via y2 to Media Functions which deliver the media. At the end of the SIP session setup procedure, media channels have been negotiated, QoS resources reserved, charging identifiers created and user authorizations checked.

This allows for controlled media consumption. For example, in the case of Content on Demand, the UE controls the media streaming by using RTSP [3], directly interacting with the Media Functions via Xc. For services such as Live TV which is multicast, Multicast Control Protocols such as IGMP [4] or MLD [5] are used for channel switching. The Media itself is delivered via Xd and can be Multi- or Unicast using RTP or direct UDP encapsulation of MPEG2 Transport Streams.

As mentioned in the previous section, the UE depicted in Figure 2 can actually represent a Customer Network. In light of IPTV, the CND (Customer Network Device) specified in TISPAN can exhibit Set Top Box (STB) functionality which can be SIP enabled. The alternative to running SIP/RTSP/IGMP protocols from the STB all the way into the core is to equip the CNG with protocol translation capabilities and then e.g. translate in-home UPnP signaling from/to the STB for IPTV consumption. Both

methods are possible but require different capabilities of the Customer Network Gateway (CNG) – the boundary between the Customer Network and the Access Network of the Operator.

Considering how many diverse technologies – ranging from legacy Telephones to advanced IPTV STB devices – may be connected at the same Customer Premises, it becomes evident how complex Access Control, QoS and service consumption scenarios can become.

2.2.2 TISPAN NGN Release 3

Naturally, this new Release of TISPAN specifications is an evolution of the Release 2 specifications, reusing and expanding the previous concepts. New services as well as general purpose features enhancing usability and experience of all TISPAN IPTV services are introduced:

- User Generated Content (UGC): This service allows users to generate content and upload/stream it to the IPTV Service Provider infrastructure. In turn, authorized users can access this content with QoS and Reliability.
- Targeted Advertisement Insertion (TAI): Referring to existing specifications of OMA and SCTE, personalized advertisements can be implemented to boost Operator revenues while enhancing the user experience during advertisement breaks through delivering advertisements relevant to the user.
- Media Synchronization: The ability to synchronize e.g. two neighbors' IPTV sets so that in case of Live events the user experience is enhanced. This feature relies on a negotiation of playback delays among a group of UEs to cope for differences in round-trip-time delays of those UEs.
- Shared Service Control: This 'on-top' service allows sharing IPTV service consumption among multiple parties by allowing e.g. also to share Trick Play Commands among a defined group of users. This creates a compelling 'watching apart together' experience for everyone, as they not only watch the same content but also share their service experience.
- IPTV Content Markers: This feature allows users to 'bookmark' content (entire movies/channels or individual scenes) for sharing with other users or for future convenient access.

At the time of writing TISPAN Release 3 specifications of IPTV are still being worked on and therefore this section is to be considered with caution.

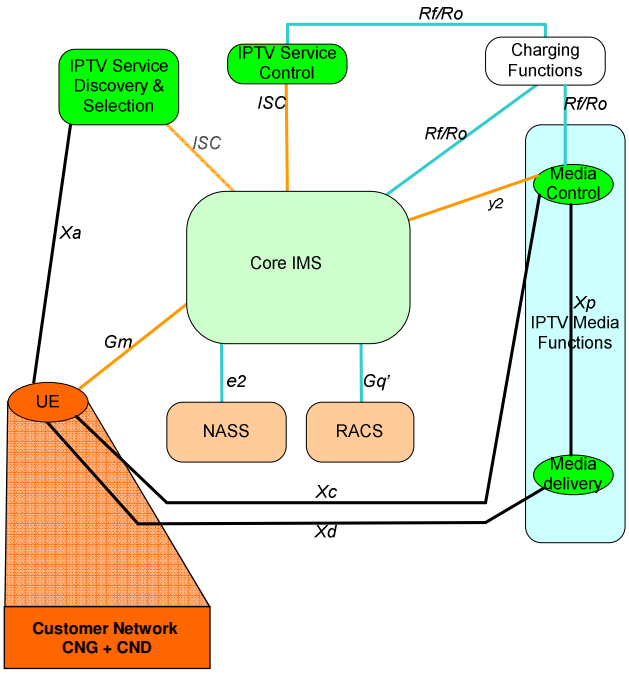

Figure 2: IMS based IPTV architecture [2]

2.2.3 Beyond IMS based IPTV specifications: Content Delivery Networks

In TISPAN Release 3, it was seen that the concept of Media Functions of Release 2 might be expanded to Content Delivery Networks (CDN), i.e. a network of media servers which serves media requests autonomously without rerouting over the session control entities. The aim of this work is to remain compatible with the existing IMS based IPTV architecture, i.e. to core IMS and SCF entities. Even deployments mixing CDN and 'traditional' TISPAN Media Functions are conceivable.

This work area is under active development at the time of writing.

2.2.4 Beyond IMS based IPTV specifications: Prevention of Unsolicited Communication

IMS based IPTV draws heavily upon the strengths inherited from IMS: the concept of multimedia sessions, the uniform QoS handling, the centralized charging, etc. However, while the multimedia session concept allows for compelling service scenarios such as call handling on the TV set, it bears also the risks apparent in the use cases in the introductory section – e.g. VoIP SPAM. ETSI TISPAN is aware of this and is currently defining a flexible framework to Prevent Unsolicited Communication (PUC) in the NGN [6].

3. Expanding to E2E IPTV

ETSI TISPAN specifications define platforms for Service Providers and how to deliver Services to Users. However, when looking at the TV value chain, it becomes evident that another important part of this chain is not covered by TISPAN: i.e. the Content Providers, the business entities owning the multimedia content. While this is subject to business agreements and a service provider may very well also be the owner of TV content in some scenarios, the more general case where the roles of distributing

and owning content are separated is not covered by ETSI. To address and resolve this shortcoming, ETSI created in early 2009 another group dealing with Media Content Distribution (MCD). First results can be expected in the near future. Naturally, a tight collaboration between the two ETSI groups MCD and TISPAN e.g. on the requirements and mechanisms to make content from Content Providers available in IPTV Service Provider networks is anticipated.

4. Conclusion

In this paper advanced IPTV NGN services were described from a user perspective, by presenting use cases showing a taste of what is possible with current specifications in the IMS based IPTV area. Subsequently, we introduced ETSI TISPAN IMS based IPTV specifications Releases 2 and 3 that allow service providers to build such service offerings based upon standardized Network platforms.

5. REFERENCES

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[6] ETSI TS 187 015: *Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Specifications for PUC (Prevention of Unsolicited Communication) in the NGN.*