AUDIENCE MEASUREMENT TECHNOLOGIES FOR USER CENTRIC MEDIA

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ABSTRACT

How to know which is the consumption and generation of content in a new media world where the user can be a consumer or a creator/distributor, compared to the traditional media? How interesting is it for the final users? Which new viable business models can be found in this world or which is the possible evolution of the market and the technology?

Possibly, it is rather impossible to answer these questions and possibly never will be answered properly but the development of new audience measurement reference models for the new media world and its adaptation to the user centric media using combined metrics, are the most promising ways of achieving these goals.

This paper describes an end-to-end system proposal based on the said reference model for the new media world applied to user centric media to provide an answer to some of the above questions and to obtain the necessary resulting figures.

Index Terms— audience measurement, user centric media, testbeds, convergent media.

1. INTRODUCTION

In the media industry and specifically in the user centric media, the collection of the necessary figures using testbeds or complete panels of households/individuals to obtain reliable figures of media consumption is a necessary mechanism to validate the impact and interest of service offerings, new technology developments or even to predict new viable business models. Without reliable consumption data, many businesses will be reluctant to participate in the new platforms and hinder the development of new media technologies or services.

Not all the characteristics of the audience measurement for traditional media can be applied to the user centric media paradigm where the user has the ability to create-distribute-consume audiovisual content, and the situation gets more and more complicated with the consumption or creation in user communities where not only individual consumption is important but also the collective one.

This paper presents an end-to-end system proposal for obtaining the said figures in both traditional and user centric media based platforms.

System parts will be described as follows: firstly, the presentation of a model for convergent media consumption in a variety of terminals and networks including broadcasting to Set-Top-Boxes, mobile and portable devices or broadband IPTV delivery. Secondly, the adaptation of this model to user centric media and collective consumption is presented. Then, a set of metrics to combine the results will be formalised.

2. SYSTEM REFERENCE MODEL

Inside the proposed end-to-end system three parts can be distinguished: the content provider premises, the household and the data centre. The audiovisual content provider, whose model has fast evolved for the last years, is in charge of delivering the content to the user to be consumed in a household, where a meter is located. The data centre must process the audience data sent by the meter and other information related to the user as well as accurate programming data (as-run logs or similar) provided by the content provider. This scheme can be found in Fig.1.

In a user centric media scenario, the referenced model must focus on the meter side. It is in this side where networks and services meet to let the user carry out the content consumption.

In this way, the main objective of the reference model is to provide an abstract meter to accommodate all the variety of terminals and networks available by the user.

These systems can be described by means of three items: the block diagram, the service architecture and the data model.

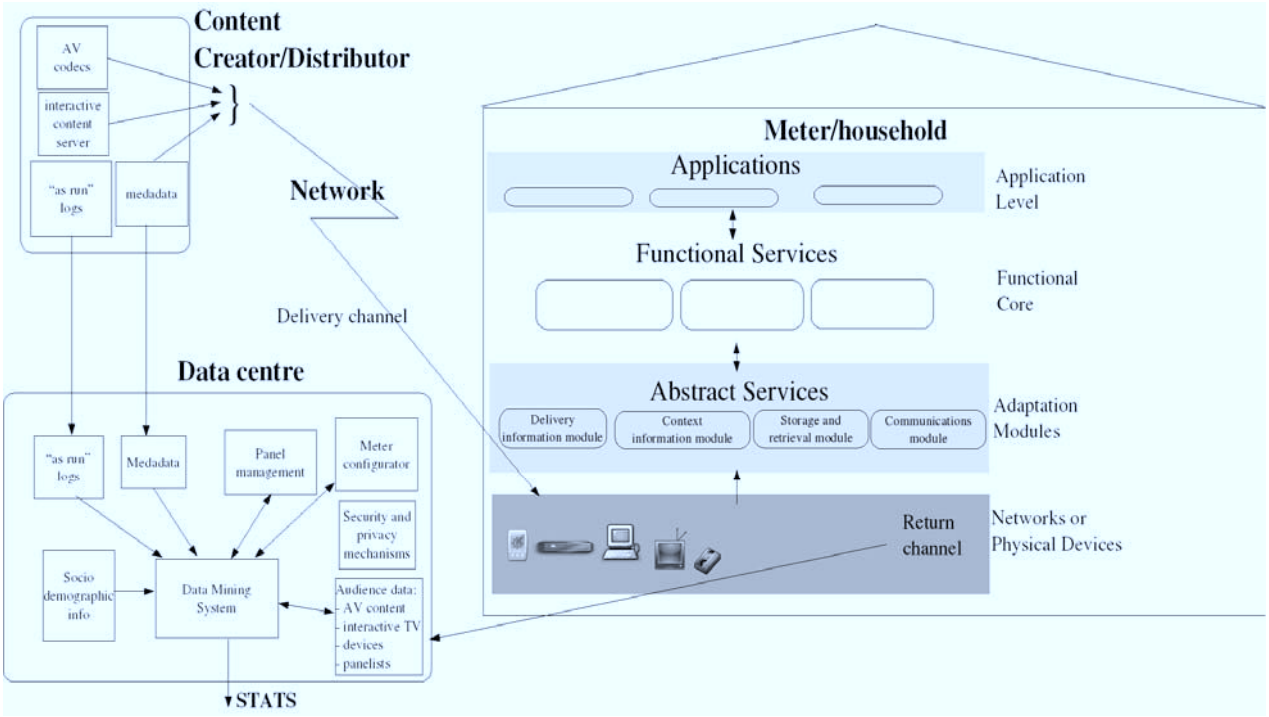

Fig.1 System layout

With regard to the block diagram, an abstract four-level structure is proposed to fulfil the above mentioned requirements. The lowest level consists of the particular networks or physical devices that are used to receive the media content. An adaptation level is located above the lowest level to hide the peculiarities of the mentioned networks and interfaces. Four modules can be distinguished inside the adaptation level, according to the capabilities needed in the meter and offered by physical level devices: audience measurement performance, context measurement performance, storage and retrieval of the measures and communications (use of the return channel). In this way, the rest of the model does not need to take into account the particular capabilities or interfaces of the said physical devices. This is shown in Fig. 1

The service architecture or software hierarchy is closely related to the four-level structure because each level has its own characteristic service. For the purpose of this abstract, only two kind of services must be taken into account: abstract services, located in the adaptation level, are in charge of providing simple capabilities making use of the lowest level interfaces; and functional services, located in the next level, called functional core, which are in charge of offering more complex capabilities making use of a chain of abstract services. Applications are located on top of this hierarchy of levels and services. The mentioned abstract and Functional services form an integrated development environment, which is available to allow the developers to create their applications. In this way, applications can accurately satisfy the requirements and need of any audience research system.

Whereas the block diagram explains the system modules and the service architecture, as well as the relationships between modules, the data model specifies the information exchanged by services inside the meter. Moreover, the data model describes the information exchanges between parts of the end-to-end system (typically, between the meter and the data centre).

In the data centre, data streams from a variaty of source meet. This includes audience measures from the meter, as-run logs from the content provider, several databases, metadata describing audiovisual contents, etc. Data mining process are carried out to obtain the final stats of audience results.

Finally, it must be taken into account that this section explains a generic system model and not an instantiation. Particular implementations are possible to adapt this reference model to specific scenarios. A very favourable case can be a software implementation inside the user equipment for media consumption.

3. ADAPTATION TO USER CENTRIC MEDIA

The popularity and affordability of broadband connections in the home and the popularity of social networking services (normally web-based) allow users to exchange their preferred TV program information, thus helping them in their digital TV content selection. For that reason, traditional media consumption figures should be mixed-up with global consumption parameters in user communities[4].

Indeed, the approach to the solution does not rely only on the technology but also on the system requirements: a) the individual user is replaced by communities, b) it is needed to collect global audience per channel with ability to filter on a per community basis and c) audience information up to date in a near real time for service providers and communities/end-users.

If one of the end user communities is interested in a particular programme, then it could be of a potential interest for this end user. This means that the interest and impact of the content to the user may differ if is a "member" of a user community or not.

In the technological level, there should be elements that following the elsewhere mentioned reference model can be adapted to user centric media. Fig. 2 outlines the main elements identified: Web portal, Popularity Zapper and EPG server.

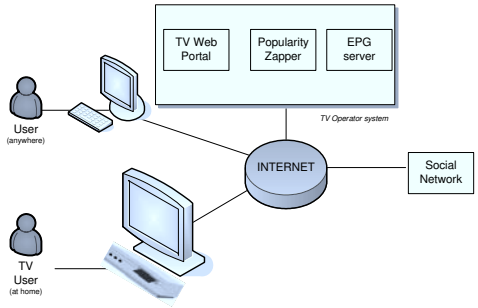

Fig.2 system architecture for user centric media

When consuming TV programs at home, the TV user interacts with his STB, which is in charge of retrieving preferences and settings from this said web portal which implementation can be In fact, the TV Web Portal is not directly interfaced with the Social Network but with a Social Network Adaptor. It acts as an abstract layer between the portal and the social network in order to support more than one social network and for not being impacted by social networks changes in the interface definition.

The interface between the EPG server and the TV Web Portal can be implemented in order to set up a real time audience viewing service through this web application. All actions on the STB that change the current channel on which the STB is currently tuned imply a communication with the Popularity Zapper, which is a server managed by the digital TV Operator for receiving channel audience update information from STB. The Popularity Server is in charge of forwarding audience statistics to the EPG server. By setting an index renewal strategy it is then possible to provide updated information to STB or to the Web Portal.

The system acts as follows: from anywhere users can connect to the web portal, managed by the digital TV Operator. This TV Web Portal is used by subscribers for managing their preferences / settings. Such audience information, once received by the Popularity Zapper, is stored in a local database.

The Social Network is used indirectly by the TV User from the TV Web Portal. The hypothesis is that the end user has an existing account on this said social network. Then, once logged into the portal, the TV User can import his social network account profile in order to select which community he is member of he would like to use in the digital TV system.

When the TV user wants to get more information about a channel on which the STB is currently tuned on, the STB gets audience information from the EPG server. The audience information returned is about the global audience and for each community defined on the TV Web Portal and flagged as having to be used in the TV environment.

Once completed these steps it is necessary to set-up a proper method to link the measures obtained from the said architecture to the presented architecture.

4. METRICS TO MERGE BOTH APPROACHES

Many metrics has been defined for tackling the user consumption and possible recommendations of programmes to the users[3]. But one of the main problems is the adaptation of the metrics for the measurement of the interest and impact to the audience when users are linked in communities.

In our model, the meters provide accurate information to the data centre, including measured consumption C_M, and user profile U_P. The measured consumption C_M relates to the sample of people represented by the panels, so the actual consumption C_A is a stochastic function of the measured consumption C_M and the representativity of the sample R_P: $C_A = f(C_M, R_P)$. We define a set of users $U = \{U_1, U_2, \ldots, U_n\}$ that could be members of a community or not. Linked with C_A we may find another parameter that provides useful information for the media industry: the actual audience impact I of the consumed content. Impact is again a

stochastic function of several parameters, among them, and for simplicity of the model, we may consider the actual consumption C_A and the interest I_{nt} of the particular audience in the content: $I = g\ (C_A, I_{nt})$, where I_{nt} can be estimated upon the user profile information U_P. Both C_A and I are absolute parameters.

Taking into account the user centric approach of our proposal and the available knowledge about the user communities, it could be of more interest to consider a relative parameter that provides information about the *efficiency E* of the impact, described as:

$$E = \frac{I}{C_A} = h\ (C_A, I_{nt})$$

E is a multidimensional random variable whose precise estimation is to be properly modelled at the data centre.

With all this variables described, it should be firstly understood the main problem to be solved, with the hypothesis of having different methods for solving the rest of the parameters and modelling stochastic variables. The problem that we are tackling is the different result of the impact and efficiency variables when the user is member or not, of a user community.

To simplify the operation as due to the length of the paper it is not possible to elaborate a complete demonstration or an example covering all the possible cases. In the example we have assumed, in order to simplify the understanding of the paper, normal distributions which are the common case in the interest functions proposed. In the communities (U_c) the term "mean" is the degree of interest (or correlation of interests) of the user w.r.t this community and the variance the deviation. In U_p the mean μ is the declared interest by the user and variance σ^2 the deviation (depending on the exactitude of the declared interest).

$Int(U_c)$ (μ, σ^2)	U_1	U_2	U_3	U_4	U_5	U_6	U_7	U_8	U_9	U_{10}
Com.1	0.8; 0.2	0	0	0	0	0.8; 0.15	0.8; 0.15	0	0	0,6; 0.1
Com.2	0	0	0	0	0	0,7, 0,15	0	0.8; 0.15	0	

$Int(U_p)$ (μ, σ^2)	U_1	U_2	U_3	U_4	U_5	U_6	U_7	U_8	U_9	U_{10}
Films	0.8; 0.2	0.8; 0.2	0.4; 0.1	0,5; 0.2	0,5; 0,2	0.4; 0.2	0,5; 0,1	0.4 0.1	0.9; 0.2	0.4; 0.1
Sports	0.8; 0.2	0.8;0 .2	0.5; 0.1	0.4; 0.2	0.9; 0.2	0.9; 0.1	0.9; 0.2	0.9; 0.1	0.9; 0.2	0.3; 0.1
News	0.4; 0.1	0.8;0 .2	0,5; 0,1	0.9; 0.2	0.9; 0.2	0.4; 0.2	0.8; 0.1	0.3; 0.1	0.8; 0.1	0.9; 0.1

Fig.3 Sample values for the stochastic variables U_c and U_p

C_M can be described as the content consumption variable which is the asset consumed by the user U_i. To simplify the example we assume only the 3 content types and with a complete viewing of the content to avoid using discrete time variables. In the metric proposed:

$$I = \sum_{c=1}^{C} \sum_{i=1}^{N} Int\left[U_i \left| (U_{pi}, U_{ci}), C_{Mi} \right. \right] * R_{pi}$$

where R_p is the "representativity" of the sample according to the statistical inference of the users panel (in audience measurement some users should be carefully selected as representatives of a universe of people and then their data inferred to obtain, under a controlled error, the consumption figures).

If we use U_c as a weighting factor for $U_c\ k \in (0,K)$, we can approximate the equation in our example, as a sum of independent normal distributions (total mean μ is the sum of the means and the same applies to the variance σ^2).

The difference between I (including user community's effect) and I' (not including this effect) can be found measuring the square error between both.

Finally with the values of the table and using some simplifications such as: taking k=1.1 and assuming that it is affecting only the mean; considering C_M fixed, where C_1 is a user community with high interest in "Films" and C_2 in "Sports"; where the users from 1 to 5 are consuming a film and from 6 to 10 a sport match; we can obtain the different values of I and I' resulting $\mu = 0.713$ meanwhile $\mu' = 0.69$ and in our simplified example $\sigma^2 = 0.16$.

This does not demonstrate that participation in user communities increases the impact of the content, but shows that with reliable metrics it could be measured the impact which can be different in both cases.

5. CONCLUSIONS

Audience Measurement techniques are lacking of the adaptation to new media paradigms such as user centric media. The described model and the adaptation system can merge the necessary data to obtain more reliable figures of the consumption, easing the development of new business models and giving better figures of the content and publicity impact in the users.

6. REFERENCES

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