

NEM position paper on Content Management

New ways of participation in the production and consuming of multimedia contents:

The creation of contents (understanding content as file format including video, audio, data, text, metadata or any combination of all of them) is the preserve of professionals, who were in charge of the production in a systematic way of these elements with the aim to create value and monetize it. Additionally, the last trends shows the increasing number of non-professional people who create contents not targeting to earn money but to show, share or even jointly manipulate content with their relatives and friends for ludic purposes.

This tendency, along with the amount of proliferation of non-professional contents due to the world's hungry of information in any kind, and the existence of a number of cameras, recording systems etc. has brought the existence of huge amounts of available contents everywhere.

Moreover, it is much frequent today having a co-creation of contents between professional or amateur creators in such a way that it is quite difficult to determine the authorship of the final multiple-times combined content result. As a consequence of these facts, the borders between creator and consumer are blurring rapidly. The content frame is usually provided by the professional and this frame is fulfilled by the user.

Furthermore, contents present nowadays much more rich and complex formats than ever, including combination of traditional types of media, emerging 3D formats with higher definition, usage of metadata along with the raw data etc. It is foreseen that the orchestration of contents everywhere might give the consumer a richer fully immersive experience of virtual worlds coexisting with the real world.

All these new emerging scenarios pose some challenges in terms of seeking technical solutions to handle the whole value chain of producing, storing and consuming contents, but also legal issues related to the rights of the contents and the way the user can dispose, manipulate or share contents. It is important to think about new business orientation in the light of the trends in creating and consuming and do business with contents. The new development challenges networks in a new way (e.g. micro-billing and micropayment systems).

Challenges (technical and legal, economical) of handling contents.

One of the main obvious challenges the proliferation and complexity of content arises is the need to have new convergent next generation networks to convey and render contents more complex and more bandwidth demanding (high definition, 3D...). The traffic increase of multimedia content through the network will impose the development of next-generation networks not only with significantly higher bandwidth but also with new possibilities of use. The architecture of these new networks will be largely influenced by the existence of multiple digital media content crossing the networks, being storage, classified, retrieved and handled. An important source for growth and innovation in this sector is the regulatory differentiation between networks and media

content. The challenge is to let all players of the value chain participate at this significant growth while content is still delivered non-discriminatory.

Creating services for different terminals, networks and media format is becoming more complex, but it is mandatory to increase the capability to have the content adapted to any terminal and platform and personalized to user preferences. Contents for the users must be ubiquitous, context-aware, personalized, adaptive and even anticipatory to user expectations. The content must be adapted to a multiplatform environment as well. As we see e.g. in the mobile sphere one of the elements of hampering success is the lack of standardization of terminals for content creators.

Another important issue in the content management and multimedia networking is certainly quality of service (QoS) control. The visual quality of video content and audio quality experience control and maintenance, in the network media, is of crucial importance for reliable multimedia management and consumption. Specifically, in order to provide all multimedia consumers with high level of QoS, in highly complex network environment, video and audio quality should be constantly monitored. This is especially important having in mind different content formats, their re-formatting in network nodes and necessary display adaptations. Optimally, QoS control should be driven by subjective assessment by the end-users. In practice, this can be accomplished by introducing objective metrics, suitably matched with audio-video subjective quality and multimedia artifacts. Different video and audio quality assessment schemes are to be applied for different multimedia content in terms of an event that they present, content features (e.g. in video spatio-temporal activity), and quantity and value of information they provide. Consequently, for this purpose content based classification should be employed. Finally, a specific relation between multimedia content/format, required quality and network specifications should be determined and taken into account for development of an advanced framework for video quality assessment in multimedia management, storage and consumption. It includes development and implementation of algorithms for content-based clustering, set of audiovisual quality measures and network monitoring.

In terms of content professional management the challenge is devising the organizational practices to identify, create, store, distribute contents in order to generate knowledge within the companies. It is mandatory to provide the right content, to the right people in the moment it is required. In practice, apart from providing information access, it will be required an adequate processing means that includes intelligent ways of storing data and contents, classifying it, searching mechanisms to capture just the required information, systems to recommend and guide users or even generating knowledge in the intellectual sense the humans usually do.

A major challenge in the intelligent management - storage, search and retrieval, recommendation, etc. - of content is the reliable and efficient automatic extraction of rich metadata that characterize it. Content management typically relies on metadata that are provided by the content creator, such as content thematic categorization, related events, location, etc. Whilst some of them can be seamlessly generated together with the content itself (e.g. GPS coordinates automatically recorded by a smart camera, together with the actual image/video content), the generation of others requires additional effort by the content creator. However, the extremely high rates at which new content is created and the shift from professional to amateur creators render the manual generation of content metadata a tedious and extremely expensive process, while at the same time the resulting metadata typically suffer from inconsistencies and

incompleteness that hamper the entire content management chain. This necessitates the development and integration in the content management chain of content analysis methods for automatically processing the content and generating rich and highly accurate metadata for it.

Another challenge of the paramount importance in the world of contents is the provision of technical solutions to guarantee the legitimate intellectual property right of the content creators and interest of consumers (DRMs and associated systems). A right balance between the right of the intellectual property owners who must monetize its ideas, creations and works and the consumer who might want to use the content (listen, watch, copy, translate, storage, distribute) must be pursued. The balance might be achieved by bringing together the restrictions of use (e.g. listening just for a limited period of time) of the consumer and the obligation they have to meet (e.g. payments). However, careful must be taken not to destroy the cultural achievement of the digitalization by changing the rules too radically.

Interoperability represents the correct functioning of all the elements of the value chain when interacting among them. This feature is one of the most important challenges of the content world due to the advantages it provides to the final user in terms of the freedom to choose different kind of terminals in which any kind of content can be rendered. Furthermore, the content producer is not bound to any particular transmission channel and for the device manufacturers it gives them a more ample spectrum of service capable to be settled on their terminals and equipments.

Security and trust are as well necessary attributes to guarantee a viable business around contents. This means building secure and trustworthy mechanisms to preventing illegal access to private content, hindering identity tampering, guaranteeing digital identities, ensuring privacy in transactions, anonymity of access to contents and assuring the creators will be rewarded.

The new trends in content handling will as well pose some requirements on the legal and regulatory framework where the competition/cooperation among different actors is taking place. To guarantee a fair environment, a proper balance between intellectual property rights and consumers expectations must be achieved. Transparency together with stable and predictable rules must be set in order to encourage competition, investment, innovation within the professional arena but, at the same time, to foster the spontaneous creativity of the people or communities. A market with regulatory uncertainties will prevent proper innovation and create a potential source of conflicts between producers and consumers which will not guarantee the adaptation of the model to user needs. The regulation must have a transnational approach as the networked media market has a clear global nature. Furthermore, a right balance between over-regulation and no regulation at all must be aimed; as an over-regulation might prevent innovation and business exploitation, whereas, no regulation may, equally, bring a market under-development.

Regrettably, there has not been a universal way of representing and coding the multimedia content. On the contrary, there is a number of standards (de facto or universally accepted) for individual media coding (video, images, audio etc.) being MPEG-x the most representative. Efforts should be devoted to guarantee, respecting the market laws and competition, the rights of user of having better access to content based on standards or, at least, ensuring interworking and gracefully coexistence of different approaches thus promoting seamless access to any kind service.

Furthermore, given the envisaged intelligent content management services, it is crucial to pursue representations that ensure the common understanding of the exchanged semantics, as opposed to mere syntactic stipulations that capture meaning only implicitly and in non declarative ways. Advocating semantics interoperability strengthens further the potential for the effective and efficient handling of the content complexity and allows heterogeneous systems to share, reuse and process content towards more complete and user meaningful services. Finally, a major challenge ensuing from the sheer volume and richness of multimedia content and its ubiquity across diverse kinds of professional and amateur applications, relates to the pursue of scalable and generic content representations and mechanisms for their handling.

Conclusions

The main aim of the NEM community is fostering the advent of services based essentially in providing to the people an access to multimedia contents everywhere, in any time, in any format in a secure and trustworthy and personalized manner. Furthermore, giving the chance of handling those contents meaning the storage, classification, search, retrieving and enriching them or even generate real knowledge from them, must be pursued as well.

Targeting that, the following position element should be encouraged:

- Fostering a balance between intellectual property rights and expectations, interest and rights of consumers of networked contents.
- Promoting the creation of a trustworthy and safe model of production, transfer, storage and consuming of multimedia contents, always respecting IPRs as well as consumer safety and privacy.
- R&D efforts are indispensable to develop new solutions for security assurances that can achieve the best trade-off between the protection of contents and the protection from the contents. The security objective is not only to protect the contents throughout its lifecycle but also to protect the underlying systems from the contents-enabled threats (data theft by embedding into large chunks of contents, protection against processing of illicit contents, etc.)
- Guaranteeing interoperability of formats as a means of increasing and facilitating new business model applicable to contents on line.
- Advocating syntactic as well as semantics interoperability through formal representations and well-grounded, generic mechanisms for uniform meaning interpretation.
- Promoting the investigation of scalable, yet comprehensive mechanisms for capturing the richness of information characterizing the entire value chain of content production and consumption.

- Promoting the development and integration in the content management chain of content analysis methods for automatically processing the content and generating rich and highly accurate metadata for it.
- Ensuring, as much as possible, the interoperability as one of the key factors in the success of DRM systems.
- Supporting a fair regulation environment with transparency and stability to avoid uncertainties in order to promote investment, innovation and the creation process.
- Coordinating efforts in R&D to create mechanisms for content processing, knowledge creation and dissemination. That includes intelligent ways of storing data and contents, searching mechanisms to capture just the required information, systems to recommend and guide users etc. Project in this regard must be considered as strategic.
- Engaging in multimedia QoS control in terms of video and audio quality that should be guaranteed and maintained. This requires development of video assessment tools for real-time network monitoring with objective metrics which are well matched with subjective feeling by end-users, and its suitable utilization, adaptation and application in smart multimedia networks.
- Jointly considering the methods for the automatic generation and the consumption of content metadata and the different parameters that can affect them (e.g. network architectures, services, terminals, media formats, etc.). This is the cornerstone for optimizing the content management chain as a whole.
- Marking the content management as a potential and priority field where creating new business opportunities. The coexistence of user that are at the same time content creators and content consumers; along with the co-authorship between professional and non-professional content generators, opens new opportunities that must be supported.