

Innovation Reports

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ACDC

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Head in the clouds

Using cloud computing to manage resource-hungry video content distribution

The proliferation of video content on the Internet, from both service providers and consumers, is placing great strain on existing public infrastructures and slowing many services to the point of unusability. With Internet broadcasting (Web TV) and streaming video on demand (VoD) becoming more popular, increasing bandwidth on communications infrastructures is being taken up by the delivery of such content. So much so that conventional video-processing systems, search tools and content-personalisation mechanisms are becoming saturated and threatening to overload public infrastructures.

MOVING TARGET

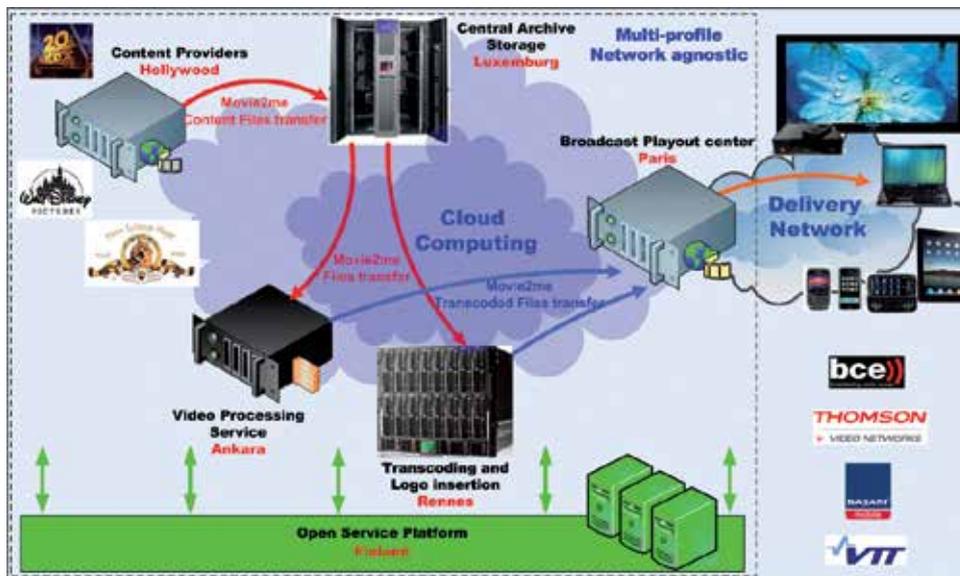
The ongoing fast penetration of cloud computing technology in all sectors of ICT based systems reveals the technical and strategic relevance of the ITEA 2 ACDC (Adaptive Content Delivery Cluster) project; the project results are increasingly relevant to lowering the cost and raising the competitiveness of multimedia and entertainment services delivery. Cloud computing is still a relatively young and fast-moving technology and research area within ICT. In each application domain, and between different application scenarios, the security, trust, scalability and availability requirements as well as business models can vary considerably. This makes it challenging or

even undesirable to select only one cloud computing deployment model for the implementation of a complex end-to-end system with multiple actors, services, applications and business models involved (e.g. ACDC system). Rather the variance in requirements of different end-to-end application scenarios favours an approach where deciding among different cloud computing deployment models can be made per service or application. In terms of system architecture and cloud service models, the approach of ACDC project is to use service-oriented system architecture with Software as a Service (SaaS) model, also allowing programmatically accessible services. This approach leaves the decision on the type of cloud computing

deployment model to the service provider, based on security, trust, scalability, availability and business requirements per service while interoperability with other services possibly using a different cloud deployment model are retained. The feasibility of the ACDC project service model as well as integration and interoperability approach is validated in the ACDC demonstrations.

CLOUD WITH A SILVER LINING

While the usage of video delivery over Internet is growing exponentially, the complexity also is growing, with more and more contents types, more devices and uses, as evident in the appearance last



year of new protocols to cope with varying bandwidth, such as Apple's HTTP Live Streaming (HLS), Adobe with Flash-based Dynamic Streaming, Microsoft with Smooth Streaming for Silverlight and MPEG DASH (Dynamic Adaptive Streaming over HTTP) ISO standard. Such growth of traffic and such a multiplicity of streams and codecs show a critical need for efficient video delivery over IP solutions.

The ITEA 2 ACDC project set out to tackle this problem using the resources of 'cloud computing', which offers practically limitless resources from an online virtual infrastructure, and pave the way for a range of new services and applications based on semantic-knowledge technologies. This involves computers and other devices sharing resources, software and information over the Internet on demand, much like the electricity grid. Using the resources offered by such virtual infrastructures could make possible much larger-scale, digital-content processing, storage and delivery, and underpin more efficient end-to-end transmission of multimedia content. The goal of ACDC was to develop and demonstrate an adaptive content-delivery cluster with intelligent multimedia applications such as web and mobile TV, video on demand, personal video recording and targeted advertising services, all using different networks and delivered to a variety of user terminals.

FROM USE CASES TO DEMONSTRATION

The pathway to success has been achieved in three steps. Firstly, following a thorough study, 25 elementary use cases were completely reworked into four consistent and fully comprehensive master scenarios: the business case of a cloud infrastructure

that allows broadcasters and mobile operators to offer and request transcoding services; the case of a service provider proposing a huge volume of video content through a public site that relies on the ACDC Transcoding & Delivery services to stream videos in a format adapted to the end-user's device and network capabilities with high level performances and low investment; new kinds of value-added convergence services and advertising models that allow television broadcasts to create an interactive and augmented viewing experience via linear broadcast; and an on-line gaming service that can increase the number of consecutive game plays and end-user loyalty, allowing more advertisement views for the gaming service provider. Scenarios for final demonstrations were then defined and implementation begun so that the results could be demonstrated during the Co-summit and final review in November 2012.

From a technical point of view, the main contributions came by way of defining business case implementation scenarios and requirements as well as the development of partners' components and constituting the prototype, platform installation and configuration. Work then focused on the design and implementation of the user awareness services of the ACDC software and services platform while comprehensive scientific contributions advancing the state-of-the-art were made in the form of numerous scientific publications. The final demonstration took place in Luxembourg with the presentation of four demonstrators that comprise a B2B approach for one business case scenario addressing content delivery and transcoding in the cloud and three B2C approaches, one demonstrating optimised content delivery and adaptive processing, the second

one showing smart Hybrid broadcast broadband TV (HbbTV) services with cross-device mobile notifications and advertisements and the final one showing semantic recommendations for efficiency in web gaming.

DISSEMINATION AND STANDARDISATION

As far as communication is concerned, several articles were published on paper and online media while a lot of effort went into preparing this dissemination in the form of an international workshop with NextMedia in Finland in March 2012. There were 40 peer-reviewed documents (scientific publications, Master's thesis, book chapters) and extensive participation by the project partners in international & national events (workshops, conferences and International exhibitions such as IBC, NAB, WMC, EBU, SCTE Cable-Tec...). Electronic tools have also been utilised (extranet, addresses reflectors, internet website...) along with promotional material, project presentations (video, leaflets, posters, slides...) and project newsletters.

In terms of standardisation, Institute Mines Telecom participated in and contributed to the standardisation of an HEVC-based 3DV codec by ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 1, Joint Collaborative Team on 3D video coding extension development. Bull is involved in the OpenStack ecosystem, and is leading the CompatibleOne project geared to the need for interoperability in the cloud (Implementation of the OCCI standard). Interoperability tests and a proof of concept have been realised between the ACDC and CompatibleOne projects. In addition, Thomson Video Networks has been involved in the standardisation of MPEG DASH following several ISO/IEC JTC1/SC29/WG11 meetings and is involved in the MPEG DASH promoter group. Sofia Digital joined the HbbTV consortium, participating in the HbbTV standardisation work and contributing especially to conformance and interoperability testing of the specification, applications and receivers.

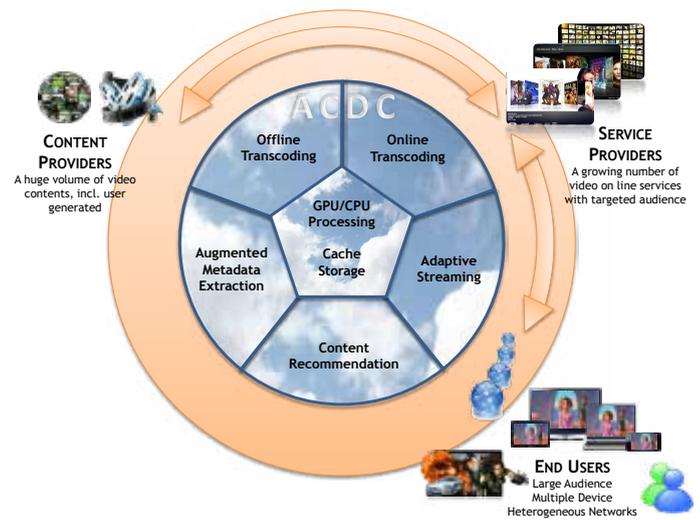
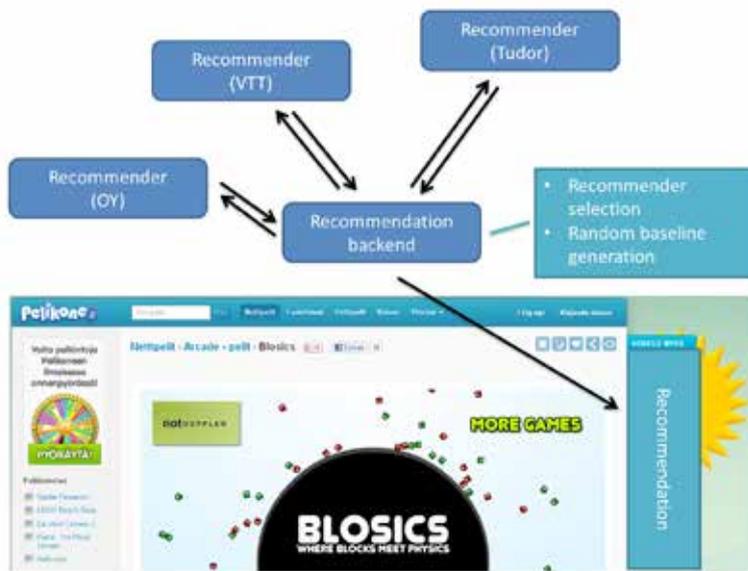
OPENING A DOOR TO NEW MARKETS

ACDC results are expected to be significant drivers for new and competitive multimedia services in Europe, a market based on cloud-computing infrastructures for user-aware entertainment applications. The cloud will provide the resources for content and semantic-knowledge processing, storage and delivery, thereby opening the door to a whole new marketplace for the European computing industry. Such advances will enable semantic content and knowledge technologies to be progressively exploited in Europe and so boost the competitiveness and, consequently, the value of European multimedia and entertainment applications.

A few cases studies from the project are illustrative of the impact that the innovative ACDC platform is already having at customer level and of the threshold of a television revolution. For example, a service company within the RTL Group (the Luxembourg-based radio and television business), BCE, used the results of the ACDC project to implement RTL India via the cloud from Luxembourg. The success of this is being seen as a springboard to implementing a cloud service in Luxembourg for the whole global RTL Group. Another example is provided by Thomson Video Networks, which provided to NHK the unified

video files to be transported quickly and securely through the cloud. BCE initiated first test installations for the major production studios in California and New York, which are now commercially operational. Also RTL's new RTL India channel, as indicated above, will receive its broadcast material via this service. The usage of cloud transcoding and storage is currently being evaluated. The idea is to better allocate the available resources within the RTL Group worldwide and so significantly reduce costs and accelerate the media handling in the workflow from production to broadcast.

Sofia Digital has been working as chairman of the Finnish HDTV-Forum (HbbTV working group) responsible for TV-markets self-regulation in Finland. After ACDC project demonstrators were shown to TV market key players in Finland, the Finnish HDTV-Forum announced it would employ the NorDig specification for hybrid television. Sofia Digital started HbbTV Trial Broadcasts with Digital in Finnish national DVB-T2 network on 19 June 2012 using the HbbTV server product and applications partly developed and demonstrated in the ACDC project. The Sofia Digital HbbTV server was delivered to and used by all the major



system developed in the context of the ACDC project and commercially deployed under the name of VS7000 to show more than 35,000 video clips of the London Olympics to more than four million viewers. (see <https://www.thomson-networks.com/en/news/nhk-japan's-public-broadcaster-chooses-thomson-video-networks'-vibe™-vs7000-support-online-vod->).

The benefits of using the cloud to relay such services mean that all the heterogeneity inherent in current practice can become homogeneous, ultimately leading to more speed and efficiency as well a higher level of accessibility and making non-linear and interactive television a much more realistic and practicable option. TV in and from the cloud signals not just an innovation but a revolution.

FAST EXPLOITATION

Several partners have transformed the results of studies and research done in ACDC with their customers. Among the many examples is the Movie2Me Service developed within the context of the project that allows

The new generation of Video Transcoder/Streamer (BVS-NG) enabling multiple user device support (set-top-box/ipad/tablet/android) has been integrated in the Bull Offer and has been proposed to several telecom operators with a first commercial deployment. In addition, work done in ACDC is contributing to enhance the Bull Cloud offer.

Kit Digital integrated ACDC transcoding and delivery services into its platform (OVP) and its Kit Cloud is now compatible with ACDC services and could be customised for any customer with any ACDC transcoding and delivery services. Sanoma has used the recommendation system analytics tool prototypes developed during ACDC to measure the effect of various recommendation algorithms on user session lengths and click-through rates. This has shed some light on the actual benefits (increasing user activity on the web site, and thus being able to display more advertisements) that can be achieved by varying the recommendation algorithms.

TV channels in Finland for their internal HbbTV trials. The Thomson Video Networks Unified System studied in the frame of ACDC project is a fully-integrated IP video solution tailored for all new convergent applications such as Web TV and Over-The-Top (OTT) service delivery, as well as traditional IPTV and IP/ Cable delivery. This Unified System, now known as VS7000, was tested in several field trials deployed worldwide in 2012.