Multi-Screen Cloud Social TV:
Transforming TV Experience into 21st Century

Yichao Jin, Tian Xie, Yonggang Wen
Nanyang Technological University
Nanyang Avenue 50, Singapore
{yjin3,xietian,ygwen}@ntu.edu.sg

Haiyong Xie
University of Science and Technology of China
96 Jinzhai Road Baohe, Hefei, Anhui, China
haiyong.xie@ustc.edu

ABSTRACT

Nowadays, TV experience has been transformed from the traditional "laid-back" video watching experience to a "lean-forward" social and multi-screen experience. In this demo, we design and develop a multi-screen cloud social TV system in response to this trend. Our system is built upon two enabling technologies, including a cloud based back-end infrastructure and a multi-screen front-end application. We demonstrate two key features of our system based on real user scenarios, including a living-room video watching experience with remote viewers, and the video teleportation as an enhanced multi-screen experience.

Categories and Subject Descriptors

[**H.5.1**]: Multimedia Information Systems

Keywords

Cloud; Multi-screen; Social TV; Video Teleportation

1. INTRODUCTION

Recently, the emergence of multi-screen social TV [1, 3, 4] is dramatically transforming the TV experience. First, the traditional "laid-back" video watching experience is integrated with an immersing "lean-forward" social networking experience, resulting in an user-centric living room TV experience [4]. Second, social TV aims to offer ubiquitous services that are available at anytime, on any device, at an affordable price [3]. Finally, with the significant growth of media consumption across multi-screen [1], users want to transfer the ongoing sessions from one device to another, without any interruption of video streaming. Nevertheless, given its highly regarded value, large scale deployment of multi-screen social TV is limited, if not totally absent.

In response to this trend, we design and implement a multi-screen cloud social TV system. Two enabling technologies are developed to build this system. In the back-end,
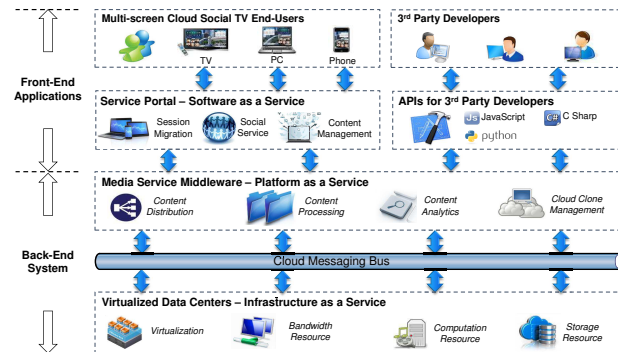
Figure 1: Multi-screen cloud social TV framework

we proposed a cloud-centric media platform [2], which encapsulates a set of media services into a middleware based on virtualized data centers, and exposes them throughout APIs (Application Programming Interfaces). In the front-end, we invented a multi-screen orchestration protocol for user sessions to migrate across different media outlets.

In this demo, we will demonstrate two key features. First, we will show a rich set of social features, where all the occasions of social TV consumption are offered as a one-stop solution. Second, we will show an enhanced multi-screen experience, *video teleportation*, by which viewers can seamlessly move a program in progress across multiple devices with intuitive human computer interaction technologies.

2. SYSTEM DESCRIPTION

Figure 1 presents a systematic view of our multi-screen cloud social TV. This system can be viewed as a layered cloud computing service model, consisting of two fundamental components, including a back-end infrastructure and a front-end application deployment.

Back-End System: The back-end system (i.e., the cloud centric media platform), leverages cloud computing paradigm to provide both infrastructure and platform service.

In the infrastructure layer, the physical servers in datacenters and the intra/inter datacenter networks, are abstracted into a pool of IT resource, including bandwidth, computation and storage, via virtualization techniques. Those resources can be elastically carved out by virtual machines, to meet application demands in an economical fashion, while maintaining a high level of quality of service (QoS). This service is offered to upper layers via a cloud messaging bus.
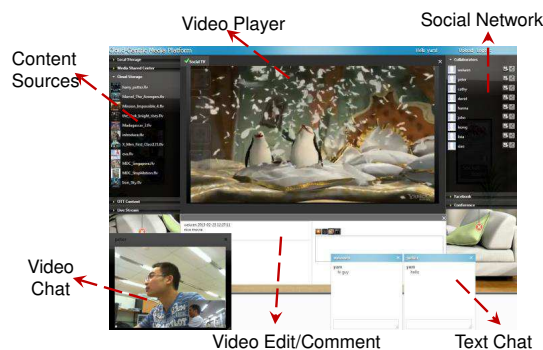
Figure 2: Multi-screen cloud social TV GUI

(a) Authentication   (b) Interest indication

(c) Session migrated   (d) Throw session back

Figure 3: Video Teleportation

In the platform layer, we encapsulate a set of media services (e.g., content distribution, processing, and analytics), into a middleware, on top of the infrastructure. We also integrate those services into a cloud clone management module, which is the key technology to support multi-screen social experience. In particular, each user is represented by a virtual machine, serving as his proxy in the cloud, to manage all the associated devices and session information. Such a virtual machine is called cloud clone. All the platform services are exposed to upper layers via APIs.

Front-End Application: Multi-screen social TV is the pilot application built on our platform. We develop various application services (e.g., session migration, social functions, and content management), based on the cloud clones. Those services are accessible to the end users via web based interfaces. In this way, we hide all the intelligence in the cloud. Thus learning process for the end users can be minimized, and no special equipment is required on the user side.

We will soon release a set of APIs in different language versions including Javascript, python and C#. As such, any third party can use them to develop new applications.

3. DEMONSTRATION

We will demonstrate two key features of our multi screen social TV system, including a rich set of social TV modalities and the video teleportation as an enhanced multi-screen experience, based on real user scenario.

Rich Social TV Experience: At the weekend, Peter is enjoying his TV time via multi-screen cloud social TV (the user interface is shown in Figure 2) at home. Among various content resources, including video on local disk, video on the cloud, OTT videos and live streaming, Peter chooses a video to watch. During his watching, he finds his best friend Cathy is online among his friend list in Facebook and Google+. Peter says "hi" to Cathy via text chat box, and invites her to view the same video from the same point at a same pace. Now they can discuss the content they are both watching via video chat from different locations. They can even collaboratively edit the original content by inserting text, pictures and audio, and generate new contents.

Video Teleportation: Peter suddenly realizes that he has a family party tonight, and he has to go to the supermarket at once. However, he never wants to give up the chance to en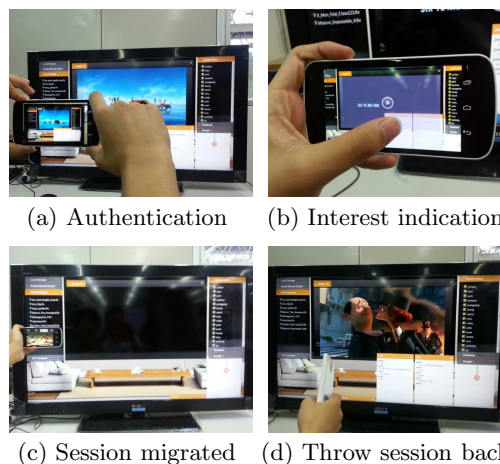joy a video and have a nice discussion with his best friend. Fortunately, our system can help him to teleport this experience from TV screen to his mobile device.

Peter first scans the TV screen, which contains a digital watermarker, to get authentication on his smartphone (Figure 3-(a)). Once his phone is authenticated, a synchronized image will be displayed on the phone screen. Peter then chooses to bring away the video chat and content viewing parts with him (Figure3-(b)). Finally, he simply flips his phone away from the TV to grab the sessions, and continues to enjoy the video and chatting on his smartphone (Figure3-(c)). When Peter returns back home, he simply "throws" his phone towards the TV, and the sessions also immediately get back to the TV screen (Figure3-(d)).

4. CONCLUSIONS

In this demo, we presented our multi-screen cloud social TV system as a novel paradigm to transform the TV experience. It adopts the cloud computing paradigm to encapsulate media services in the back-end, and provides attractive multi-screen and social features in the front-end. This system had been deployed on top of a private cloud at Nanyang Technological University. Upon its debut, it had been featured in more than 1600 news articles from 29-plus countries, resulting in a worldwide media coverage. A beta version of this system will be soon exposed to over 200 students.

5. REFERENCES

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