

1 Introduction

The advent of the Internet poses great challenges to the design of public submission systems as it eliminates traditional barriers, e.g. geographical location, costs associated to physical media, and mailing, that helped keep the number of submissions at bay in the past. In addition to cost reduction, recent technological advancements and the popularization of digital media capturing devices, especially photo and video cameras, have made it possible for the common citizen to produce multimedia files routinely [BREITMAN 2010]. An important aspect of the Internet today is that the amount of User Generated Content (UGC) [YATES 2009], i.e., text, video and image content produced by users worldwide, accounts for four times the volume of conventional content generated in a daily basis [RAMAKRISHNAN 2007]. As the quantity of generated information grows, so does the demand for information systems capable of processing storing, querying and retrieving relevant data [COHEN 2007].

1.1 Motivation

The Brazilian Big Brother reality show is broadcasted by free-to-air TV network with an audience of more than eighty million people simultaneously. The idea behind this reality show is to portray the life of 16 random anonymous people while living together under the same roof, for a total period of three months. They are isolated from the outside world but are continuously monitored by television cameras. The housemates try to win a cash prize by avoiding periodic evictions from the house.

With technological advances the application process evolved from sending a videotape by postal mail to uploading a digital video using the Internet. Due to legal reasons, videos can not be hosted in websites such as YouTube or Vimeo. Applicants are allowed to send videos in the video format of their choice. These must be stored until the end of the selection process (three months). All the videos need to be transcoded to a standard format, so that the TV show's production team is spared from the hassle of having to deal with a plethora of video formats and different codecs.

1.2 Goals

In this thesis we focus on the problem of designing open UGC submission systems. More precisely, we define public, open ended, submission systems as the class of software applications in which the public at large can submit a contribution in the format of digital objects. Typical examples of such systems are conference management systems and open registration websites, where users can submit their contribution electronically.

In this scenario we explore Cloud Computing technology, and argue that it provides the necessary resources upon which to propose a general architecture for elastic, open access, public submission systems.

1.3 Thesis Organization

This thesis is based on a series of published articles, organized as follows:

- **Chapter 2.** General overview of the problems and challenges of research associated with this work, the background and an overview of the online video landscape;
- **Chapter 3.** Proposed architecture for large scale processing systems using cloud computing;
- **Chapter 4.** Architecture implementation details and case study of the Big Brother reality show;
- **Chapter 5.** Different usage scenario for distributed high performance video processing;
- **Chapter 6.** Conclusion and future work.

The research produced by this work was published in the following articles:

- Breitman, K.; Endler, M.; Pereira, R.; Azambuja, M.;, “When TV Dies, Will It Go to the Cloud?”, IEEE Computer, vol. 43, no. 4, pp.81-83, April 2010;
- Azambuja, M.; Pereira, R.; Breitman, K.; Endler, M.; , “An Architecture for Public and Open Submission Systems in the Cloud,” Cloud Computing (CLOUD), 2010 IEEE 3rd International Conference on, pp.513-517, 5-10 July 2010;
- Pereira, R.; Azambuja, M.; Breitman, K.; Endler, M.; , "An Architecture for Distributed High Performance Video Processing in the Cloud," Cloud Computing (CLOUD), 2010 IEEE 3rd International Conference on , pp.482-489, 5-10 July 2010;
- Azambuja, M.; Pereira, R.; Breitman, K.; Endler, M.; An Architecture for Public and Open Submission Systems in the Cloud,” Symposium on Computer Networks and Distributed Systems (SBRC 2010), Tool Session (Salão de Ferramentas), Gramado, pages 1023-1031.

This research was also the focus of the following presentations at scientific events:

- Breitman, K.; Azambuja, M.; Pereira, R.; “Cloud TV”, Cloud Futures 2010, Microsoft Research, Redmond, USA. 8-9 April 2010;
 - Video available at:
<http://research.microsoft.com/en-us/events/cloudfutures2010/>
- Azambuja, M.; Breitman, K.; Endler, M.; Pereira, R.; “Architectures for Distributed High Performance Video in the Cloud”, Cloud Slam 2010, 23-25 March 2010;
 - Video available at:
<http://www.youtube.com/watch?v=j0uM0NGF380>
- Breitman, K.; Pereira, R.; Azambuja, M.; “From Big Brother to Electronic voting: Challenges and Opportunities in Cloud Computing”, 3rd Conference on Free Software and e-Government (CONSEGI 2010), 18th August 2010;
- Breitman, K.; Pereira, R.; Endler, M.; Azambuja, M.; “Architectures for Distributed High Performance Video in the Cloud”, Cloud Computing Brazil 2010, 27th April 2010;