A Cloud Based Architecture for Improving Video Compression Time Efficiency: the Split&Merge Approach

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Abstract— **In this paper we argue that the combination of mature video compressing techniques, to emergent Cloud Computing technology, using the Split&Merge architecture, can drastically improve time efficiency of the compression process.**

I.   INTRODUCTION

It is universally acknowledged that video compression processes have greatly evolved over the past decades, especially in what concerns the efficiency of the process in relation to the amount of bits encoded. However, as overall compression efficiency increases, also does its computational cost, often translated into the increase of production times. However, for those who make practical and intensive use of video compression processes, more attention must be given to the compression time efficiency issue [1].

II.   THE SPLIT&MERGE APPROACH FOR DISTRIBUTED VIDEO COMPRESSION

In order to speed up data processing times the ideal scenario is to optimize resources by distributing the tasks among them evenly. Thus, we propose the Split&Merge approach, an evolution of the Map Reduce idea geared towards video processing. It provides an infra structure to deal with video processing in a simple split-distribute-process-merge process.

In the first step, *The Split*, we extract audio stream, and then we break video stream in several chunks, exactly in the *key-frame* positions, since *b-frames* and *p-frames* require it to be decoded. In *The Process* step, the chunks and the audio stream are distributed among the nodes to be compressed simultaneously. Finally, in *The Merge* step the original content is reconstructed from its separate parts, basically by joining compressed video chunks in their logical order, followed by streams remixing. After the split, process and merge steps, we created a fully parallel and distributed video compression process.

In order to validate this approach, we experimented it using Amazon's Cloud AWS services. Table 1, compares the traditional encoding with the proposed Split&Merge.

Input Video Duration	Traditional Encoding Duration	S&M Encoding Duration	Number of S&M Nodes	S&M Encoding Cost Using EC2 (in US dollar)
5 min.	19 min.	2 min.	10	$0.03
2 hour	7.5 hour	2 min.	225	$0.63

TABLE I.   COMPARISON BETWEEN THE TRADITIONAL ENCODING PROCESS AND THE SPLIT&MERGE APPROACH

III.   CONCLUSION

With this approach, we argued that the combination of research in data compression to emergent Cloud Computing technology opens up a great number of research challenges and possibilities. We introduced the Split&Merge architecture, a generalization of the MapReduce, that rationalizes the use of resources by exploring on-demand computing. We also demonstrate the feasibility of the proposed approach, which reduces the total encoding time for a 2-hour video from 7.5 hours to 2 minutes, with a cost of $0.63.

IV.   REFERENCES

[1] 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, July 2010