# GAPOTT

Automatic Catch-UP TV in Over the Top Networks

GAPOTT provides end-to-end optimization of content delivery systems, for the migration of a popular catch-up TV service from managed ip TV (IPTV) networks to OTT (over-the-top) delivery. It builds demand forecasting models relying on machine learning techniques and strategies to optimize ott multimedia delivery solutions, to achieve power and cost savings whilst maintaining a high QoE.
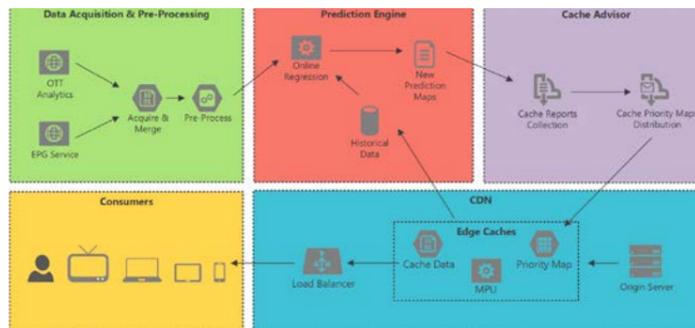
Main Project Team

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Funding Agencies

QRENSI I&DT 34009/2013	**-**
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Indicators

Journal Papers	3
Conference Papers	4
Concluded Msc	2

Two Main Publications

J. Nogueira, L. Guardalben, B. Cardoso, S. Sargento, **Catch-Up Tv Analytics: Statistical Characterization And Consumption Patterns Identification On A Production Service,** Multimedia Systems, Vol. Na, No Na, Pp. 1-19, May, 2016

J. Nogueira, S. Sargento, **Channel Selection Relying On Probabilistic Adjacent Channel Interference Analysis And Pattern Recognition**, Wireless Personal Communications, Vol. 86, Issue 3, Pp. 1333-1357, July, 2015
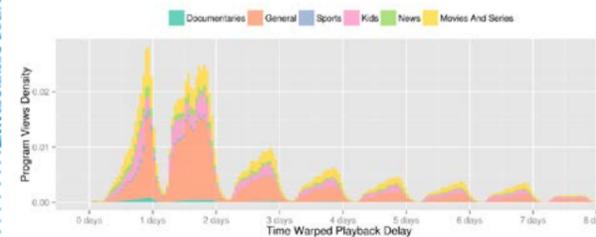
PROJECT WEBPAGE URL
https://www.it.pt/Projects/Index/2075

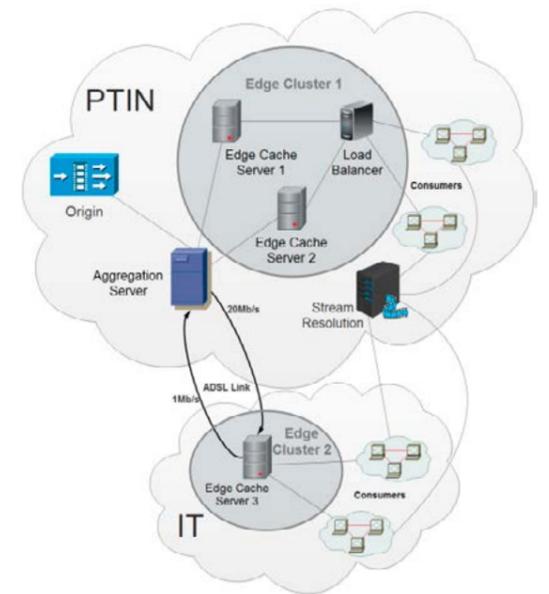**Fig. 1** Catch-Up Program Views by Days from Original Airing

Fig. 2 Experimental platform

GENERAL MOTIVATION AND OBJECTIVES

OTT delivery is a very appealing proposition that takes advantage of the internet's ubiquity to provide flexible and globally accessible services, capable of unrestrained device targeting, while holding the promise of low delivery costs.

In spite of its appeal and many advantages, OTT delivery is not without its issues. The delivery architectures must be carefully planned and optimized to maintain a high quality-of-experience (QoE) and rational resource usage, especially when migrating from services running on managed networks with established quality guarantees.

The purpose of this project is to expand on current scientific knowledge on the issue of OTT content delivery, considering the global end-to-end delivery chain: develop content delivery optimization to optimize the delivery infrastructure, the CDN, to support novel OTT multimedia delivery protocols in an efficient and QoE-maximizing manner:

- Understanding of demand characteristics to know the exact service requirements, demand modeling to ensure that sufficient resources are available to sustain target QoE-levels and SLAs, that servers are placed close to its users, and that the chosen CDN architecture is adequate to the services being delivered.

- OTT consumption forecasts to predict when and what resources will be necessary at any given point for a higher-quality, efficient, and cost-effective operation.

- OTT caching optimization to take advantage of the static and dynamic models produced by the previous two objectives to improve the performance of a key CDN component: cache.

CHALLENGE

OTT services have been growing at a fast pace driven by a low barrier of entry, mostly because of little to no investment being required in infrastructures traditionally necessary to reach the masses. This fast-paced growth presents an opportunity for all the involved partners, but comes with several challenges, especially with regard to scalability and QoE, which must be addressed.

In the face of being treated as dumb-pipes, current telecommunications operators must, on the one hand, adjust their business models to leverage their assets and capabilities, while on the other hand, migrate some of their current services to convergent OTT delivery models, capable of meeting their clients demands, while reducing their operational expenditures (OPEX) and capital expenditures (CAPEX).

WORK DESCRIPTION AND ACHIEVEMENTS

The project focused on the problematic of catch-up TV delivery on next-generation OTT networks as this fast-growing, highly popular, nonlinear TV service presents an excellent use-case on the applicability of OTT multimedia delivery networks.

First, a proposal is made for a next-generation multimedia-tailored CDN, taking advantage of content knowledge, prediction and caching algorithms to improve the efficiency and performance of OTT multimedia CDNs. We developed this component by resorting to advanced machine-learning forecasting techniques. This prediction engine is capable of accurately forecasting demand

For each individual catch-up TV asset, hence enabling novel dynamic and elastic scenarios where the existing resources may be optimized according to the contents' demand. An application of this predictive model is researched, where a smart caching algorithm Most Popular Used (MPU) is proposed that is able to maximize the hit-ratios of modern OTT CDN caches, thus improving the overall service QoE, and promoting a more efficient usage of the existing resources.

Finally, the experimental results on the complete end-to-end solution demonstrate a potential for improvement in catch-up TV content delivery networks, particularly with respect to the cache replacement policies. The proposed strategy Most Popular Used (MPU) is an alternative cache replacement algorithm, better suited for these specific scenarios, and is shown to outperform the sophisticated default implementation of cache replacement algorithms of apache traffic server, with respect to cache hit ratios.