V-FORCE

Streaming 4K video as efficiently as possible – without giving in on quality of experience

Research has shown that consumption of TV and video content is soaring. On top, new formats such as 4K (very high resolution) video are under way, enabling loads of new applications and a more immersive viewing experience.

Yet, as increasing amounts of bandwidth-demanding video are transported over our telecom networks, challenges arise. One important question is how to stream 4K video as cost-efficiently as possible – without overloading the network, but without giving in on quality of experience (QoE) either. Over the past two years, V-FORCE has developed insights and technologies that effectively address that question.

According to some reports, online video will be responsible for 80% of global Internet traffic by 2019; an increase that is not only driven by the popularity of video streaming services, but also by the sheer number of people that make use of those services.

"Through V-FORCE we wanted to investigate how we can prevent networks from collapsing under the heavy strain of 4K video," says professor Filip De Turck (iMinds - Ghent University), the project's research lead. "It was our objective to develop approaches that can help us deliver 4K video as efficiently as possible while safeguarding users' QoE."

"In a second track, we studied how parallel (4K) video streams can be displayed and (re)arranged on a single big screen – easily, automatically, with high quality and in real time. And finally, we also wanted to assess people's 4K video quality perception (versus HD video) as to find out in which circumstances the transmission of 4K video is warranted and when it is not," he adds.

THE OUTCOMES

1. A novel, standard-compliant coding scheme that compresses and stores video more efficiently – reducing storage requirements up to 40%

V-FORCE resulted in novel video coding schemes that are high performing and bandwidth-efficient, yet very quick as well.

"HTTP-based adaptive streaming (HAS) – which was at the core of V-FORCE – starts from the assumption that content is stored throughout the network in various quality formats. This allows a user's device to receive the most appropriate version, depending on the available bandwidth," says Patrice Rondao Alface (Nokia Bell Labs). "It is an approach, though, that ultimately will lead to major storage and transmission issues – especially as more ultra-high quality content (such as 4K video) becomes available."

"That's why we developed a new, standards-compliant coding scheme that enables video to be better compressed and stored more efficiently. Leveraging an ultra-low complexity transcoding solution, our approach enables network operators to reduce storage capacity up to 40% while keeping the full flexibility of HAS in terms of bandwidth adaptability."

2. A new approach to display and (re)arrange 4K content on a big screen – easily, automatically, with high quality, and in real time

V-FORCE developed a real-time transcoding approach, leveraging the network's assets and intelligence to smoothly display and (re)arrange 4K content on a big screen.

Typically, transcoding mechanisms come with the idea that quality gets lost if you want it in real time. The V-FORCE approach, however, maintains a superior quality while taking into account bandwidth constraints. It even considers the characteristics of the content that is displayed, automatically reserving less bandwidth for a slide in favor of a more bandwidth-sensitive video feed.

3. V-FORCE user study indicates that differences in perception between 4K and HD content largely depend on content

V-FORCE conducted a user study in order to find out which type of content benefits the most from being streamed and displayed in a 4K format.
"And it appeared that the difference between 4K and HD content was not always that obvious," says Patrice Rondao Alface. "Especially for still images and movies with slow-moving scenes, for instance, 4K adds a lot of value – as opposed to action scenes. That's an important learning that will help us optimize traffic on our telecom networks even more – easily and without too much of a cost."

NEXT STEPS

Research on V-FORCE's latency reduction is already being continued in other projects.

From a commercial perspective, Nokia has a firm interest in valorizing the novel coding scheme and the push-based approach in its product offerings.

Barco will leverage the V-FORCE outcomes for internal learnings.

Telecom operator Proximus is very much interested in the 4K perception user study, helping them prepare their roadmap towards a 4K video offering.

FACTS

NAME	**V-FORCE**
OBJECTIVE	Streaming 4K video as (cost-) efficiently as possible – without without giving in on quality of experience
TYPE	ICON project
DURATION	01/01/2014 – 31/12/2015
PROJECT LEAD	Patrice Rondao Alface, Nokia
RESEARCH LEAD	Filip De Turck, iMinds - IBCN - UGent
BUDGET	2,931,000 euro
PROJECT PARTNERS	Barco, Proximus, Nokia
IMINDS RESEARCH GROUPS	ETRO - VUB IBCN - UGent MMLab - UGent SMIT - VUB Technical Testing Lab

WHAT IS AN
ICON PROJECT?

iMinds is the digital research center and business incubator for Flanders, Belgium. Its ICON research projects are agile and demand-driven, combining academia and industry partners. ICON projects typically have a duration of two years, yet quickly adapt to the rapidly-evolving digital landscape. ICON partners intend to use the project results in their products or services.

V-FORCE project partners:

iMinds