# 5G BROADCAST

**Efficient software-defined adaptive video streaming leveraging 5G terrestrial broadcasting in combination with existing (mobile) over-the-top streaming.**

**Video has become an integral part of our daily lives, with distribution and consumption reaching unprecedented levels. In the past, the Flanders region has relied on Digital Video Broadcasting (DVB) networks for distributing linear content over wireless or cabled networks. However, the emergence of high-speed internet connections has introduced parallel over-the-top (OTT) distribution paths. These paths enable users to access video content on any IP-capable device, overshadowing terrestrial DVB technologies.**

**This shift risks rendering a unique region-wide transmission infrastructure obsolete. Yet, the advent of 5G presents a significant opportunity. 5G serves as both a telecom and broadcast technology, bridging the gap between broadcast and OTT realms. With 5G terrestrial broadcast, live video delivery to handheld devices becomes feasible through a unified high-power, high-tower (HPHT) network without straining the mobile public networks.**

## FRAMING THE RESEARCH OBJECTIVE

The objective of the 5G BROADCAST project is to investigate the use of 5G terrestrial broadcasting in synergy with existing public broadband networks. The aim is to deliver reliable video streams to end-users by leveraging dedicated encoding and streaming protocols. Additionally, the project explores the use of software-defined networks to steer and optimize the complex interplay of peak demand and frequency usage in real time.

## THREE MAIN OUTCOMES

The project has led to the development of a standalone 5G HPHT broadcasting system for linear video to end-users, as an alternative for wireless broadcast technologies such as DVB-T2. In addition, an end-to-end field setup has been realized that can broadcast video over HPHT networks to home gateways with multiple users. This setup includes adaptive bitrate encoders and packagers for sending out live feeds as MPEG-DASH streams, as well as multicast servers, a broadcast service and control center, HPHT transmitters and receivers, and monitoring probes and gateways.

In addition, the project participants designed and integrated optimized transport and encoding techniques to combine unicast error concealment and enhancement layers with 5G terrestrial broadcasting as a way to maximize the quality of service. This allows for video delivery using a broadcast-only mode (with FEC repair), a unicast support mode (to timely recover lost packets in the broadcast signal), and a unicast enhancement mode (to deliver improved video quality by delivering additional video layers over broadband on top of the broadcast session).

Detailed analysis and large-scale emulation experiments have shown that, based on the per-channel market share reported by the Belgian Center for Information, up to 90% of the views (25 most popular TV channels) can be served in high quality using nine broadcast channels, with only moderate unicast repair traffic. Alternatively, these channels can also be offered at medium quality using only three broadcast channels, but enhanced over unicast with additional video layers for optimized viewing quality.

Finally, a monitoring framework has been designed to support dynamic offloading from the public broadband networks towards 5G terrestrial broadcast networks based on network, CDN and client metrics aggregated in a novel network quality index. This framework opens up possibilities to further improve network efficiency and user experience in an automated way.

# NEXT STEPS

In terms of commercialization, Norkring intends to construct and operate a HPHT 5G broadcast network, albeit three years later than initially planned. The project has yielded technology that supports the intended business models. However, it also revealed ongoing work needed on the receiver end, which has been delaying commercialization.

In addition, as a further research topic, hybrid broadcast/unicast streaming solutions show promise for optimizing the delivery of immersive video content in virtual reality settings such as virtual teleconferencing and event streaming. Combining broadcasting of scene parts which are common with unicast delivery of user-specific viewpoints could significantly improve the encoding and network resource efficiency.

# FACTS

| | |
|---|---|
| NAME | **5G BROADCAST** |
| OBJECTIVE | Reliable video streaming over 5G terrestrial broadcasting |
| TECHNOLOGIES USED | DVB, OTT, MPEG-DASH, HPHT network, 5G terrestrial broadcasting, CDN, SDN |
| TYPE | imec.icon project |
| DURATION | 01/01/2022 – 31/12/2023 |
| PROJECT LEAD | Ludo Palmans, Norkring België |
| RESEARCH LEAD | Filip De Turck, imec – IDLab – UGent |
| BUDGET | 2,445,265.45 euro |
| PROJECT PARTNERS | Norkring België, Skyline Communications, Synamedia Vividtec Europe, Zappware |
| RESEARCH GROUPS | imec – IDLab – UGent |

5G BROADCAST project partners:

norkring skyline Synamedia zappware

UNIVERSITEIT GENT imec VLAIO

The 5G BROADCAST project was co-funded by imec, with project support from Agentschap Innoveren & Ondernemen

WHAT IS AN

## IMEC.ICON PROJECT?

The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and/or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

CONTACT US

**WWW.CONTACTIMEC.COM**