5G RECORDS

5G KEY TECHNOLOGY ENABLERS FOR EMERGING MEDIA CONTENT PRODUCTION SERVICES

NEWSLETTER

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A MESSAGE FROM
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5G-RECORDS COORDINATOR

5G KEY TECHNOLOGY ENABLERS FOR EMERGING MEDIA CONTENT PRODUCTION SERVICES

Hola there!

5G-RECORDS is an H2020 European research project of the 5G-PPP program that focuses on 5G professional content production
The project is coordinated by the Universitat Politècnica de València (UPV), and it involves 19 partners from 12 countries. The project brings together leading companies from both the audiovisual sector, such as the BBC, EBU, RAI. TV2 and Sennheiser, and the telecommunications sector, with Ericsson and Nokia.

The audiovisual production sector traditionally uses several wireless technologies, and it will be among the first verticals to take advantage of 5G. In 5G-RECORDS, we expect to make new forms of audiovisual production possible thanks to 5G.

During the first year, the project has focused on the design and development of innovative 5G components for professional content production. The project is structured along three use cases: live audio production, wireless multi-camera studio, and live immersive content production, each with a range of 5G enabling technologies and components. The second phase will be about the integration, validation and demonstration of the components and use cases.

If you are interested on the topic, I strongly recommend you to stay tuned to the progress of the project! In the newsletter you can find the most interesting activities during the first year of the project.
David

David Gómez-Barquero
PROJECT COORDINATOR

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AN INTRODUCTION TO THE
5G-RECORDS PROJECT

More info:

5G mobile networks are profoundly changing the way the media industry is creating efficient and scalable solutions for society. They offer improved performance in terms of bandwidth, reduced latency, support for accurate timing, assurance of quality of service and scenario flexibility. Furthermore, it is expected that standardized 5G-based solutions would bring down production costs, reduce environmental impact and increase the operational efficiency and flexibility of production workflows, particularly, in news gathering, remote production and coverage of live events. In this context, 5G-RECORDS (5G key technology enablers for Emerging media content production Services) is an European H2020 project that aims to explore the opportunities that new 5G technology bring to the professional audio-visual (AV) content production sector, including Programme Making and Special Events (PMSE) and taking advantage of 5G key features such as Non-Public Networks (NPNs), network slicing for guaranteed Quality of Service, Time Sensitive Network (TSN) support, and Dynamic Spectrum Access (DSA).

5G-RECORDS will build on 5G components developed within previous 5G-PPP projects and earlier R&D investments and will further develop them for applications in content production, thus enforcing the industry rollout of 5G. Three use cases will be demonstrated in the project: live audio production, multiple-camera wireless studio and live immersive media production.

5G-RECORDS aims to develop, integrate, validate and demonstrate specific 5G technologies in end-to-end 5G infrastructures consisting of core network

(5GC), radio access network (RAN) and end devices for professional AV media content production. The main objectives are:

✓ Design 5G components for professional media content production.
✓ Develop state-of-art 5G prototypes based on 3GPP Rel-15, Rel-16 and beyond.
✓ Integrate and validate them into end-to-end 5G infrastructures.
✓ Performing live trials in 2022, one of each use-case.
✓ Influencing standardization and regulation bodies thanks to the results achieved in the project.

5G-RECORDS will play also an important role on 5G R&D and deployments in general thanks to a comprehensive exploitation, communication and dissemination activities. The main expected impacts are:

✓ Demonstrating the potential value that 5G brings to the content production vertical.
✓ Proposing/exploiting new business models and opportunities.
✓ Influencing standardization in 3GPP and other bodies
✓ Promoting the rise of virtual production environments and,
✓ educing logistic efforts to allow the production team to work remotely over more events.
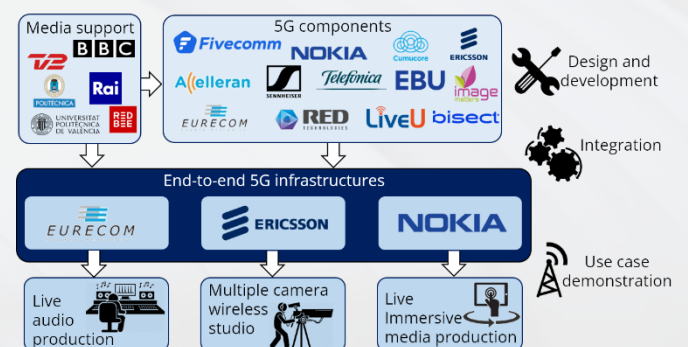
USE CASE 1:
LIVE AUDIO PRODUCTION

In a typical live audio production setup, performers are equipped with Programme Making and Special Events (PMSE) equipment such as wireless microphones and in-ear monitoring (IEM) systems. UC1 aims to deploy a local 5G wireless high-quality ultra-reliable and low-latency audio production network based on standalone NPN (SNPN) by designing a NR-Redcap audio device prototype. Latency is one of the main challenges for the professional audio use cases as well as reliability, synchronicity and spectral efficiency. In this regard, UC1 will focus on meeting a stringent round-trip latency requirement of 4 milliseconds (from microphone to IEM going through live audio processing tools and other network elements). Using 5G as a system-based approach will result in a reduction of todays efforts to handle remote production and spectrum access.

This use case contains 4 main areas of a wireless scenario:

- Capturing of live audio data. Producing and capturing of a live event for further exploitation involves many wireless audio streams.
- Temporary spectrum access. Each wireless application during the whole production time inside the studio requires different spectrum occupancy setup and different spectrum access, respectively.

- Automatic setup of wireless equipment. After receiving a grant for the useable spectrum, setup and configuration of all wireless PMSE equipment is done automatically.

- Local high-quality network. A typical studio setup is limited in coverage and number of wireless devices (UIs).

More info: ▶

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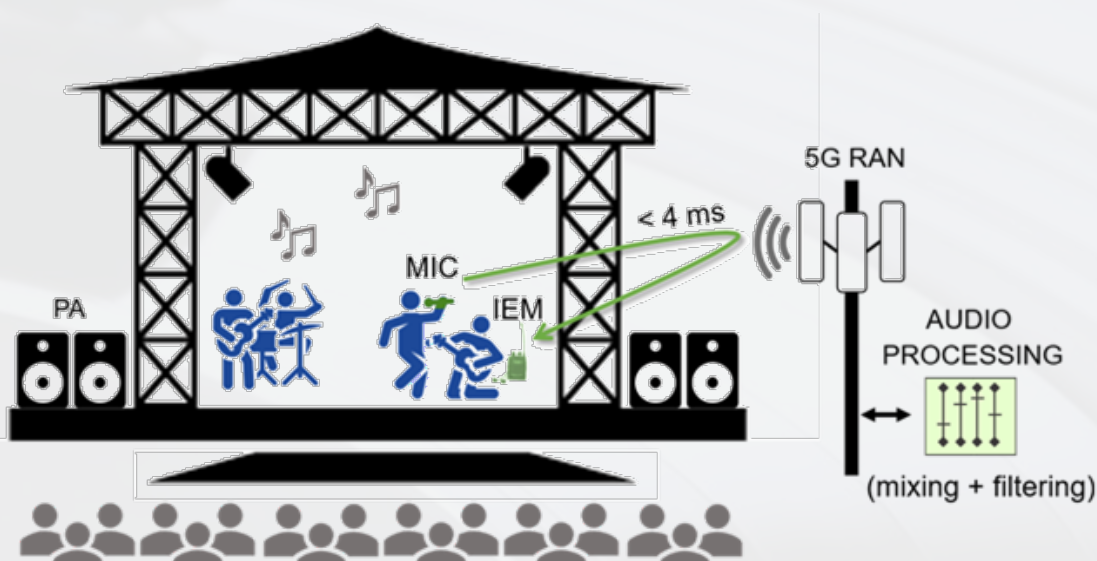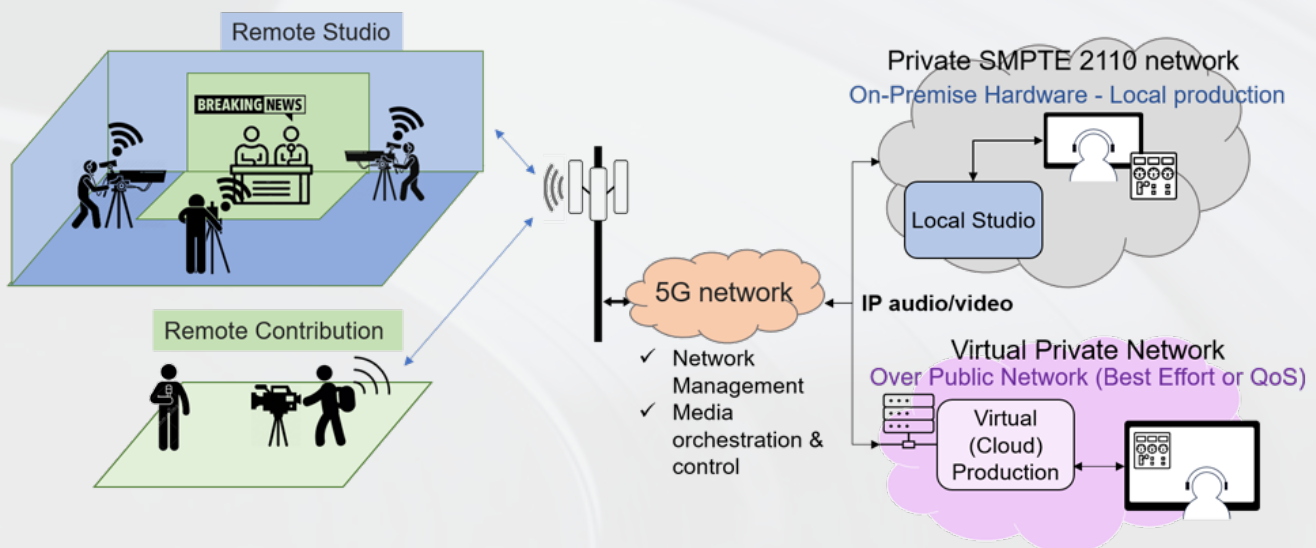
USE CASE 2:
MULTIPLE CAMERA WIRELESS STUDIO

This use case is based around multi-camera audio and video production in a professional environment. It will aim to replicate existing technologies such as COFDM radio cameras in terms of performance and capabilities using 5G technology.

Furthermore, UC2 focuses on exploring multi-location scenarios with production facilities local to an expected to integrate 5G based contribution solutions using different types of network configuration to provide contribution links into production centers. This will create opportunities for media companies to face the continuous challenge of producing more content with less resources along with the automation of some of their processes, reaching new ways to increase efficiency and effectiveness in production.

The wireless IP component, based on 5G, is key to improve technical and operational efficiency, increase flexibility and reduce production cost. Under this scenario, 5G NPNs play a key role to enable a self-operated environment not dependent on the network conditions of any underlying MNO.

The scenario also envisages the potential of making 5G-enabled equipment able to be transparently used under NPN and public networks and even move between them seamlessly during productions and while continuing transmitting, and while continuing transmitting, thus maximizing the interoperability between different systems and components with the commonality of an IP-based infrastructure.

This use case also contemplates the deployment of an outdoor production scenario with the additional deployment of two or more 5G-enabled cameras and sound capture devices still connected to the NPN, which acts as an appendix of the indoor TV studio. In here, cameras will be controlled from the broadcast centre located in the studio. Multiple TV cameras, microphones, intercom systems and monitoring devices (provided by Sennheiser) will be connected over radio links to the 5G gNB or using device to device direct communications.

USE CASE 3:
# LIVE IMMERSIVE CONTENT PRODUCTION

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This use case considers a real-time, end-to-end, Free Viewpoint View (FVV) system that includes capturing, 5G contribution, virtual view synthesis on an edge server, 5G delivery and visualization on users' terminals. The system will generate in real-time a synthesized video stream from a free-moving virtual position.

FVV technology is able of providing immersive video experiences which allows the user to freely move around the scene, navigating along an arbitrary trajectory as if there were a virtual camera that could be positioned anywhere within the scene.

FVV technology aims at taking advantage of 5G features and functionalities in order to take a step forward in terms of flexibility and portability. 5G connectivity will allow a portable FVV system to operate in real time with a very reduced deployment cost and high flexibility. The incorporation of 5G into the FVV pipeline will allow the distribution of the computational load, thus paving the way for possible future service virtualisation. Moreover, the extensive use of 5G for subsystem interconnection will allow the synchronization of all involved elements and the remote control and operation of the live immersive service. Besides, all system interfacing and control aspects will be handled by the 5G network.

The envisaged use case targets, among other possibilities, the real-time immersive capture of events such as a theater play or a festival. It will be possible to reproduce content both live and offline (replay) of free-viewpoint trajectories around the scenario. The content can then be distributed not only to people attending the event (local delivery), but also to third parties. The most innovative part of this use case is the fact that different producers can work simultaneously with different camera views, since all possible angles are available at any time.

FVVLIVE:
FREE VIEWPOINT VIDEO
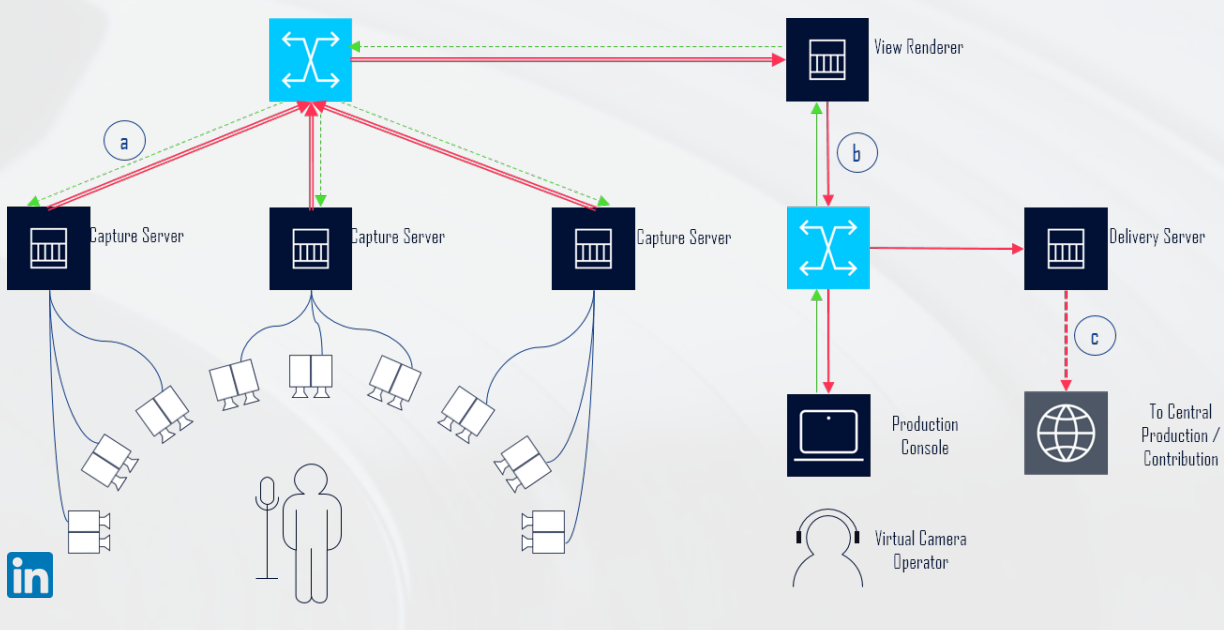
FVV Live is a real-time, low-latency, end-to-end free viewpoint video system including capturing, 5G contribution, virtual view synthesis on an edge server, 5G delivery and visualization on users' terminals.

The system will generate in real-time a synthesized video stream from a free-moving virtual position. FVV generates synthetic views of a 3D scene from a virtual viewpoint chosen by the user by combining the video information from several real reference cameras. It will be possible to reproduce content both live and offline (replay) of free-viewpoint trajectories around a scenario. The content can then be distributed not only to people attending the event (local delivery), but also to third parties. Each user can access a specific selected angle live, since all possible angles are available at any time.

CAPTURE
- ✓ Consumer-grade stereo cameras over standard USB connections, no genlock required.
- ✓ Software synchronization procedure over a shared clock source distributed using PTP (IEEE 1588-2002).
- ✓ Real-time depth estimation and segmentation to enable layered synthesis and bandwidth savings.

TRANSMISSION
- ✓ Real-time encoding all (necessary) camera streams, both color and depth, RTP transmission.
- ✓ Depth information means structure, but video lossy codecs are designed for natural images and the HVS: lossless coding.

- ✓ Extended precision to deliver depth data for the synthesis: adaptation of 4:2:0 video structures to get 12 bits per pixel.
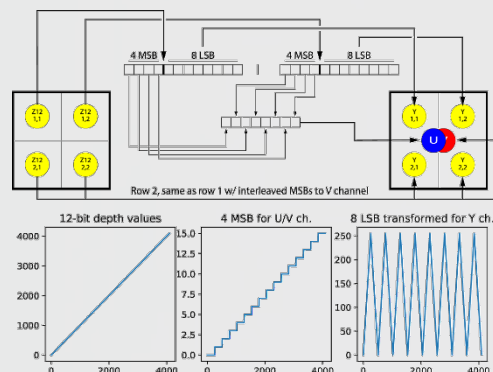
SYNTHESIS AND VISUALIZATION
- ✓ Real-time synthesis, too much data from all cameras, therefore only the cameras nearest to the virtual viewpoint are used.
- ✓ Very complex task, and also unreliable depth data. Soft transitions mix contributions from closest reference cameras.
- ✓ Dense off-line background model with Retinex+AKAZE+SfM+MVS.
- ✓ Layered synthesis to integrate reliable off-line background model with on-line foreground to combat noisy on-line depth estimation in the background.
- ✓ Cell phone controls the position of the virtual camera.
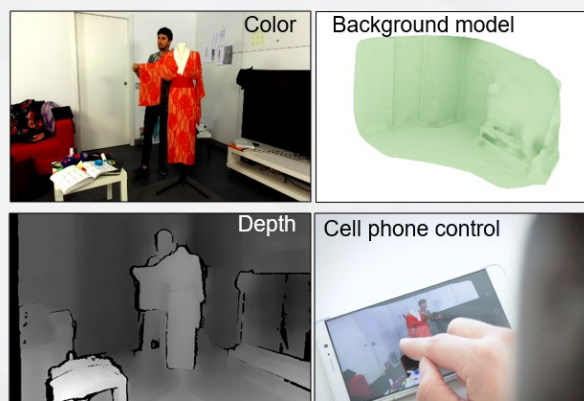
More info: www.gti.ssr.upm.es/fvvlive

WORKSHOP:
IEEE BTS PULSE 5GCP 2021

IEEE BTS PULSE
February 9-11, 2021

FEBRUARY 11, 2021

Day 3 of the IEEE BTS Pulse 2021 was dedicated to 5G content production. The session was organized by the 5G-RECORDS project. This session explored the opportunities and challenges of 5G for the professional audio-visual content production industry. 5G offers improved performance in terms of bandwidth, reduced latency, timing and quality of service. It is expected that standardized 5G-based solutions would bring down production costs and increase the operational efficiency and flexibility of production workflows, in particular in news gathering, remote production and coverage of live events.

The session started with a presentation of the activities led by the European Broadcasting Union on 5G content production, which has successfully engaged in 3GPP Release-17 5G standardization. The session continued with presentations from Ericsson and Nokia about key 5G technology enablers for professional content production, such as network slicing for guaranteed Quality of Service (QoS), Non-Public Networks, mimilimeter wave frequencies, edge and cloud computing, etc. The on-going technical work in 5G-RECORDS to enable the three use cases was then presented, and the session concluded with an open panel discussion.

The agenda of the session was:
✓ Opening Remarks – Session Chair David Gómez-Barquero
✓ 5G in content production - the European perspective - Ian Wadgin
✓ 5G Technology Enablers for Content Production – Part I - Thorsten Lommar
✓ 5G Technology Enablers for Content Production – Part II - Pablo Perez
✓ 5G Wireless Studio - Paola Sunna
✓ 5G for Live Audio Production - Maria Perez
✓ Panel Session and Q&A

More info: https://www.smpte.org/webcast/ieee-bts-pulse

WORKSHOP:
MEDIA PRODUCTION OVER 5G NON-PUBLIC NETWORKS

APRIL 21, 2021

Ian Wagdin, Peter Brightwell (BBC), Thorsten Lohmar (Ericsson), Maria Dolores Pérez (Sennheiser), Morten Brandstrup (TV2), and Jordi Giménez (5G-MAG), members of the 5G-RECORDS project, participated in the 5G-MAG Workshop on Media Production over 5G NPNs.

This was an interactive workshop hosted by Jordi Giménez aimed at gathering input from different stakeholders in the media and ICT industries around the objectives of the new study item of 3GPP: Media Production over 5G NPN.

The workshop was organized in three sessions, which tackled different aspects of Media Production over 5G NPNs. An important part of the workshop was devoted to exchanging questions and answers allowing attendees to get involved in the discussion. In this interactive session the aforementioned 5G-RECORDS members acted as moderators.

On the first session, Ian Wadgin and Thorsten Lohmar presented the media production requirements (AVPROD and VIAPA) collected in TS 22.263 and TR 22.827; and the SA4 Study Item on "Media production over 5G NPN", respectively. Further, Maria Dolores Pérez gave some valuable insights into the audio use cases.

The second session about initiatives in the media industry was hosted by Peter Brightwell, who presented the technology landscape that enable the transition towards IP media production. The thirds session consisted of 3 interactive sections, moderated by Ian, Thorsten, María Dolores and also Morten Brandstrup, in which the participants could ask questions and spark discussions about NPNs for media production for tier 1, 2 and 3 events, as well as Audio networks and production.

More info: https://www.5g-mag.com/workshop-media-production-npn

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JUNE 8, 2021

The first edition of workshop on 5G Non-Public Networks (5G-NPNs) took place on June 8th at the 2021 joint EuCNC and 6G Summit. It was a full day workshop (zoom room) with four sessions, two in the morning and two in the afternoon. Around 70 attendees joined the workshop.

It was organized by 12 5G-PPP projects working on 5G NPNs, recognized experts in this area. The workshop provided a holistic view of NPNs, covering from vertical use cases, operation aspects, business models, trials and emerging technologies.

A private 5G network, known as Non-Public Network (NPN) in 3GPP terminology, allows the use of 5G technologies to create a dedicated network with unified connectivity, optimized services and a secure means of communication within a specific area. A private network can be run either by the company itself or a third party, based on the same or different spectrum owned by mobile network operators.

The private networks 5G market is expected to see significant growth in the next few years. A recent study estimates the private LTE and 5G network market in $4.7 Billion in annual spending in 2020 and it is expected to growth nearly $8 billion by the end of 2023.

This study estimates that as much as 30% of that investment will be directed towards the build-out of private 5G networks, as 5G becomes the preferred wireless connectivity medium to support Industry 4.0 and other verticals. Private networks are positioned to address the increasing demand for access to communication services by vertical industries, pushing a true digital transformation across manufacturing industries and other verticals.

The agenda of the session was:
- ✓ Vertical Use Cases for 5G Private Network.
- ✓ Operation of 5G Private Networks.
- ✓ Emerging Technologies for 5G Private Networks.

More info: https://www.eucnc.eu/workshops/workshop-6/

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FUTURE EVENTS

5G WORLD: UNLEASHING THE POWER OF 5G

SEPTEMBER 21-23, 2021
ExCeL, LONDON
SEPTEMBER 20-24, 2021
VIRTUAL EVENT

5G World returns in September as a hybrid event! More info

WEBINAR: 5G TECHNOLOGY IN PROFESSIONAL AUDIO

SEPTEMBER 22, 2021

This webinar will explore the opportunities and challenges of 5G for the professional audio production industry (audio PMSE). More info

5GIA-TSDSI WEBINAR ON 5G TESTS & PILOTS

SEPTEMBER 22, 2021

The objective of this webinar is to enable the sharing of information, data, lessons learnt and areas for collaborative 5G Tests and Pilots. More info

PRIVATE 5G FOR INDUSTRY 4.0

SEPTEMBER 28, 2021

A massive digital transformation to Industry 4.0 is taking place worldwide that transcends virtually every business from manufacturing to transportation, warehouses, energy, medical and retail. more info

FORESCAST 2021

NOVEMBER 16-17, 2021

FORECAST is our annual 2-day conference on the evolution of media distribution technologies, spectrum issues, regulation and associated business models. More info

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