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5G-Enabled Immersive Experiences in Smart Tourism

The Smart Tourism Project & Extension

5G Smart Tourism Project (5GST)

The 5GST project was led by the West of England Combined Authority and funded by Department for Digital Culture, Media & Sport. It brought together 19 organisations to work at the forefront of innovation, overseeing the 5G testbed with selected applications in Bristol and Bath, and demonstrating 5G network's capabilities.

Mativision's use case focused on exploring how the technology can perform when distributing synchronised 360° content to a group of users so that they are sharing the same experience at the same time in the same environment, while each one maintains individual interactivity control. Our Use Case **revealed 5G's potential to overcome current barriers to sharing immersive content to groups of viewers.**

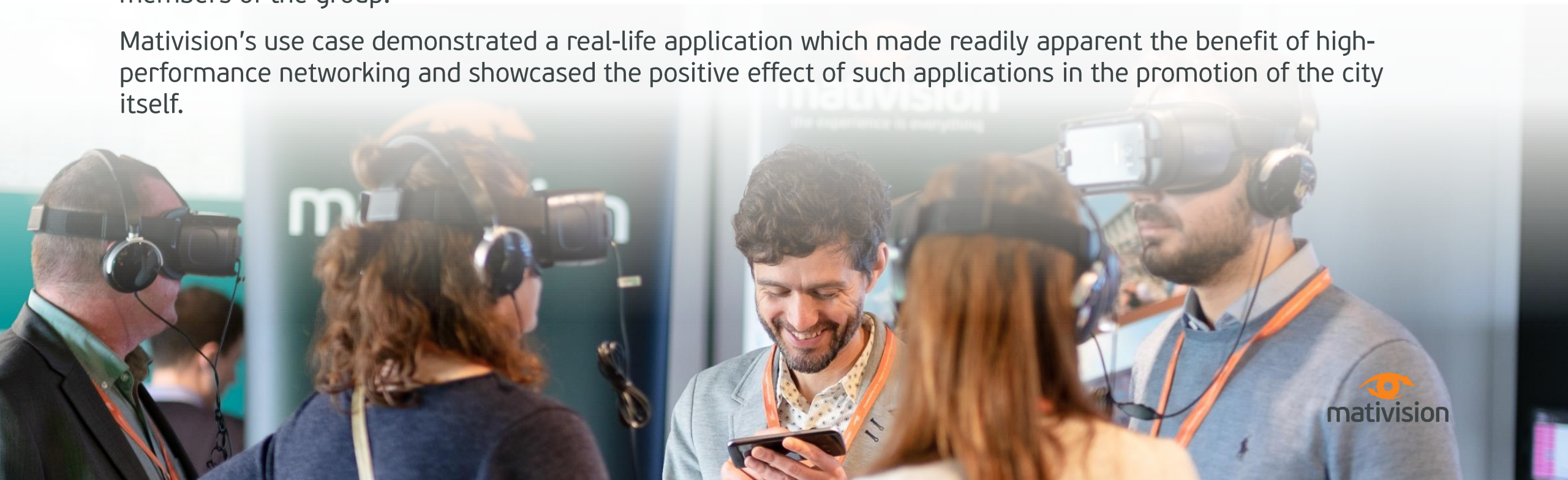
Mativision's 5GST Use Case

Streaming of overlayed 4K 360° content for synchronous play to multiple users in a small area.

High-quality, 360° video content has been filmed in Bristol during two selected high-profile events (Bristol Pride Day and Harbour Festival). The content has been edited into short immersive documentaries.

The group leader (narrator) used a master device to "start/pause/stop" the actual 360-degree video which then played in synchronism on all devices of the group, delivering the controlled immersive experience to all members of the group.

Mativision's use case demonstrated a real-life application which made readily apparent the benefit of high-performance networking and showcased the positive effect of such applications in the promotion of the city itself.



5GST Extension (5GST-X)

Following the successful delivery of the 5GST project, the 5G Smart Tourism Project Extension (5GST-X) aimed to utilise the Bristol Harbour Festival in July 2019, one of the region's largest annual touristic events, to perform ambitious 5G trials at scale.

Mativision in collaboration with project partners (**Zeetta Networks**, the **University of Bristol Smart Internet Lab**, **Bristol is Open** and the **Digital Catapult)**, pioneered the **integration of 5G technology with high-quality 360-degree video**, to develop and deliver a unique 4K, 360° VR experience to the public during the Harbour Festival.

The project had two main KPIs: A target of 500 simultaneous views and total of 2,000 unique views over the weekend of the festival.

Three locations in Bristol were selected from which 360-degre video live streams were delivered for the full duration of the festival, both on the 20th and the 21st of July.

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5GST-X Trial 2: Mativision

This trial focused on testing Mativision's world-leading VR/AR live video streaming capability from three selected locations over a 5G network in a large and dynamic environment serving hundreds of end-users simultaneously and make the generated immersive content available for viewing in real-time to all people present in Millennium Square and the Amphitheatre.

Mativision used successfully its upgraded workflow, including multiple brand-new, state-of-the-art 360-degree cameras to live stream from three different locations in Bristol city.

To ensure delivery of the service under the occasional rainy conditions, Mativision used a separate 2nd set of cameras, not originally planned for. Interchange between the two systems was seamless to viewers.

The live interactive streaming lasted for the full two-days' duration of the Harbour Festival and was the first time worldwide that a 5G network was used to deliver such an immersive experience from multiple locations to the public during a real event.

5GST-X Trial 2

Selected Live Streaming Source Locations:

1. **Amphitheatre** (Main Stage)
2. **Millennium Square** (Dance Stage)
3. **Queen Square** (Performance Stage)

Selected Transmission Receiving Locations:

1. **Amphitheatre** (around the main stage)
2. **Millennium Square** (around the stage area)
3. **Millennium Square** (Smart Futures Space)

5GST-X Trial 2: Challenges

High number of concurrent users

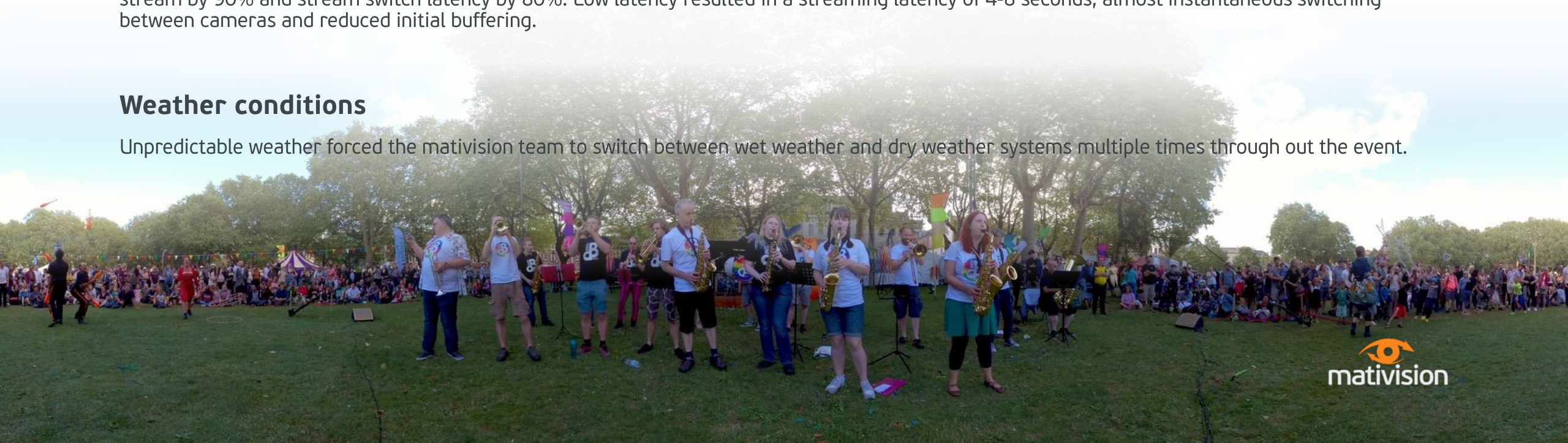
Local streaming server with hundreds of concurrent viewers posed a challenge but even at the maximum number of concurrent viewers connected the Mativision streaming server stayed under 10% CPU load showing excellent scaling capabilities. In a scenario with multiple edge servers running the mativision streaming server setup, hundreds of thousands of users could be server by the multiple 360 live-streams.

Low latency

Requests for low latency streaming posed a challenge but the optimisation of the HLS streaming reduced latency between real-time events and the stream by 90% and stream switch latency by 80%. Low latency resulted in a streaming latency of 4-8 seconds, almost instantaneous switching between cameras and reduced initial buffering.

Weather conditions

Unpredictable weather forced the mativision team to switch between wet weather and dry weather systems multiple times through out the event.



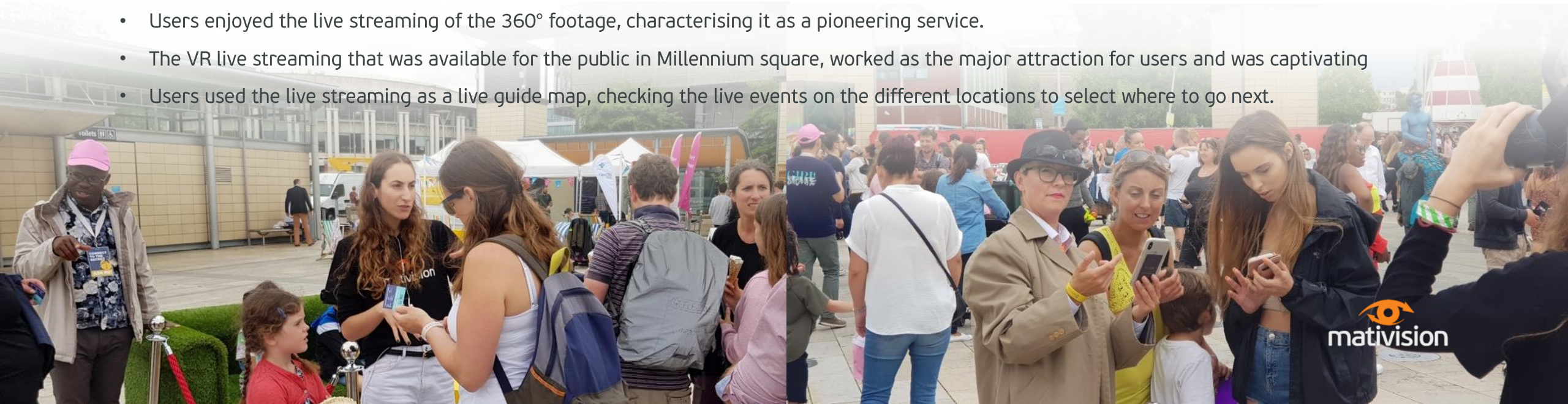
5GST-X Trial 2: Performance Data

User's Feedback Analysis

Users provided their feedback through an **online** available **questionnaire** and **in person** through **discussions** at the Smart Futures tent and at the different locations where staff with the specific task to promote the experience were urging members of the public to engage with it.

Interesting points that have risen are that:

- Users are informed about immersive technologies, still they are not yet 100% familiar/trained on how to use them on their devices.
- Users are enthusiastic in exploring and exploiting 5G network's potentials, and even pay for its immersive services.
- Users enjoyed the live streaming of the 360° footage, characterising it as a pioneering service.
- The VR live streaming that was available for the public in Millennium square, worked as the major attraction for users and was captivating
- Users used the live streaming as a live guide map, checking the live events on the different locations to select where to go next.



Thank You

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