QUANTUM² COMMENTARY UNITS
Portable Equipment for Audio & Video encoding/decoding over IP

INTRODUCTION

Recent developments have changed our lives and imposed new ways of working. One of these developments has been the increasing integration of audio and video transmissions on a single device. Managers are looking for cost savings without having to give up the ability to add live commentary to events that can no longer be attended in person or without giving up the ability to broadcast visual content on social media. Prodys' answer to these needs has been the new generation of Quantum² portable codecs.

MAIN FEATURES

Quantum² portable units are compact commentary devices capable of encoding and transmitting audio and video and adapting to any remote production scenario.

Its main features include:

- Multiple audio input possibilities (between 3 and 5 microphone inputs, line level inputs, digital, USB) and the possibility to mix them all.

- Possibility to work with 8 I/O channels in AES67 AoIP networks, such as Dante or Ravenna.

- 2 independent stereo audio channels and a video channel, which allows sending and receiving images with a latency of less than 300 ms.

- Compatibility in video transmissions through the implementation of numerous encoding and transmission protocols: SRT, MPEG-TS, RTMP/RTMPS, BRAVE.

- Streaming forwarding, which allows comments and video to be sent directly to the cloud.

- Multiple IP interfaces (5G/LTE, Wi-Fi, Ethernet) for the transmission of encoded audio and video, enabling secure and quality transmissions over unreliable IP networks thanks to the BRAVE protocol.
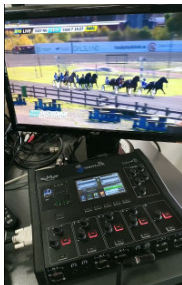
APPLICATION SCENARIOS

The features listed above make the new Quantum² devices highly flexible and adaptable to different application scenarios.

Commentators at events

The traditional application for this type of equipment is to accompany the commentator(s) to the venue and from there send audio to the studios, where it will be used to create the final program. The Quantum² family of equipment allows the transmission of two different stereo audio mixes, which can be used for two programs (e.g. using different languages) or for a single program together with a separate command channel.

In such scenarios, the possibility of receiving a video stream from the studio provides invaluable assistance to the commentator.

- o If the commentators have a full view of the event, the video channel can be used to send supporting information such as statistics or replays, VAR...

- o In broadcasts where the commentators do not have a complete view (motorcycling, motor racing, cyclo-cross, marathons...) the video channel allows them to view the part of the event that they cannot access.

In both cases, if an Ikusnet video encoder were available as a video source, the video could be transmitted using the BRAVE protocol bonding techniques to aggregate the bandwidth of several IP interfaces, fixed or 5G/LTE, and obtain perfect transmission quality with high bandwidth.
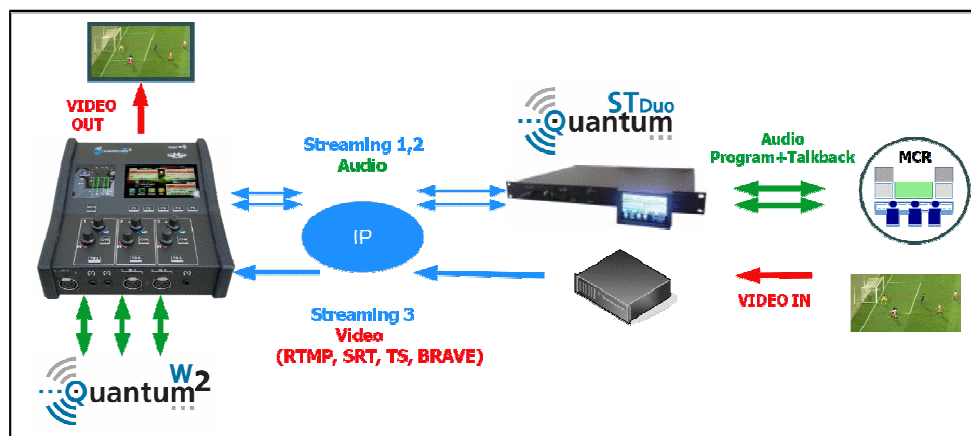
Remote commentator

In situations where the commentator cannot travel to the location of the event, receiving a video feed may allow him to do his work in a different location, such as his office or home. The video source can come directly from an encoder or from a streaming server in the cloud, which could be accessed using the SRT or RTMP protocol.
In this scenario, good IP connectivity is foreseeable, so it should be possible to have high quality video on a single IP link.

This scenario can be extended to other types of applications such as program dubbing or simultaneous translation.
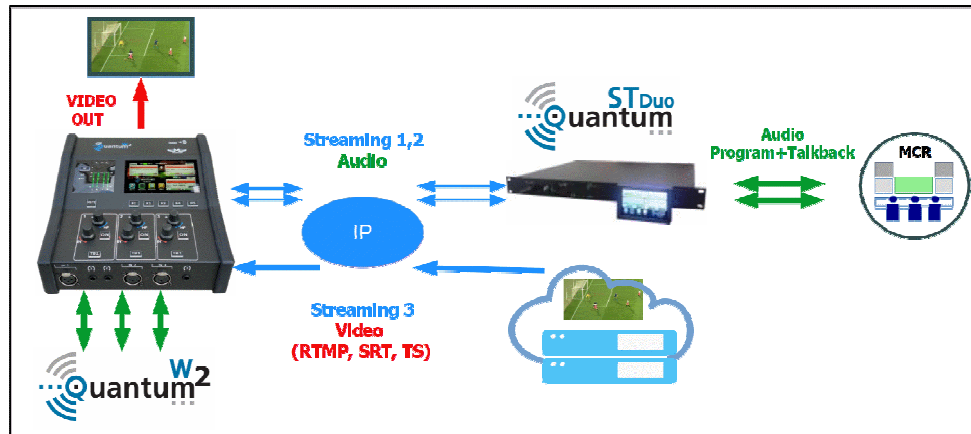

Insertion of audio comments

With the Quantum^2 family of equipment, it is possible to insert audio commentary into a received video channel and forward the whole program (audio plus video) to its final destination. In this way, a commentator can work from home receiving the encoded video, insert his comments to the program perfectly synchronized with the image and send the whole to the studio for broadcasting.

Encoding and sending video from Quantum^2 equipment

Thanks to this function, it is possible to contribute images of commentators carrying out their work (presentations, interviews...) so that they can be mixed in the studio to enrich a program with personalized images or to be broadcast on social networks
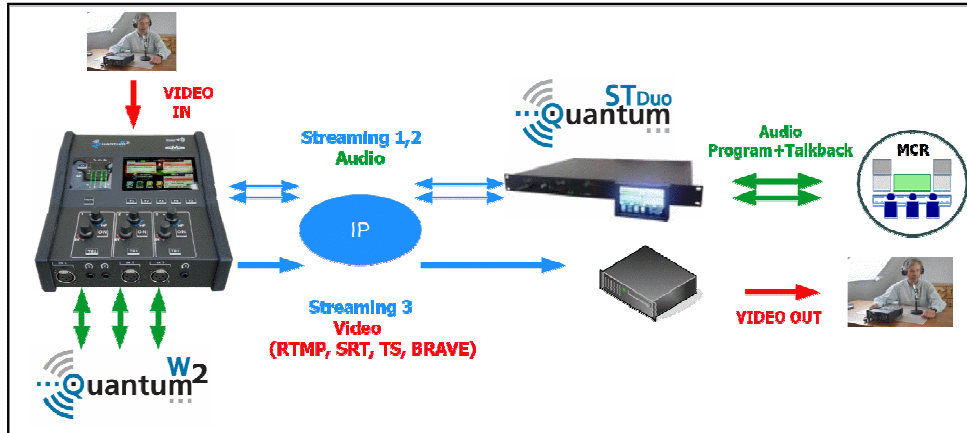
This option would allow a commentator's camera to be used for stadium broadcasts and to transmit extra and personalized content in HD quality.

QUANTUM² PORTABLE UNITS

There are two models of Quantum2 portable devices: Quantum² W and Quantum² XL. The main difference between them lies in the number of audio inputs and outputs:

Audio

There are two models of Quantum² portable devices: Quantum² W and Quantum² XL. The main difference between them lies in the number of audio inputs and outputs:
Quantum² W has 3 microphone/line inputs, while Quantum² XL has 5. As for the headphone outputs, Quantum² W has 3 outputs and Quantum² XL has 4.

In addition to these inputs, the units have a USB audio input/output that allows the device to be connected to a PC. This allows the playback of audio files stored on the PC, which become an additional audio source to be used in the program mix.

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Optionally, the Quantum^2 codecs have the possibility to work as a commentary unit with uncompressed audio on AoIP networks, with 8 input and output channels of Dante or Ravenna type.

All audio inputs are fed into an audio matrix where they are mixed to generate two stereo bi-directional channels. These two independent streams can be used to send two programs (e.g. to send commentary in two different languages) or to send a single program to the studio and use the second one as a co-ordination or talkback channel.

These two streams can be encoded with a wide set of compression algorithms to achieve the best possible quality depending on the capacity of the transmission line.

Video

The Quantum^2 units have the possibility to decode and encode video simultaneously and independently of the two audio channels.

The equipment works with HD video resolution, 720p, 1080p and 1080i (only for HEVC), with the possibility of working in H.264 and HEVC compression formats and with 4 different transmission protocols: BRAVE, SRT, MPEG-TS and RTMP. For SRT and BRAVE the equipment can send and receive a video stream at the same time.

The delay that can be achieved by working in any of these protocols is less than 500 ms, even when using BRAVE Protocol, the end to end delay is less than 300 ms.

The receive video stream includes a number of embedded audio channels depending on the transmission format:

- BRAVE, MPEG TS and SRT support up to 4 channels.
- RTMP only supports two channels.

These audio channels are given the same treatment as all other audio inputs and are therefore available in the input audio matrix and headphone matrices.

As for the transmission video stream, it shall be accompanied by the same audio that is transmitted on the program audio channel but encoded with a compression algorithm suitable for the MPEG4 format.

Quantum^2 devices have a new feature that is perfect for professionals working in the cloud: video streaming forwarding. This mode consists of forwarding the video stream received with the addition of the audio of the commentators. This forwarding can be done in any of the three supported standards: MPEG TS, RTMP/RTMPS, SRT.
This mode, by not re-encoding the video, maintains the original quality.

As for the audio originally received with the video, the equipment can be configured to add or not to the local audio added by the commentators.
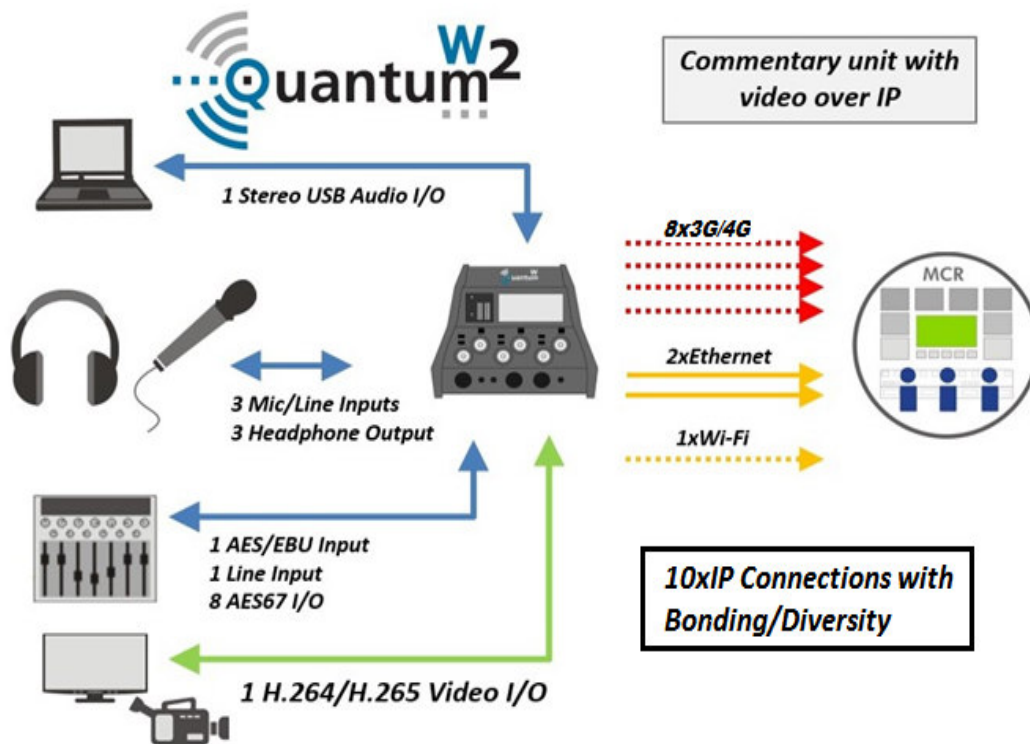
IP Connectivity

One of the great strengths of the Quantum family, which has now been inherited by the Quantum^2 family, is the wide range of IP connectivity possibilities available. Up to 10 different interfaces are available for both audio and video transmission, choosing from the following options:

- 2 Ethernet ports, for connection to fibre lines, ADSL, LTE routers, satellite connections…

- 2 LTE/5G internal modems and/or one external communication module with up to 8 modems (the units can work with up to 8 LTE/5G modems in total, adding internal & external modems).

- 1 Wi-Fi port.

For the transmission of audio streams, Quantum^2 devices offer two protocols:

- The proprietary BRAVE protocol, which allows working in bonding and diversity modes. For audio transmissions on unreliable lines, the diversity mode is the most advisable. In this mode, the audio stream is multiplied and sent on each interface, so that every IP packet has a copy sent on other paths, so that a packet loss on one of the interfaces is easily corrected by packets sent on the others.

- The SIP standard protocol (EBU N/ACIP 3326 & 3368) allows audio connections with equipment from other manufacturers. Within the SIP standard, Prodys has implemented the SIP Diversity mode which allows sending a redundant SIP audio stream.

For the transmission of video streams, the Quantum^2 devices have 4 protocols:

- To work on unreliable transmission lines: SRT (standard, allows encryption of the video stream) and BRAVE (proprietary protocol allowing channel aggregation, or bonding).
- To work with reliable lines: MPEG-TS and RTMP (both standard protocols, allowing compatibility with video encoders from other manufacturers).

Operability

The Quantum^2 family of devices can not only be controlled locally using their touchscreen but can also be controlled remotely from the MCR using the ProdysControlPlus application. This application works without the need to configure the ports of the receiving equipment, which simplifies the operation of the equipment by the end users, who can delegate the configuration and monitoring of the portable equipment, including the preview of the video signal, to the technicians located at the MCR.

The Quantum^2 devices are optionally available with a battery that allows them to work autonomously for approximately 4 hours.

SUMMARY TABLE OF PRODYS PORTABLE EQUIPMENT

	QUANTUM2 W	QUANTUM2 XL	QUANTUM LITE
Audio Interfaces			
Mic/line	3/4	5/5	1/2
Headphone Outputs	3	4	1
AES3 Digital Stereo Input	●	●	
USB Digital Stereo Input	●	●	●
AES67 / DANTE / Ravenna	●	●	
Audio Protocols			
BRAVE: 1x stereo /mono	●	●	●
BRAVE: 2x stereo	●	●	
SIP: 1x stereo /mono	●	●	●
SIP: 2x stereo	●	●	
Video Interfaces			
HDMI Input	●	●	
DVI Output	●	●	
Video Protocols			
BRAVE	●	●	
SRT	●	●	
RTMP	●	●	
MPEG- TS	●	●	
Streaming Protection			
BRAVE: Diversity	●	●	●
BRAVE: FEC	●	●	●
BRAVE: Active Packet Recovery	●	●	●
SIP: FEC (RFC2733)	●	●	●
SIP: Diversity Streaming EBU3368	●	●	●
Streaming Interfaces			
Audio over 1x LAN	●	●	●
Audio over 2x LAN	●	●	
Audio over Wi-Fi	●	●	●
Audio over LTE	●	●	●
Compression Algorithms			
OPUS	●	●	●
Enhanced Aptx	●	●	●
Uncompressed (16, 20, 24bit)	●	●	
G.711	●	●	
G.722	●	●	●
MPEG L2	●	●	●
MPEG-4 AAC LC, LD, HE, ELD	●	●	
Management			
Touch Panel	●	●	●
Web Browser	●	●	●
ProdysControlPlus	●	●	●
Power			
VAC	●	●	●
Battery	●	●	●

● Standard   ● Optional

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