

19/07/2019

BRAVE protocol applications

Introduction

PRODYS have developed a new protocol for point to point real time media streaming suitable to be used to eliminate media artefacts such as packet loss and jitter over public networks such as the Internet, HSPA, LTE or Wifi networks. This protocol has been called "BRAVE" and is an industry leading advanced streaming technology for Prodys video and audio products - Ikusnet and Quantum.

BRAVE's outstanding resilience against packet loss is primarily based on the combined use of multiple Network Interfaces (NICs). There are no restrictions to the combination of different technologies, Ethernet, LTE/HSPA and Wifi that can be selected. For example, the maximum number of NICs Ikusnet portable video codec is 11 links and for the Quantum audio codecs is 7 links.

This document describes several flavours of the BRAVE protocol and their applications.



BRAVE Diversity protocol

This BRAVE configuration is meant mainly for audio contributions from field reporters connecting to studio codecs at their base. The Internet access from the remote site (field reporters) is expected to be much less reliable than the Internet access at the studio site. Therefore, the remote codec (e.g. Quantum portable codec) might be using several NICs, but addressing all of them to one single point gateway at the studio site. Please note that in *Figure 1*, the four IP paths i.e. four NICs of the portable codec are “landing” on one single Ethernet port of the studio codec. This implies the BRAVE call must be initiated from the remote device addressing the studio gateway, also each IP path carries the same data.

This configuration is set using the **Streaming | TX | Codec1 | Diversity** menu.

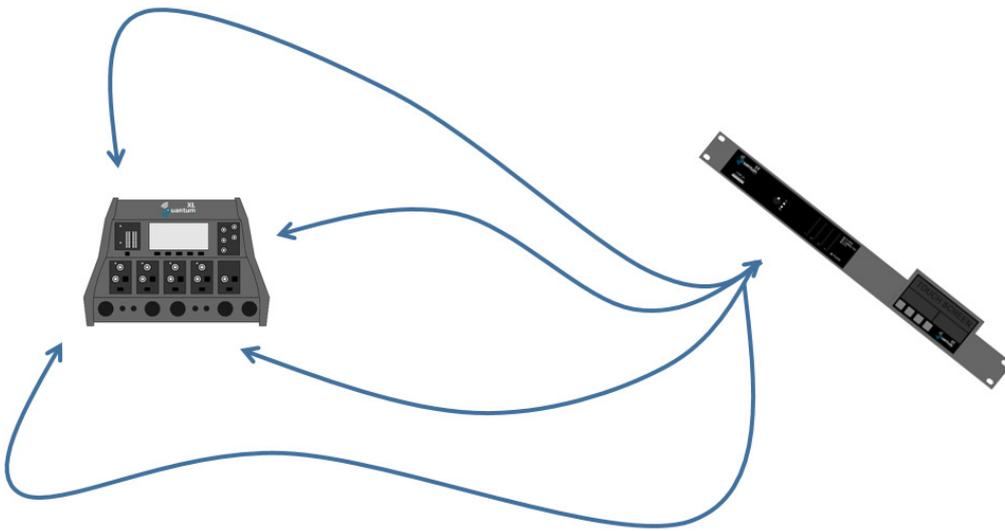


Figure 1

The BRAVE Diversity protocol operates as NAT transversal from the calling side. This means no router arrangements (Port forwarding rules) are required to be undertaken at the field codec side. Port Forwarding definitions must be set at the studio site:
Port 53000 TCP & UDP, additionally port 53001 UDP (Codec 2) if Quantum DUO codecs are used at the studio site.

The data is identical for each IP stream between codecs. Typically, the first packet to arrive at the receiving codec is used and all others are discarded. But be aware that the system will buffer to match the longest delay path, but can be configured to ignore packets that come outside of a set time “window”.

This protocol variation is suitable to be used with very short receive jitter buffers. When dialling a BRAVE communication link options are available to choose preferred audio delay (jitter buffer depth: Low, Medium or High Delay) according to user’s previous knowledge of supplied IP services.

BRAVE Bonding protocol

This BRAVE configuration is mainly devoted to split a high bandwidth media stream and spread it over several NICs from a field-based codec. Since video information usually requires large bandwidth, this is the BRAVE variation is used by default for Ikusnet video codecs.

This configuration is set using the **Streaming | TX | Codec1 | Bonding** menu.

Notice in *Figure 2*, the BRAVE bonding driver is not splitting the media stream in equal or static portions, but is dynamically balancing the workload for each NIC according to the current uplink capacity and its drop-out rate. This enables enhanced resilience if any or several of the NIC loose completely their ability to transfer data over the related link (for example LTE link dropped due poor RF signal – that’s why its’s always worth using multiple different ISPs). Please note also in *Figure 2*, some paths are of different sizes between the encoder and decoder, showing the instantaneous balance of uplink capacities.

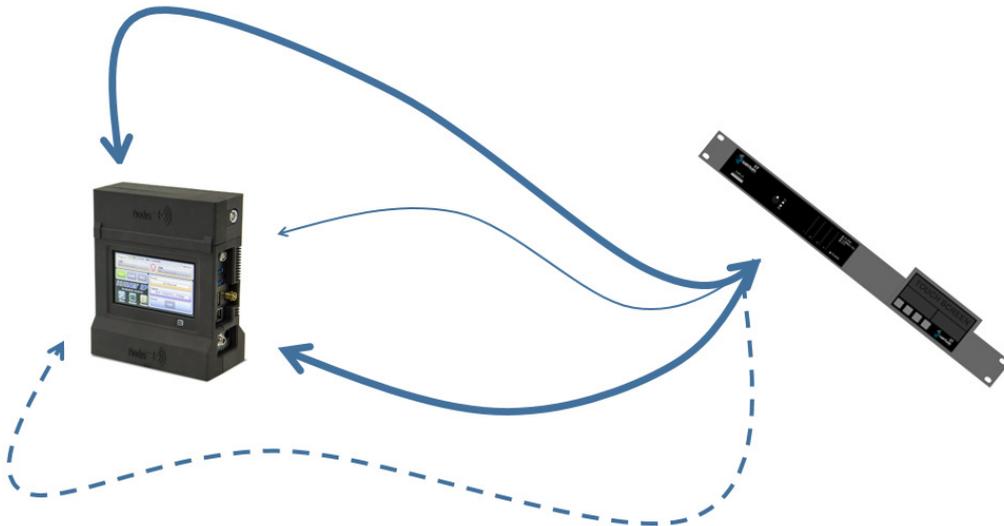


Figure 2

This variation would be suitable not only for high bandwidth encoded video streams, but also for pure audio application if the transmission is expected to be significantly error prone or only a single NIC is enabled on the field codec. Therefore, this could be a possible choice for some Quantum applications for example if only Wifi is enabled for the Quantum. The important point is the BRAVE Bonding protocol includes an “Active Error Recovery” function. By means of this protocol the sending unit can resend any IP data packets that are “lost” in transit until successful reception is acknowledged. Using this protocol to get “clean” audio has a downside of needing a longer jitter buffer at the receiving end. Therefore, the recommended profile for an optimal “Active Error Recovery” operation is by setting the receive buffer to Medium or High delay.

BRAVE Diversity 2x2 protocol

This BRAVE configuration is mainly aimed at permanent connections or STL applications using Quantum codecs. This protocol operates like the original Diversity configuration, but both communication partners are using two NICs for communication. Therefore, access redundancy is given for both end points. Each NIC exchanges a full copy of the media stream with the opposite side.

Please note this protocol configuration is also preferred if fully independent transmission networks are to be used, for example Priority network and separate Backup network.

Finally, also note that the BRAVE 2x2 protocol is restricted to a maximum of two NICs and is an optional licence. Once licensed this operation is set in the Menu – **NET | Diversity 2x2**

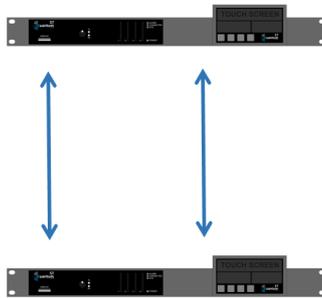


Figure 3

BRAVE point to multi-point protocol (Multi-Unicast)

This BRAVE configuration enables the sending to up to 10 different link locations. Each link can be enabled or disabled on its own without disturbing the other connections. The point to multi-point protocol is an extension of the BRAVE Diversity protocol. This function is an optional licence. Once licensed this operation is set in the Menu – **NET | MultiUnicast**

Two layouts might be chosen for a point to multi-point network. Please compare the number of NICs used by either the Decoders and the Encoder in *Figures 4 & 5* below:

Figure 4 indicates the layout if the “Encoder” is dialling out to each “Decoder”. In this case the “Encoder” is enabled to use two NICs, while the “Decoders” accept the connection on a single NIC.

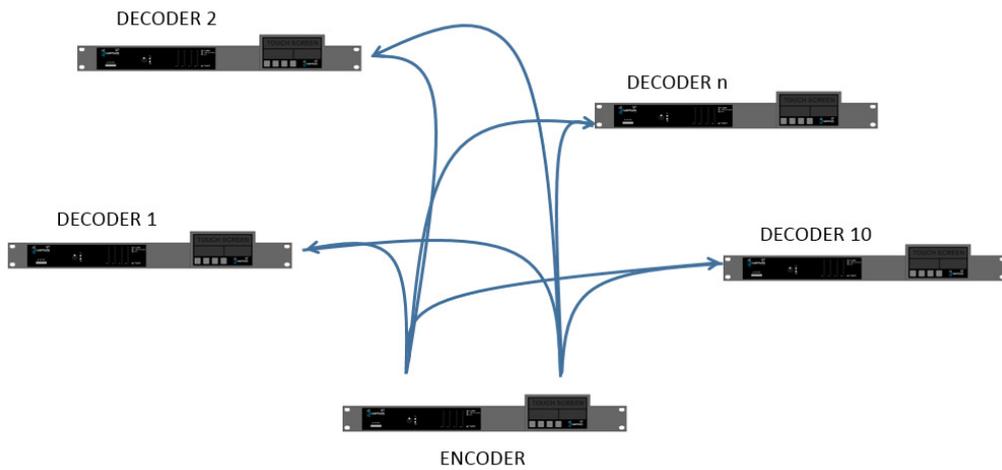


Figure 4

An alternative layout could be achieved if every “Decoder” dialled into the “Encoder” independently. In this case the “Decoders” are enabled to use two NICs, while the “Encoder” will only accept connections on a single NIC.

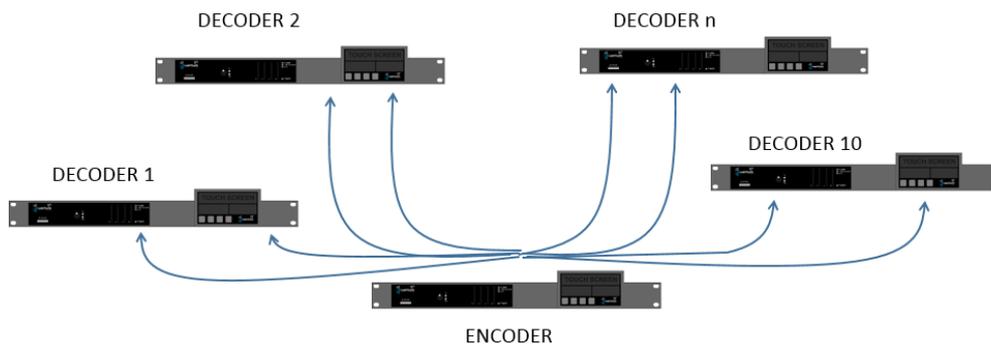


Figure 5

Please notice a mix of the first and second network topology is not possible.

BRAVE independent TX /RX Multicast operation

BRAVE protocol supports Multicast operation within the given Multicast address space 224.0.0.0 to 239.255.255.255¹.

Sending any audio to a Multicast address or retrieving any content from a Multicast address is possible by entering the requested address in the Dial dialog and choosing either [TX one way] or [RX one way].

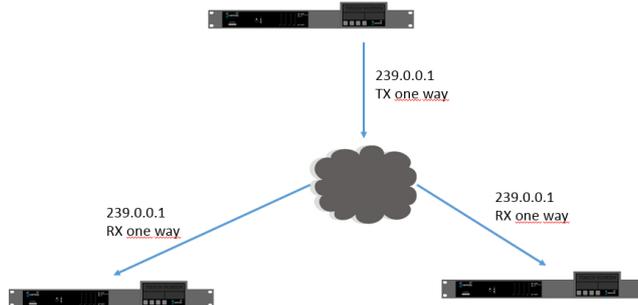


Figure 6

However, setting the BRAVE protocol in Menu – **NET | Independent TX/RX** enables sending its own media stream over a specific Multicast address, whilst receiving content from a different Multicast address.

Please be aware that *Figure 7* below depicts “logical” data paths. That is, physically each codec actually uses only one NIC; each “cloud” is meant to stand for one specific multicast group (i.e. Multicast address), each coloured arrows (blue or red) indicates the media streams flow. The physical layout could be that those three codecs shared the same Ethernet Switch (or the same Local Area Network).

¹ Although the complete Multicast address space is possible for Quantum, many addresses are reserved for special protocols. However, RFC2365 keeps available a Multicast address range for private use within an organization. This “administratively scoped range” is 239.0.0.0/8 [from 239.0.0.1 until 239.255.255.255 or 16.777.214 Multicast addresses]

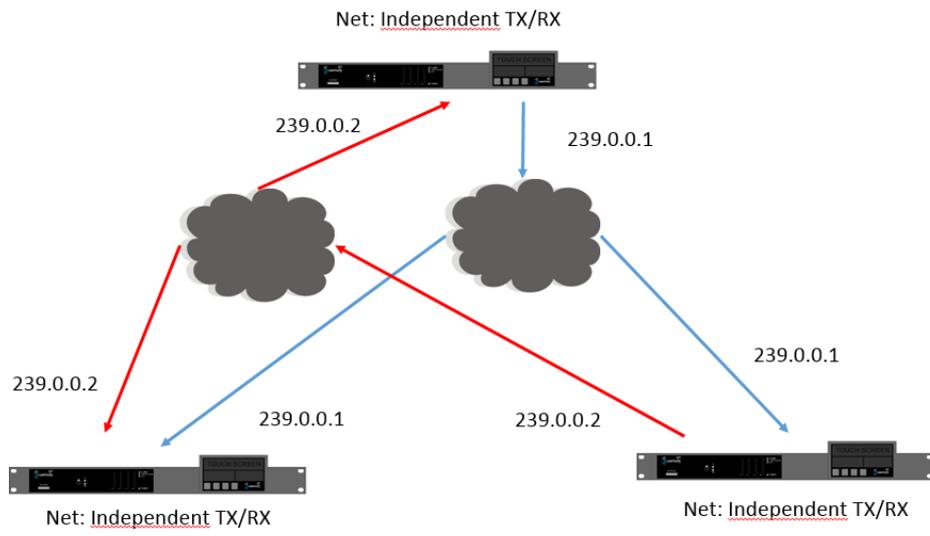


Figure 7