Backup and Redundancy Solutions

Overview

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Introduction

Broadcasters strive to provide their listeners with a high-quality audio experience. If, however, no precautionary measures are taken, audio errors can easily occur—or in the worst case, complete silence. Although a wide range of solutions is available to ensure error-free audio broadcasting, it can be difficult to determine which solutions best suit your needs. This document gives a simple overview of the various solutions that 2wcom offers.

Dual Streaming

Description: Dual streaming is the simultaneous transmission and reception of 2 identical IP streams that come from the same encoder. This allows a seamless exchange of IP packets in case of errors: If the main stream drops packets, the decoder immediately replaces them using the packets from the second stream. Ideally, the two streams use different networks, so one stream is still available in case of the other network failing.

Alternatively, it is possible to send both streams over the same network, with one stream being slightly delayed. By using a dejitter buffer, lost packets in the primary stream can be replaced in case of a burst error. The downside of using one network for both streams is that both streams will be affected in case of the network failing.

Bandwidth: Dual streaming uses twice the bandwidth a single stream would require. This bandwidth is ideally split up between 2 separate networks.

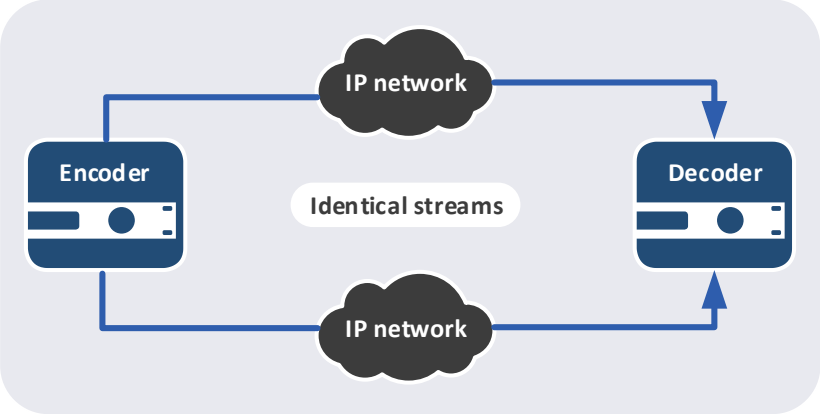
Delay: Low to moderate. The delay only consists of the transmission time and the input buffer.

Seamless: yes

Multicast: yes

Combinability: Combinable with all the other solutions

Expense: This is a standard function for 2wcom devices that comes without additional charge. An additional IP network is recommended.



RIST

Description: RIST (Reliable Internet Stream Transport) is a transport protocol for IP streams that is meant to recover lost packets by resending them and to support interoperability with devices that do not have this function. If the decoder detects lost packets in the received stream, then it uses the buffer time to request the lost packets from the encoder. The lost packets are sent again to complete the stream.

As RIST is an attachment for normal RTP streams, the stream can also be processed by receivers that are not equipped with a RIST function and therefore cannot request packets using RIST. Additionally, RIST and SRT both provide better results in terms of latency, absolute packet recovery and especially packet recovery in case of burst errors compared to FEC.

Bandwidth: The bandwidth needed for RIST depends on the number of lost packets. If only few packets need to be requested, RIST is a reliable low-bandwidth solution. If too many packets are lost, RIST becomes ineffective and needs lots of bandwidth. If used for multicast, newly requested packets are sent to every single receiver individually.

Delay: Moderate. The delay is at least 3 times the transmission time plus the input buffer.

Seamless: yes

Multicast: yes

Combinability: Combinable with all the other solutions

Expense: SRT and RIST can be purchased as a license for 2wcom devices.

SRT

Description: SRT (Secure Reliable Transport) is a transport protocol for unicast IP streams developed to recover lost packets by resending them. If the decoder detects lost packets in the received stream, it uses the buffer time to request the lost packets from the encoder. The lost packets are sent again to complete the stream. As opposed to RIST, SRT is only usable for unicast, and receivers that are not equipped with the corresponding SRT function are not able to receive and process the stream. A benefit of SRT is that the stream can be encrypted and secured with a password. Additionally, RIST and SRT both provide better results in terms of latency, absolute packet recovery and especially packet recovery in case of burst errors compared to FEC.

Bandwidth: The bandwidth needed for SRT depends on the number of lost packets. If only few packets need to be requested, SRT is a reliable low-bandwidth solution. If too many packets are lost, SRT becomes ineffective and needs lots of bandwidth.

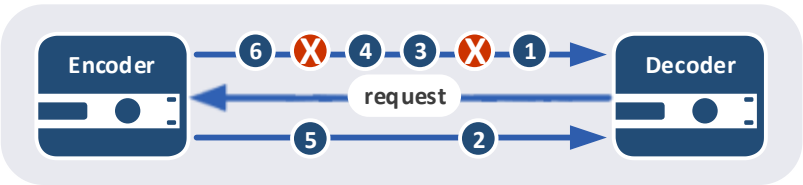
Delay: Moderate. The delay is at least 3 times the transmission time plus the input buffer.

Seamless: yes

Multicast: no

Combinability: Not combinable with Stream4Sure

Expense: SRT and RIST can be purchased as a license for 2wcom devices.



FEC

Description: Pro-MPEG FEC CoP #3 Release 2 (FEC = Forward Error Correction) is a technique used for controlling errors in data transmission. In addition to the stream, the encoder also sends redundant FEC correction packets. This enables the receiver to correct errors without needing to newly request lost packets.

Bandwidth: As every single FEC packet is sent redundantly, FEC uses a fixed, high bandwidth. FEC is therefore applied in situations where re-transmissions are costly or impossible, for example when transmitting to multiple receivers in multicast.

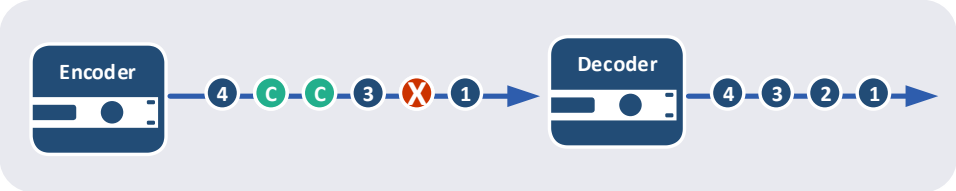
Delay: Low to high. Depending on the settings, there may be a high delay when creating the stream.

Seamless: yes

Multicast: yes

Combinability: Combinable with all the other solutions

Expense: This is a standard function for 2wcom devices that comes without additional charge.



Stream4Sure

Description: Stream4Sure is a solution developed by 2wcom that allows the decoder to receive up to 4 IP streams of different coding and quality. The decoder can check the main stream for lost packets and precisely repair any lost samples by seamlessly copying them from the backup streams.

Bandwidth: The bandwidth depends on the number and quality of backup streams. If only one backup stream is used, Stream4Sure requires less bandwidth than dual streaming if the backup stream is encoded with a smaller bit rate than the main stream.

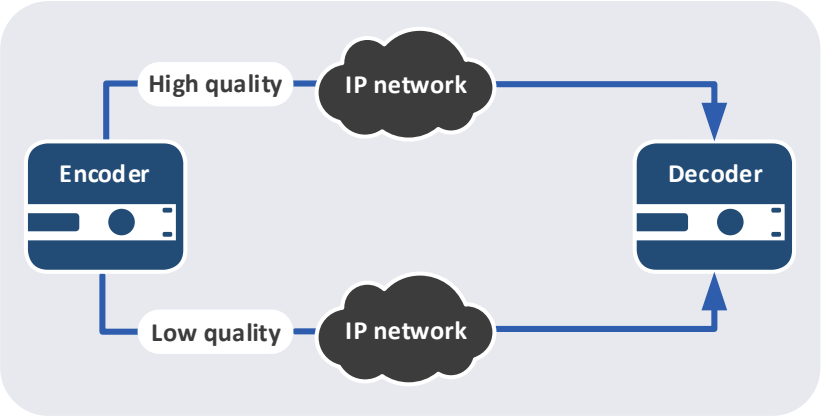
Delay: Low to moderate. The delay only consists of the transmission time and the input buffer.

Seamless: yes

Multicast: yes

Combinability: Not combinable with SRT
The number of streams used for Stream4Sure reduces the number of other backup sources that can be used.

Expense: Stream4Sure can be purchased as a license for 2wcom devices. Additional IP networks are required.



3 Backup sources

Description: 2wcom offers the possibility to use up to 3 backup sources in case the main audio source fails. Configurable switch criteria determine in which case the next best input source should be used. If a higher-priority source is available again, the decoder automatically switches back to it.

Bandwidth: Each input can either be always active and ready to be used or it can be only activated when needed to save bandwidth. The exact bandwidth depends on the type of sources and the settings.

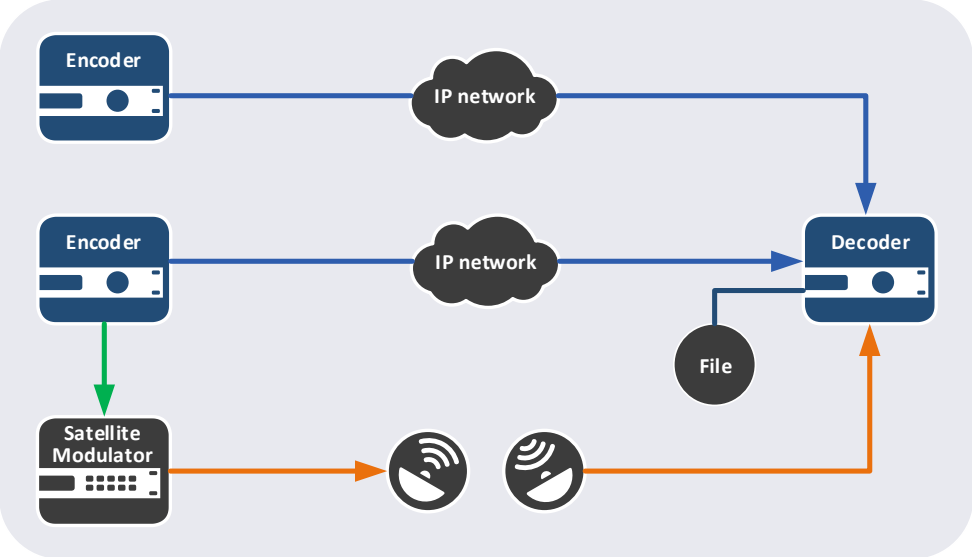
Delay: The delay depends entirely on the source type and its settings. It is possible to configure a delay time for switching between main and backup sources.

Seamless: no

Multicast: yes

Combinability: The number of streams used for Stream4Sure reduces the number of other backup sources that can be used.

Expense: This is a standard function for 2wcom devices that comes without additional charge.



Codec specific: microMPX FEC

Description: microMPX FEC is a codec specific error protection scheme used for controlling errors in data transmission in between microMPX encoder and decoders. In addition to the stream, the encoder also sends redundant FEC correction packets using two parameters: insertion interval and FEC packets per insertion, i.e. send 2 FEC packets every 20 main-stream packets. This enables the receiver to correct errors without needing to newly request lost packets, for this FEC, each FEC packet can be used to restore one main-stream packet, so in above example 2 per 20.

Bandwidth: microMPX typically sends 95 packets per second, adding n FEC packets every m main-stream packets increases the bandwidth accordingly. There is an option to limit the total bandwidth in the encoder settings.

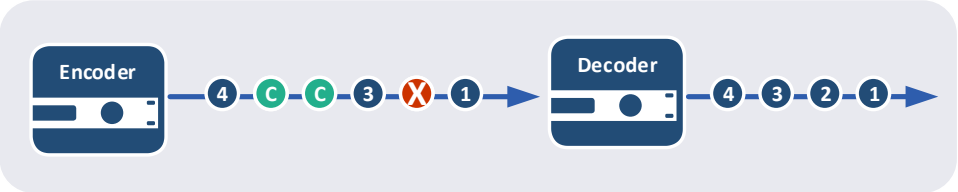
Delay: Low to high. Depending on the settings, decoders might need to buffer more data in order to be able to restore lost packets using the microMPX FEC.

Seamless: yes

Multicast: yes

Combinability: Combinable with all the other solutions

Expense: microMPX encoder and decoder are individual paid licenses, but the FEC is included in each one.



Summary

The appropriate solution depends on the broadcaster's needs and priorities:

If it is important to use as little bandwidth as possible, then RIST and SRT are recommended. If cost-efficient solutions are desired, then FEC, dual streaming and the 3 backup sources are the best choice as they are standard features for 2wcom devices. FEC and dual streaming also provide the best multicast support. If multicast is required, SRT is not an option. However, SRT is the only option if encryption is needed.

The 3 backup sources are the only solution that is not seamless. However, the backup sources are a very useful addition to avoid complete failure. In case of network failure, dual streaming and stream4Sure both provide the safety of a redundant network. Out of these two, Stream4Sure requires less bandwidth than dual streaming if the second stream is encoded with a smaller bit rate than the main stream. RIST, SRT and FEC do not protect against network failure.

The following table gives a basic overview of the different backup and redundancy solutions.

Solution	Seamless	Delay	Bandwidth needed	Free of charge	Multicast	Encryption
Dual Streaming	✓	Low to moderate	Twice as much, ideally in separated networks	✓	✓	-
Stream4Sure	✓	Low to moderate	Depends on number of backup streams	-	✓	-
RIST	✓	Moderate	Low, depends on number of lost packets	-	✓	-
SRT	✓	Moderate	Low, depends on number of lost packets	-	-	✓
FEC	✓	Low to high	Depends on settings	✓	✓	-
3 Backup Sources	-	-	Depends on type of sources and settings	✓	✓	-
microMPX FEC	✓	Low to high	Depends on settings		✓	✓