

How to use Auto Bit rate Opus and Auto Jitter Buffer

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1. Introduction

The two automatic systems described here possibly allow to simplify the configuration of a codec when setting up AoIP links.

- The "Auto Bit Rate Opus" system allows to adjust automatically the Opus bit rate during a link, depending on the transmission conditions.
- The "Auto Jitter Buffer" system allows to adjust automatically the depth of the reception jitter buffer, depending on the observed reception quality.

2. Auto Bit Rate Opus: description

2.1. Basic principles

With a coding algorithm with adjustable bit rate such as Opus, the selection of the bit rate is typically a compromise between two antagonistic needs:

- Looking for the best audio quality naturally leads to preferring the highest possible bit rate;
- But a reduced bit rate is preferred for minimizing the risk of packet losses when the network is busy, if not congested.

The automatic bit rate system avoids having to make this choice beforehand, by adjusting the bit rate automatically during transmission. If the quality decreases the system reduces the bit rate to look for better robustness, conversely it increases the bit rate if the quality is good and steady.

This system can only work with the Opus coding algorithm, as it is the only one with two required characteristics:

- Its bit rate is widely adjustable;
- This can be done during transmission, with no switching noise or other artefact (except the decrease in audio quality that can become evident with very low bit rates).

2.2. Specific settings

The system adjusts the bit rate automatically and dynamically during transmission, but its behavior can be somewhat customized if desired:

- On one hand one it is possible to adjust the limits within which the system is allowed to vary the bit rate;
- Besides it is possible to select a behavior that is more or less reactive: a "Safe" policy reacts less quickly to transmission quality variations than the "Standard" policy, while conversely the "Punchy" policy favors a closer tracking of the quality fluctuations.

2.3. Complementary information

The automatic regulation is optimal when the two connected codecs feature the system, with at each end an AETA codec with the automatic bit rate active. The bit rate is then automatically adapted in both transmission directions, independently on each one.

That is also the case if the remote codec is an AETA codec, even without ABR active.

However, the codec with this system can still regulate its *transmitted* bit rate even if the remote codec is of another brand, provided that it supports the RTCP protocol.

Warnings:

- *Any automatic system has its limitations, and it may not necessarily provide a better result than manual tuning by an expert.*
- *The automatic adjustment cannot compensate for a very poor link quality, which will consistently lead to the lowest bit rate of the allowed range.*
- *The system is incompatible with double streaming, whether in diversity or bonding mode.*

3. Auto Bit Rate Opus: operation

The basic setting is simple as it is just about activating the "Auto Bit Rate" setting on the codec. This chapter describes the requisites and the customization settings.

3.1. Pre-requisites

The codec must have firmware supporting the feature, available for following products:

- ScoopFone 4G
- Scoopy+ S
- ScoopTeam
- μ Scoop
- Scoop5 S
- MultiScoop

3.2. Parameters of the function (html)

This operation mode is available for all the above mentioned products. The settings are available on the "CODING" tab of the html interface, in the "AUTO BIT RATE (OPUS)" section.

If the device is set as a double codec, the automatic system and its settings apply to both codecs.

One just has to check the "Auto adapt" box to activate the function. The other settings allow to customize the operation of the auto adjustment:

- Policy: affects the reactivity of the regulation algorithm (see 2.2 above).
- Minimum: floor value below which the system will not go.
- Maximum: ceiling value that the system will not exceed

Additional note: with auto adjustment, the bit rate in the "Codec" section is of course less relevant than in the "manual" mode. However this is the initial value that the system applies when starting the connection.

3.3. Parameters of the function (front panel)

This chapter is irrelevant for μ Scoop and MultiScoop, that are only controlled through the html pages.

The settings are same as those on the html pages, their location in menus depends on the concerned codec.

3.3.1. ScoopFone 4G

The activation and the policy are available from the keypad/display interface, menu:

IP > Auto Bit Rate, choice: **Disabled / Safe / Standard / Punchy**.

The complementary settings (minimum/maximum bit rates) are only available in the html pages.

3.3.2. Scoopy+ S, Scoop5 S

The activation and settings are available in the sub-menu:

Config > Algorithm > Auto Bit Rate (Opus)

3.3.3. ScoopTeam

The activation and settings are available in the Coding sub-menu, section:

Coding > Auto Bit Rate (Opus)

4. Auto Jitter Buffer: description

4.1. Basic principles

The function of the reception jitter buffer is to compensate for the jitter, that is the variation in the pace of arrival of the received packets, caused by variations in the packet transfer time through the transmission network. A bigger or "deeper" buffer allows for larger fluctuations, while a smaller buffer can be insufficient for this. However a big buffer size also implies a higher latency, which is undesired in some use cases.

Therefore setting the buffer size stems from a compromise between two antagonistic needs:

- For maximum stability when experiencing strong network disturbance, it is preferred to select a larger buffer size.
- But this size should be reduced if looking for controlled latency.

On an AETA codec, this is the choice behind the "Network quality" parameter that is proposed for each IP transmission interface: poor network quality requires a larger buffer at the cost of higher latency, while a good quality allows a smaller buffer and hence lower latency.

The suitable setting may be tricky; for instance running a test link can help, monitoring the available quality indicators (in this case, jitter metrics).

The "Auto Jitter Buffer" system will avoid having to make this choice beforehand, by adjusting the buffer automatically during transmission. If the jitter is high the system increases the buffer size to reach better stability, conversely it reduces the buffer size if the jitter appears to be low, thus reducing the latency.

The system is operative regardless of the AoIP protocol, with or without the SIP protocol.

Note: the system is not operative when 4SB or CELP coding algorithms are selected.

4.2. Specific settings

The system behavior can be somewhat modified by selecting an operating policy: a "Safe" policy reacts less quickly than the "Standard" policy to fluctuations in transmission quality, conversely the "Punchy" policy favors a faster tracking of these fluctuations.

4.3. Warnings

The Auto Jitter Buffer functions brings some ease of use, but one should be aware of its limitations and inherent drawbacks; an automatic system has its limitations, and it may not necessarily provide a better result than manual tuning by an expert.

By its mere principle, the function implies variable latency (each buffer size change causes a change in latency), with the following consequences:

- The latency is unpredictable (in normal mode it is roughly known in advance, and it remains stable during a session); among other issues, this can cause synchronization problems when the program is linked to a video program.
- Each variation is likely to cause an audible effect.

5. Auto Jitter Buffer: operation

5.1. Pre-requisites

The codec must have firmware supporting the feature, available for following products:

- ScoopFone 4G
- Scoopy+ S
- ScoopTeam
- μ Scoop
- Scoop5 S
- MultiScoop

5.2. Parameters of the function (html)

This operation mode is available for all the above mentioned products. Activation is simply done via the "NETWORK" > "AOIP PARAMETERS" page of the html interface, by checking the "Adaptive" box in the "Auto Jitter Buffer" section.

The automation then applies to all the IP interfaces of the codec.

However, each interface has its independent setting for the operating policy (see 4.2 above), available on the page dedicated to the network settings for this interface (example for the Ethernet interface: "NETWORK" > "ETHERNET PARAMETERS"). This "AJB Policy" parameter replaces the "Network Quality" setting that is present when AJB is not active.

5.3. Parameters of the function (front panel)

This chapter is irrelevant for μ Scoop and MultiScoop, that are only controlled through the html pages.

The settings are same as those on the html pages, their location in menus depends on the concerned codec.

5.3.1. ScoopFone 4G

The activation is available from the keypad/display interface, menu:

IP > Adaptive Jitter (Yes/No).

When adaptive jitter is on, each network interface (Ethernet or Mobile) has a setting "AJB Policy" in place of the "Net. Quality" setting, for example:

Ethernet > AJB Policy , choice **Safe / Standard / Punchy**

5.3.2. Scoopy+ S, Scoop5 S

The activation is done in the sub-menu: **Config > Network > AoIP Parameters > Auto Jitter Buffer** (on/off)

The sub-menu "Parameters..." of each IP network interface includes an "AJB Policy" selection, replacing the "Network Quality" setting which is present when AJB is absent or disabled.

5.3.3. ScoopTeam

The activation is done in the sub-menu: **Network > AoIP settings > Jitter Buffer Mode** (Adaptive/Fixed latency)

The sub-menu "... settings" of each IP interface includes an "AJB Policy" selection (Safe/Standard/Punchy), replacing the "Network Quality" choice available when the AJB system is absent or disabled.