International Telecommunication Union

ITU-T
TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.729
Annex J
(05/2006)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital terminal equipments – Coding of analogue signals by methods other than PCM

Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)

New Annex J: An embedded variable bit-rate extension to G.729: An interoperable 8-32 kbit/s scalable wideband extension to G.729

ITU-T Recommendation G.729 – Annex J

ITU-T Recommendation G.729

Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)

New Annex J

**An embedded variable bit-rate extension to G.729:
An interoperable 8-32 kbit/s scalable wideband extension to G.729**

Summary

Annex J/G.729 describes an extension of ITU-T Rec. G.729 for 8-32 kbit/s scalable wideband speech and audio coding algorithm interoperable with ITU-T Rec. G.729 and its Annexes A and B.

The details of Annex J are specified and published in ITU-T Rec. G.729.1 in order to provide for easier maintenance and to give it better visibility.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

ITU-T Recommendation G.729

Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)

New Annex J

An embedded variable bit-rate extension to G.729:
An interoperable 8-32 kbit/s scalable wideband extension to G.729

Annex J/G.729 describes an extension of ITU-T Rec. G.729 for 8-32 kbit/s scalable wideband speech and audio coding algorithm interoperable with ITU-T Rec. G.729 and its Annexes A and B.

The details of Annex J are specified and published in ITU-T Rec. G.729.1 in order to provide for easier maintenance and to give it better visibility.

Summary

Annex J describes an 8-32 kbit/s scalable wideband speech and audio coding algorithm extension interoperable with G.729 and its Annexes A and B. It was referred to as "G.729EV" or "future G.729 Annex J" during its standardization development phase, since it is an extension of ITU-T Rec. G.729.

Annex J extends the existing ITU-T Rec. G.729 and its Annex B with some modifications that have no effect on the interoperability with existing implementations of ITU-T Rec. G.729 and its Annexes A and B, because no modification of the bit allocation in the bitstream, frame size, or sampling frequency of ITU-T Rec. G.729 and its Annexes A and B has been made. In addition, Annex J brings extensions with respect to wideband capability and scalability.

The output of Annex J has a bandwidth of 50-4000 Hz at 8 and 12 kbit/s, and 50-7000 Hz from 14 to 32 kbit/s. At 8 kbit/s, it is fully interoperable with ITU-T Rec. G.729 and its Annexes A and B. Hence, an efficient deployment in existing G.729-based VoIP infrastructures is foreseen. The Annex J extensions operate on 20 ms frames and have an overall algorithmic delay of 48.9375 ms. By default, the encoder input and decoder output of the Annex J extensions are sampled at 16 kHz.

The Annex J embedded bitstream is structured in 12 layers corresponding to 12 available bit rates from 8 to 32 kbit/s. The bitstream can be truncated at the decoder side or by any component of the communication system to adjust "on the fly" the bit rate to the desired value with no need for outband signalling.

The underlying algorithm is based on a three-stage coding structure: embedded Code-Excited Linear Prediction (CELP) coding of the lower band (50-4000 Hz), parametric coding of the higher band (4000-7000 Hz) by Time-Domain Bandwidth Extension (TD-BWE), and enhancement of the full band (50-7000 Hz) by a predictive transform coding technique referred to as Time-Domain Aliasing Cancellation (TDAC).

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