ISO/IEC JTC1/SC29/WG1
(ITU-T SG16)

Coding of Still Pictures

JBIG
Joint Bi-level Image Experts Group

JPEG
Joint Photographic Experts Group

TITLE: Draft Call for Proposals on JPEG XE

EDITORS: Tim Bruylants – tbr@intopix.com
Walt Husak – wjh@dolby.com

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Contact:
ISO/IEC JTC 1/SC 29/WG 1 Convener – Prof. Touradj Ebrahimi
EPFL/STI/IEL/GR-EB, Station 11, CH-1015 Lausanne, Switzerland
Tel: +41 21 693 2606, Fax: +41 21 693 7600, E-mail: Touradj.Ebrahimi@epfl.ch
Draft Call for Proposals on JPEG XE

1 Introduction

The purpose of this Call for Proposals is to receive input contributions for technology to losslessly represent event data as an interchangeable format. Such an event data format, in addition to providing high compression efficiency, should also offer ultra-low latency and allow for low complexity implementations with low-power consumption. Additionally, with lower priority, the format may also facilitate classic image processing in the compressed domain to enhance the quality of the captured visual information for human consumption, like for example denoising, stabilization, deblurring, etc, as well as performing effective computer vision tasks, like object recognition, object tracking, motion segmentation, etc.

In this context, standardization by JPEG will allow the design of a versatile and broadly applicable event-data format, based on a multitude of proposed technologies and close collaboration between industry and academics, while fitting the use cases and requirements. JPEG believes that a well-designed standard can cover a wide range of event-based use cases.

A detailed overview of the use cases and requirements for JPEG XE can be found in document number wg1n100630 [1]. This document also defines the terms and definitions as used in this call for proposals.

The Common Test Conditions (CTC) for JPEG XE document [2] defines the conditions and objective metrics for measuring the performance and quality of applicable technology.

2 Scope

The scope of JPEG XE is the creation and development of a standard to represent Events in an efficient way allowing interoperability between sensing, storage, and processing, targeting machine vision and other relevant applications.

An Event in this context is defined in [1] as the message that signals the result of an observation at a precise point in time. It is typically triggered by a detected change in the physical world. Examples are contrast detection (CD) events from an EB vision sensor or inertial measurement unit (IMU) readings.

In the context of this Call for Proposals only lossless representation of event data is considered. Future calls will be issued to address lossy representation of event data.

3 Use cases and requirements

The JPEG XE use cases and requirements are given in document wg1n100630 [1]. Numerous use cases have already been identified, from which a set of requirements have been derived.

The following use case categories were identified:

- Embedded edge computing – examples are eye tracking, localization, mapping, gesture recognition, obstacle avoidance, presence detection.
- Mobile (phone and tables) – examples are still image deblur, video deblur, super slow-motion, augmented reality, and gesture and face recognition.
- **Industrial machine vision** – examples are vibration monitoring, object counting, object tracking, object sorting, quality monitoring, area monitoring (people, robots).
- **Long-term storage** – for any of the other applications, for AI training data.
- **Movie production** – related to motion capture, virtual production, and live capture.
- **Gaming** – related to motion capture, gesture recognition, game controllers, visual input interfaces.
- **Scientific and engineering measurement** – examples are observation (nature events like lightning, space, stars, lunar eclipse, etc), monitor of rocket launches, space situational awareness (tracking satellites and space debris).

4 **Evaluation conditions and processes**

This section describes the three phases for this Call for Proposals to transition from proposals towards a standard specification. In this process, the Common Test Conditions (CTC) for JPEG XE [2] play a major role.

4.1 **Proposal phase**

- Proponents are not required to be accredited JPEG experts at the time of submission (open to everyone).
- Proposals shall address at least one of the requirements specified in [1] assessed under the conditions specified in [2].
- Proposals shall comply with at least one of the two operation scenarios for lossless formats as specified in [2], notably:
  - Constrained operation scenario;
  - Unconstrained operation scenario.
- JPEG encourages proposals that include proof-of-concept implementations on relevant platforms.
- Proposals adopting a learning-based approach and requiring training material will be accepted under the assumption that all materials used, not only be described, but also made available for free use in the posterior JPEG XE standardization process and associated publications.

4.2 **Evaluation phase**

After receiving the proposals, an extensive evaluation will be conducted according to the following basic principles:

- The evaluation shall be open, transparent, fair, and unbiased.
- The evaluation shall allow an as detailed and deep-technical discussion as possible.
- The evaluation shall be efficient and timely towards the goal – working towards a JPEG XE standard.

Following these principles, the evaluation process will be organized as:

1) Proposals may be cross-checked by the JPEG committee.
2) Discussion and assessment of the proposals, requirement by requirement, as given in [1] under the conditions defined in [2].
3) Proponents shall present their proposal at the JPEG meeting just after the submission deadline and participate in the discussion.
4) Selection of the initial technology for building the standard based on consensus. The concept is to build one standard that selects and combines the best technology from all proposals, with the goal of serving as many of the requirements as well as possible [1].

4.3 Standardization phase

After the evaluation phase, a collaborative process for standardization will be initiated under the following principles:

- The standard shall be built using the requirements assessment performed during the evaluation phase and following a defined strategy.
- During the standardization phase, elements from complementary proposals may be combined into a single coherent specification.
- Experiments might be designed to compare specific elements among proposals to support better decisions.
- Respondents of selected proposals are expected to engage with JPEG as part of the development of the standard.

All decisions during the evaluation and standardization phases will be made by consensus in line with ISO processes.

5 Timeline

The following timeline is targeted:

- 2024-04: Draft Call for Proposals
- 2024-07: Final Call for Proposals and Final Common Test Conditions (including software)
- 2025-01-03: Registration of interest (not mandatory)
- 2025-03-31: Deadline for submission of proposals
- 2025-04-05 to 2025-04-11: Presentation and discussion of proposals at the 107th JPEG meeting
- 2025-07: Committee Draft (CD)
- 2026: Draft International Standard (DIS)
- 2026: International Standard (IS)

NOTE: This timeline is indicative and may be updated in the future.

6 Proposal composition and requirements

6.1 Proposal elements

1. Summary of the proposal.
2. Detailed technical description of the proposal.
3. Requirements compliance table: proponents must indicate which requirements from [1] they address and how they are addressed via the attached “JPEG XE Requirements Compliance” sheet.
4. Metrics results according to the CTC [2] using the software provided by JPEG and the attached “JPEG XE Metrics Results” sheet.

5. Any other information and metrics that demonstrates the potential of the proposal, both at encoder and decoder sides, under the given operational cases as described in the CTC [2]. This includes any evidence to support the proposal, notably used technologies, documentation, etc.

6. Executable software, and optionally source code, for the decoder of the proposal for eventual cross-check validation. Encoder is optional but encouraged.

7. Bitstream files of encoded event sequences of the reference dataset as given in the CTC [2].

6.2 Proposal registration and delivery

Proposals shall be submitted by the deadline specified in Section 5 of this document and shall contain the documents listed in Section 6.1.

A proposal should be registered by sending an email that contains the summary and technical description of the proposal to the three listed contacts in Section 9.

Furthermore, a ZIP archive file containing all the proposal elements as listed in Section 6.1 should be: i) registered and uploaded to the ISO document register as an input document to the 107th JPEG meeting, or ii) proponents without access to the ISO registry should provide a ZIP archive file through a link (external) send by email to the three listed contacts in Section 9. An acknowledgment of receipt will be sent to the proponents.

6.3 IPR conditions (ISO/IEC directives)

Proponents are advised that this call is being made in the framework and subject to the common patent policy of ITU-T/ITU-R/ISO/IEC and other established policies of these standardization organizations. The persons named below as contacts can assist potential submitters in identifying the relevant policy information.

6.4 Contribution to standardization

Proponents are informed that based on the submitted proposals, a standard specification will be created. If they submit a proposal and (part of) the proposed technology is accepted for inclusion in the standard, they will hence need to attend subsequent WG1 meetings and contribute to the creation of the different standardization documents. Within this process, evolution and changes are possible as several technologies may be combined to obtain a better performing solution.

7 Royalty-free goal

The royalty-free patent licensing commitments made by contributors to previous standards, e.g. JPEG 2000 Part 1, have arguably been instrumental to their success. JPEG expects that similar commitments would be helpful for the adoption of a JPEG XE standard.

8 Participation

All relevant work is conducted by the JPEG XE Ad hoc Group (AhG). Interested parties are invited to join the JPEG XE AhG mailing list via https://listregistration.jpeg.org and regularly consult the https://jpeg.org website for the latest news and updates.
9 Contacts

Contact List:

- Touradj Ebrahimi (JPEG Convener)
  touradj.ebrahimi@epfl.ch
- Fernando Pereira (JPEG Requirements Subgroup Chair)
  fp@lx.it.pt
- João Ascenso (JPEG Coding and Performance for Machines Subgroup Chair)
  joao.ascenso@lx.it.pt

References
