# JPEG-XL Transfer Syntax and DICOMweb Support

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## On Behalf of Working Group WG-04

# Introduction/Scope

Modalities such as Microscopy generate a large number of colour images, and other modalities are starting to generate more colour images. Demand for web browser based applications that support fast image viewing and color accuracy are growing. None of the existing DICOM transfer syntaxes can be used to meet this demand due to one or more limitations which are described below. JPEG-XL was standardized in 2020 and has the needed features to meet this demand. JPEG-XL has seen rapid adoption over the past 12 months and is available for testing today in the two main web browsers (FireFox and Chrome), several image editors and has a robust open source implementation.

## Limitations of Current Standard

Each of the existing transfer syntaxes has significant limitations for use as a colour image encoding. Likewise, the existing image formats for DICOMweb also have significant limitations. These are:

* JPEG is 8 bit only, and only supports lossy encoding which prevents it from being used for use cases that require higher bit depths and lossless image quality
* PNG is only supported in DICOMweb Retrieve Rendered Transaction which prevents it being used for archiving, is slow to encode and has low compression ratios preventing it from being used for use cases that are sensitive to viewing performance and/or storage cost.
* JPEG-2000 is slow to decode which prevents it from being used for use cases that are sensitive to viewing performance
* JPEG Lossless and LS do not include proper colour encoding information which prevent them from being used for image quality sensitive use cases
* LEI is quite large which increases storage costs when used for archiving, and is also missing proper colour encoding information which prevents it from being used for image quality sensitive use cases

Given these limitations, important use cases cannot be met today in a web browser using the DICOM standard. To address this gap, a new transfer syntax is needed for a codec that features high compression ratios (for archive) and fast decode times (for fast viewing) with full ICC profile support (for color accuracy).

## Description of Proposal

This proposal is to add a JPEG-XL lossy and lossless transfer syntax, and support for JPEG-XL in the DICOMweb standard. This has been tried before with other work items such as JPEG XR, but the other formats haven’t been widely adopted. As such, for this supplement, the idea would be to use as a test whether or not a major browser has enabled JPEG-XL as a fully supported image format. If this occurs, then it will be assumed that the format will become mainstream.

In the DICOMweb area, the JPEG-XL format will be added as a return type for both pixel data and rendered images, allowing for lossless rendering of images from DICOMweb.

## Parts of Standard Affected

This work item will affect Part 5 and Part 18 of the standard.

## Resources & Time Line

About 8 people are active in Working Group 4. Bill Wallace and Chris Hafey have volunteered to work on writing this supplement. It is estimated that the work will take about 12 months. A first draft will be available by January, 2022.

Members of WG-04 anticipate that four hours of Working Group Six meeting time will be required on each of four occasions during 2022 and 2023 to review and approve an early draft as well as public comment, letter ballot, and final text versions of the supplement.