DICOM Secretariat/MITA
1300 North 17th Street, Suite 900
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MINUTES

MEETING NAME WG-32

MEETING PLACE/DIAL IN Via Zoom

DATE & TIME Thursday 21 August 2025
10:00– 11:00 AM Eastern Daylight Time (EDT)

PRESIDING OFFICERS Jonathan J. Halford,
Ralph H. Johnson VA Medical Center (Charleston, SC)
User Co-Chair
Andrew Ehrenberg, Nihon Kohden Corporation
Vendor Co-Chair

IFCN SECRETARIAT Kim Zaiss

DICOM SECRETARIAT Shayna Knazik

Present	First Name	Last Name	Organization	Voting Status
	Kevin	O'Donnell	Canon Medical Research USA, Inc.	Voting
	Felix	Rosenow M.D.	DGKN (German Society of Clinical Neurophysiology and Functional Imaging)	Voting
	Jan	Remi	Ludwig-Maximilians-University of Munich	Voting
X	Benjamin	Brinkmann	Mayo Clinic Rochester	Voting
X	Jonathan	Halford	Ralph H. Johnson VA Medical Center	Voting
X	Andrew	Ehrenberg	Nihon Kohden Corporation	Voting
	Alan	Huang	Philips	Voting
	Wim	Corbijn van Willenswaard	Philips	Alt. Voting
	Justin	Dauwels	TU Delft	Voting
	Jeroen	Medema	Philips	Alt. Voting
	Raymond	Kraskinski	Philips	Observer
	David	Clunie	PixelMed Publishing	Voting
X	Silvia	Winkler	Sigma Software Solutions	Voting
	Ana	Alves	CortexXus Inc.	Observer
X	Giuseppe	Campobello	University of Messina	Observer
	David	Alves	CortexXus Inc.	Observer
	Babak	Razavi	CortexXus Inc.	Observer
	Matt	Stead	Dark Horse Neuro, Inc.	Observer
	Gritsch	Gerhard	AIT Austrian Institute of Technology GmbH	Observer
	Ignacio Ramírez	Paulino	Facultad de Ingeniería - Universidad de la República	Observer
	Sandor	Benizcky	Aarhus University	Observer
	Gardar	Thorvardsson	Kvikna / Stratus EEG	Observer

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	Richard	Moberg	Moberg Research, Inc.	Observer
	Casey	Stengel	NeuraLynx, Inc.	Observer
	Bill	Antilla	Nihon Kohden Corporation	Observer
X	Koichiro	Matsumoto	Nihon Kohden Corporation	Observer
	Andrey	Pirozhenko	Persyst Development Corporation	Observer
X	Shane	Poznikoff	Persyst Development Corporation	Observer
	Stefan	Rampp	University Klinikum Erlangen	Observer
	Dagmar	Krefting	University Medical Center Göttingen	Observer
	Gloria	Menegaz	University of Verona, Italy	Observer
	Jonathan	Pfaff	Fraunhofer Heinrich Hertz Institute (HHI)	Observer
X	Gary	Sullivan	Dolby Laboratories	Observer
X	Kristian	Bernard Nilsen	Oslo University Hospital	Observer
X	NS	Nagarajan	GE Healthcare	Observer
	Bruno	Monnerat	University of Sao Paulo	Observer
	Christof	Fersch	Dolby Germany	Guest
X	Heidi-Maria	Lehtonen	Dolby Germany	Guest
X	Brian	Lee	Dolby Laboratories	Guest
X	Mattia	Galanti	Clemson University	Guest

1. CALL TO ORDER AND REVIEW OF ANTI-TRUST RULES AND DICOM PATENT POLICY

The meeting was called to order at 10:00 AM EDT. Participants were reminded that the Guidelines for Conducting NEMA Meetings and Patent Disclosure Policy are in effect and they may be found here: https://www.dicomstandard.org/patent.

2. WELCOME/ATTENDANCE/INTRODUCTION

Attendance was taken.

3. REVIEW AND APPROVE AGENDA

The agenda was reviewed, motion to approve by JH and seconded by SW.

4. REVIEW MINUTES

The minutes of the 17 July 2025 meeting were reviewed, motion to approve by JH and seconded by BB.

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5. OLD BUSINESS

- Update on the ITU-T Call for Proposals (CfP) for Biomedical Waveform Coding
  - Gary Sullivan (GS) reported that there was a new version of the H.BWC reference software which would be released publicly in a few days, which would have better compression capability and probably lower complexity for encoding. GS reported that the proposal to launch the H.BWC codec project as a joint project between ITU-T and ISO/IEC/MPEG is currently in open ballot, which will close in mid-October when MPEG will be having its next meeting in Geneva (including an ITU-T SG-21 [VCEG] meeting), and that is when the open ballot phase will conclude.
  - Jonathan Pfaff (JP) reported that, in the lossy setting, the design of H.BWC was beginning to stabilize, but for the design of the lossless mode of the codec there were highly active technical investigators ongoing which he expected to lead to one or more fundamental changes to the design, which would be finalized by the end of the October meeting. JP stated that he expected that the overall design of the H.BWC codec would be nearly complete by the end of the October meeting, with changes permitted after this time but fundamental design changes not anticipated by VCEG.
  - Jon Halford (JH) asked GS and JP how it was going working to parameterize the codec such that there was just one parameter, named something like "quality index", which controlled the fidelity of lossy encoding. JP stated that the H.BWC encoder currently set the level of fidelity for lossy encoding automatically [based on certain measurements it made of the waveform signal] and a design whereby a level of fidelity was set as an input parameter to the codec (such that this level of fidelity was guaranteed to the decoder) had not been finalized. But there were plans to take this up and add options for this approach to the draft codec spec at the next VCEG meeting. GS stated that a tricky part of this is the quantization design, particularly a component of the quantization design which came from JP's company and asked JP if he thought that a clear limit on the error induced by the quantizer was achievable. JP answered yes, he thought that this was achievable and a plan for this was going to be submitted at the next VCEG meeting, specifically a plan to specify the quantization parameter (step size) that guarantees a limit on the error induced by the quantizer in the transform domain. GS: stated that he hoped to see this confirmed in testing at the next VCEG meeting.
  - Andrew Ehrenberg (AE) asked, given DICOM is usually implemented on a physical PACS server, and since there are many users who are moving to cloud storage with one of the big cloud storage providers (like AWS), whether DICOM encoding can also function well in cloud environment? JP answered that DICOM should be useful and translatable to the cloud storage environment because the data is stored in a standard format, which makes storage and use platform and device

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independent. Silvia Winkler (SW) added that when the H.BWC codec is standardized, just as for encapsulated (compressed) JPEG images, it will make no difference if encapsulated DICOM waveform data is stored in a local PACS server or on the Cloud.

- Development of IOD for LTM EEG and Sleep Studies.
  JH reviewed the planning document for this IOD which had been pre-circulated to WG-32 the week before this telecon, and the topics below were discussed:
  - Series versus Modality. JH and SW pointed out that there can only be one Modality type in each Series. [Examples of Modality types include EEG, EMG, EOG, ECG, etc.] Therefore, for example, if both EEG and EMG signals were recorded in different channels by a device, there would need to be a different Series for the EEG and EMG waveform data.
  - Series versus SOP Instance versus IOD. SW pointed out that within a Series there can be more than one SOP Instance, depending on factors including: (1) if a recording runs for a long time, even if the channels and sampling rate do not change, it is possible for the waveform data to be split up into multiple SOP Instances [which do not temporally overlap] so that the SOP Instances are not too large and (2) if there are discontinuities (gaps or interruptions) then this will produce multiple SOP Instances containing at least one multiplexed group of waveform data with the same channels and sampling rate or rates [which do not temporally overlap]. JH asked WG-32 if neurophysiology recording equipment existed that recorded certain channels with one sampling rate and other channels with a different sampling rate. Andrew Ehrenberg (AE) reported that this is a feature of some recording devices. SW stated that if there were subsets of different channels which had different sampling rates being recorded concurrently [but were of the same Modality], then this would lead to the DICOM encoding of more than one multiplexed group within one SOP Instance. SW also stated that, to the best of her knowledge, and assuming that the channels are of the same Modality and are produced by the same IOD ("Object"), multiple subsets of different input channels could optionally be stored in different SOP instances such that, for example, all of the channels on the right side could be encoded in one SOP Instance and all of the channels on the left side could be encoded in another SOP Instance [and the time epoch covered by these two SOP Instances could overlap]. JH and SW pointed out that multiple SOP Instances within one Series or multiple multiplexed groups within one SOP Instance would *only* be allowed if the waveform data was from one Modality and produced from the same IOD. Ben Brinkmann (BB) pointed out that it was useful that DICOM organized the data in this way because, for waveform data from wearable devices, it was common for different waveform types to be sampled at different rates, such as actigraphy sampled at 128 Hz and temperature sampled at 4 Hz.

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- Frames versus Fragments. JH stated that he thought this IOD was going to need to use at least the Frames structure to provide random access points (and byte offset indexing to random-access points) in the encapsulated (compressed) waveform data. SW pointed out that the term "Frame" in DICOM [if not associated with Fragments] refers to the encoding of native (uncompressed) data only and if a multi-frame DICOM image SOP Instance is created, it contains multiple pixel matrixes, each representing one native-encoded (uncompressed) image. Therefore, if there are to be DICOM encoding of random-access points placed within H.BWC encapsulated (compressed) waveform data, this would mean that there would need to be a sequence of items, with each item representing a single Fragment (a portion of the encoded compressed data). The relationship to the uncompressed Frames of a multi-frame image may be 1:1 (one Frame results in one Fragment) or 1:many (one Frame results in multiple Fragments).
  In the Sequence of Items representing the encapsulated data, the first Item is reserved: it might be empty, or it might contain a so-called Basic Offset Table with pointers to first fragment of each encoded frame. GS stated that the term "frames", for audio-video encoding, was not connected to random-access points because the decoding of sequential frames was dependent on the information in previous frames, and that the first frame was termed an "I-Frame" or a "Synch-Frame". GS stated that it was good for WG-32 to be working to compile an outline of the DICOM terminology relevant to developing this new IOD, so that ITU-T VCEG could try to align the design of the novel H.BWC compression standard with this terminology, as much as possible.

- Development of Intracranial EEG (iEEG) IOD
  JH mentioned that a planning document for this IOD was being prepared but not yet ready for circulation to WG-32, and that this planning document would be discussed at the next WG-32 telecon.

- Objective Development of H.BWC Lossy Transfer Syntaxes
  JH reported that he is moving forward to get IRB approval for a research project on this topic at his Veterans Health Administration (VHA) Health Systems Research (HSR) Center of Innovation (COIN) in Charleston SC. The research protocol for this project had already been pre-circulated to WG-32 a month or two ago, and feedback received. He reported that he and other staff were working to develop data use agreement documents for (1) entities (such as private companies and universities) to sign if they donated de-identified and non-coded neurophysiology waveform reference datasets and (2) entities (such as companies and individual university research labs) to sign if they wanted access to these reference datasets (and access to these would probably come with some restrictions). Kristian Bernard Nilsen (KBN) asked what kinds of reference waveform datasets were going to be collected. JH responded that the types of datasets which would be collected

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included needle EMG (with high sampling rate), intracranial EEG macro- and microelectrode recordings, and polysomnogram (sleep) studies. KBN stated that his research group could donate de-identified and non-coded needle EMG data to this effort. KBN also stated that his research group had received funding to encode their neurophysiology data in DICOM format, so he was interested if any WG-32 participants knew of any software resources to help with this project. SW stated that should could assist KBN with this because she has access to software tools for exporting waveform data in DICOM format, although she pointed out that, because there is no standardized codec that DICOM can use to encode waveform data (given that H.BWC has not yet been standardized), only encoding of native (uncompressed) waveform data was currently supported by DICOM.

- WG-32 Fundraising
  JH reported that IFCN had raised $7400 earmarked for the support of WG-32 and that if any attendees knew of any companies or private donors who were interested in donating to IFCN (earmarked for the work of DICOM WG-32) then they could contact Kim Zaiss, the Executive Director of IFCN, who could work with them to assist in the process for IFCN receiving the funds.

- Upcoming WG-32 Face-to-Face Meeting at ECCN2025
  JH reported there will be an informal one-hour meeting for participants of WG-32, or persons or companies interested in the work of WG-32, in a conference room at the upcoming ICCN2025 conference in London (https://www.eccn2025-london.com/). This meeting will be on 10 September 2025 from 1:00- 2:00 PM local time (lunch starts at 12:30 so participants can pick up conference food and bring it to the conference room listed below). Below is the location for this meeting:
  Building: Central Hall Westminster
  Location: Level 2
  Room Name: 206

6. NEW BUSINESS

- None

7. DATE AND TIME OF NEXT MEETINGS

Thursday 18 September 2025	10:00- 11:00 am UD ET
Thursday 16 October 2025	10:00- 11:00 am UD ET