Standardization

2024/25 Q2

Jaime Delgado

DAC - UPC

Standardization – Basic concepts

- **Specifications for interoperability**
- Public vs. Private → PUBLIC
- Free vs. Paid
- Patents possible in standards:
    - RAND: Reasonable And Non-Discriminatory
- Open vs. Closed development
- "Individually" initiated (e.g. RFCs in IETF)
- Organizations →

Standardization – Organizations

- Forum-like: **industry**, users, service providers, regulators, administration, …
  OMA, DVB, ECMA, …

- "Formal" standardization organizations:

  - *(States-based)*
    ISO, IEC, ITU, ITU-T, CEN, ISO/IEC, …

  - *(Organizations/Individuals-based)*
    IEEE, IETF, W3C, HL7, GA4GH, …

- SDO: **Standards Development Organization**

Examples of SDOs

- **ISO** (International Organization for Standardization)
- **IEC** (International Electrotechnical Commission)
- **ITU-T** (International Telecommunication Union - Telecommunication Standardization Sector)
- **CEN** (European Committee for Standardization)
- **IEEE** (Institute of Electrical and Electronics Engineers)
- **IETF** (Internet Engineering Task Force)
- **W3C** (World Wide Web Consortium)
- **HL7** (Health Level Seven)
- **GA4GH** (Global Alliance for Genomics & Health)
- …

Examples of SDOs

- **ISO** (International Organization for Standardization)
- **IEC** (International Electrotechnical Commission)
- **ITU-T** (International Telecommunication Union - Telecommunication Standardization Sector)
- **CEN** (European Committee for Standardization)
- **IEEE** (Institute of Electrical and Electronics Engineers)
- **IETF** (Internet Engineering Task Force)
- **W3C** (World Wide Web Consortium)
- **HL7** (Health Level Seven)
- **GA4GH** (Global Alliance for Genomics & Health)
- …

Less relevant

Specific topics: LANs, …

Internet standards! RFCs

Web standards

eHealth standards

Activities around standardization

- **Identify/select a standard for a need**
- **Understand what does it solve and how to use it**
- Be aware of the status of a standard within its development process
- Identify new possible standards
- *Develop new standards*

Activities around standardization

- **Identify/select a standard for a need**

- **Understand what do___ ___solve and how to use it**

- Be aware of ___ ___ndard within its dev___

- Iden___ ___ds

- *Deve___ ___s*

Exercises! ("Workshop")

Standardization

More details after "Workshop"

Standardization – **Examples**

- **W3C**: HTML
- **IETF**: TLS (Transport Layer Security)
- **ISO** (ISO/IEC):
  - Structure
  - MPEG
  - DASH (streaming)
  - (JPEG extensions)

W3C example: HTML5

W3C Recommendation

W3C®

HTML5

A vocabulary and associated APIs for HTML and XHTML

W3C Recommendation 28 October 2014

This Version:
http://www.w3.org/TR/2014/REC-html5-20141028/
Latest Published Version:
http://www.w3.org/TR/html5/
Latest Version of HTML:
http://www.w3.org/TR/html/
Latest Editor's Draft of HTML:
http://www.w3.org/html/wg/drafts/html/master/
Previous Version:
http://www.w3.org/TR/2014/PR-html5-20140916/
Previous Recommendation:
http://www.w3.org/TR/1999/REC-html401-19991224/
Editors:
WHATWG:
Ian Hickson, Google, Inc.
W3C:
Robin Berjon, W3C
Steve Faulkner, The Paciello Group
Travis Leithead, Microsoft Corporation
Erika Doyle Navara, Microsoft Corporation
Edward O'Connor, Apple Inc.
Silvia Pfeiffer

Please check the **errata** for any errors or issues reported since publication.
This specification is also available as a single page HTML document. See also **translations**.

W3C example: HTML5

W3C Recommendation

W3C®

HTML5

A vocabulary and associated APIs for HTML and XHTML

W3C Recommendation 28 October 2014

This Version:
http://www.w3.org/TR/2014/REC-html5-20

Latest Published Version:
http://www.w3.org/TR/html5/

Latest Version of HTML:
http://www.w3.org/T

Latest Editor's Dra
http://www

Previous Versi
http://www.w

Previous Recomm
http://www.w3.o

Editors:
WHATWG:
Ian Hickson, Google
W3C:
Robin Berjon, W3C
Steve Faulkner, The Pac
Travis Leithead, Microso
Erika Doyle Navara, Micros
Edward O'Connor, Apple Inc.
Silvia Pfeiffer

Obsolete!

Please check the **errata** for any errors or issues reported since publication.
This specification is also available as a single page HTML document. See also **translations**.

W3C example: HTML5.x

https://www.w3.org/TR/html52/
(14th December 2017, W3C Rec.)

https://www.w3.org/TR/html53/
(18th October 2018, W3C WD)

**New work going on!
"LIVING STANDARD"**
https://w3c.github.io/html/
(Editor's Draft)

W3C example: HTML5.x

https://www.ml52/

(14th Rec.)

3/

https://html.spec.whatwg.org/

https://ub.io/html/

or's Draft)

Work moved to whatwg.org

Web Hypertext Application Technology Working Group

(Apple, Google, Mozilla, Microsoft)

IETF example: TLS

- https://datatracker.ietf.org/wg/tls/documents/

- https://datatracker.ietf.org/doc/draft-ietf-tls-certificate-compression/

- https://datatracker.ietf.org/doc/draft-ietf-tls-rfc8446bis/

Standardization – Examples

- W3C: HTML
- IETF: TLS (Transport Layer Security)
- **ISO (ISO/IEC):**
    - Structure
    - MPEG
    - DASH (streaming)
    - (JPEG extensions)

Standardization (ISO)

- **International Organization for Standardization**

- Independent, Non-Governmental Organization

- 173 member countries (national standards bodies): ANSI, JISC, KATS, BSI, DIN, AFNOR, UNI, …

- https://www.iso.org/about/members

- Central Secretariat in Geneva

- ESNB: ~~AENOR~~ ~~(Asociación Española de Normalización y Certificación)~~
  UNE - Asociación Española de Normalización

- *TC (Technical Committee)*
  SC (Sub Committee)
  WG (Working Group)

  …

National Bodies and Technical Committees

	NB Acronym	TC participation (incl. "observers")
China	SAC	773
France	AFNOR	763
Germany	DIN	765
United Kingdom	BSI	765
Japan	JISC	736
Korea, Republic of	KATS	739
Italy	UNI	719
Russian Federation	GOST R	714
Czech Republic	UNMZ	713
India	BIS	711
Iran, Islamic Republic of	INSO	704
Romania	ASRO	703
Spain	UNE	687
Poland	PKN	663
Netherlands	NEN	662
Finland	SFS	627
Switzerland	SNV	587
Sweden	SIS	579
Austria	ASI	579
United States	ANSI	569

Old!

Data from 2024/09/25

National Bodies and Technical Committees

	Country	NB Acronym	TC participation (incl. "observers")
1	China	SAC	779
3	France	AFNOR	768
4	Germany	DIN	767
2	United Kingdom	BSI	769
6	Japan	JISC	738
5	Korea, Republic of	KATS	744
9	Italy	UNI	724
10	Russian Federation	GOST R	721
8	Czech Republic	UNMZ	713
11	India	BIS	712
7	Iran, Islamic Republic of	INSO	731
12	Romania	ASRO	703
13	Spain	UNE	694
15	Poland	PKN	665
14	Netherlands	NEN	666
16	Finland	SFS	636
17	Switzerland	SNV	591
19	Sweden	SIS	580
18	Austria	ASI	584
20	United States	ANSI	573

Data from 2025/02/25

Standardization (ISO/IEC)

- ISO/IEC JTC 1
    - *Joint Technical Committee 1*
    International Organization for Standardization (ISO)
    International Electrotechnical Commission (IEC)
    - All matters of **Information Technology (IT)**
    - But also in other ISO TCs (and even IEC)
    - Participating (P) and Observing (O) members
    - Other organizations: Liaison Members

Standardization (ISO/IEC)

- ISO/IEC JTC 1
    - *Joint Technical Committee 1*
      International Organization for Standardization (ISO)
      International Electrotechnical Commission (IEC)
    - All matters of **Information Technology (IT)**
    - But also in other ISO TCs (and even IEC)
    - Participa
    - Other or

Now also

JTC3: Quantum technologies (2024)

JTC4: Cities (?) (under discussion)

Standardization (ISO/IEC)

- ISO/IEC JTC1 (Information technology) *(since 1987)*
- Structured in SubCommittees (SCs), and some WGs

- <u>SC examples</u>:
  - SC 17: Smart cards
  - SC 24: Computer graphics, Virtual reality, …
  - SC 27: Information security, privacy protection …
  - SC 38: Cloud Computing …
  - SC 41: Internet of Things and digital twin *('17)*
  - SC 42: Artificial Intelligence *('17)*
  - SC 43: Brain-computer interfaces *('22)*
  - SC 44: Consumer protection in the field of privacy by design *(**'25**)*
- The rest of SCs (missing numbers are closed):
    - 2, 6, 7, 22, 23, 25, 28, 31, 32, 34, 35, 36, 37, 39, 40

Standardization (ISO/IEC)

- … and

- ISO/IEC JTC 1 **SC 29**
  (Coding of Audio, Picture, Multimedia and Hypermedia Information)

- Originally:
  - WG1 (JPEG)
  - WG11 (MPEG)

- **https://committee.iso.org/home/jtc1sc29**

- Current members: 30 "P" and 18 "O"

Standardization (ISO/IEC)

- … and

- ISO/IEC JTC 1 **SC 29**
  (Coding of Audio, Picture, Multimedia and Hypermedia Information)

- Originally:
    - WG1 (JPEG)
    - ~~WG11 (MPEG)~~

- **https://committee.iso.org/home/jtc1sc29**

- Current members: 30 "P" and 18 "O"

Standardization (ISO/IEC)

- … and

- ISO/IEC JTC 1 **SC 29**
  (Coding of Audio, Picture, Multin[...]
  Information)

- Originally:
    - WG1 (JPEG)
    - ~~WG11 (MPEG)~~
.

  (summer 2020) →

- **https://committee.iso.org/hom**

- Current members: 30 "P" and 18 "O"

WG2 – Technical requirements
WG3 – Systems
WG4 – Video coding
WG5 – Joint video ITU-T
WG6 – Audio coding
WG7 – 3D graphics & haptics coding
WG8 – Genomic coding
AGs …

Standardization (ISO/IEC) – SC29

Working Groups: (MEETINGS BASED)

- ISO/IEC JTC 1 SC 29/**WG 1:**
    - JPEG: Joint Photographic Experts Group
    - 4 meetings/year (next: 107th, April 2025)

- ISO/IEC JTC 1 SC 29/~~WG 11~~ **(WGs 2, 3, …, 8):**
    - MPEG: Moving Pictures Experts Group
    - 4 meetings/year (next: 150th, April 2025)

MPEG

Working Groups ISO/IEC

Development of standards for coded representation of digital audio and video *(ISO/IEC JTC1 SC29/WG11)*

Originally

- **Moving Picture Experts Group**
  - MPEG-1: Standard for storage and retrieval of moving pictures and audio on storage media
  - MPEG-2: Standard for digital television
  - MPEG-4: Standard for multimedia applications
  - MPEG-7: Standard for description and search of audio and visual content
  - MPEG-21: Multimedia Framework

MPEG

Working Groups ISO/IEC

Development of standards for coded representation of digital audio and video *(ISO/IEC JTC1 SC29/WG11)*

Originally

- **Moving Picture Experts Group**
  - MPEG-A (Application formats)
  - MPEG-B (Systems extensions)
  - MPEG-C (Video extensions)
  - MPEG-D (Audio extensions)
  - …
  - MPEG-DASH (Streaming)
  - …
  - MPEG-H (MMT + HEVC)
  - …

MPEG

Working Group ISO/IEC

Development of standards for coded representation of digital audio and video *(ISO/IEC JTC1 SC29/WG11)*

Originally

- **Moving Picture Experts Group**
  - …
  - *MPEG-G (Genomic information)*
  - MPEG-H (MMT + HEVC)
  - MPEG-I (…, VVC, …)
  - …
  - MPEG-M (Middleware)
  - MPEG-V (Virtual "worlds")
  - …

MPEG

Working Group ISO/IEC

Development of standards for coded representation of digital audio and video *(ISO/IEC JTC1 SC29/WG11)*
Originally

- **Moving Picture Experts Group**
  - MPEG-1: Standard for storage and retrieval of moving pictures and audio on storage media
  - MPEG-2: Standard for digital television
  - MPEG-4: Standard for multimedia applications

  - MPEG-5: Essential Video Coding (No licenses!)

  - MPEG-7: Standard for description and search of audio and visual content
  - MPEG-21: Multimedia Framework

MPEG roadmap (1/2)

From ISO/IEC JTC 1/SC 29/WG 2 N00404 – November 2024

2023 **2024** **2025** **2026** **2027**

MPEG meeting: 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157

Lenslet video coding for dense light fields

Neural network-based video compression

Compression of neural networks

Enhanced compression beyond VVC capabilities

Coding for Gaussian splatting

6G opportunities

AI support for representation and search of genomic data

Management of privacy and protection of genomic data

Authenticity for media

Audio Coding for Machines

Explorations

Versatile Video Coding v 4

Video supplemental enhancement information v4

Major Maintenance Items

From ISO/IEC JTC 1/SC 29/WG 2 N00404 – November 2024

Standardization (Working Groups)

ISO/IEC
JTC1
SC29/WG11
→
WG2 to WG8

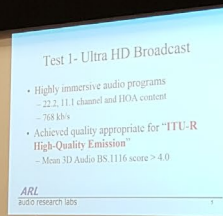# Standardization (Working Groups)

ISO/IEC
JTC1
SC29/WG11
→
WG2 to WG8

Standardization (Working Groups)

ISO/IEC
JTC1
SC29/WG11
→
WG2 to WG8

"Experts" from companies /
universities "representing"
National Bodies

Standardization (ISO/IEC process)

- **Steps** (all of them could be repeated)**:**
    - Requirements
    - Call for Proposals
    - **WD** (Working Draft) - WG level
    - **NP** (New Proposal)
    - **CD** (Committee Draft) → consultation
    - **DIS** (Draft International Standard) → ballot SC level
    - **FDIS** (Final Draft International Standard)
        → ballot TC level
        (optional)

    - **IS (International Standard)**

    - *Corrigenda and amendments*

The main balloting stages

Project registered | Publication | Withdrawal

Document :	NP	CD	DIS	FDIS	IS	SR	WDRL
Ballot:	BALLOT	Consultation	BALLOT	BALLOT		BALLOT	Consultation
Stage Code :	10	30	40	50	60	90	95

Committee Internal Voting (CIB)

All Members voting

NSB participation:

P-members <u>must</u> vote
O-members can comment

P-member <u>must</u> vote
All ISO Members can vote
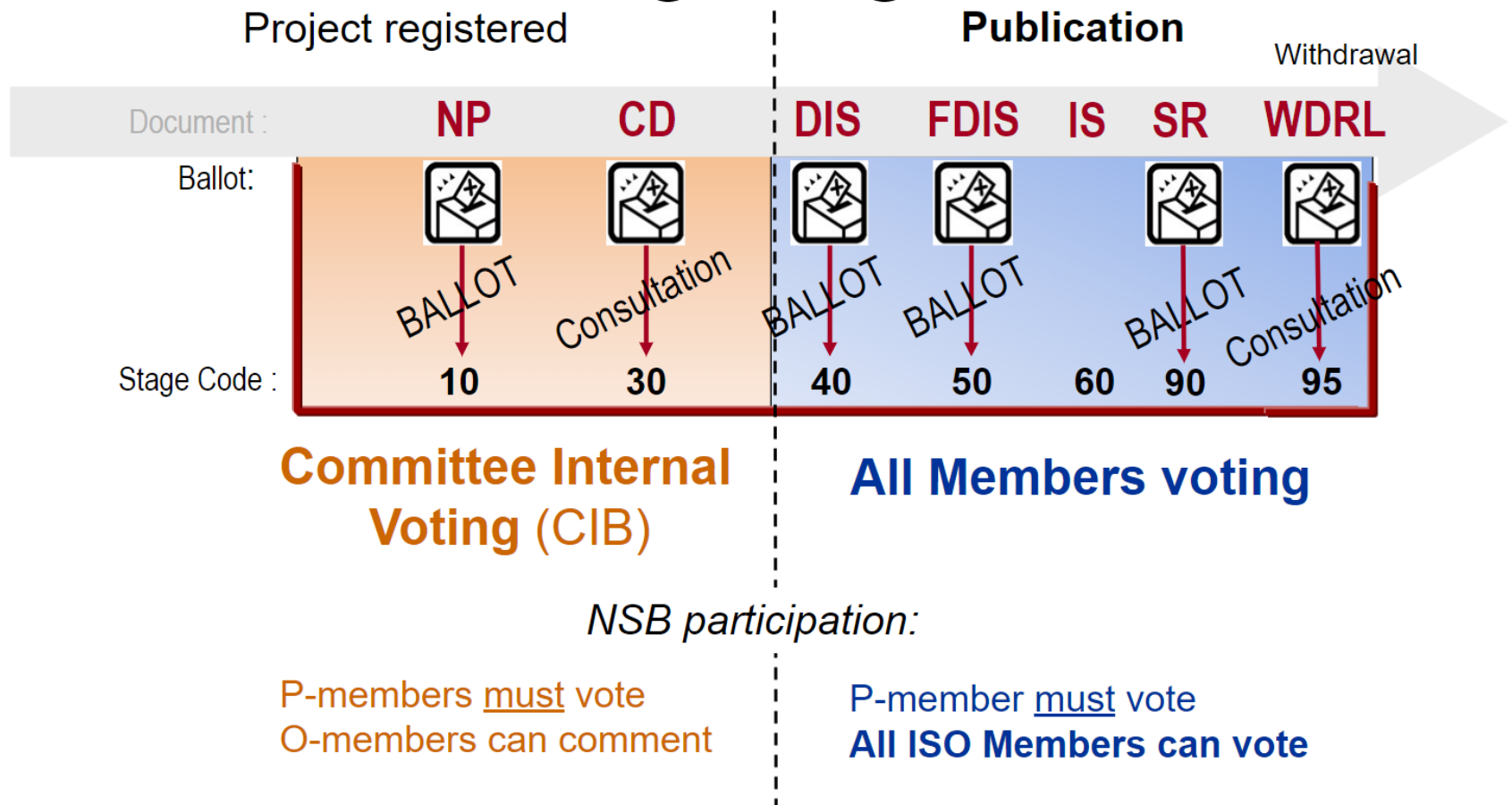
ISO/IEC process

ISO/IEC JTC1 Stages and Ballots

Stage	IS	TS	Level	Ballot Period	Requirements & Notes
10 Proposal	NP	NP	SC22	3 mo	5 NBs agree to actively participate
30 Committee	CD	PDTS	SC22	2-4 mo 2-3 mo	Principal comment stage, 2/3 Yes majority
40 Enquiry	DIS	—	JTC1 / ITTF	3 mo	2/3 Yes, ≤1/4 No
50 Approval	FDIS	—	JTC1 / ITTF	2 mo	No comments, 2/3 Yes, ≤1/4 No

Standardization (ISO/IEC process)

- **Steps** (all of them could be repeated)
    - Requirements
    - Call for Proposals
    - **WD** (Working Draft)
    - **NP** (New Proposal)
    - **CD** (Committee Draft)
    - **DIS** (Draft International Standard) → **ballot** SC level
    - **FDIS** (Final Draft International Standard)
        - → **ballot** TC level
          (optional)

    - **IS (International Standard)**

    - *Corrigenda and amendments*

Example: MPEG DASH (Streaming over HTTP)

Standardization – DASH example

Apple HTTP Live Streaming	Adobe HTTP Dynamic Streaming	Microsoft Smooth Streaming	Others

- Requirements
- Call for Proposals
- **WD** (Working Draft)
- **CD** (Committee Draft) `consultation`
- **DIS** (Draft International Standard) `ballot`
- FDIS (Final Draft International Standard) `ballot`
- **IS (International Standard)**

- *Corrigenda and amendments*

Standardization – DASH example

Apple HTTP Live Streaming

Adobe HTTP Dynamic Streaming

Microsoft Smooth Streaming

Others

- Requirements
- Call for Proposals

Experts agree!

- **WD** (Working Draft)
- **CD** (Committee Draft) **consultation**
- **DIS** (Draft International Standard) **ballot**
- FDIS (Final Draft International Standard) **ballot**
- **IS (International Standard)**

- *Corrigenda and amendments*

Standardization – DASH example

Apple HTTP Live Streaming

Adobe HTTP Dynamic Streaming

Microsoft Smooth Streaming

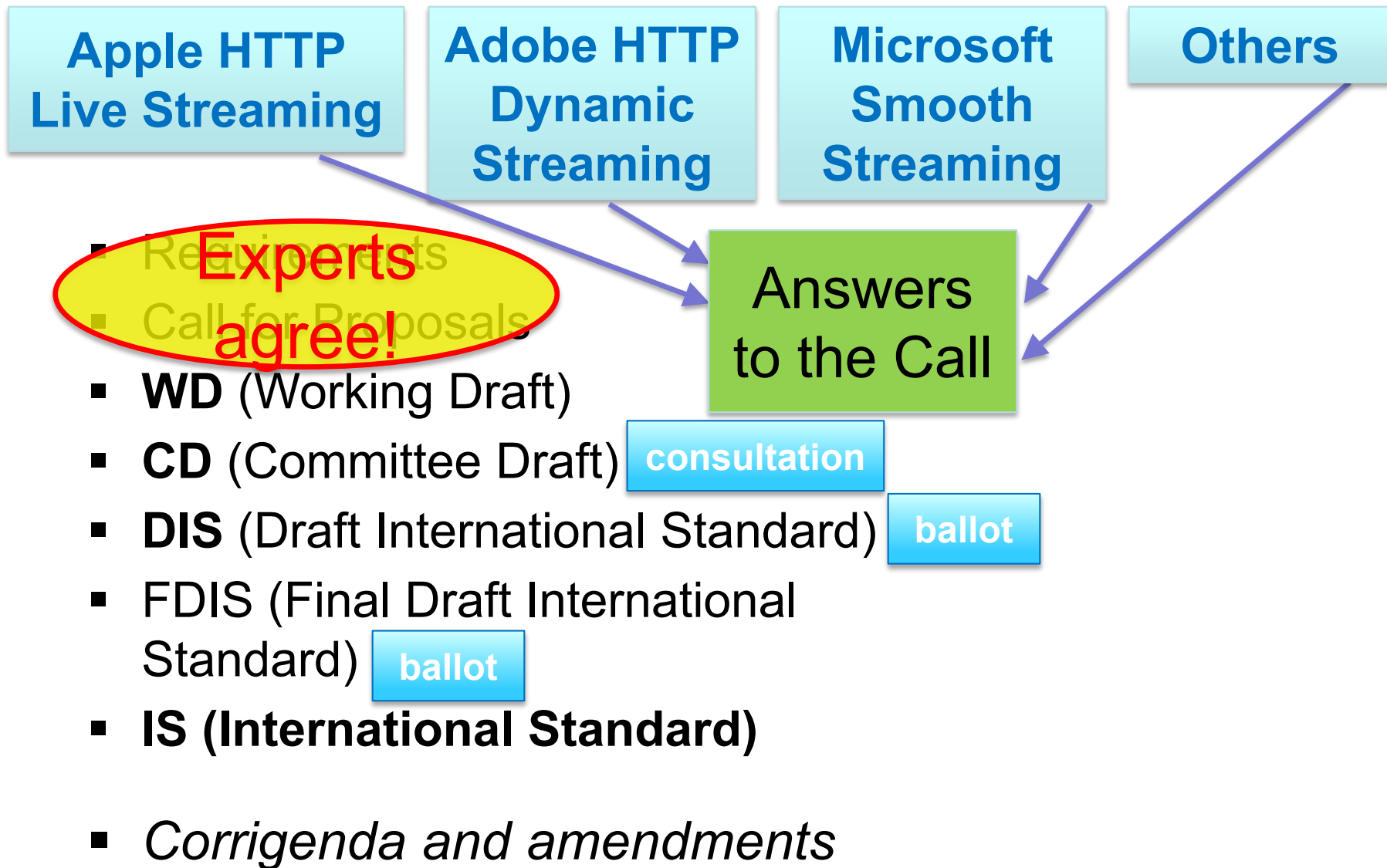**Others**

Answers to the Call
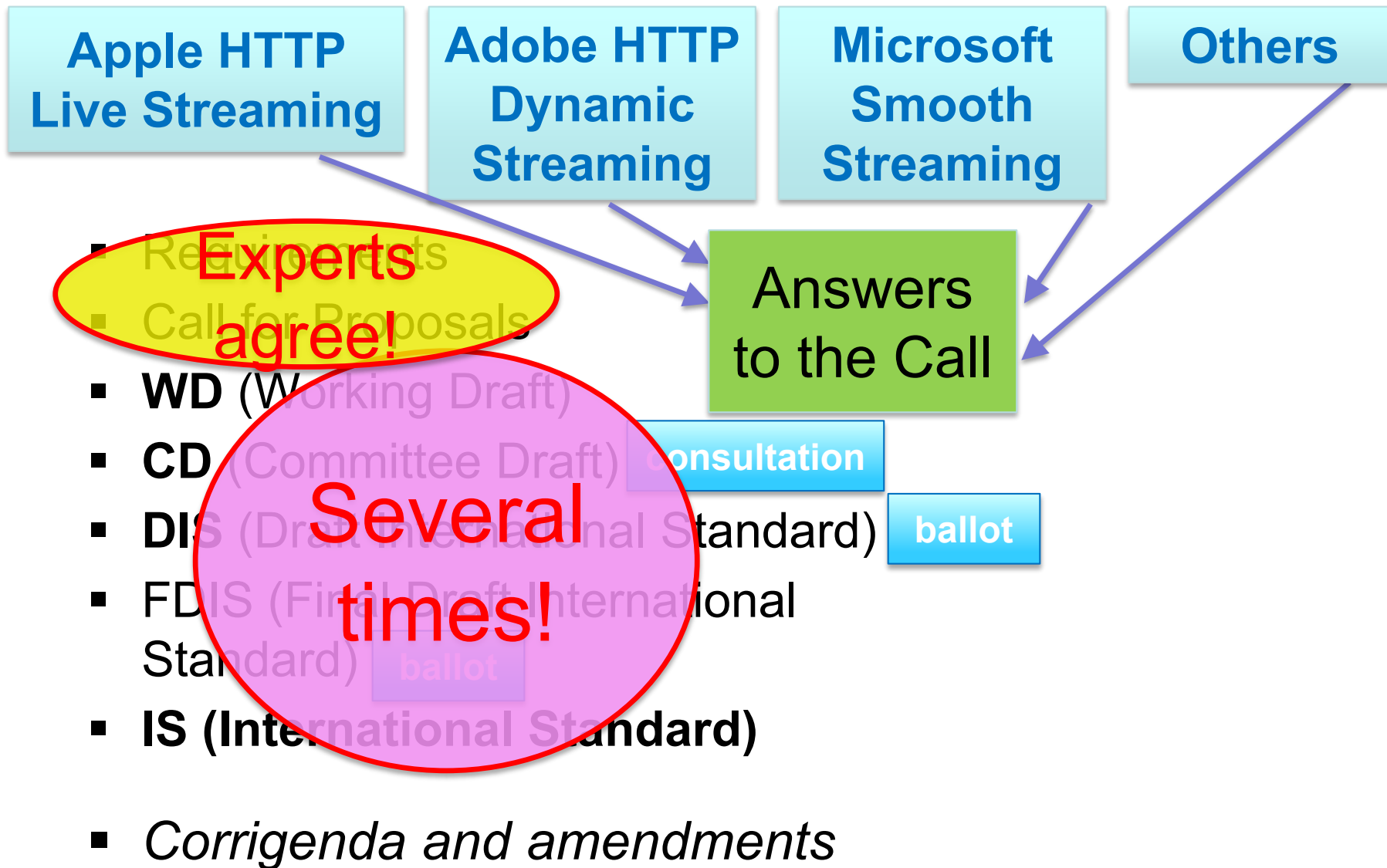
- Requirements
- Call for Proposals

Experts agree!

- **WD** (Working Draft)
- **CD** (Committee Draft) consultation
- **DIS** (Draft International Standard) ballot
- FDIS (Final Draft International Standard) ballot
- **IS (International Standard)**

- *Corrigenda and amendments*

Standardization – DASH example

| Apple HTTP Live Streaming | Adobe HTTP Dynamic Streaming | Microsoft Smooth Streaming | Others |

- Requirements
- Call for Proposals

Experts agree!

- **WD** (Working Draft)
- **CD** (Committee Draft)
- **DIS** (Draft International Standard)
- FDIS (Final Draft International Standard)

Several times!

Answers to the Call

consultation

ballot

ballot

- **IS (International Standard)**

- *Corrigenda and amendments*

DASH Standardization

- ISO/IEC 23009 (Dynamic Adaptive Streaming over HTTP)
- Part 1: Media presentation description and segment formats
- Part 2: Reference software and conformance
- Part 3 (TR): Implementation guidelines
- Part 4: Format Independent Segment encryption and authentication
- Part 5: Server and network assisted DASH (SAND)
- Part 6: DASH with Server Push and WebSockets
- Part 7 (TR): Delivery of CMAF content with DASH
- Part 8: Session based DASH operations
- Part 9: Redundant encoding and packaging for segmented live media (REAP)

DASH Standardization

- Part 1:
  1st edition 2012, 2nd edition 2014, 3rd edition 2019
  4th edition Dec. 2019 ! Several AMDs!
  5th edition 2021 (FDIS May 21) !!! Several AMDs!
      → 6th Edition FDIS Jan 2025

- Part 2:   3rd edition 2020

- Part 3 (TR): 2nd edition 2015. 3rd edition WD 2018

- Part 4:   2nd edition 2018

- Part 5:   2017. AMD in 2020

- Part 6:   2017

- Part 7 (TR): WD 2018 → 2025

- Part 8:   2021; 2nd edition 2022

- Part 9:   FDIS Nov 2024

Ballot Information

Reference	ISO/IEC DIS 23092-2	**Committee**	ISO/IEC JTC 1/SC 29
Edition number	1		
English title	Information technology -- Genomic information representation -- Part 2: Coding of genomic information		
French title	Titre manque -- Partie 2: Titre manque		
Start date	2018-10-18	**End date**	2019-01-10
Opened on	2018-10-18 00:02:07	**Closed on**	
Status	Pending		
Voting stage	Enquiry	**Version number**	1
Note			

Result of voting

P-Members voting: 17 in favour out of 17 = 100 % (requirement >= 66.66%)

(P-Members having abstained are not counted in this vote.)

Member bodies voting: 0 negative votes out of 17 = 0 % (requirement <= 25%)

Approved

Ballot Information

Reference	ISO/IEC DIS 23092-2	**Committee**	ISO/IEC JTC 1/SC 29
Edition number	1		
English title	Information technology -- Genomic information representation -- Part 2: Coding of genomic information		
French title	Titre manque -- Partie 2: Titre manque		
Start date	2018-10-18	**End date**	2019-01-10
Opened on	2018-10-18 00:02:07	**Closed on**	
Status	Pending		
Voting stage	Enquiry	**Version number**	1
Note			

Result of voting

P-Members voting: 17 in favour out of 17 = 100 % (requirement >= 66.66%)

(P-Members having abstained are not counted in this vote.)

Member bodies voting: 0 negative votes out of 17 = 0 % (requirement <= 25%)

Approved

Example of vote (ballot) result   (2/2)

Votes by members					
Country	Member	Status	Approval	Disapproval	Abstention
Australia	SA	P-Member	X *		
Austria	ASI	P-Member	X		
Belgium	NBN	P-Member	X *		
Brazil	ABNT	P-Member			X
Canada	SCC	P-Member	X		
China	SAC	P-Member	X		
Denmark	DS	O-Member			X
Finland	SFS	P-Member			X
France	AFNOR	P-Member			X
Germany	DIN	P-Member	X *		
Hungary	MSZT	P-Member	X		
Iran, Islamic Republic of	ISIRI	P-Member			X
Israel	SII	P-Member			X

Votes by members

Country	Member	Status	Approval	Disapproval	Abstention
Australia	SA	P-Member	X *		
Austria	ASI	P-Member	X		
Belgium	NBN	P-Member	X *		
Brazil	ABNT	P-Member			X
Canada	SCC	P-Member	X		
China	SAC	P-Member	X		
Denmark	DS	O-Member			X
Finland	SFS	P-Member			X
France	AFNOR	P-Member			X
Germany	DIN	P-Member	X *		
Hungary	MSZT				
Iran, Islamic Republic of	ISIRI				
Israel	SII				
Italy	UNI	P-Member	X *		
Japan	JISC	Secretariat	X		
Korea, Republic of	KATS	P-Member	X		
Lebanon	LIBNOR	P-Member	X		
Netherlands	NEN	P-Member			X
Poland	PKN	P-Member			X
Portugal	IPQ	P-Member			X
Russian Federation	GOST R	P-Member			X
Singapore	ESG	P-Member	X		
Spain	UNE	P-Member	X *		
Sweden	SIS	P-Member			X
Switzerland	SNV	P-Member	X *		
Turkey	TSE	P-Member			X
Ukraine	DSTU	P-Member	X		
United Kingdom	BSI	P-Member	X *		
United States	ANSI	P-Member	X		
P-Member TOTALS Total of P-Members voting: 17			17	0	11
TOTALS			17	0	12

(*) A comment file was submitted with this vote

Standardization work – Is it relevant?

- A *close* example on JPEG WG activities
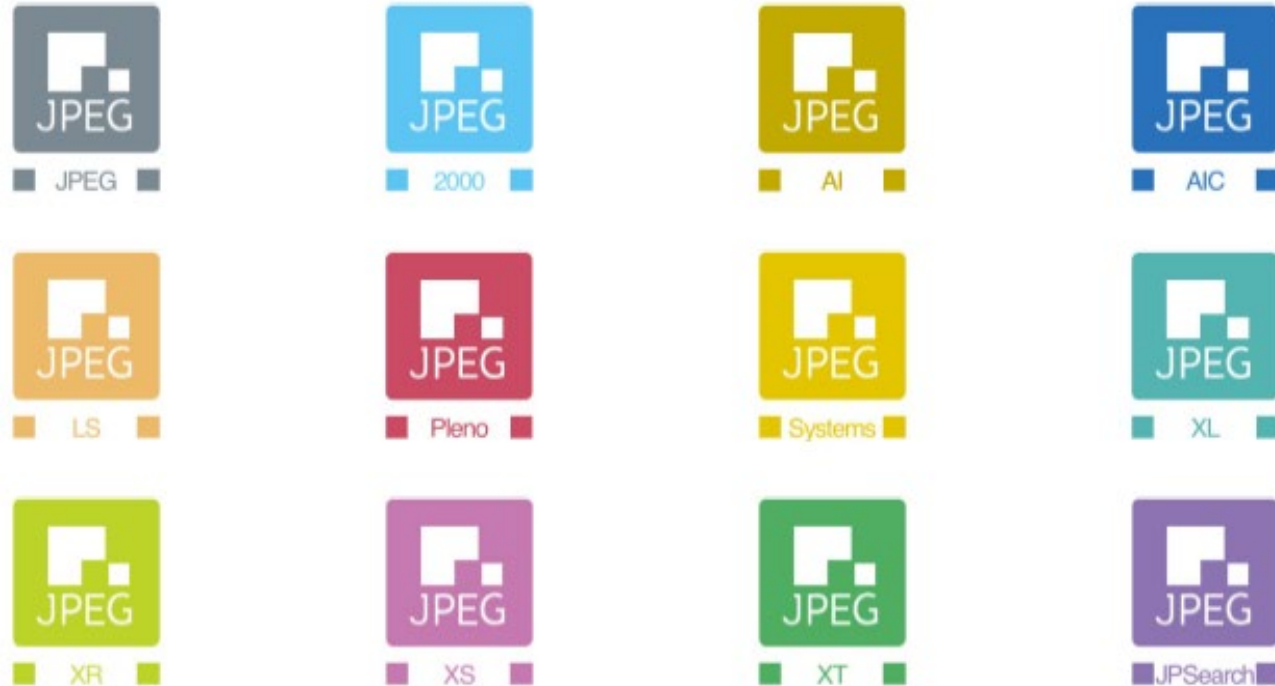
Standardization – JPEG standards

Metadata, Privacy & Security, Linking images, …
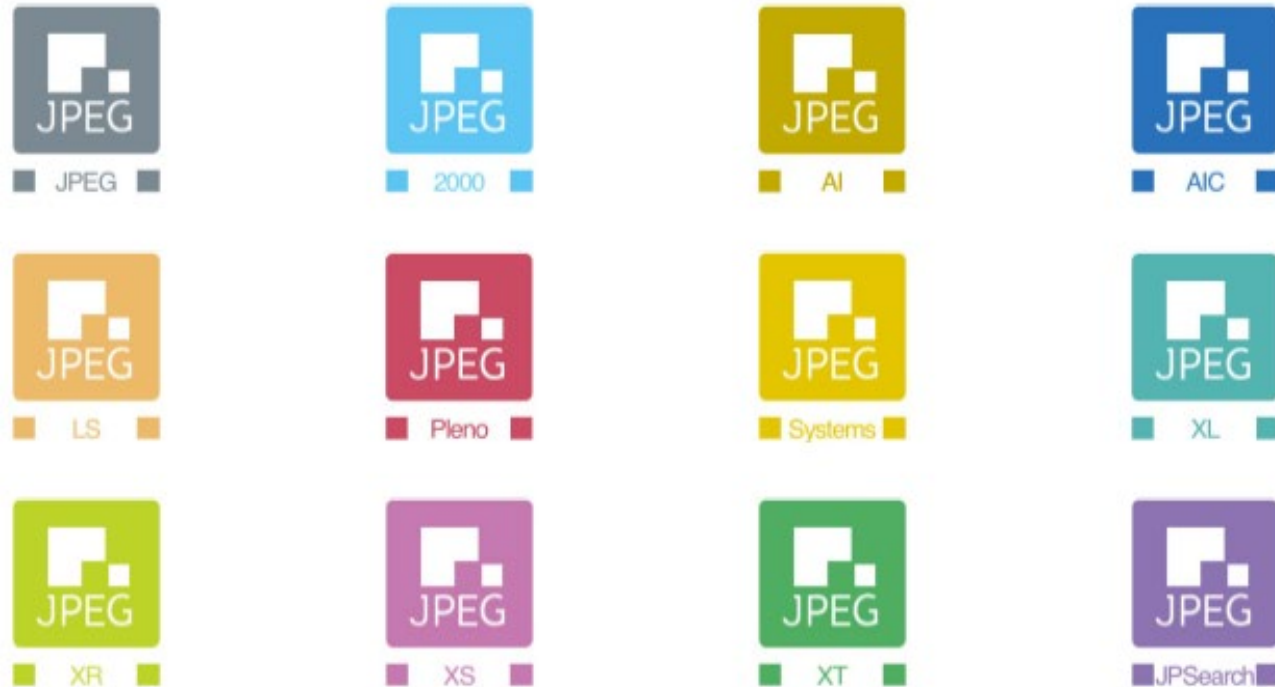
Standardization – JPEG standards

Recently started

Standardization – JPEG standards

Standardization work – Is it relevant?

- A close example on JPEG WG activities

- Topic going on: JPEG Systems

- Call (closed October 2022) on JPEG Fake Media

- *UPC Master student*: TFM work on

  - Reference Software for JPEG Systems (new Part 10!)
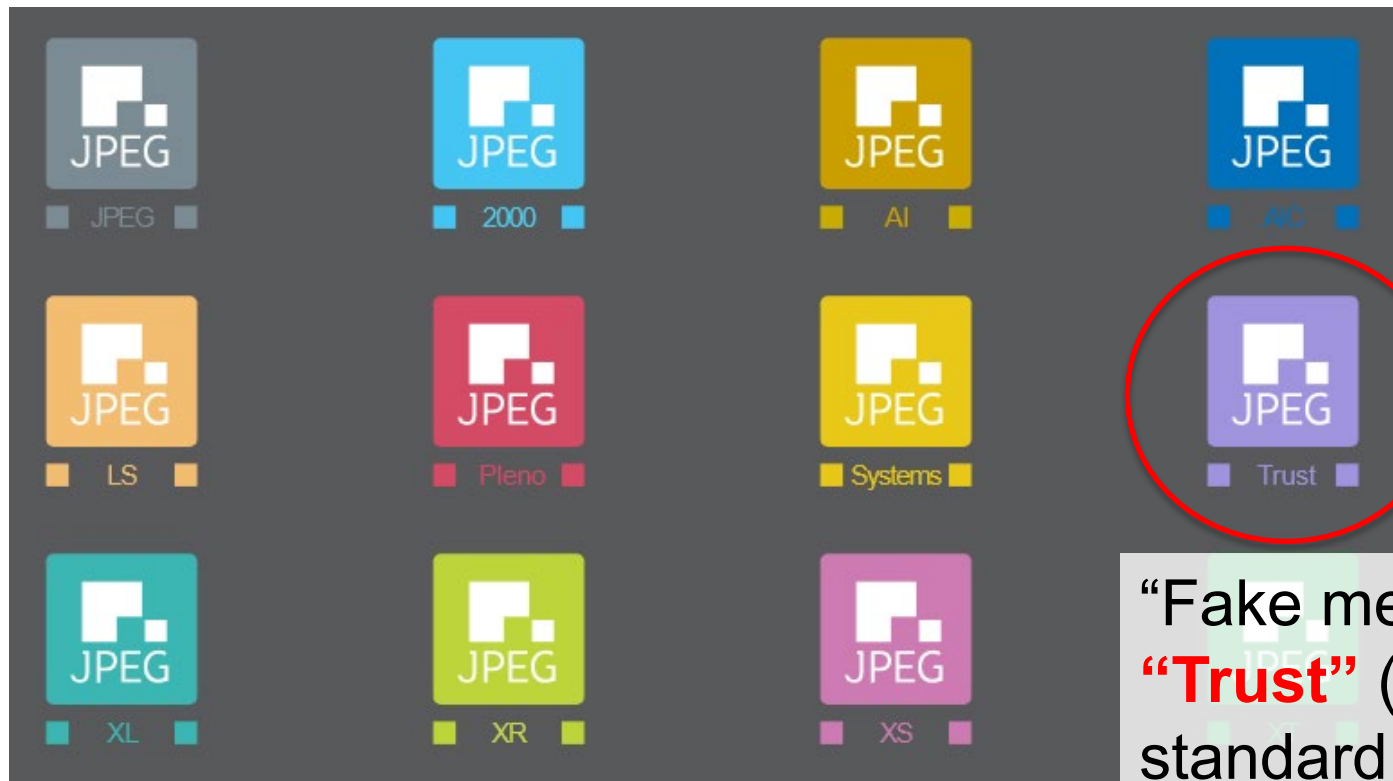
  - Answer to JPEG Fake Media call

Standardization – JPEG standards (update)

- **https://jpeg.org/**

"Fake media" →
"Trust" (new
standard under
development)

- **https://jpeg.org/**

56