

X3D Graphics and VR

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Web3D Consortium

W3C Workshop, Virtual Reality (VR) and the Web

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Web3D Consortium

www.web3D.org



- Web3D Consortium founded in 1998 to protect, support and advance the Virtual Reality Modeling Language (VRML) specification

Continued efforts on new technology by multiple working groups led its successor, Extensible 3D (X3D) Graphics International Standard

Non-profit organization ensures that X3D remains royalty free, relevant

- Partnership of industry, agency, academic and professional members
- Many stakeholders with archival stability and “staying power”

Liaison relationships with key standards organizations worldwide



What is Extensible 3D (X3D) Graphics?

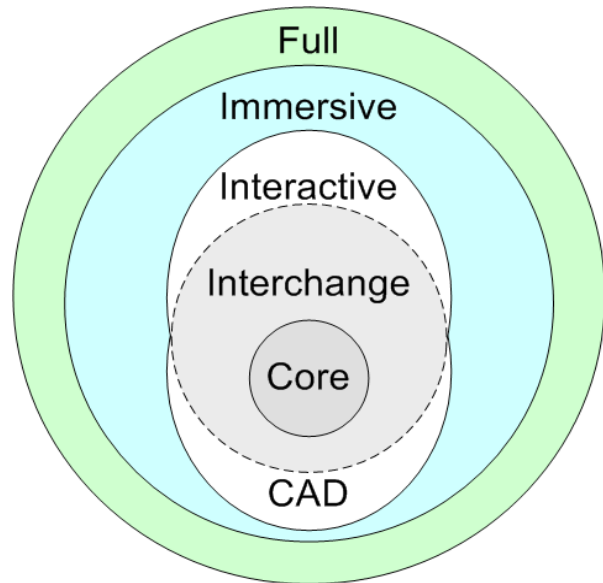


X3D is a royalty-free open-standard file format

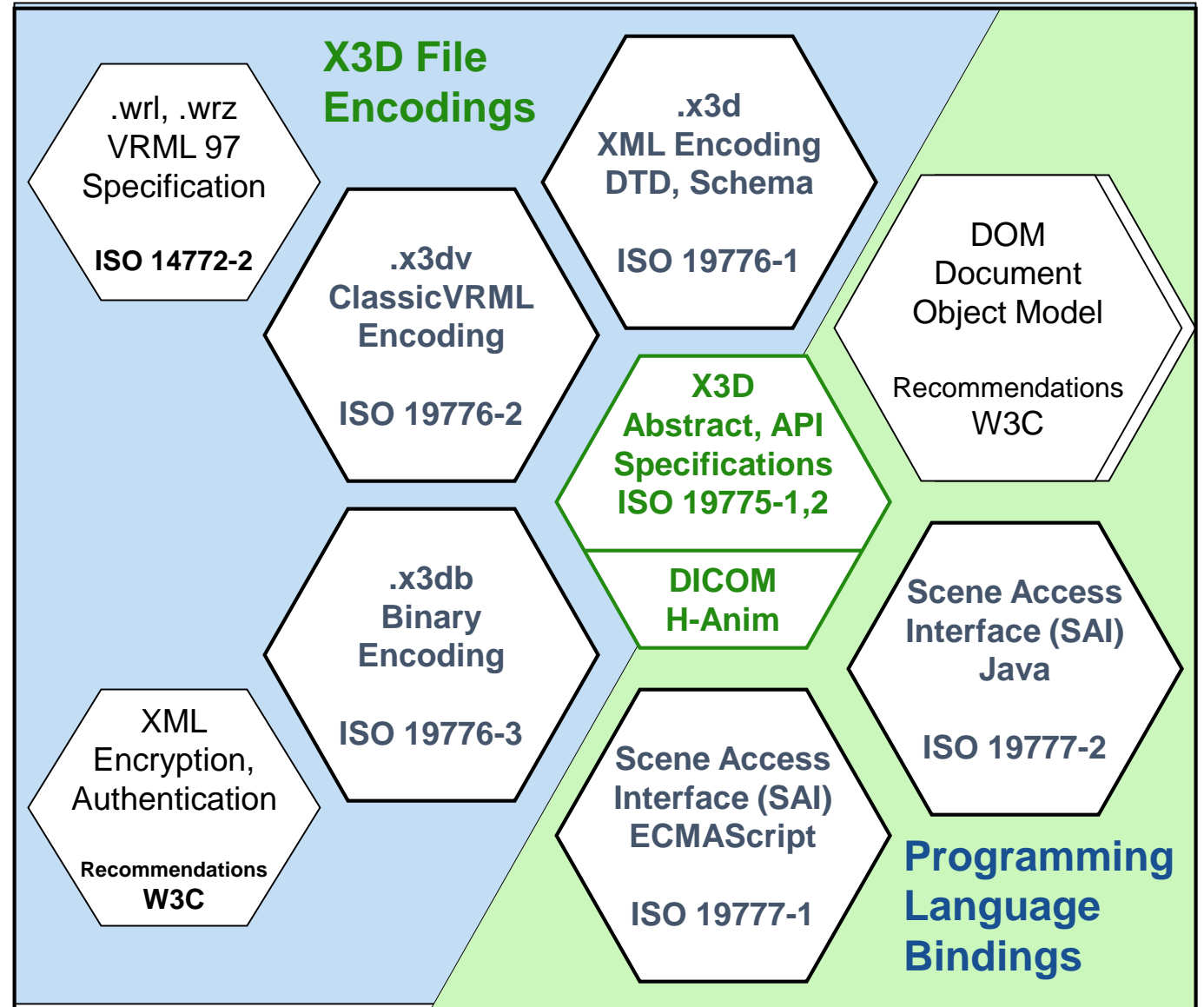
- Communicate animated 3D scenes using XML, in Web pages or separate
- Run-time architecture for consistent user interaction
- ISO-ratified standard for storage, retrieval and playback of real-time 3D graphics content
- Enables network communication of 3D data across applications, and provides archival publishing format for 3D models on the Web
- Rich set of componentized features for engineering and scientific visualization, CAD and architecture, medical visualization, training and simulation, multimedia, entertainment, education, and more

Multiple encodings, common basis

Family of standards for X3D on the Web



Composable and adaptable structures that play consistently via many forms



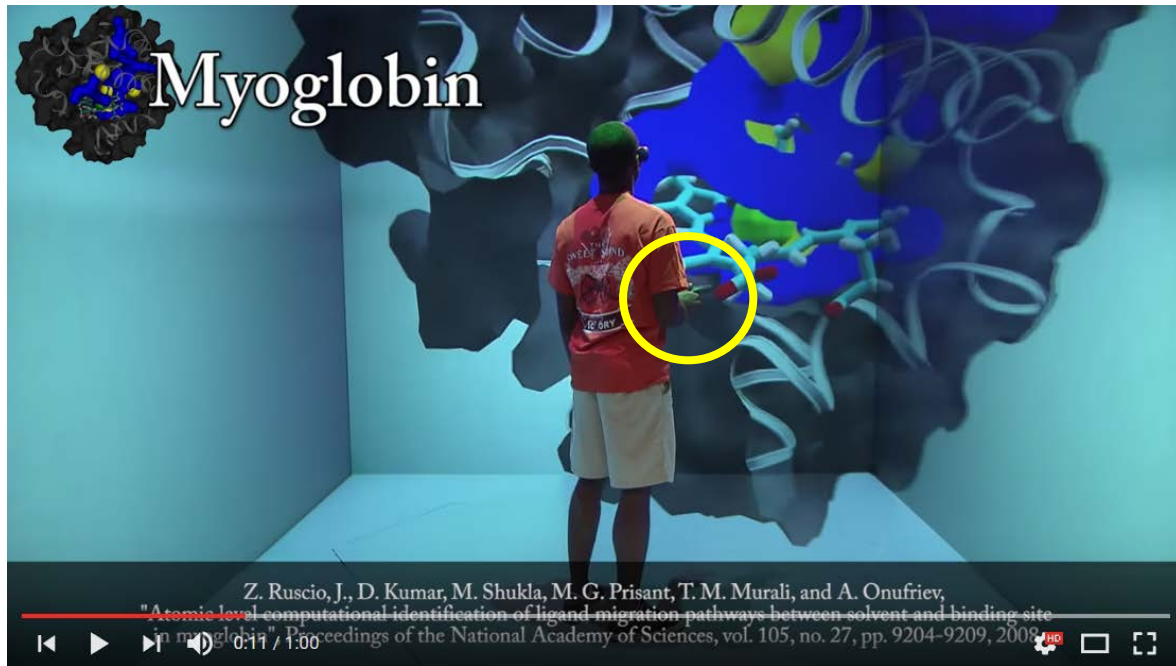
X3D design rationale: *platform independence*

- 3D content defined in device-neutral, language-neutral fashion
 - Example: “selection” rather than button/point+click/activate/gesture/etc.
 - Those modalities can each be applied coherently, rather than uniquely
- Aligned with Web architecture
 - Declarative, augmented by Scripts for imperative activity
 - URL for anchors, files, streams, etc.
 - Media types, protocols, etc.
- Adaptation and reuse, rather than compilation/version dependencies

How Important is Stability?

- 3D graphics authors create wonderful content, but it tends to “time out” and break after 2-3 years, simply becoming no longer usable due to software changes, company acquisitions/shutdowns, etc.
- Creating quality 3D content is expensive, both time & software costs
- Something just as expensive: recreating identical quality 3D content when underlying software/hardware technology might no longer work
- X3D provides an accessible archival approach for publishing 3D content

Virtual Reality Exemplars

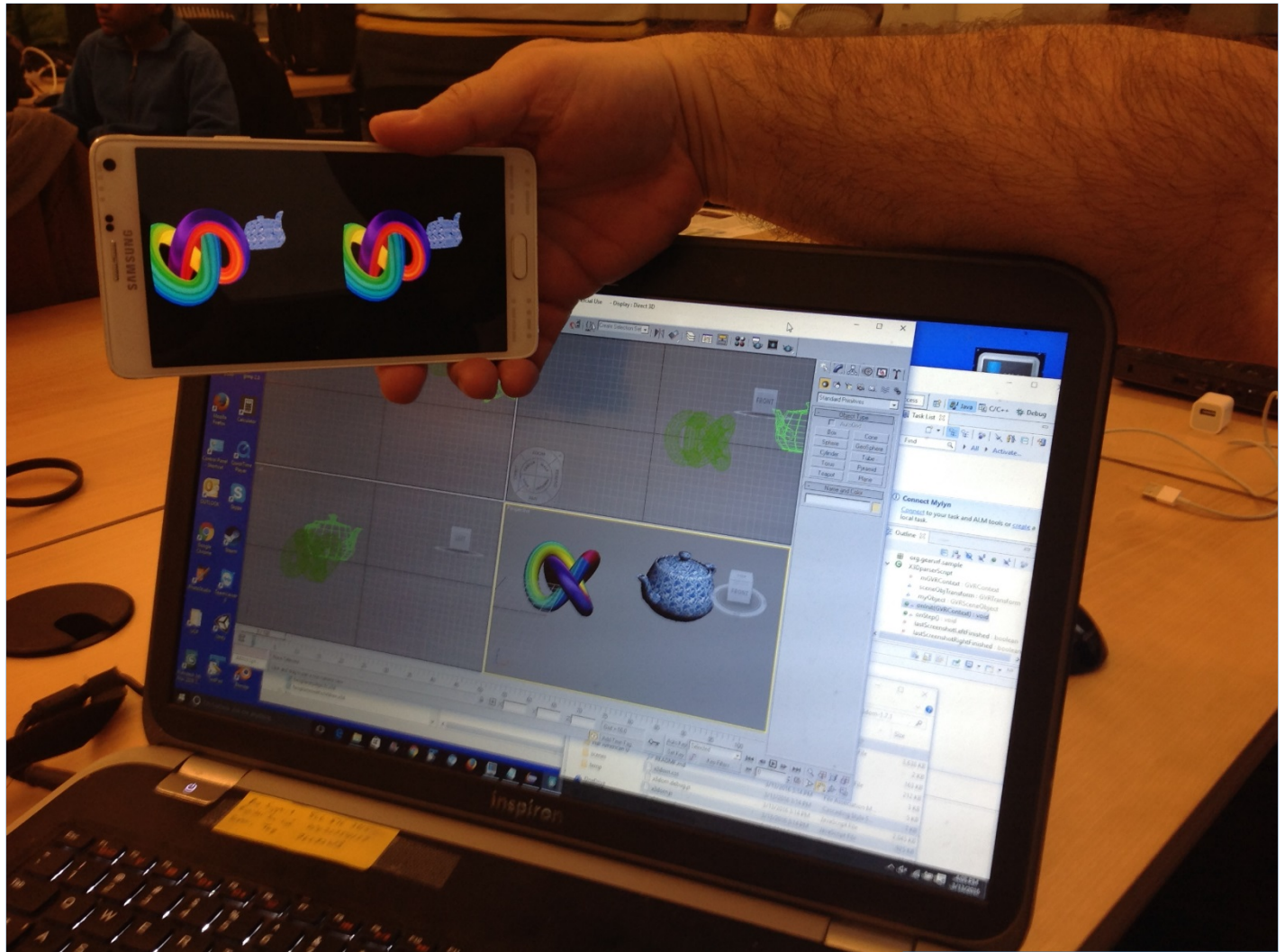


Software for understanding robot data: Spatial Temporal Oceanographic Query System (STOQS)

 Monterey Bay Aquarium Research Institute (MBARI)
Subscribe 35,733

2,337 views

VR content in browsers, HMDs, CAVES, scanners



Sony GearVR
VR Hackathon
San Francisco
March 2016

Mixed Augmented Reality (MAR)

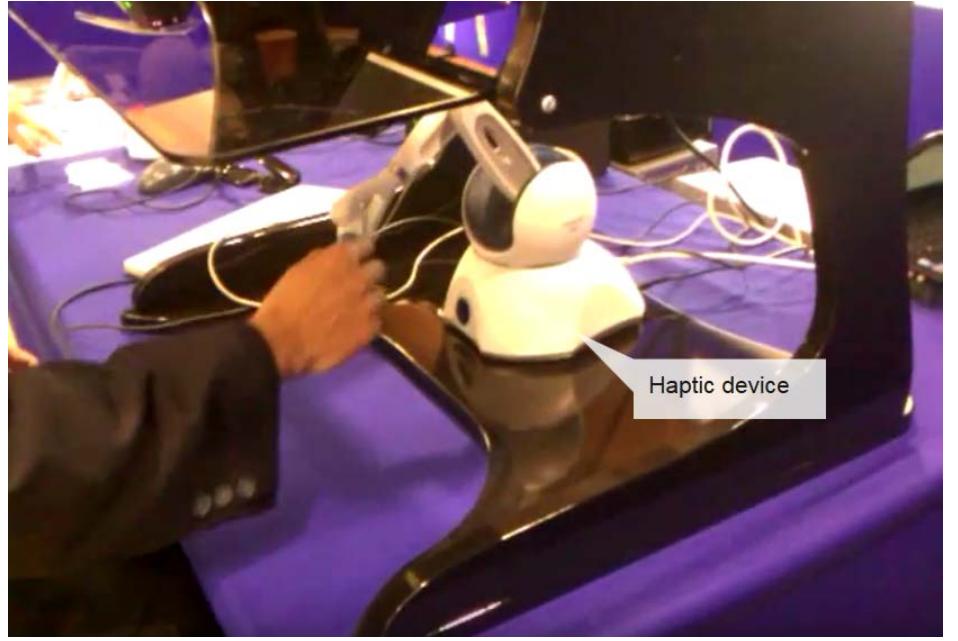
X3DOM player, Google Cardboard



ISO Mixed Augmented Reality (MAR) Reference Model

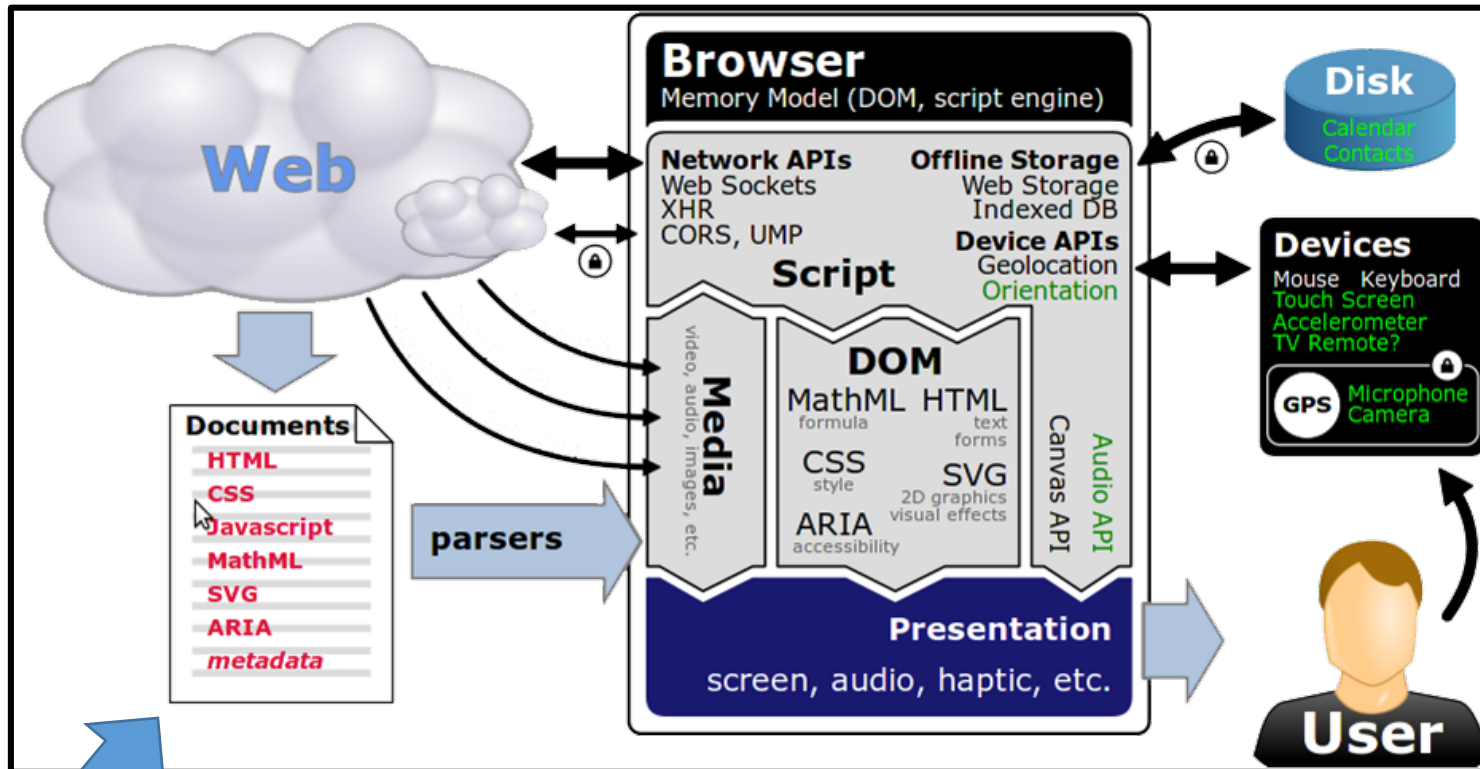
- Collaborative joint ad hoc group (JAHG) between ISO SC24, 29
- Describes common terminology, use cases, baseline technologies, and architectural commonalities for all MAR applications
- X3D v4.0 is aligning with HTML5, X3D v4.1 adds MAR, VR support

Mixed Augmented Reality (MAR) Exemplars



Strategic opportunities continue...

Open Web Platform (OWP)



Reference: Dave Raggett, [The Open Web Platform](#), 2013

< X3D > scenes (documents) fits in with HTML, similar to SVG and MathML

X3D Graphics fits right in

- XML scene included in HTML page
- Full integration with DOM and CSS
- Transparency, can float above page
- Shape Resource Container (SRC) for progressive geometry compression
- Matching XML, VRML, JSON encodings
- Open source players: X3DOM, Cobweb

Note that even more is possible:

Efficient XML Interchange (EXI)

- Smaller size, beats zip/gzip/cbor/etc.
- Faster performance decompressing
- Reduces power consumption
- Now XML, JSON, CSS; more to follow

XML Security

- Digital signature authentication
- Encryption, alternate algorithms OK
- Investigating use of Canonical EXI for consistent approach throughout

Suggested Considerations

“Content is King”

Think big, beyond the device

Wearing a head-mounted display is an act of **trust**

VR is part of a larger, longer-term Web ecosystem

Web3D and X3D participation are always welcome

Additional Information

www.web3D.org

Interoperability - what's the difference?

Multiple paths, but often confused as equal

- **Standard:** proven process for content interoperability, scalability, compatibility, licensing, growth, success
- **Specification:** Algorithm descriptions, necessary detail
 - But might hide royalty problems such as GIF imagery debacle

Open source software: pile of (maybe repeatable) code

- But: usage licensing is not same as source-code licensing

Market share dominance: biggest competitor wins?

- Companies (or at least investors) hope to “own” 3D
- But: many defunct companies, dead-end technologies
- Everyone ends up with much smaller market than the Web





VIRTUAL REALITY HACKATHON



X3D assets are numerous

- Web3D Consortium web3D.org
- X3D Resources
- X3D Tooltips
- X3D Scene Authoring Hints
- X3D Specifications family
- X3D Validator Quality Assurance
 - XML DTD, Schema, Schematron
 - JSON Schema, regexes
- 3800+ open-source examples
- Active community
- 7 active working groups
- Annual Web3D Conference
- Commercial and open source players , tools, implementations
- Dozens of converters, importers
- YouTube playlists for VR, MAR
- Twitter for Web3D Consortium
- Books and documentation

Multiple active Web3D initiatives

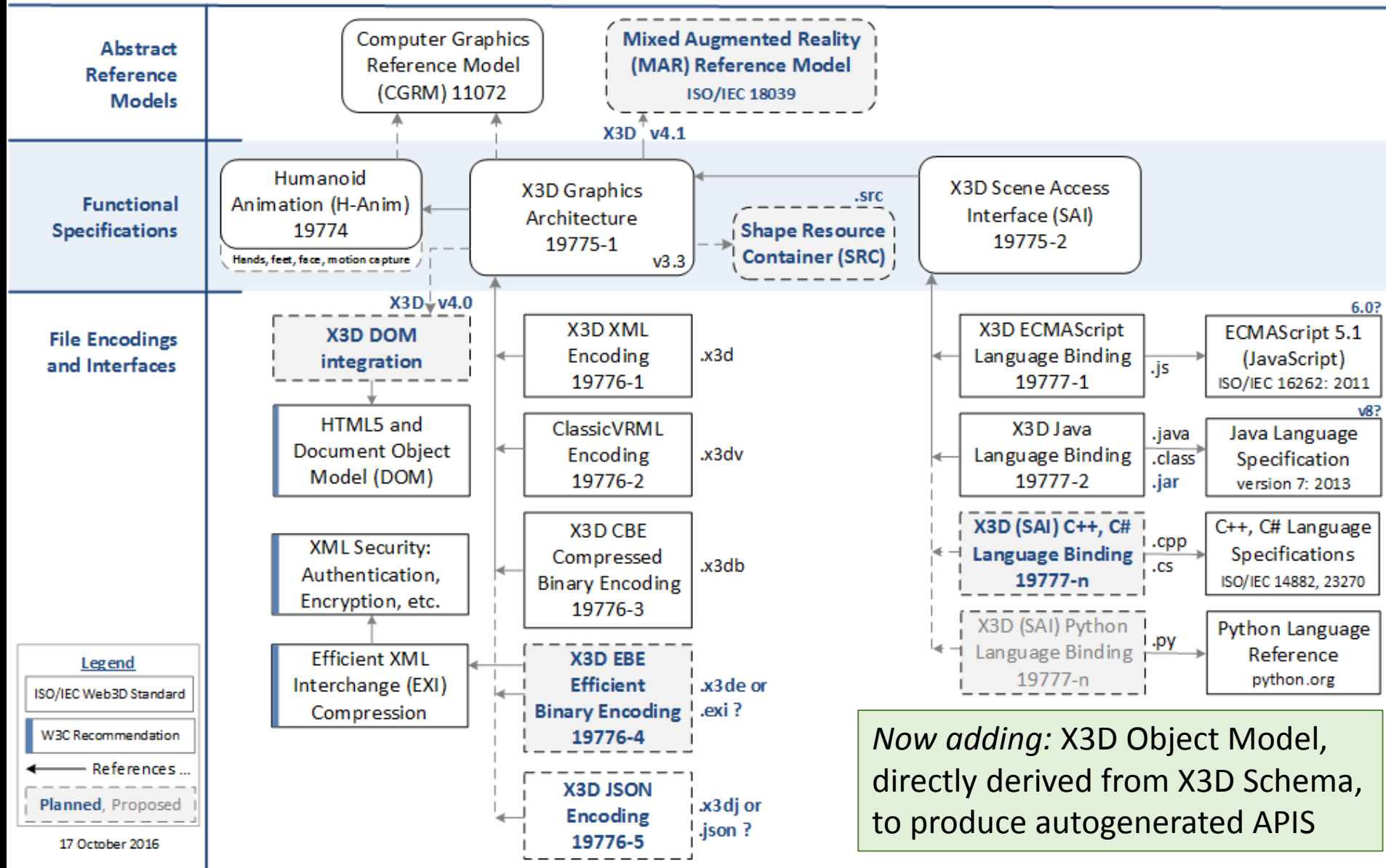
- 3D printing and 3D scanning integration with CAD profile
- Workflows and toolchains, import/export, best practices
- Cultural and natural heritage for archival publication
- Geospatial visualization and Humanoid Animation (H-Anim)
- Medical applications support for archival 3D medical records
- 3D Annotations: heritage, medical, geospatial, CAD/printing/scanning
- X3D Object Model refinement and codebase autogeneration
- ... and more. Declarative 3D publishing using the Web.

X3D Profile for 3D Printing and Scanning

- New work by Web3D Consortium has commenced
 - Initial drafting stage, now determining requirements
 - Today's workshop, X3D Profile 3D Printing and Scanning
- Recognize 3D printers are a “vertical” capability domain of end users, tool developers, hardware systems, workflows
- Recognition that 3D scanning is a rapidly emerging complement with overlapping technical requirements
- How big an overlap?
 - 3D printing is *bits into atoms*
 - 3D scanning is *atoms into bits*



X3D Graphics Standards: Specification Relationships



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