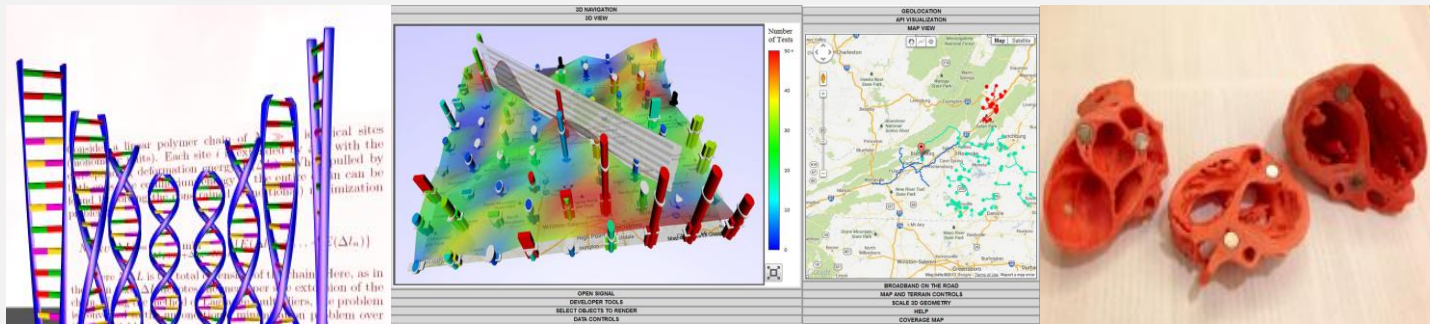


Web3D Consortium: X3D Integration Strategies



HL7 Meeting - New Orleans - January 2018

Anita Havele, Executive Director - Web3D Consortium

Nicholas Polys, President - Web3D Consortium - Virginia Tech (Professor)

Web3D Consortium

Founded in 1997 Developing the ISO specification for interactive 3D graphics on the Web.

- International
- Non-profit
- Member-funded
- Industry group



Our members span business, enterprise, academia, government and the military

A community of technologists, artists and enterprise

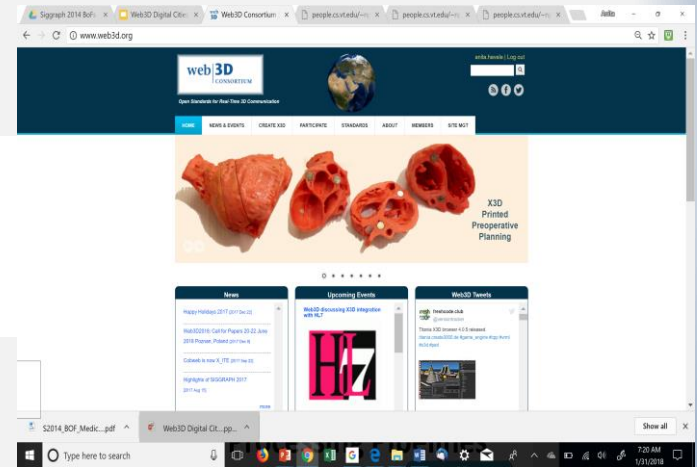
Our Standard: X3D

Interactive Real-time 3D publishing standard for the Web

- Originated from VRML now in XML
- Royalty Free
- Open ISO Standard
- Evolutionary - 1997
- Durable
- Interoperable
- Multi Platform

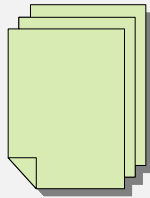


www.web3d.org

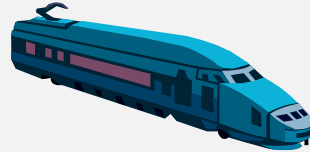


X3D: Scene graph for real-time interactive 3D

X3D graphics provides a system for the storage, retrieval and playback of real time 3D graphics content embedded in applications, all within an open architecture to support a wide array of domains and user scenarios.



File Format



Run-Time Engine

Real-Time • Web-based • Interactive • Animation • Extensible • Scriptable • Scriptable

Meshes • lights • materials • textures • shaders
Interaction • Animation • Audio/Video

Scene graph for real-time interactive 3D

Delivery of virtual environments over the web

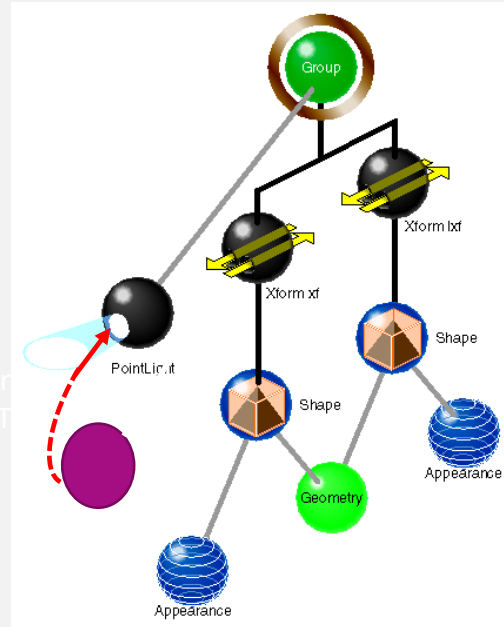


Multiple ISO-ratified encodings

- XML (.x3d)
- Classic VRML (.x3dv)
- Compressed Binary (.x3db)
- JSON

Multiple APIs

- JavaScript
- Java
- C++
- C#
- Python

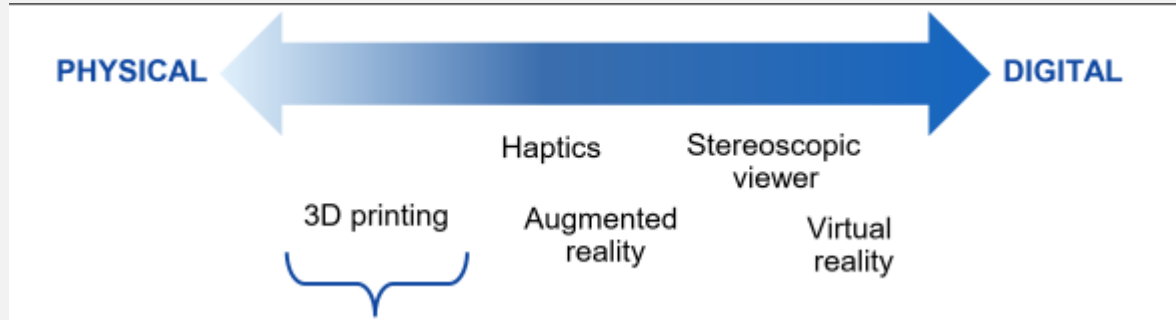


Ever
ROUT

X3D/Virtual Reality/ Augmented Reality

3D is the building blocks for AR/VR/MAR

Use same language for all content display environments



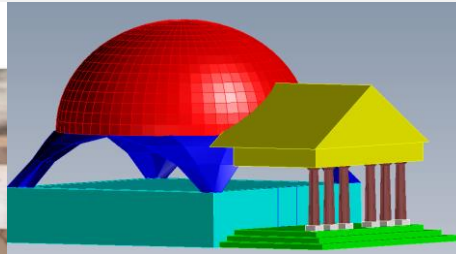
VR

==

X3D

==

AR



X3D: Create once - Run Anywhere

The Web is the platform



All browsers
All platforms



Plug-in free support on all browsers
with WebGL



Making 3D an ordinary media
by publishing 3D to the Web

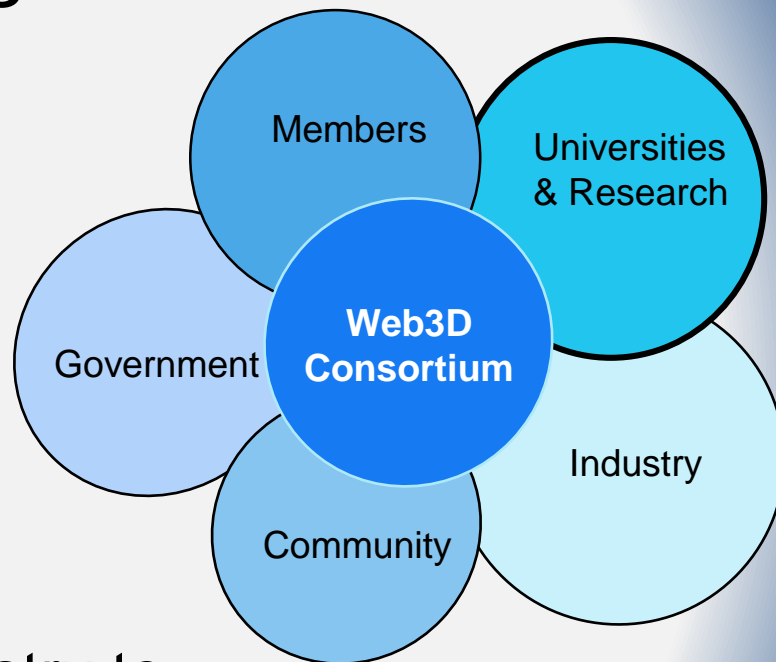
Web3D Consortium Goals

Evolve open Web3D based 3D technologies

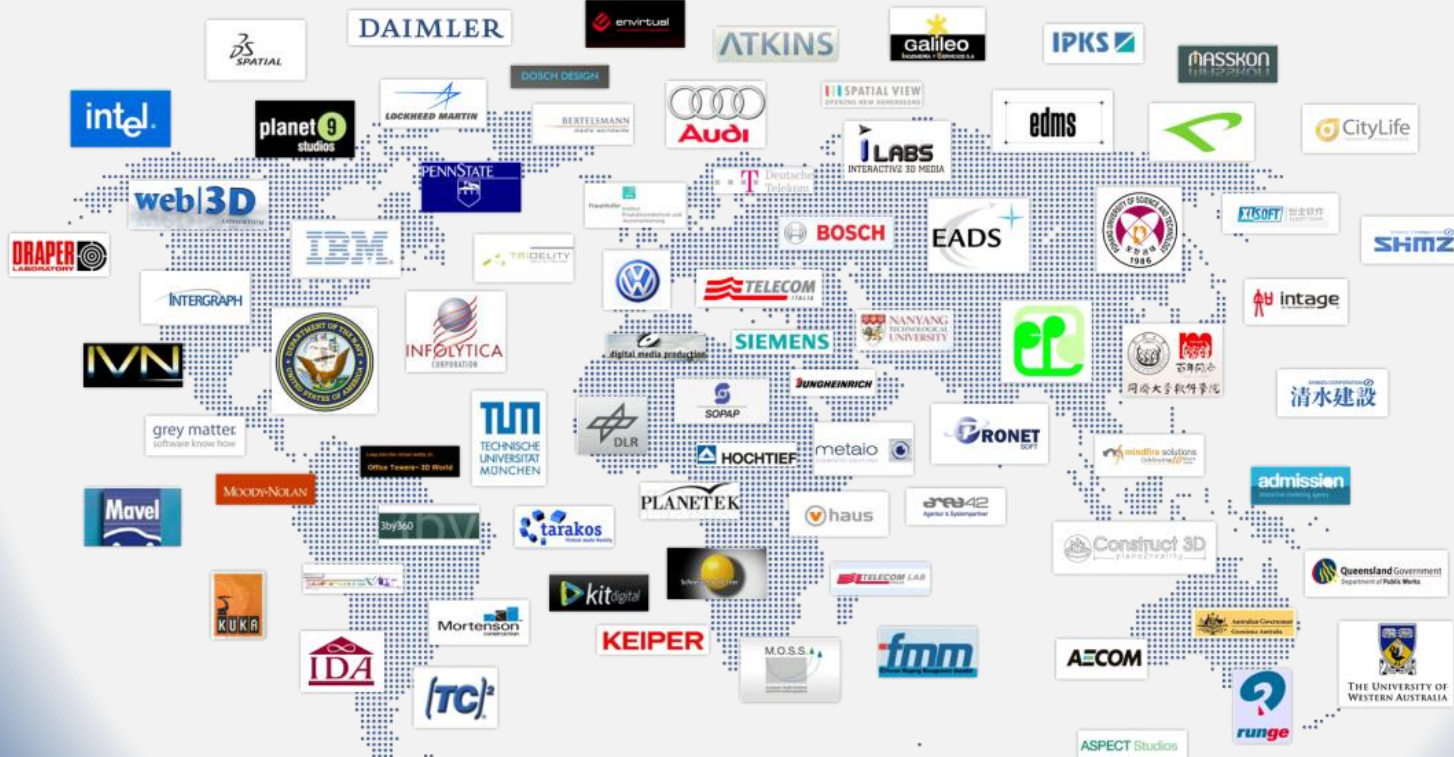
Empower 3D/VR Developers

Guide Policy Makers

Encourage enterprises and industry to use open standards and protect their Investments



Web3D standards Adoption



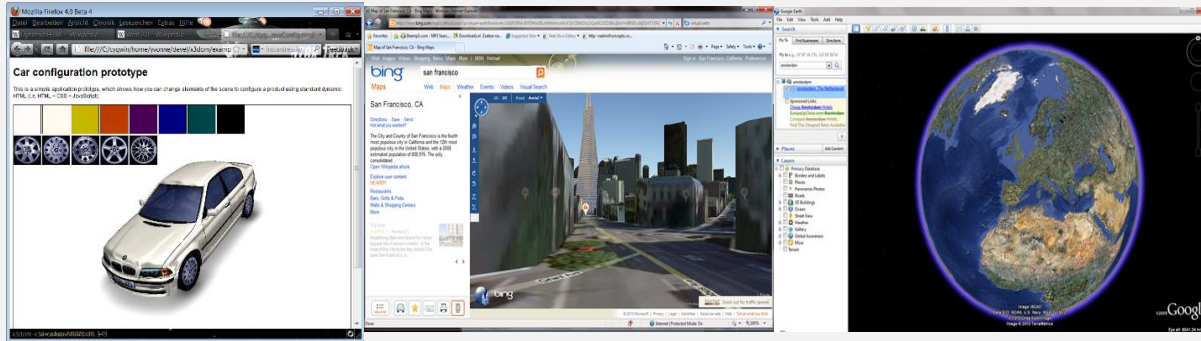
X3D: A hub for rendering 3D data

Geospatial
Medical
Design
3D Printing

Simulation
Humanoid Animation
VR Technologies
Augmented Reality



Web3D ISO Standards



- X3D V3.3 - 19775
- H-Anim - 19774
- X3DOM/X3D V4.0



What is X3D (Extensible) 3D

- Originated from VRML now in XML

```
<?xml version="1.0" encoding="utf-8"?>  
<!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.0//EN"  
"http://www.web3d.org/specifications/x3d-3.0.dtd">
```

```
<X3D version='3.0' profile='Interchange'>  
<Scene>  
  <Transform translation='-2.4 0.2 1.0' rotation='0.0 0.707 0.707 0.9'>  
    <Shape>  
      <Sphere radius='10'>  
        <Appearance>  
          <Material diffuseColor='0.0 0.5 1.0'>  
        </Appearance>  
      </Shape>  
    </Transform>  
  </Scene>  
</X3D>
```



What is X3D (Extensible) 3D

- Large set of nodes for 3D modeling
- Profile and Component structure promotes interoperability
 - 8 Profiles for common use cases [X3D Profiles](#)
 - 35 X3D Components for modular design [X3D Components](#)
 - 233 X3D Nodes for every little thing! [X3D Nodes](#)
- Implementations on multiple platforms: desktop, mobile, Web
- Domain components - Design, 3D Printing, Medical, Geospatial, Humanoid Animation, AR and VR
- Multiple open source implementations ([X3DOM](#) and [X-ite](#))



www.web3d.org/what-x3d

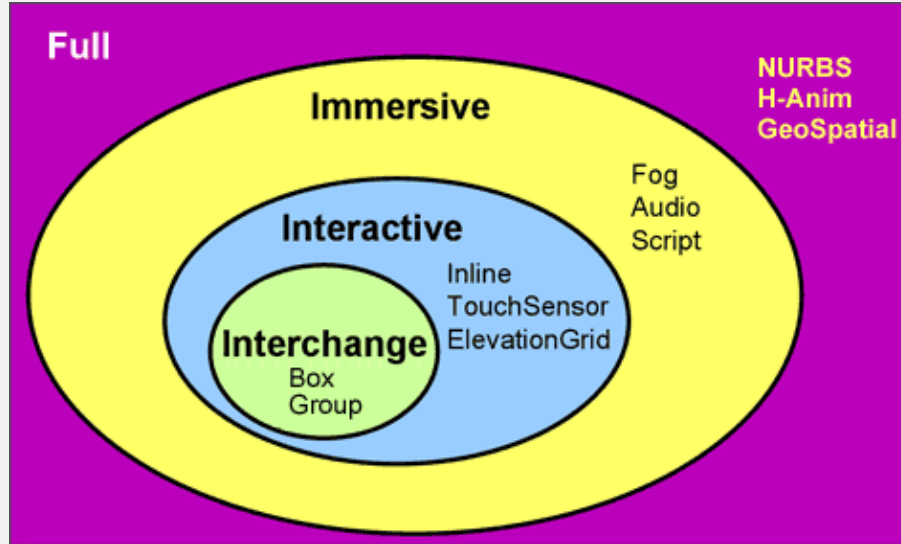
x3dom
Instant 3D the HTML way!
www.x3dom.org



X-ite

web**3D**
CONSORTIUM

X3D Baseline Profiles



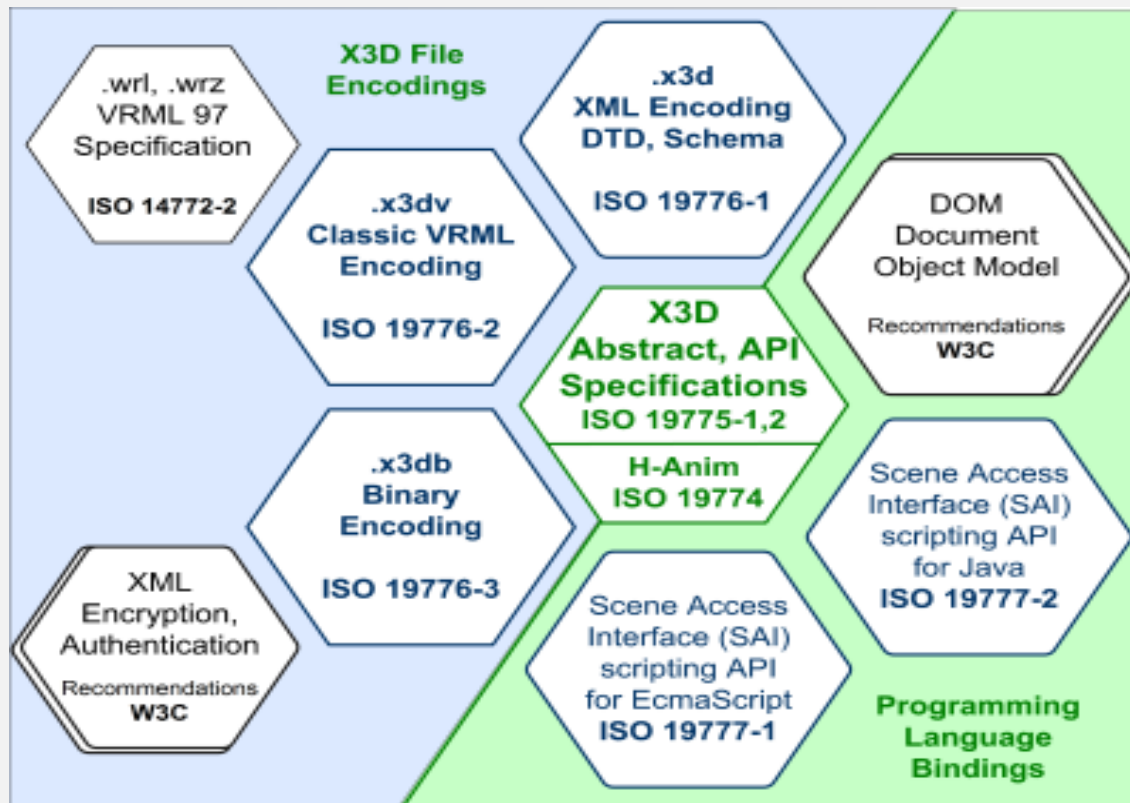
Full includes all defined nodes including NURBS, H-Anim and GeoSpatial components.

Interchange: supports geometry, texturing, basic lighting, and animation. There is no run time model for rendering, making it very easy to use and integrate into any application

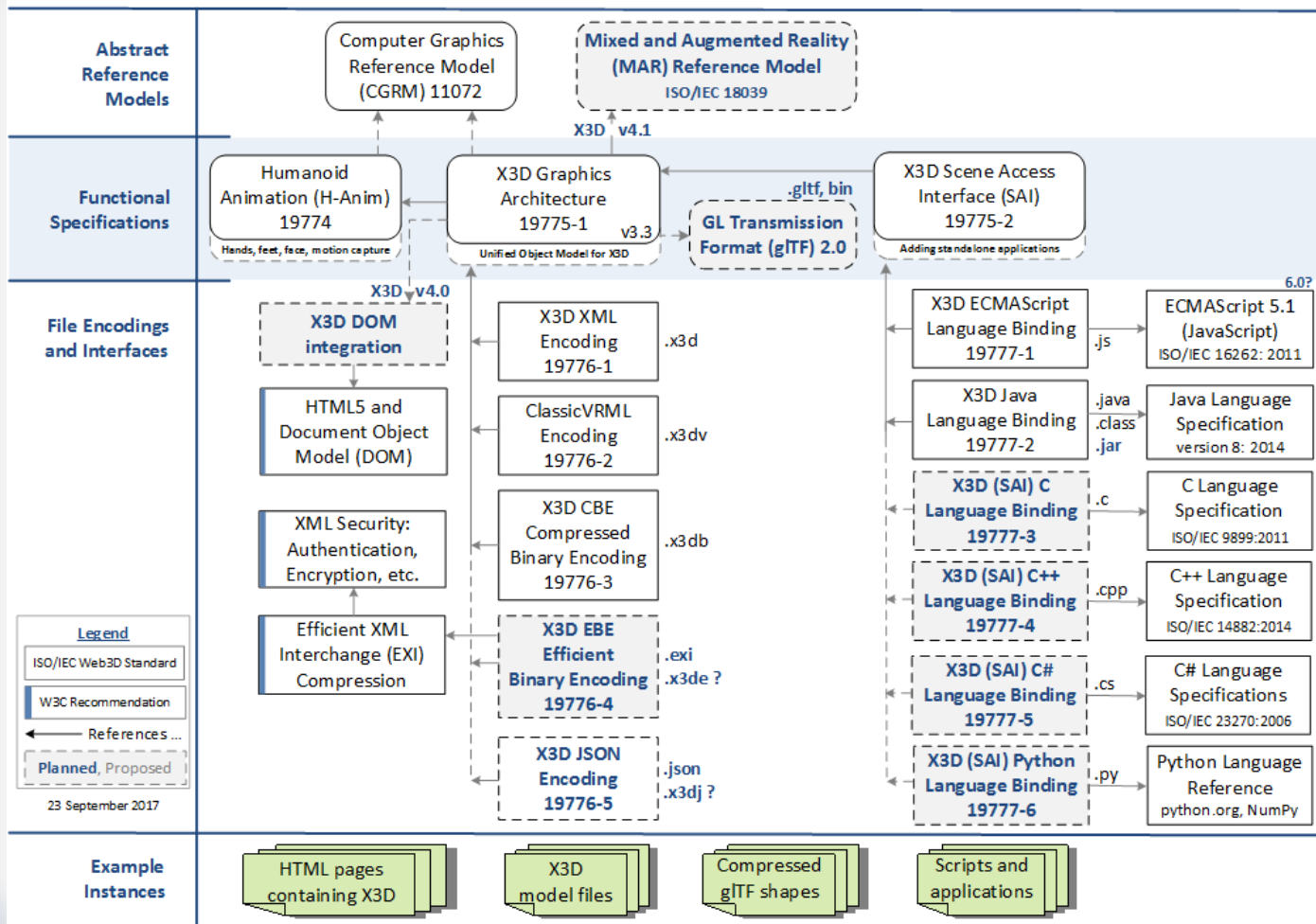
Interactive enables interaction with a 3D environment by adding various sensor nodes for user navigation and interaction

Immersive enables full 3D graphics and interaction, including audio support, collision, fog, and scripting.

Web3D ISO Documents

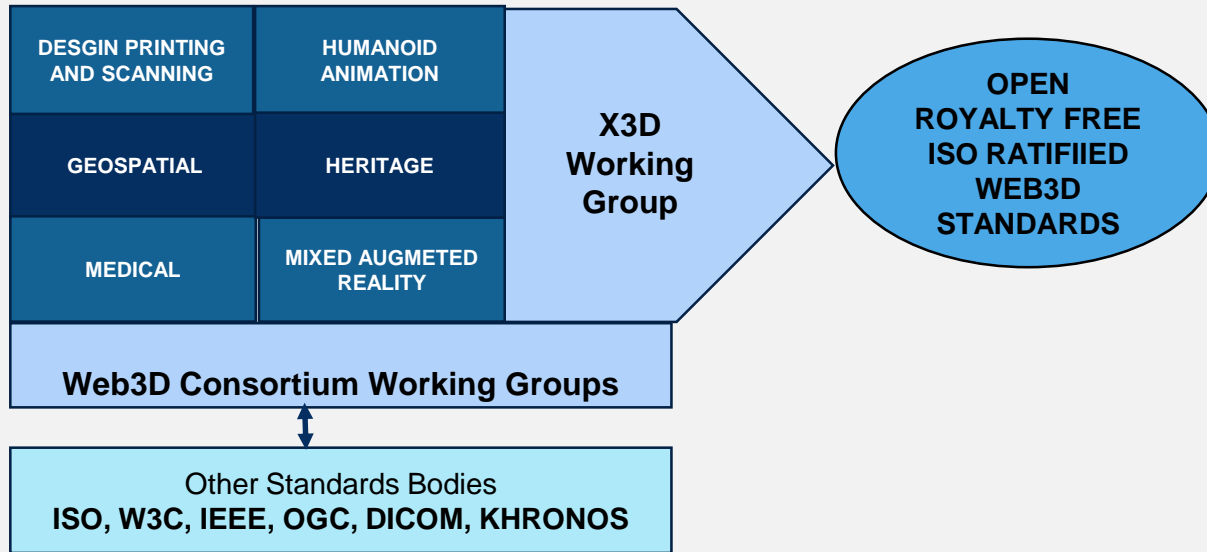


X3D Graphics Standards: Specification Relationships



Web3D: Working Groups Structure

- Domain Specific working groups provide recommendations to the X3D WG for ISO Ratification
- Working groups open to all members



www.web3d.org/working-groups

Member Benefits

- Join our Web3D Community
- Join our Working Groups to evolve X3D
- Marketing Partners
- Adoption Partners
- Outreach Partners
- [Web3D Chapters](#)
- [Web3D Fellows Program](#)

<http://www.web3d.org/member-benefits>

Web3D Consortium Membership

Organization:

Large \$9,500
Standard \$3,500
Small \$1,500

Professional \$100

Community Free

www.web3d.org/join

Membership Benefits:

Marketing	Business Opportunities	Drive Web3D Standards	Networking	Web3D Talent Bank
<ul style="list-style-type: none">Promote productsConference participationPress partnership	<ul style="list-style-type: none">Business partnershipJoint grants	<ul style="list-style-type: none">Working Group participationEarly access to specBoard SeatVoting Rights	<ul style="list-style-type: none">Industry LeadersResearch experts3D companies	<ul style="list-style-type: none">Access to Web3D experts



Open Standards for Real-Time 3D Communication

Log in



- HOME
- NEWS & EVENTS
- CREATE X3D
- PARTICIPATE
- STANDARDS
- ABOUT



News

- Happy Holidays 2017 [2017 Dec 22]
- Web3D2018: Call for Papers 20-22 June 2018 Poznan, Poland [2017 Dec 9]
- Cobweb is now X_ITE [2017 Sep 22]
- Highlights of SIGGRAPH 2017 [2017 Aug 15]

[more](#)

Upcoming Events

IEEE VR 2018

IEEE VR 2018 REUTLINGEN

2018 Mar 18 (All day) to 2018 Mar 22 (All day)
Reutlingen, Germany
IEEE VR 2018

The Web Conference 2018

2018 Apr 23 (All day) to 2018 Apr 27 (All day)

Web3D Tweets

República Catalana @AlberJover
Replying to @PettitPois70
Serà pitjor a partir de les 17 h, ànim! 😞
Jan 28, 2018

James flynn @jamesf42099220
Replying to @Barralsland
Ar dheis dei a bhfuil a h'ànim dhìlis
Jan 24, 2018

X3D Use Cases
www.web3d.org

Why Extensible 3D (X3D) for HL7?



- ISO-IEC 1977x suite of standards:
- Scene graph data structure for interactive 3D worlds
 - Defines rendering and interactions for multiple data types (points, lines, meshes, volumes) in *Profiles*
 - 24 year history evolved from Inventor and VRML
- Encoded in XML, Binary, JSON, or utf8
- Interface bindings for common languages (JavaScript, Java; C++, C#, Python,...)

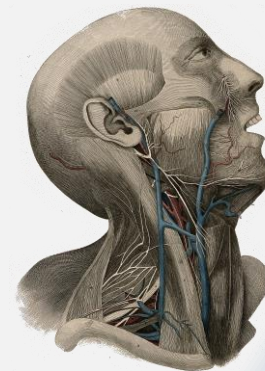
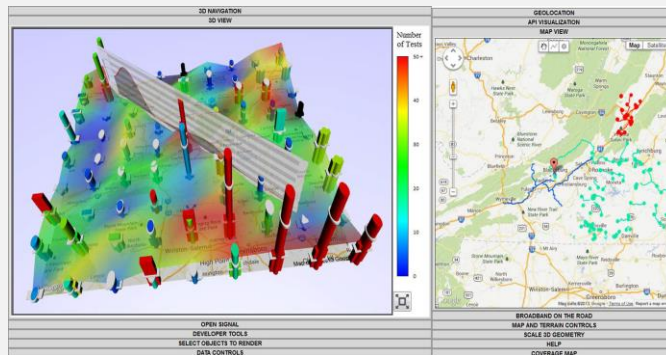
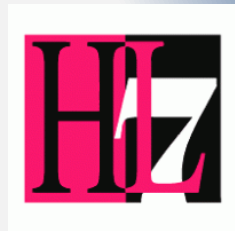
X3D Use Cases for Healthcare

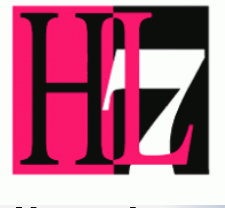


- Presentation of DICOM data, molecules, anatomy
- Pre-operative planning
- CAD models (stents, prostheses)
- 3D Printing
- Patient informed consent
- Visualizing geospatial distributions of health data (incident rates, outcomes, etc)

HL7 and X3D Integration Strategies

1. X3D content as payload in HL7
2. HL7 in X3D files (Metadata, namespaces)
3. HL7 and X3D peer applications

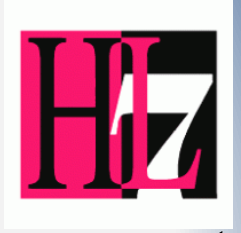




1. X3D content as payload in HL7

- X3D payloads are demonstrated for medical applications:
 - Volume rendering & DICOM presentation
 - Isosurfaces, text, lighting, animations
 - Visualization of model databases
 - CAD models (stents, prostheses)
 - 3D Printing

1. X3D content as payload in HL7 (Medical Profile)

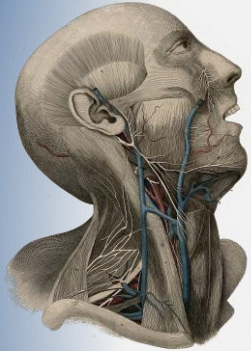


- Medical Component Profile (ISO-IEC 19775)
 - Provides an open format to exchange polygonal geometry between medical imaging systems.
 - Volume Rendering
 - Uses Geometry and dimensions from DICOM images to create a 3D volumetric model
 - Annotation

X3D Use Cases



MIRROR4all: Volume Rendering



- 3D reconstruction of a medical scan from a series of DICOM images.

MRI scans:
http://www.kshell.com/pages/dicom_volren/collection001/series03/index.html

3D Printing (3dprint.nih.gov)



X3D for 3D Printing
Interoperability, Portability,
and Multipurposing

DNA Molecule (SicViz) : VT



KSHELL: 3D DICOM images presentation

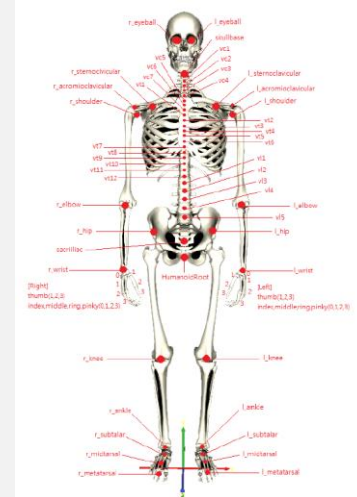


This is a Q-Code for the URL of a 3D volumetric image created from DICOM scans. The URL is http://www.kshell.com/pages/dicom_volren/collection000/series00/index.html

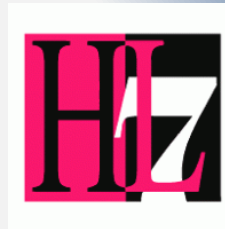
1. X3D content as payload in HL7 (H-Anim)



- Humanoid Animation (H-Anim: ISO/IEC 19774)
 - Feature points match CAESAR and ISO 7250
 - Atomically - accurate joints, segments, skin
 - Animate with BVH mocap data
- Visualizing:
 - Body morphology, growth
 - Body mechanics, therapies



2: HL7 in X3D



Lossless record information can travel with the 3D model / interactive world:

- Metadata sets on any node in the scene graph
 - Similar strategy to using SNOMED terms w/ X3D models
- In XML encoding:
 - Create mixed namespace documents
 - use W3C's authentication & encryption

2: HL7 in X3D

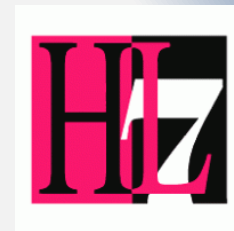


- Metadata sets on any node in the scene graph

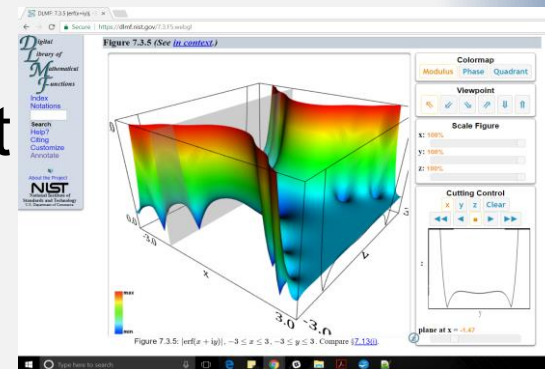
```
<MetadataSet name="DICOM" reference="http://dicom.nema.org">
  <MetadataString containerField="value" name="Recognizable Visual Features" value="NO">
    <MetadataSet containerField="metadata" name="tag">
      <MetadataString containerField="value" name="GROUP" value="0028"/>
      <MetadataString containerField="value" name="OBJECT" value="0302"/>
    </MetadataSet>
  </MetadataString>

  <MetadataString containerField="value" name="Burned In Annotation" value="NO">
    <MetadataSet containerField="metadata" name="tag">
      <MetadataString containerField="value" name="GROUP" value="0028"/>
      <MetadataString containerField="value" name="OBJECT" value="0301"/>
    </MetadataSet>
  </MetadataString>
</MetadataSet>
```

3: HL7 + X3D



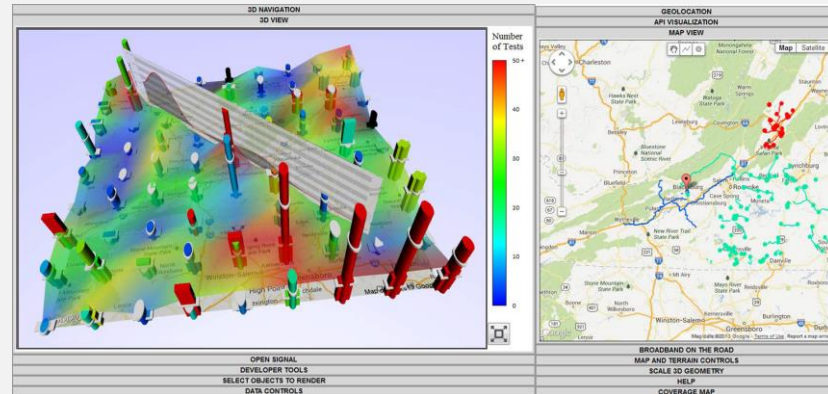
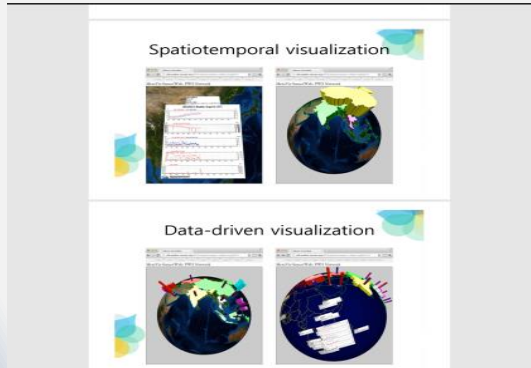
- Peer integration:
 - Patient data lookup from 3D objects and interaction
 - Interactive 3D charts from patient data
- Analytics of high-dimensional data including:
 - Geo-referenced visualization
 - WebServices and sensor streams



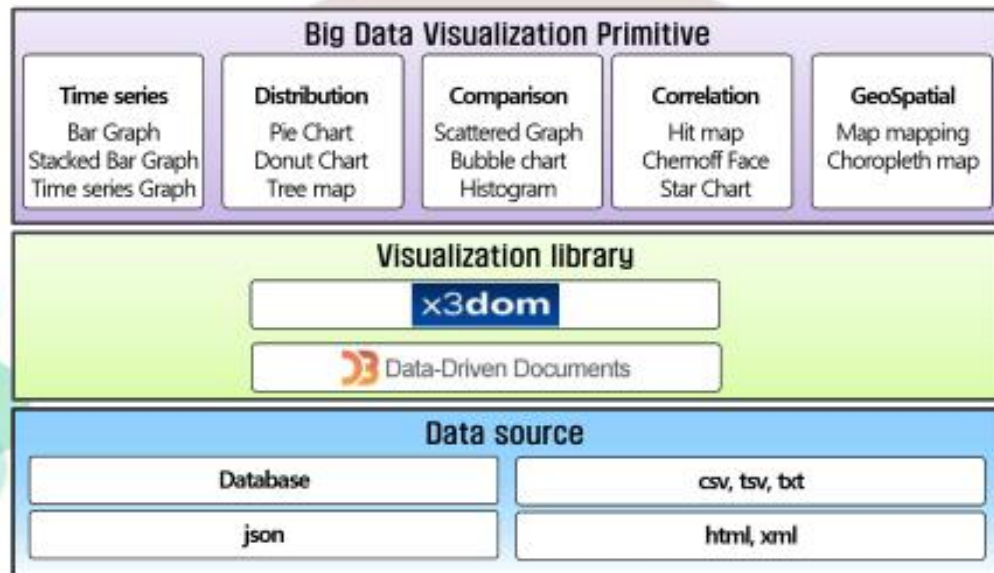
3: HL7 + X3D



- Data driven visualization
Analyzing large, high-dimensional data records
- Tools for mining and interactive analytics on big data



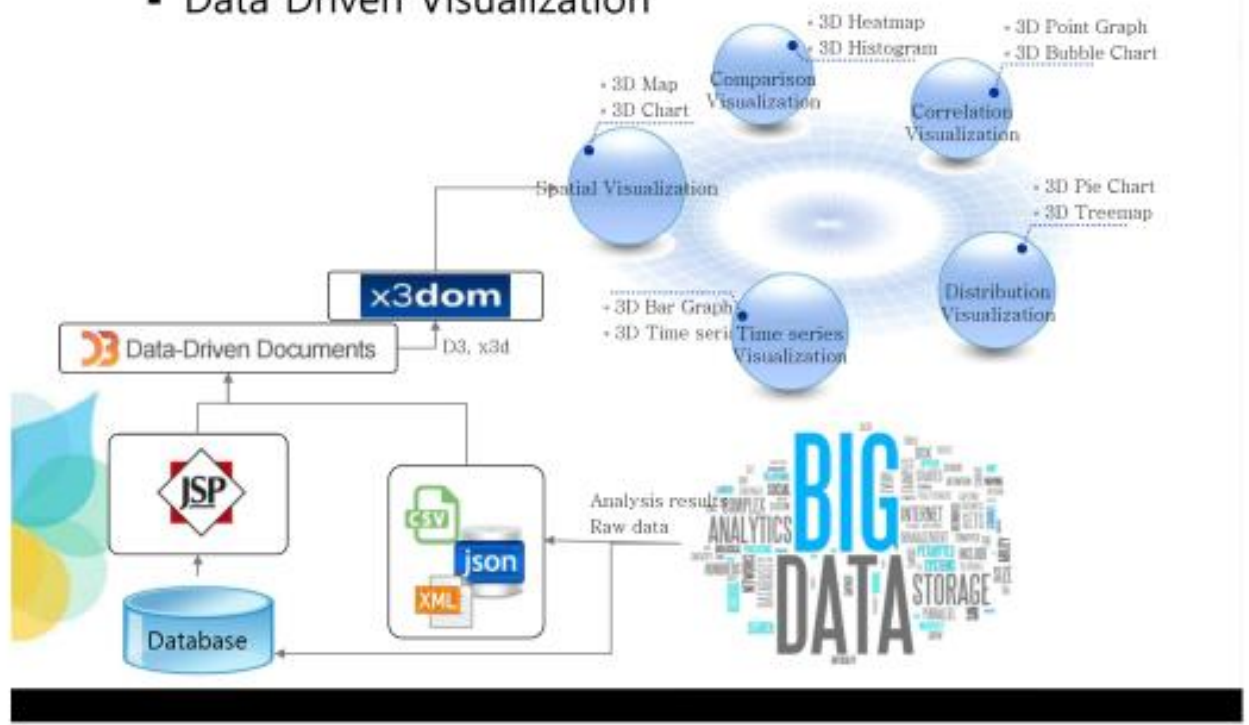
Data Driven Visualization (DDV) Web 3D Visualization Tool



26



Data Driven Visualization



Forward

Identify Projects and Partners for Integration Strategies

- Partnership Strategies
 - Liaison agreements and MoU,
 - Membership
 - Working Group collaborations
 - Member inreach
- Feasibility study, Implementation profiles
- Pilot projects



Join the Web3D Team



Make open 3D standards
work for you!

www.web3d.org/join

[**WWW.Web3D.org**](http://WWW.Web3D.org)

Upcoming Events:

[Web3D 2018 Conference](#)

20-22 June 2018, Poznań, Poland

[SIGGRAPH 2018](#)

12-16 August, Vancouver, USA

Contact:

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Nicholas Polys, Virginia Tech
npolys@vt.edu

X3D For ALL



Join us to Build the Future of 3D

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