



Web3D Emerging Technologies Showcase

Virginia Tech Research Center
25 March 2014

Anita Havele
Executive Director, Web3D Consortium


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Why Are Open Standards Important for 3D?

- Creating quality 3D content is expensive**
Both in time and software costs
- Something just as expensive is recreating 3D content**
when the underlying technology no longer works
- Well-kept secret of proprietary 3D technologies**
Rarely interoperable
- Single vendor solutions are almost always limited**

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Building blocks for stable 3D solutions

- Stability
- Extensibility
- Interoperability
- Stable Development
- Leverage Existing Skills

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Is your technology stable?



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Is your technology extensible?



Stability

Extensibility

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Is your technology Interoperable?

Market Dominance
Biggest competitor wins?

- Companies hope to “own” 3D
- Success short lived
- Close technologies
- Single vendor solutions
- No Interoperability

Stability

Extensibility

Interoperability

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Business case for open standards

[ISO study showing the benefits of open standards](#)

1. Address open standard in your planning
2. Build a process of understanding how open standards can improve or impact your business
3. Evaluate available open standard options and organizations
 - Membership benefits
 - working group structure
 - Outreach opportunities
 - IPR Policies
4. Focus on long-term goals
 - you might be surprised how easy it is to make a business case for open standards?

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X3D: Extensible 3D

Interactive Real-time 3D Open Standard for the Web




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Is your 3D solutions providing these building blocks?

	X3D
Stability	Durable - 1997
Extensibility	X3D V4.0 extending to HTML5
Interoperability	Between systems and platforms
Stable Development	Vendor Neutral/Consensus
Leverage Existing Skills	VRML X3DOM

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Benefits of open standards: X3D

Increasing the value of your existing and future investments
ROI

Open standards drive more competitive solutions

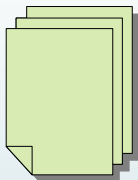
- Encourage open source software solutions
(X3D has 11 Open Source, 12 Commercial implementations)
- Stable versioning of specifications (X3D V3.3 now)
- Reliable, fixed terms of availability of standards
- Provides greater software re-usability (backward compatibility since 1997)
- Enables greater data portability (Several conversion tools)
- INTEROPERABLE and CONVERGING standards (OGC, W3C, Khronos, DICOM)

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What is X3D?

Second Generation VRML
A complete solution for 3D on the Web



File Formats:
XML, ClassicVRML, Binary

+



Run-Time Engine (player)
1 open source and 9 players

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

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

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X3D - Interactive Real-time 3D publishing standard for the Web

- Royalty Free
- Open ISO Standard
- Evolutionary - 1997
- Durable
- Interoperable
- Multi Platform



www.web3d.org

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Who is developing X3D?

Web3D Consortium founded in 1997 to support and advance the VRML specification now called X3D

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



Our members span business, academia, government and the military

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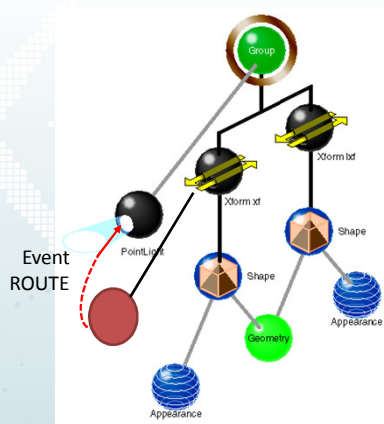
Scene graph for real-time interactive 3D

Delivery of virtual environments over the web


Multiple ISO-ratified encodings

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

- Multiple APIs
 - ECMAScript (JavaScript)
 - Java



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X3D Profiles

<http://www.web3d.org/files/specifications/19775-1/V3.0/index.html>

General Goal:

- A 3D visualization component for any runtime environments
- Reduced complexity and implementation effort

A lightweigh X3D

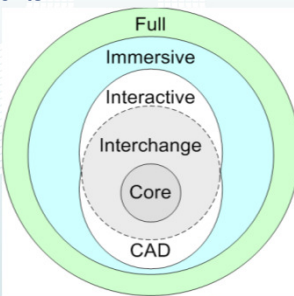
- Lightweight runtime essentials
- A Stripped down X3D Scene Graph Rendering System
- Complimentary to other external runtime systems (HTML5, Mobile, OGC, W3C...)

Eliminate


- X3D-Script
- Protos
- High-Level Sensors

Use

- Mobile applications
- Lightweight HTML web pages
- Augmented Reality Applications



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X3D Specifications

X3D File Encodings

.wrl, .wrz
VRML 97
Specification
ISO 14772-2

.x3d
XML Encoding
DTD, Schema
ISO 19776-1

DOM
Document
Object Model
Recommendations
W3C

.x3dv
ClassicVRML
Encoding
ISO 19776-2

**X3D
Abstract, API
Specifications
ISO 19775-1,2**

Scene Access
Interface (SAI)
Java
ISO 19777-2

.x3db
Binary
Encoding
ISO 19776-3

**DICOM
H-Anim**

Scene Access
Interface (SAI)
ECMAScript
ISO 19777-1

XML
Encryption,
Authentication
Recommendations
W3C

Programming Language Bindings

© 2007, Daly Realism & Don Brutzman


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X3D Resources

- **Open Source Players**
 - Xj3D – stand-alone player
 - FreeWRL – (Mac, PC, Linux), stand-alone and plug-in
- **Open Source Authoring Tools**
 - X3D-Edit
- **[X3D Resources](#)**
 - Conversion Tools
 - Example/Models
- **[X3D Book/Course Videos](#)**

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Geospatial X3D

Geospatial scenes have requirements beyond ordinary 3D scenes

- **Double-precision accuracy** on floating-point displays
- Diverse yet **coherent spatial reference** systems


11 X3D Geospatial nodes add Geo functionality to X3D

- Integrate Earth with X3D scenes

X3D Earth - Generation of local regions or full-scale globes using any data

- Without license restrictions, openly scalable

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X3D- Earth

Open Standards based visualization infrastructure for geo referenced simulation


Geo data is delivered as scenes graphs of highly synthesized X3D display elements, optimized for efficient real time rendering at high frame rates.

- 3D Map Server - 3D Globe
- 3D Street Views
- 3D Virtual Globes
- Extensibility and interoperability between 3D City Models
- Open interface to exchange servers and clients



X3D Streaming allows effective fly-throughs for web applications and datasets that are too big for being stored in single files.

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X3D Geospatial Nodes

Level	Prerequisites	Nodes/Features	Support
1	Core 1	GeoCoordinate	All fields fully supported.
	Time 1	GeoElevationGrid	All fields fully supported.
	Networking 1	GeoLocation	All fields fully supported.
	Grouping 3	GeoLOD	All fields fully supported.
	Rendering 1	GeoMetadata	All fields fully supported.
	Shape 1	GeoOrigin	All fields fully supported.
	Geometry3D 1	GeoPositionInterpolator	All fields fully supported.
	Interpolator 1	GeoTouchSensor	All fields fully supported.
	Point device sensor 1	GeoViewpoint	All fields fully supported.
	Navigation 1		
	2	Core 1	All Level 1 Geospatial nodes
Time 1			
Networking 1		GeoProximitySensor	All fields fully supported.
Grouping 3		GeoTransform	All fields fully supported.
Rendering 1			
Shape 1			
Geometry3D 1			
Interpolator 1			
Environmental device sensor 1			
Navigation 1			

[GeoCoordinate](#)

[GeoElevationGrid](#)

[GeoLocation](#)

[GeoLOD](#)

[GeoMetadata](#)

[GeoOrigin](#)


[GeoPositionInterpolator](#)

[GeoProximitySensor](#)

[GeoTouchSensor](#)

[GeoTransform](#)

[GeoViewpoint](#)

Byoungyun Yoo - NPS - www.byoo.net 

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Next Generation X3D

X3D 4.0: Complete HTML Integration no plugins

- X3D models in your native browser
- X3DOM Developed by Fraunhofer (Web3DC Member)
- No plug-in required
- Available NOW with Firefox, Chrome, and Safari
- Open source JavaScript X3D player
- WebGL and Flash support

www.x3dom.org

http://www.x3dom.org/x3dom/example/x3dom_carousel.xhtml

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x3dom Instant 3D the HTML way!

[home](#) [about](#) [showcases](#) [examples](#) [browser support](#) [documentation](#) [status](#) [profile](#) [get involved](#)



Fraunhofer
iso

About

X3DOM (pronounced X-Freedom) is an experimental open-source framework and runtime to support the ongoing discussion in the Web3D and W3C communities how an integration of HTML5 and declarative 3D content could look like. It tries to fulfill the current HTML5 specification for declarative 3D content and allows including X3D elements as part of any HTML5 DOM tree.

Declarative Scenegraph Part of HTML-document DOM Integration CSS/ Events	2D (Final HTML5 spec)	3D (No W3C spec yet)
SVG		
Imperative Procedural API Drawing context	<canvas>	

SVG, canvas, WebGL and X3DOM relation

The goal here is to have a live X3D scene in your HTML DOM, which allows you to manipulate the 3D content by only adding, removing, or changing DOM elements. No specific plugin or plugin interface (like the X3D-specific SAI) is needed. It also supports most of the HTML events (like "onclick") on 3D objects. The whole integration model is still evolving and open for discussion.

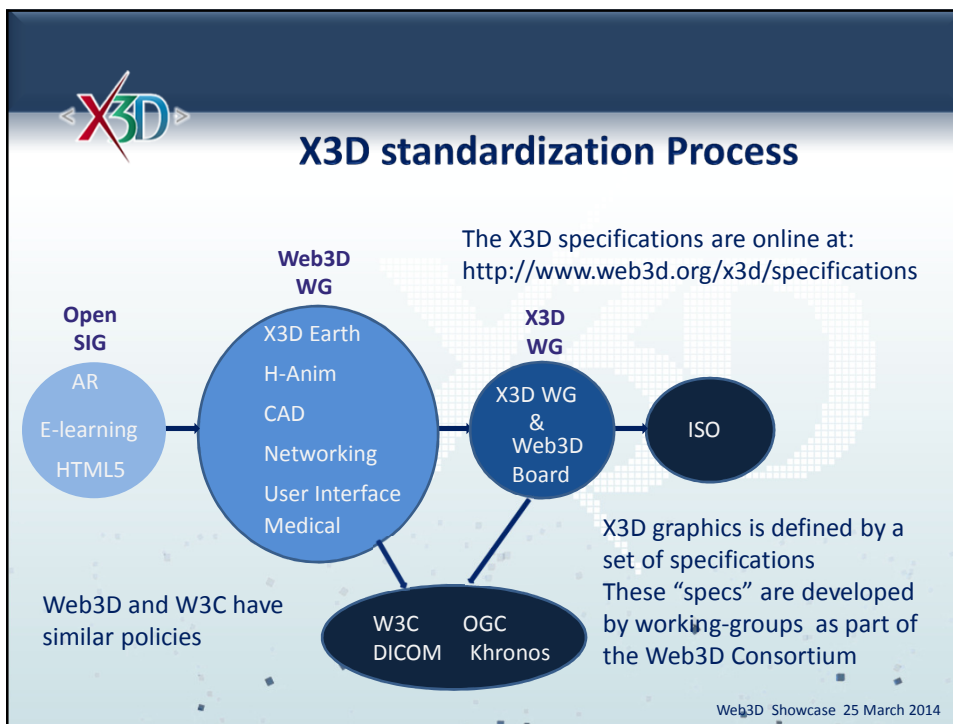
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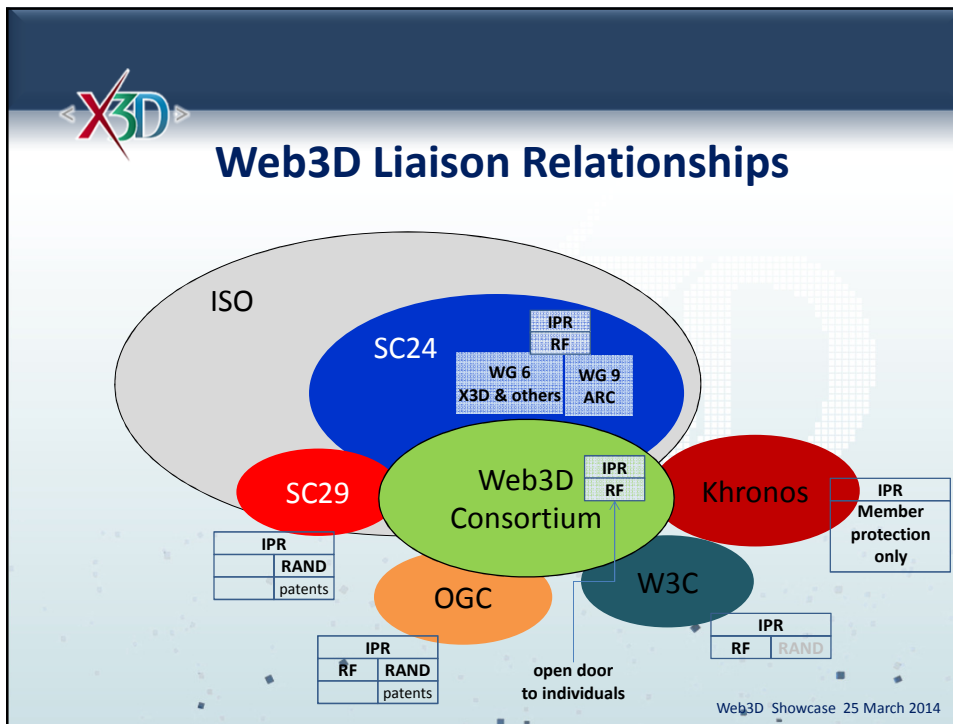


X3DOM Benefits

- Development costs:** Web developer vs. Graphics expert
- Adaptability:** Declarative material abstraction allows shading adoption per client hardware (e.g. GLSL, ray-tracing...)
- Efficiency:** UI events, culling, rendering can be implemented in native code, thus utilizes battery resources efficiently
- Accessibility:** High level navigation and interaction styles allow very late adaptations for specific use cases
- Metadata:** Allow indexing and searching content
- Mash-ups:** Asset reuse in new context
- Security:** No plugins or even direct GPU calls necessary
- ExternalMesh Compression:** Compressing geometry representation of a scene achieving significant performance improvement

[Powerful Abstraction for Web Applications](#)







Why do our members use X3D

- Build 3D products based on a stable 3D standard
- Avoid proprietary lock-in
- International, Conformant/ISO Standard
- Their customer are asking for open standards based technology
- Vendor neutral environment/ consensus based development
- Access to a community of world-wide 3D experts
- Consensus based participation from both end-users and software developers
- Converge with other 3D related standards

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Upcoming Web3D Events

Siggraph 2014 and Web3d Conference

Vancouver, Canada

- Co-sponsored by Web3D Consortium, ACM SIGGRAPH and Eurographics
- Conference 8-10 August 2014
- Siggraph 11-15 August 2014
- Highlights current Capabilities and trends in interactive 3D graphics.
- Several Workshops (Geospatial, AR, Compression) and Tutorials
- Looking forward to participation from the OGC Community



www.web3d2014.org

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Join the Web3D Evolution!

web | **3D**
CONSORTIUM

Visit us at: www.web3d.org

To Join: www.web3d.org/join

Web3D Consortium
650 Castro Street Suite #120-490
Mountain View, CA 94041
Phone: +1 248 342 7662

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