Extensible 3D (X3D) Graphics for Metaverse Interoperability

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Big picture

Web architecture provides technical foundation for scalability, connectability of all information

- Extensible Markup Language (XML) for everything
- Best-case scenario: technology, business, public

Extensible 3D (X3D) Graphics standard has needed capabilities for networked 3D on Web

- Common export/import for wide range of tech
- Extensible, both formally and informally
- Technically grounded, steady growth, long view
Extensible 3D (X3D) Graphics has steadily progressed since work first began over a decade ago.

Wow! 😊

Many other commercial companies have tried and failed to “own” 3D graphics on the Web. The Web3D-supported community process to build and extend X3D works, sustainably.

Nothing succeeds like success...
Key Technologies

Extensible Markup Language (XML)
• Validatable data, binary compression
• Web Services for message exchange

Extensible 3D (X3D) Graphics
• ISO-approved interactive visualization

Our approach
• Demonstrate application value of new technology
• Collaborate, implement, evaluate, report, repeat
The Web3D Consortium is the public-private partnership of industry, agencies, universities and individuals that has "kept the flame alive" and made X3D what is today.

How to accomplish all of this wasn’t clear as we proceeded. Structuring for success let us work together through dialog + collaboration.
**Featured Case Study**

ALIVE, University of Southern Queensland - The Phoenix Challenge

ALIVE created "The Phoenix Challenge" using Flux Studio, Maya and Rawkee and implemented Ajax3D to keep track of the player's score and to interact with their database of objects. The player's objective is to make their way around the campus picking up objects which affect their STRENGTH, SMARST and STRESS. There is a time limit to complete each level. X3D provided the ability to create a browser-based game which students can find by following a URL, and after installing the Flux Player, do not require other software on their system and can view other X3D scenes the ALIVE team create. The game can be played by visiting http://www.alive3d.org/challenge. Viewers can access this password protected game with the username guest and the password guest.

Read more

**Latest Web3D News**

Media Grid to Take Education Across the Virtual World—and the XO

Feb 02, 2008 Media Grid recently announced its plans to roll out a cross-platform, immersive world for education for academics, students, and trainers everywhere because 3D environments need to provide a 3D educational perspective. After experimenting with VRML, the Unreal Engine, and other tools since 2001, the organization realized that it needed to begin looking beyond simply one platform. It formed the Immersive Education Initiative and looked for options. They looked at all the platforms that were available and arrived at the first three systems: Second Life, which is open source on the viewer; Sun Microsystems' Wonderland; and Croquet, an open-source educational environment created by Duke University. The thrust of the initiative was to get a product out as quickly as possible that is adaptable for ongoing upgrades. That involves establishing not only a user interface but consistent across the three platforms, but a way to recognize assets for teaching tools, host them, and make them available for use in any environment. The Education Grid will be populated by file formats that can be read by existing forms and will have educational grid assets for Second Life and X3D for Wonderland and for Croquet.

Read more

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New update to X3D-Edit

Feb 02, 2008 The National Postgraduate School (NPS) team has produced another update to X3D-Edit, a new authoring tool for simple error-free editing, authoring and validation of X3D scenes. The latest weekly build includes collaboration chatting with file sharing, the complete set of X3D specifications, a new X3D Example Archives download panel, and an updated X3D viewer. Free download is available at X3D-Edit. In addition to being available as a cross-platform standalone application, X3D-Edit is now listed in the Netbeans Plugin Portal. Public or private evaluation comments are welcome.

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Community rules

Thanks to steady innovation by Web3D members, new X3D features continue to evolve and grow into great capabilities.

- Lots of working groups have formed, worked, faded, regrouped and succeeded.
- Web3D members (and big www-vrml list too) keep these successes building, year after year
ISO

Implementation, evaluation and then formal review by the International Organization for Standardization (ISO) have made X3D an approved standard for real-world use, both on and off the Web.

• Experts from 12-15 nations review our specs
• Immediate adoption by other governing bodies helps to increase deployment
Further collaboration by Web3D Consortium with the World Wide Web Consortium (W3C) has made X3D a "first-class citizen" on the Web, providing excellent (and growing) interoperability with other XML standards.

More work (especially more volunteers) needed, some excellent individual opportunities here.
Intellectual Property Rights (IPR)

Web3D and W3C have similar policies
Any known patented technology must be declared by members prior to consideration by working groups
Any patented technology contributions must be licensed on a royalty-free (RF) basis for inclusion in an openly used Web standard
http://www.web3d.org/membership

Caveat: any legal problem can be solved, but only in advance
Open Source

Open for any use, without license fees

Free = freedom to innovate

Not necessarily free cost (unlike “free beer”)

Common shared example implementation(s)
  • Not a reference implementation – the specification/standard hopefully provides that

Can provide a self-sustaining business model for continued activity, improvement

Can break logjams when company participants can’t resolve technical issues
Open standards, open source

Open standards define rendering functionality and interoperability of data

Open standards can be written using open or commercial source, benefitting everyone

• Not mutually exclusive
• 2+ implementations needed for standardization
• win – win – win situation

Open source has helped X3D stably survive ups + downs of commercial trials + tribulations
Digital rights management (DRM)

X3D’s XML and Compressed Binary encodings allow use of W3C’s Security recommendations

- XML Encryption
- XML Digital Signature (for authentication)
- Public key infrastructure

DRM is now feasible

- More uses than Hollywood-commercial exist
- Interesting example: Sun’s DReaM project

http://www.openmediacommons.org
**IPR summary**

Open standards & open source: part of success

Complements legacy approaches, traditional “hierarchical stovepipes,” provides stability

Win-win approach for government, industry
  - Both wins are needed for program success

Standards organizations, IPR agreements provide a stable playing field for long term
  - Welcome to another active playing field!
XML in 10 Points

- XML is for structuring data
- XML looks a bit like HTML
- XML is text, but isn't meant to be read
- XML is verbose by design
- XML is a family of technologies
- XML is new but not that new
- XML leads HTML to XHTML
- XML is modular
- XML is basis for RDF and the Semantic Web
- XML is license-free, platform-independent and well-supported

400+ member companies & institutions in World Wide Web Consortium (W3C) already understand the business case
Shared virtual environment self assessment for Web3D, X3D

I think X3D efforts have built over 80% coverage of what is needed technically for broad virtual-world interoperability among the various players in this somewhat-crowded field.

Some capability estimates place us even higher.

No one in Web3D has challenged the feasibility of this strategy, rather they are considering where to best place their efforts.
X3D working group

Central effort to choreograph stable standards growth.

Ensure implementations are evaluated and interoperable prior to ISO approval.

This is already working great, has already produced a rich set of 3D graphics capabilities, and can handle the further technology-coordination challenges.
Networking group: key area

We have a road map for exposing X3D events across the network via NetworkSensor node, in addition to Ajax3D and Distributed Interactive Simulation (DIS) protocol.

We can add transport independence, meaning that the same event streaming might be equivalently carried by http/https, unicast/multicast sockets through specially approved 3D avatar ports, Ajax, web services, or the XML-based XMPP chat standard.

Having all these options would get us through any firewall safely. So, what's next? To gain interoperability, we add a handful of cochairs, one each for Second Life, Forterra/There OLIVE, Wonderland/Darkstar, etc. etc. We simply map our event streams to their various protocols - it is do-able.
This group is delivering. We certainly have plenty to do over the next year, but very little invention will be needed.

Initial proof-of-concept worlds are scaling up. Efforts will all be about further datasets, improved optimization of 3D, and growing our metadata interoperability with Open GeoSpatial Consortium (OGC) and World Wide Web Consortium (W3C).
CAD working group v2

If this gets a restart, and gets re-energized by the hoped-for release of ISO SC-4 interoperability requirements, and considerably broadened by collaboration with Collada/Khronos, then we will further unlock and ease conversion of CAD data assets into interoperable X3D for use in virtual worlds.

Potential: run-time usability of any CAD model (which are otherwise too heavyweight to use)
Humanoid animation (H-Anim)

H-Anim working group. We have body interoperability, need better model exporters, need to finish animation-behavior interoperability (80% complete), and add Avatar nodes that map to the functionality of other avatars.

Obvious cross connect: identically tooled network protocol for H-Anim, with converters for different-bits, same-data protocols.
Medical working group

Medical: a recurring question I get asked is whether there is overlap with H-Anim. Since the underlying H-Anim CAESAR model is a strictly anatomical skeleton, that would seem to be feasible.

Adding medical to this mix might be considered superfluous, or might instead be a sign of deeper technological/business maturity.

Killer use case (no really): 3D medical records
There was 20 years of non-interoperable hypermedia, then effective creation of shared 2D HTML pages changed interoperability almost overnight (1990-92).

A truism of most 3D spaces is that no 2 experts can run each other's demos. Why do we put up with that?

As we achieve effective and consistent 3D user-interface metaphors for the Web, this can further help resolve virtual-world inconsistencies to achieve better user experiences.

We should add internationalization (I18N) to this group's charter.
What’s missing

Web3D Consortium and X3D Graphics Standard is an under-recognized business opportunity that has thorough standards partnerships. We have been going for 10 years, steadily growing with the Web, and can’t be killed. It will be interesting to see when maturity of interoperability and growing a bigger place becomes a more-obvious business strategy than “we have to own a technology niche.”
What we are not proposing

Commercial competitor to other schemes
• They already have technologies of choice, economic imperatives and business models
• … but they are not really part of the Web

Vive la difference
• Some commercial approaches may actually benefit by having an open approach widely available, providing new services & products
The key challenge is scalability

Because the only information systems capable of scalably growing to match global scope are the Internet and the World Wide Web, X3D and X3D Earth deliberately follow the architectural principles of World Wide Web.

- *Architecture of the World Wide Web, Volume One*
  [http://www.w3.org/TR/webarch](http://www.w3.org/TR/webarch)
- Everything else is built on this technical foundation
Upcoming events

Eurographics Conference, X3D tutorial and meeting, Crete, Greece, April 14-18

X3D Earth: Future Directions Workshop, Sao Paolo Brazil, May 8-10

Web3D Symposium, LA, August 8-10 and SIGGRAPH, Los Angeles, August 11-14

NPS MOVES Open House, 15-17 July 2008, Monterey
Recommendations

Standards interoperability is essential for Metaverse growth and scalability.

Web3D Consortium can (and will) pursue a multi-year strategic initiative to establish interoperability standards and practices for large-scale virtual worlds.

Let’s work together. 😊
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