3D Web Interoperability for the Metaverse

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Metaverse has many definitions

A virtual-reality space in which users can interact with a computer-generated environment and other users.

What might be a workable definition of term 'Metaverse'? Here is one of many:

- A constellation of connected multi-dimensional computer generated **virtual worlds**

- Where people will work, learn, play, buy, sell, communicate, collaborate, interact and travel.

- Could it be a sustainable, open and interoperable

- Could this be achieved through existing standards

  Paper: The Keys to an Open, Interoperable Metaverse

Elements of a Virtual Environment

- **Real-time scene clients with lighting, animation, objects, user interaction (load asset and I/O devices)**

- **Scene updates through user interactions (animation, events, Web links)**

- **Shared consistent state via Web**

WWW + Web3D

Extensible 3D (X3D):

3D Scene Graph

- Designed for distributed clients to experience 3D worlds from any platform across several domains.

- Designed for flexible, royalty-free authoring across verticals and data types

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X3D: Interoperable 3D for the Metaverse

Data from different domains have to Coexist
Mashup 3D data across domains

Design

Geo

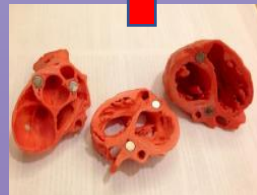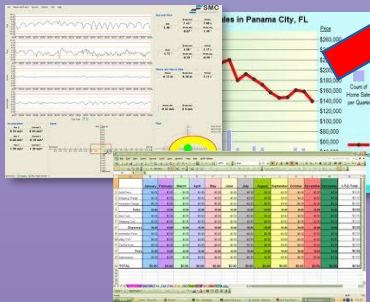OPEN STANDARDS FRAMEWORK

Medical

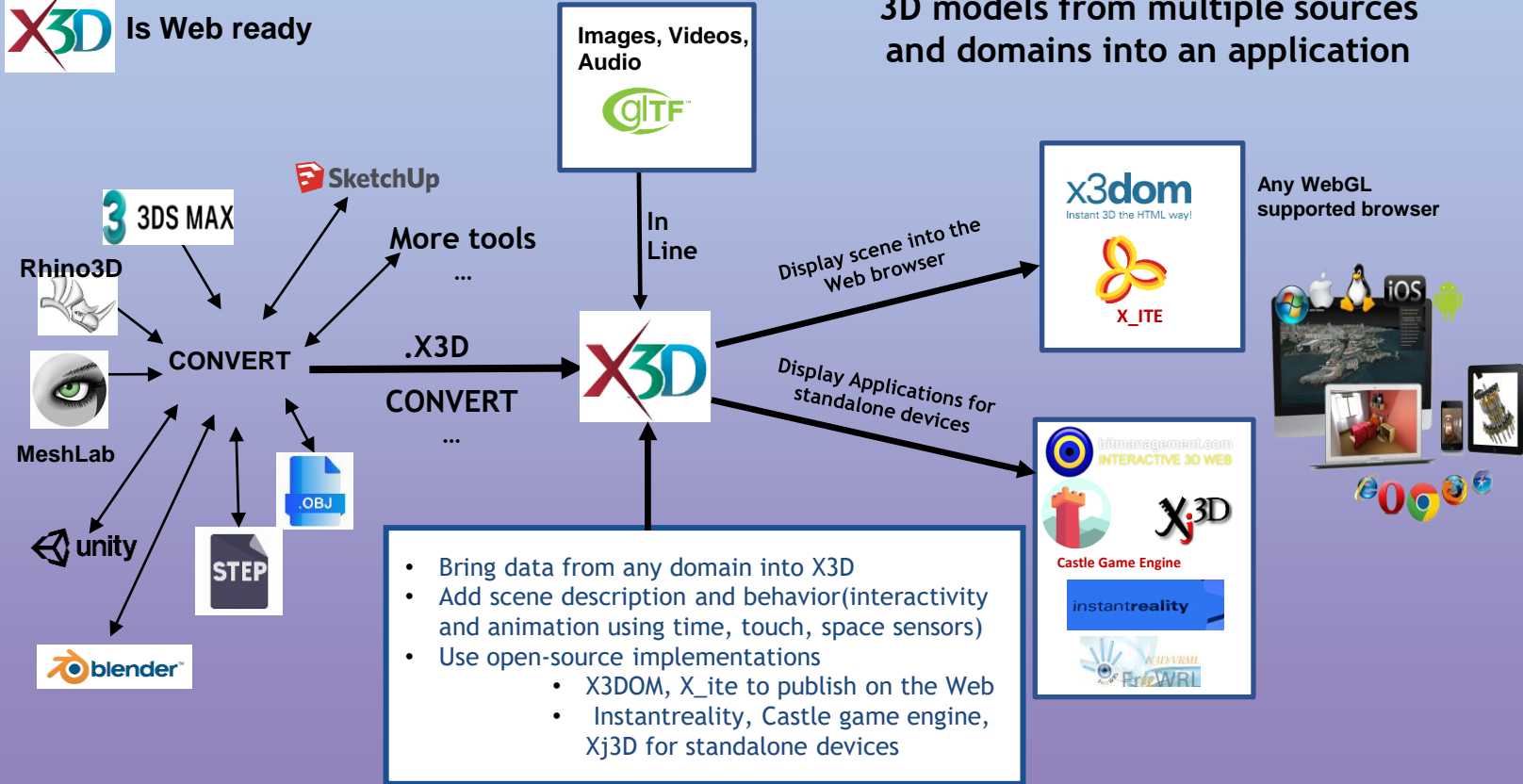3D Printing

Medical (MRI, Scans, 3D Prints

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X3D Ecosystem

 Is Web ready

X3D provides a presentation layer (a scenegraph) to display 3D models from multiple sources and domains into an application
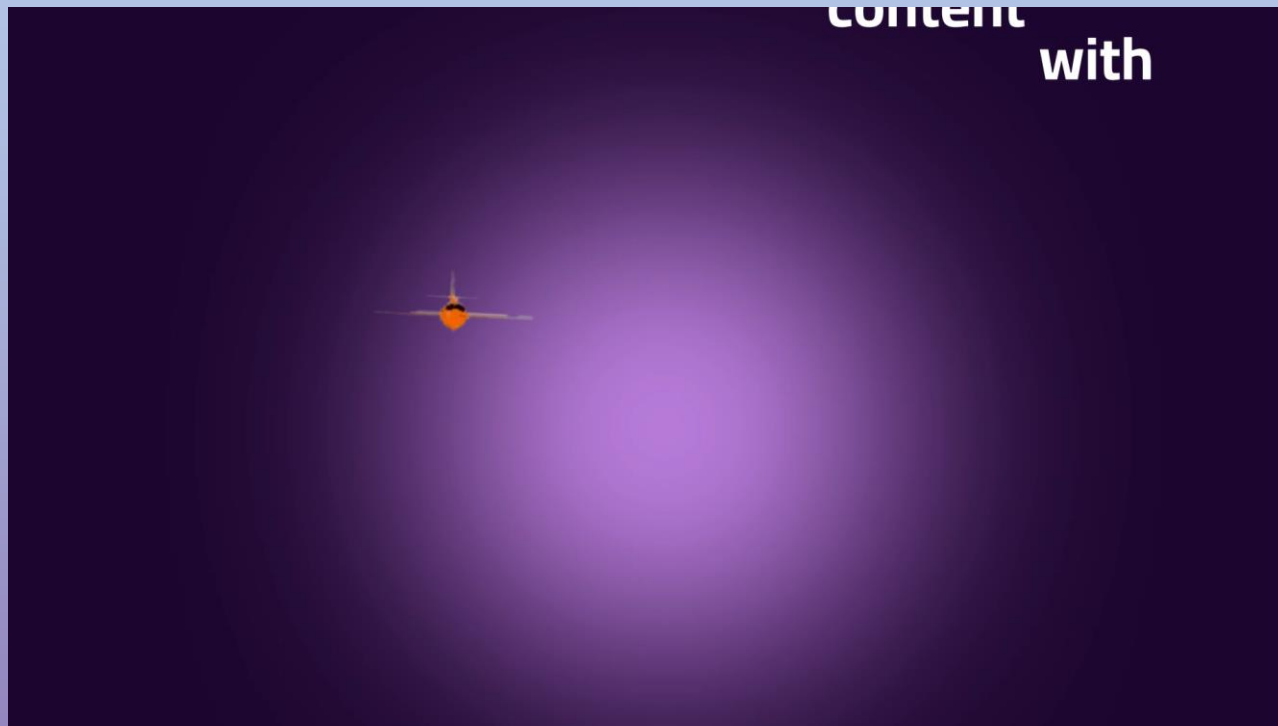
Domains

- Geospatial
- Medical
- CAM/CAM
- 3D Scanning
- 3D Printing
- Design
- Manufacturing
- Heritage
- …and more

Images, Videos, Audio

glTF

3DS MAX

SketchUp

More tools …

Rhino3D

MeshLab

CONVERT

.X3D

CONVERT …

In Line

X3D

Display scene into the Web browser

Display Applications for standalone devices

x3dom
Instant 3D the HTML way!

X_ITE

Any WebGL supported browser

bitmanagement.com INTERACTIVE 3D WEB

Xj3D

Castle Game Engine

instantreality

FreeWRL

.OBJ

unity

STEP

blender

- Bring data from any domain into X3D
- Add scene description and behavior(interactivity and animation using time, touch, space sensors)
- Use open-source implementations
  - X3DOM, X_ite to publish on the Web
  - Instantreality, Castle game engine, Xj3D for standalone devices

A complete 3D Web application with Web Services!

What is X3D?

What is Extensible 3D (X3D)

- **Originated from VRML, X3D is an ISO standardized specification for interactive 3D graphics.**

- **A File Format and Runtime API (Javascript, Java, …)**

- **Multiple encodings (file formats): XML, VRML, Compressed binary, JSON, based on the same abstract scengraph model**

- **Includes shaders, animation, interaction, geometry, texturing, lighting, camera**

- **Extensible - Capabilities added through scripting and node prototyping**

What is Extensible 3D (X3D)

- Large set of nodes for 3D modeling

- Profile and Component structure promotes interoperability

- Domain components - Design, 3D Printing, Medical, Geospatial, Humanoid Animation, AR and VR

- Implementations on multiple platforms: desktop, mobile, Web

- Multiple open-source implementations (X3DOM and X-ite)

www.web3d.org/what-x3d

Web3D® Consortium

An International, non-profit, member funded, Standards Development Organization (SDO) since 1997

Developing the royalty-free ISO specifications
X3D® and **Hanim** for interactive 3D Graphics on the Web

Community of Technologists and Enterprises who value open and stable 3D platforms

Members include Academia, Government, Industry, Research, and Professionals

www.web3D.org

We are laying the foundation

Geospatial
Medical
Design
3D Printing
& Scanning

Simulation
Humanoid Animation
VR Technologies
Augmented Reality

The backbone for the **new dimensions** of 3D!

www.web3d.org/join

X3 medical 3DX3D scanning 3DX3D platforms DX3D 3D printing DX3D geospatial DX3DX

< X3D >

Build once use anywhere
The Web is the platform

X3D Provides Flexibility, Expressive Power

- **HTML**
  - 2D User Interfaces, layouts
  - DOM and event linkages
- **X3D**
  - compose 3D scenes across formats and languages
  - user interaction, any device
- **glTF**
  - model embed, convert
  - advanced rendering

- **Audio**
  - spatialization
  - Web Audio API
  - MIDI 2.0

Screenshots: 4

X3D4 Demo: Nicholas Polys & Andreas Plesch
Web3D 2020
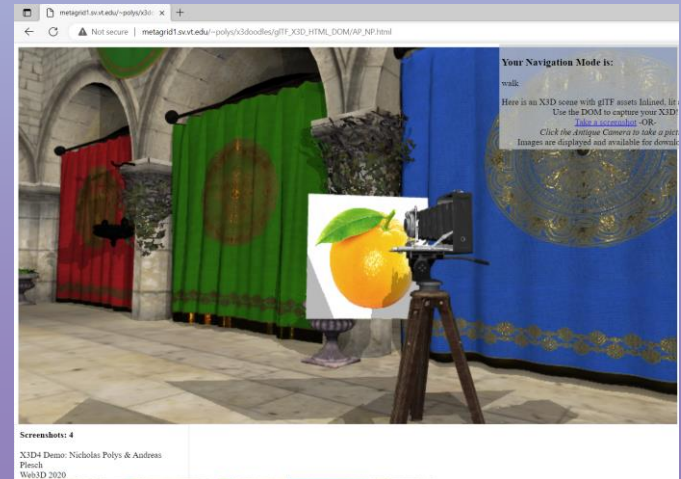
Web3D: Working Groups Highlights

X3D: X3D Version 4 specification (X3D4).

Design, Printing and Scanning (DPS): Developing standards and practices for robust and secure visualization of STEP Product Data, with valuable collaboration with other visualization formats such as JT and 3D-PDF.

Geospatial: Workflows and systems to support glTF and a Cesium Tiles-type approach for dealing with large and complex scenes.

Medical: Through our HL7 Liaison relationships, the Medical WG has developed several examples using X3D to visualize healthcare data.

Heritage: Creating a Web3D library from their world-class insect collection.

Join us and participate in building X3D

WWW.Web3D.org/working-groups

WebX3D.org and X3D Webinars

WebX3D **– Learn X3D**
Easy access to get started with X3D
Blogs, Newsletter and more!
YouTube
X3D Resources

Web3D Webinars
Learn X3D, X3D Browsers, X3D Tools
www.web3d.org/webinars

www.web3d.org/news-events

NEW RELEASES!
Four different open-source engines released for SIGGRAPH!

X3DOM.org : Javascript Engine - New Release 1.8.3

X_ITE : Javascript Engine - New Release
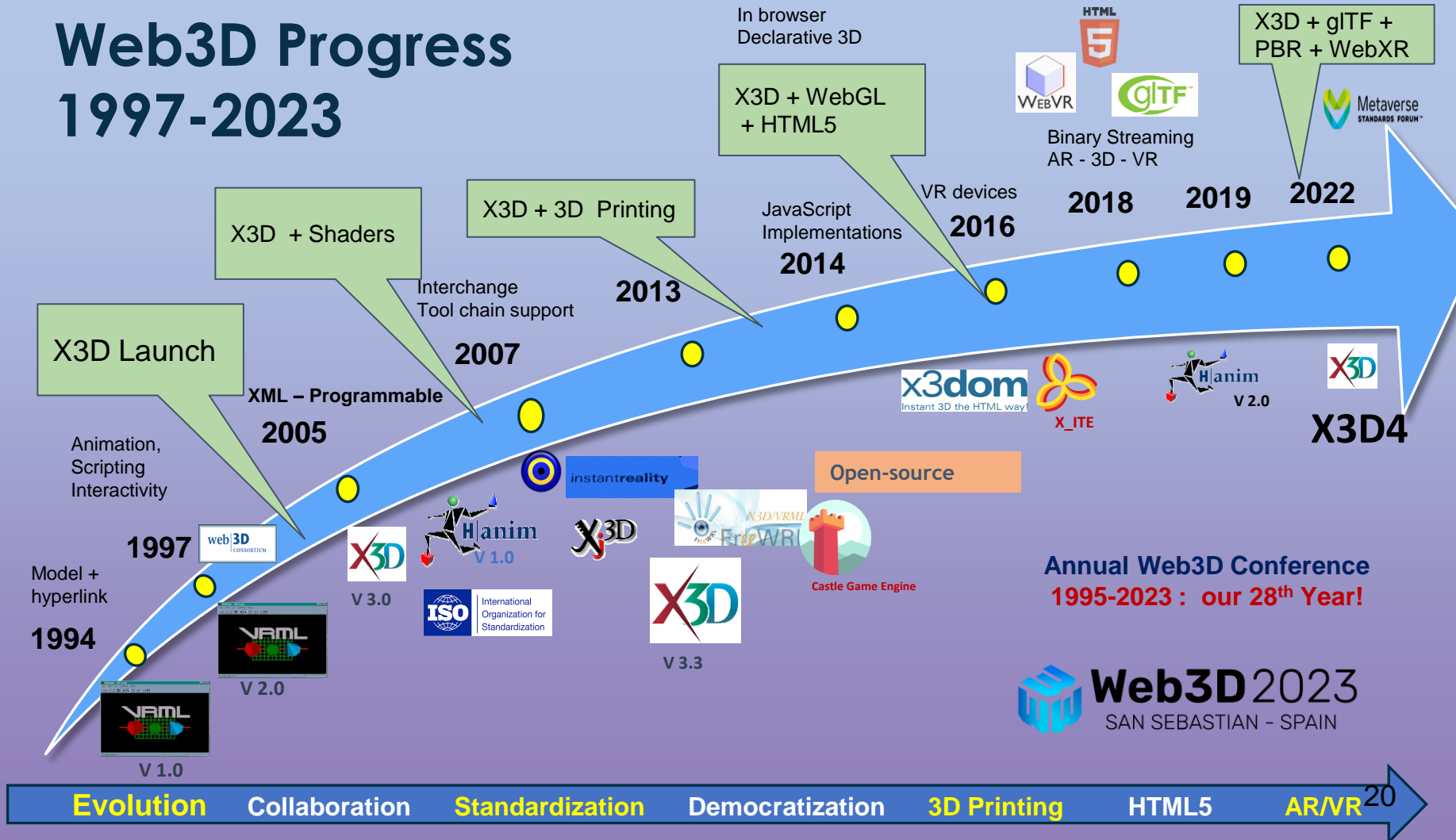

Castle Game Engine

FreeWRL 6.1

Web3D Efforts include SDO Harmonization

Engagement and coordination with multiple SDOs and open source efforts.

Web3D Progress
1997-2023

In browser
Declarative 3D

X3D + glTF +
PBR + WebXR

X3D + WebGL
+ HTML5

HTML
5

glTF

WebVR

Metaverse
STANDARDS FORUM

Binary Streaming
AR - 3D - VR

X3D + 3D Printing

VR devices

2016

2018

2019

2022

X3D + Shaders

JavaScript
Implementations

2013

2014

Interchange
Tool chain support

2007

X3D Launch

XML – Programmable

2005

x3dom
Instant 3D the HTML way!

X_ITE

H anim
V 2.0

X3D

Animation,
Scripting
Interactivity

1997

web 3D
CONSORTIUM

X3D4

Model +
hyperlink

Open-source

instant reality

1994

X3D
V 3.0

H anim
V 1.0

X3D

X3D/VRML
FreeWRL

Castle Game Engine

Annual Web3D Conference
1995-2023 : our 28th Year!

ISO
International
Organization for
Standardization

VRML
V 2.0

X3D
V 3.3

Web3D 2023
SAN SEBASTIAN – SPAIN

VRML
V 1.0

| **Evolution** | **Collaboration** | **Standardization** | **Democratization** | **3D Printing** | **HTML5** | **AR/VR** | 20 |

3D Web Interoperability Proposal
Metaverse Standards Forum

Goal

Enable the broadest possible interoperability of
Metaverse content using the Web

To make the Metaverse fully interoperable with the WWW
and the Standards ecosystem in order to enable new
Metaverse capabilities to flourish on a strong foundation.

Metaverse Standards Forum (MSF) has many current efforts, over 2300 members

A Constellation of Standards

Building a pervasive, open and inclusive metaverse at a global scale will require cooperation and coordination between a constellation of international standards organizations, including the Khronos Group, World Wide Web Consortium (W3C), Open Geospatial Consortium, OpenAR Cloud, Spatial Web Foundation, and many others.

The Forum does not create standards itself but coordinates requirements and resources to foster the creation and evolution of standards within standards organizations working in relevant domains.
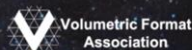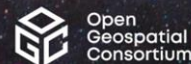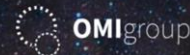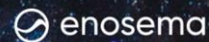
Upcoming Events

SIGGRAPH 2023 6-10 August 2023 - **Los Angeles, California**

Multiple BoF sessions: Carto, X3D4, & 3D Web Interoperability

Web3D 2023 **9-11 October 2023 - San Sebastian, Spain**

Metaverse Theme, Papers, Tutorials, Workshops, Industrial Use Cases, Demos

Metaverse Workshop on Oct 11th from 2-5 PM

Join Web3D and Participate

Join us in building X3D
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What is X3D flyer: www.web3d.og/about

www.web3d.org/join