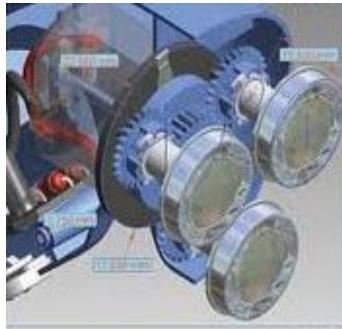


3D: Design, Print, Scan BOF

X3D: Open royalty-free interoperable standard
for enterprise 3D



15 August 2018

Web3D Consortium

www.web3d.org

Nicholas Polys Ph.D., President
npolys@vt.edu

Anita Havele, Executive Director
Anita.Havele@Web3D.org

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Scope & Outline

- Web3D Community
- 3D Print Exchanges
- Workflows & Roundtrips
- Enterprise scale (Mmarc Petit, EDF)
- *Discussion*



Who are we

An International, non-profit, member funded, standards development organization

Developing the ISO specification X3D for interactive 3D graphics on the Web

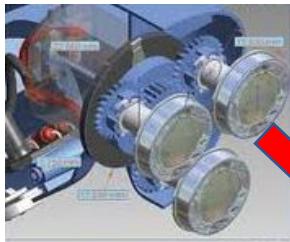
Our members span from academia, research, industry, government, and professionals

A community of technologists, artists and enterprise

web|3D
CONSORTIUM

WWW.Web3D.org

Data from different domains have to Coexist
Mash up 3D data across domains



Design



Geo



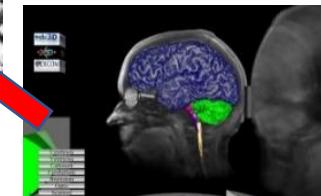
OPEN
STANDARDS
FRAMEWORK



Medical



3D
Printing





X3D: Create once - Run Anywhere

The Web is the platform



All browsers
All platforms

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



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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





Industry Standards unify communities

web|**3D**
CONSORTIUM



OGC
Open Geospatial Consortium, Inc.

W3C[®] WORLD WIDE WEB
consortium

KHRONOS
GROUP

 **DICOM**[™]
Digital Imaging and Communications in Medicine

HZ
INTERNATIONAL



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What is X3D (Extensible) 3D

- 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, JSON, based on the same abstract scenegraph model
- Includes shaders, animation, interaction, geometry, texturing, lighting, camera
- Extensible - Capabilities added through scripting and node prototyping.





What is X3D (Extensible) 3D

- Large set of nodes for 3D modeling
- Profile and Component structure promotes interoperability
- 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!

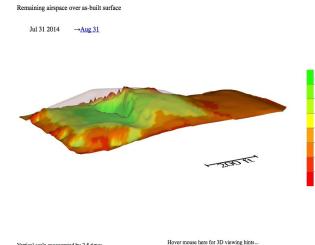
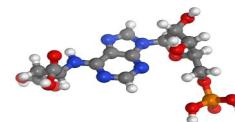


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Key Factors of durable X3D

- Long Term Stability
- Visualization
- Performance
- Integration
- Data Management
- Real-time Interactivity
- Security
- Ease of Use





Strengths of X3D

An international ISO royalty-free open standard

Robust open source implementations

Hardware and Software agnostic

Bring data from different sources and publish on different platforms

A layer above WebGL/OpenGL

Web Authors vs Graphics Programmers

Enterprise solutions

A welcoming open community (x3d-public@web3d.org)



X3D Capabilities



Drilling Rig

Animation, interaction,
shadows, details



High Poly. Progressive Loading

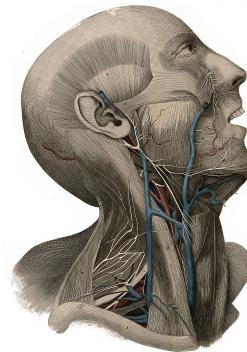
Happy Buddha



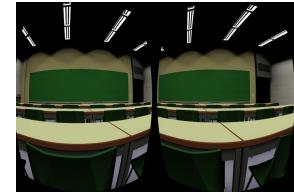
3D Printing



Volume Rendering



Oculus Support Classroom



Web3D members are making this happen



NAVAL
POSTGRADUATE
SCHOOL

TOSHIBA



NIH
3D PRINT
EXCHANGE

Synerg
SOFTWARE DESIGN

C4I CENTER



Institut
Graphische
Datenverarbeitung

Virginia Tech
Invent the Future

vicOmtech
ik4 research alliance

edf



CHUNGBUK
NATIONAL UNIVERSITY

3dMD

Smithsonian

JEJU NATIONAL UNIVERSITY

Korea Institute of
Science and Technology

THE
UNIVERSITY
of
SUWON

M B A R I



Adoption



Mission

Interoperability: Converge standards

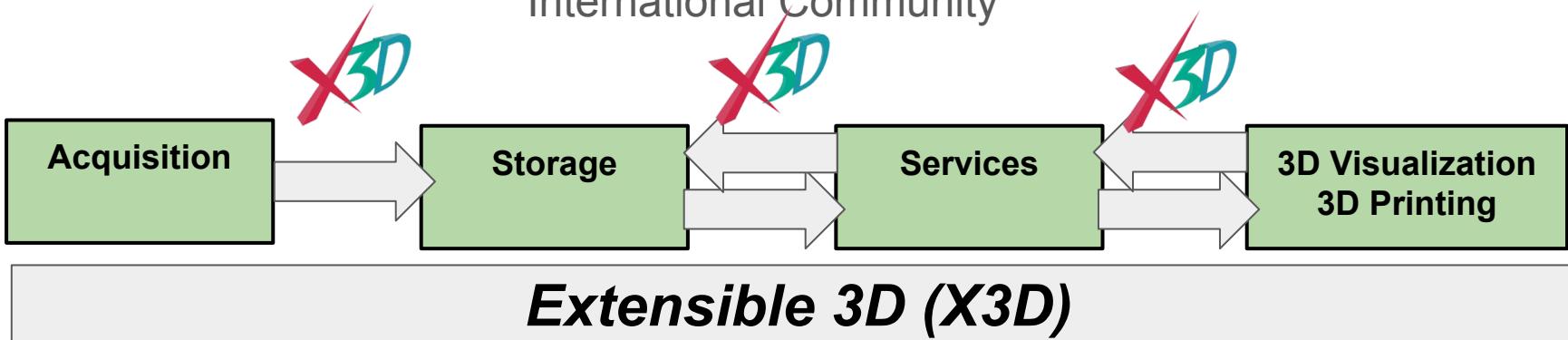
Portability: Industry Support

Durability: stands the test of time



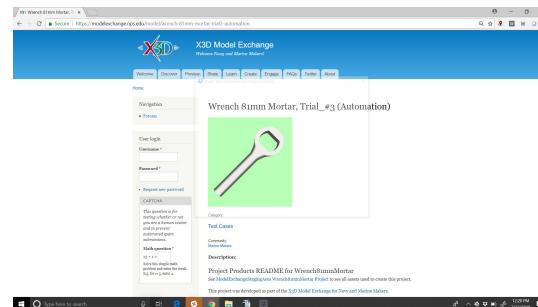
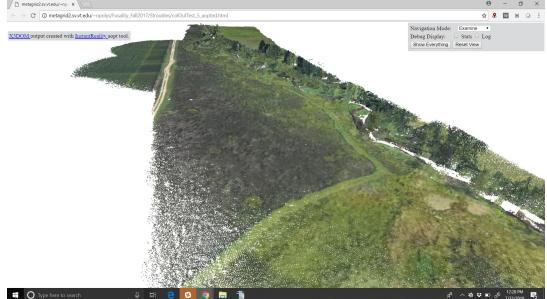
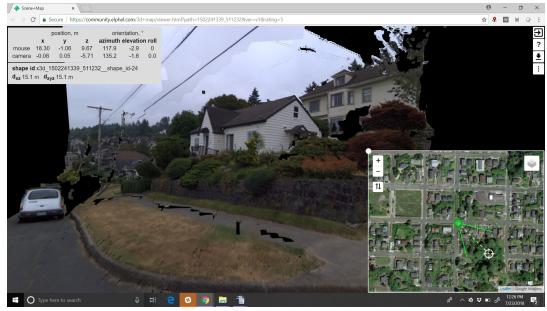
X3D: The Greatest Common Denominator

- **Portability:** multiple tools, workflows, and delivery platforms
- **Interoperability:** sharing & Accessibility
- **Durability:** ISO-IEC recognition, Standards harmonization
- **Community:** Web3D Consortium, International Community

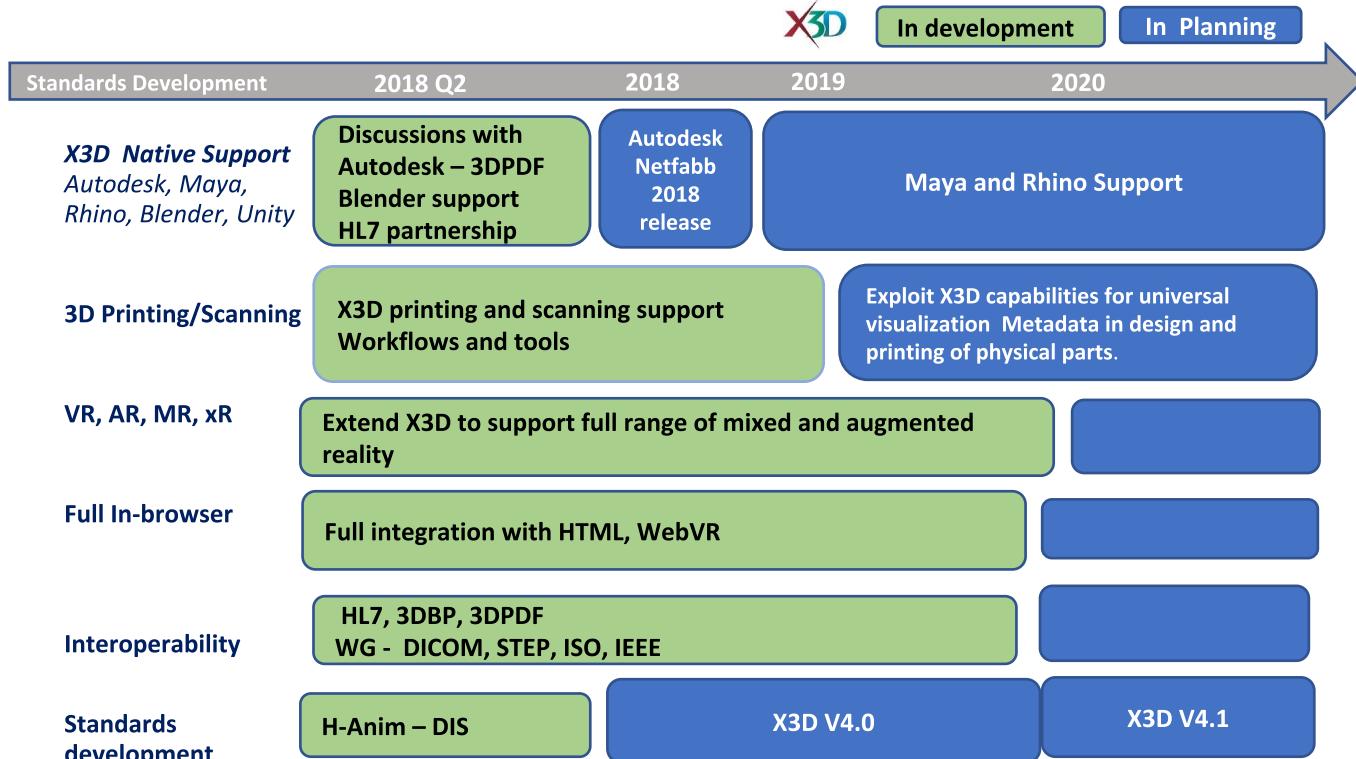


X3D Enterprise Case Studies

- **CAD publishing**
 - [Elphel](#) - STEP to X3D pipeline
 - [CADExchanger](#)
- **Presentation of Scanning Data**
 - [Photogrammetry](#) - Point Cloud to X3D pipeline
 - LIDAR - [Las2X3D](#) by Virginia Tech
- **Print Exchanges**
 - NIH: [3dprint.nih.gov](#)
 - NPS: [ModelExchange.nps.edu](#)
 - Native printer support: CURA, NetFabb, Shapeways



Web3D Standards Roadmap



NIH 3D Printing / 3DMD scanning

Cyborg Beast (Original Design)

Submitted by Creighton Lab

Sat, 2014-08-09 11:51

Model ID 3DPX-000524

Statement

The Creighton University Research Group has made the Cyborg Beast file available for research, educational, and personal use. Our intention is that this device accommodates everyone independent of their economic background. Our group is conducting extensive research (IRB # 13-16909) to identify benefit and functionality of our prosthetic design. Based on our research and feedback provided by our clinical partners we will update the files of our design as described has been done with the help of many members of e-NABLE (<http://enable3dprinting.org>) and the Creighton University Research Group.

Creighton University Research Group:
Jorge Zuriga Ph.D.¹, Dimitris Katsikas Ph.D.¹, Jean Pack¹, CHF¹, Francisco Edo, Olayinka, FADRI, Fabs¹, John Stithberg OT², Marc Peltier OT², Adam Carson¹, Nicole Dempsey¹, Kevin Conney OT², Cheyrel Frickel OT², Carolyn

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DOWNLOAD



DORV in functional single ventricle heart disease s/p Fontan

Submitted by Kevin Gralewski

Sat, 2016-04-20 15:18

Model ID 3DPX-001297

Statement

Dual Outlet Right Ventricle (DORV) status post Fontan as palliation for congenital atrioventricular canal defect causing functional single ventricle heart disease

Other features include:

- Interrupted inferior vena cava (IVC) with aygous continuation to the left superior vena cava (SVC).
- Blalock Taussig shunt(s)
- ligated native pulmonary artery (PA)
- heterotaxy

Category Medical/Anatomical

Keyword(s) DORV, common AV canal defect, interrupted IVC, Fontan, heterotaxy

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DOWNLOAD

COMPLEX OF A B21 CHICKEN MHC CLASS I MOLECULE AND A 10MER CHICKEN PEPTIDE

Autogenerated by for ACUK

Created on Fri, 2016-08-19 12:44, last updated on Fri, 2016-08-19 12:44

Model ID 3DPX-009522

Category Protein/Macromolecules and Viruses

Protein Data Bank ID 2ZEZ

Keyword(s) IMMUNE-SYSTEM, BE21, Immuno-sensor, Immunopeptidomimetic, MHC-I

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DOWNLOAD

DOD Print Exchange

A 3D Print Exchange on Drupal 8 for DOD makers@!

X3D Design, Printing, and Scanning Working Group

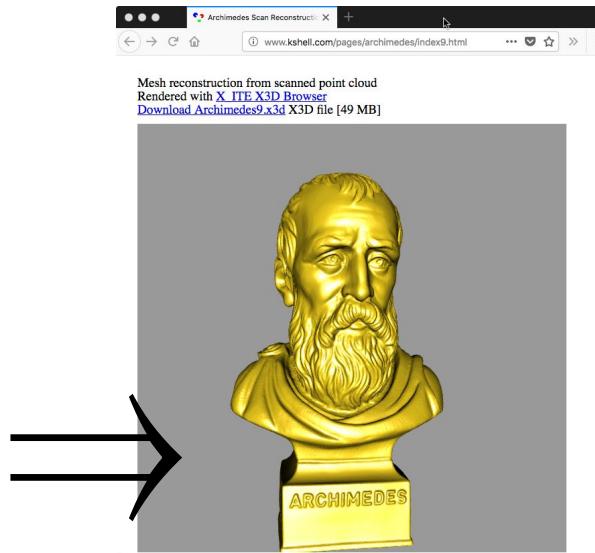
Vince Marchetti, KShell

Co-Chair Web3D Consortium

3D Design, Printing, and Scanning (3DPS)

Working Group

3D Scanning : οὐσία to X3D and the Web

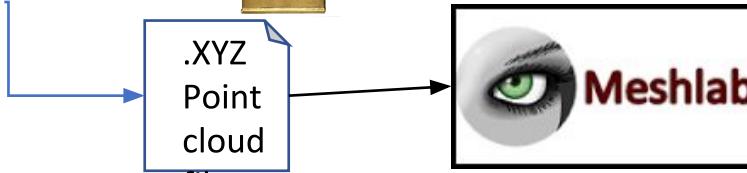


<http://www.kshell.com/pages/archimedes/index9.html>

X3D Scanning, Visualization, and 3D Printing Workflow

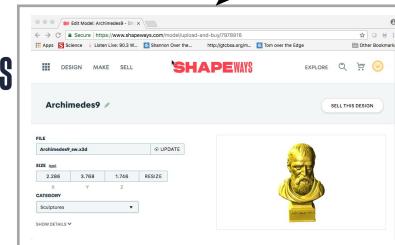


Steinbichler
Comet 5 optical
scanner

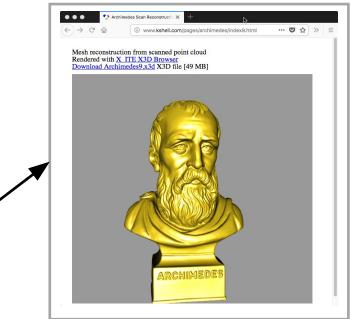
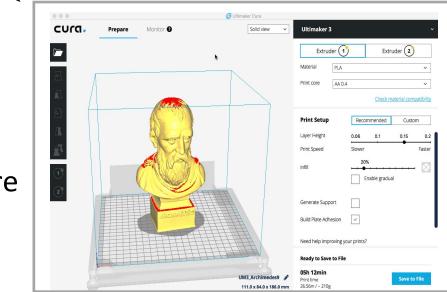


Open Source
Software

SHAPeways
3D Printing
Service



Cura software
for desktop
3D printers

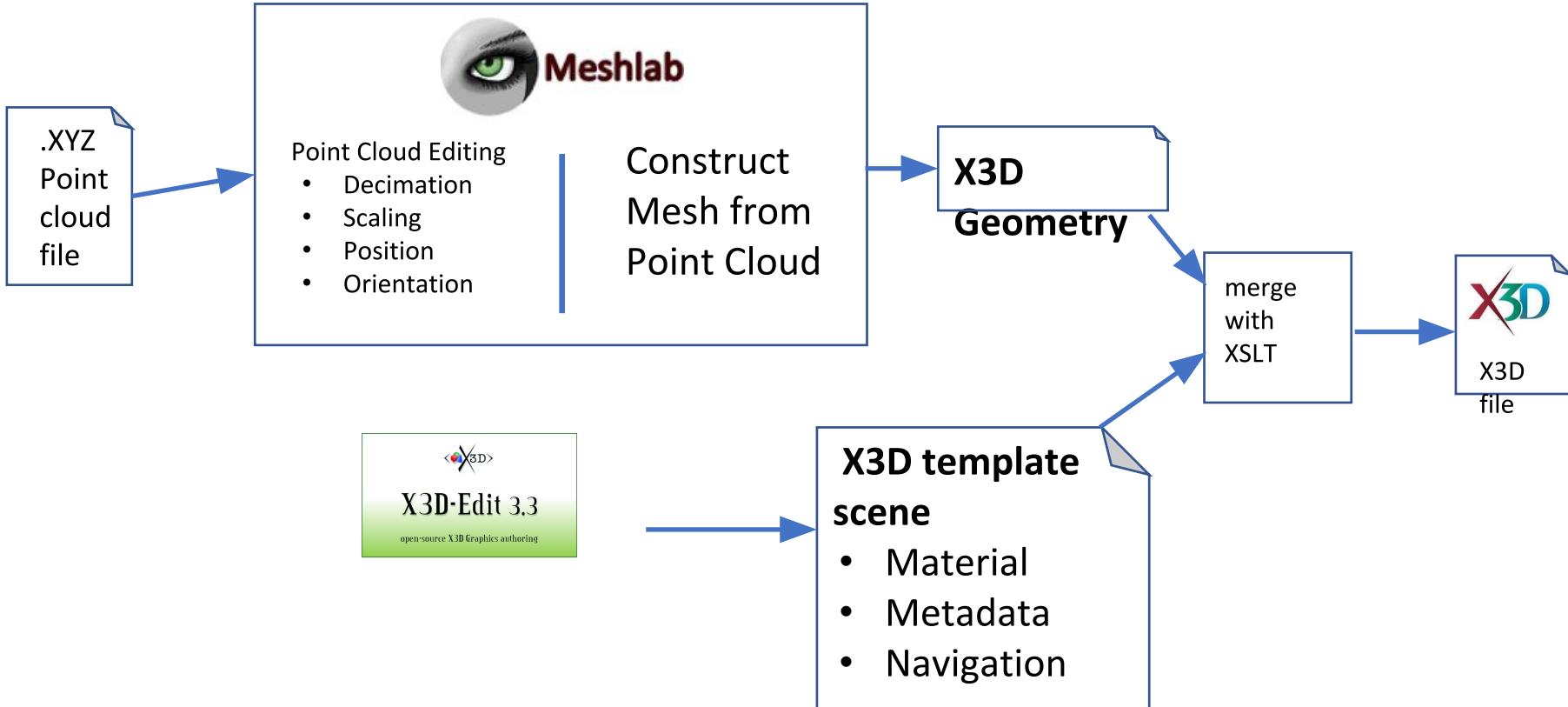


x3dom
Instant 3D the HTML way!



3D on the
Web

Workflow for X3D Scene creation from 3D Scan data



X3D Use Case: CAD Publishing

Publish CAD Data on Web for Customers and Suppliers

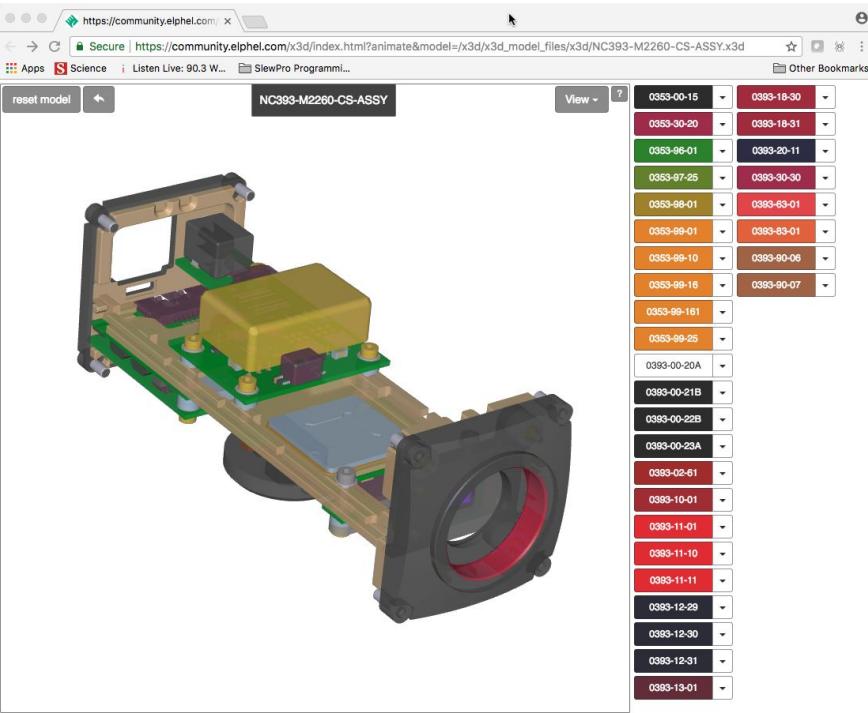
The screenshot shows a web-based CAD viewer interface. At the top, the URL is https://community.elphel.com/x3d/index.html?animate&model=x3d/x3d_model_files/x3d/NC393-M2260-CS-ASSY.x3d. The main area displays a 3D model of a blue and black assembly. To the right of the model is a vertical column of dropdown menus containing part numbers. Below these dropdowns is a QR code.

0393-00-15	0393-13-01
0393-30-20	0393-18-30
0393-96-01	0393-18-31
0393-97-25	0393-20-11
0393-98-01	0393-30-30
0393-99-01	0393-63-01
0393-99-10	0393-63-01
0393-99-16	0393-90-06
0393-99-161	0393-90-07
0393-99-25	
0393-00-20A	
0393-00-21B	
0393-00-22B	
0393-00-23A	
0393-02-61	
0393-10-01	
0393-11-01	
0393-11-10	
0393-11-11	
0393-12-29	
0393-12-30	
0393-12-31	

Link: [NC393-M2260-CS-ASSY](https://www.elphel.com)

Elphel Inc.
Salt Lake City, Utah, USA
<https://www.elphel.com>

Leverage open source software, X3D/X3DOM, and commercial CAD design application to publish CAD assembly models on any web browser.

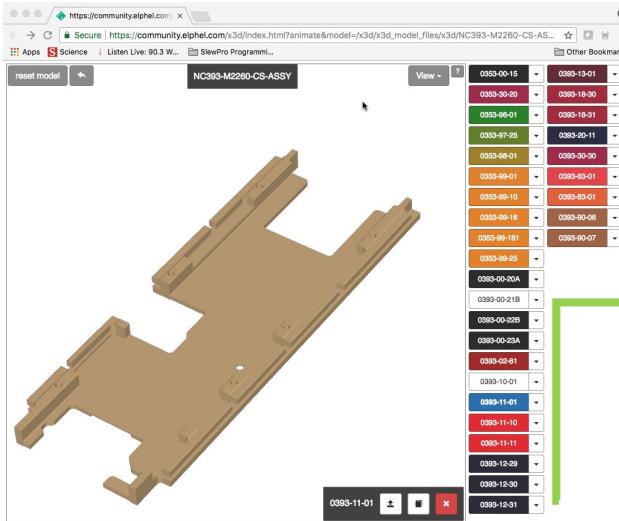


Bidirectional Javascript calls between 3D scene and HTML5 UI elements allows interactive inspection and viewing of assembly and internal parts.

Integration of X3D scenegraph and HTML5 DOM allows scripting with common web application frameworks.

3Di --- "intelligent 3D"

Touch sensitive 3D parts allow linking to descriptive Wiki pages.



Elphel camera parts 0393-11

Elphel NC393 series camera parts

Contents [hide]

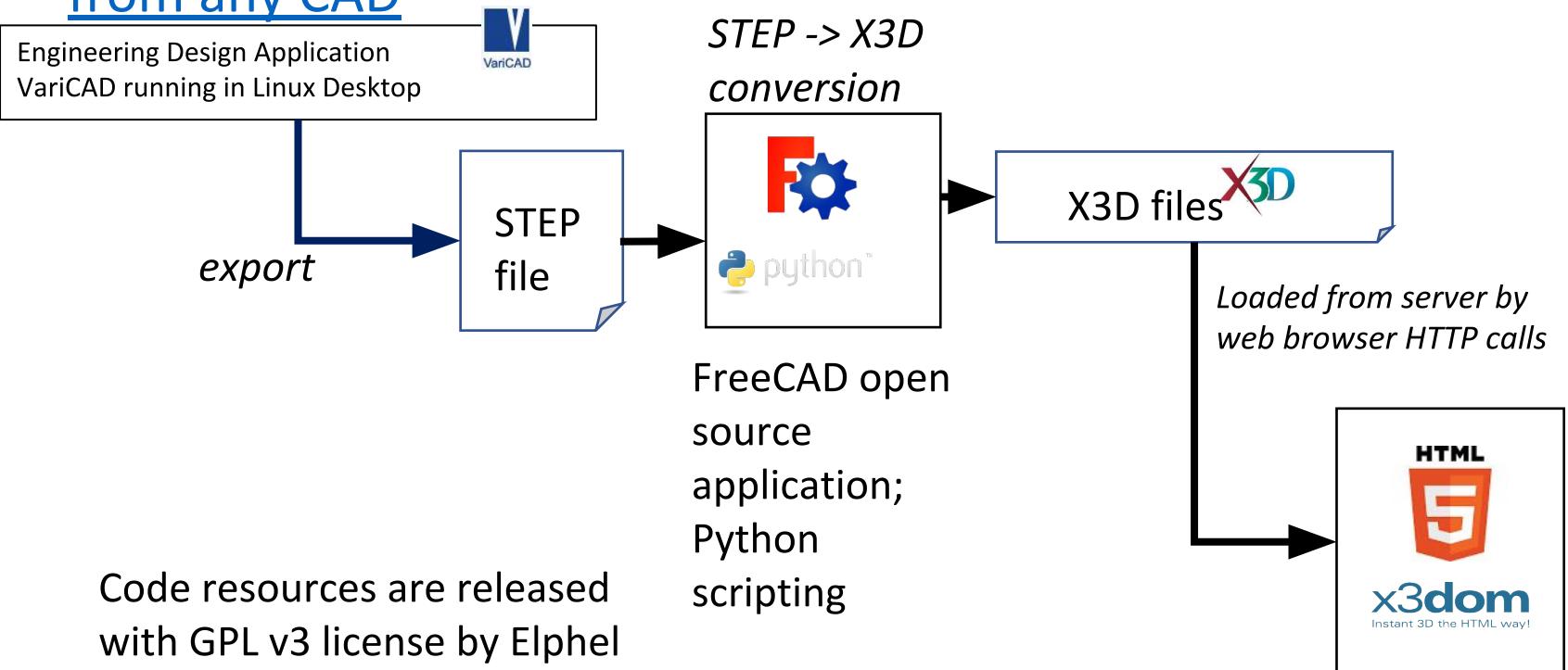
- 1 0393-11 - heat management parts
- 2 0393-11-01 - Heat frame for 10393A and 10389B PCBA
- 3 0393-11-02 - Heat frame for 10393A and 10389B PCBA, Rev "A"
- 4 0393-11-03 - Heat frame for 10393A and 10389B PCBA, Rev "B"
- 5 0393-11-01C - Heat frame for 10393A-C and 10389B PCBA, Rev "C"
- 6 0393-11-04 - Cooling fan enclosure
- 7 0393-11-04A - Cooling fan enclosure, Rev "A"
- 8 0393-11-05 - CPU heat plate
- 9 0393-11-10A - CPU heat plate, Rev "A"
- 10 0393-11-11 - Power supply heat sink
- 11 0393-11-11A - Power supply heat sink, Rev "A"
- 12 0393-11-12 - Heatsink for m.2 2280 SSD (Eysis)

0393-11 - heat management parts

0393-11-01 - Heat frame for 10393A and 10389B PCBA

Machined from 0393-00-07 extrusion, aluminum 6061T4, chromate conversion finish

Workflow: as detailed in Elphel Blog [X3D assemblies from any CAD](#)



Code resources are released with GPL v3 license by Elphel Inc.

[Public Git Repository](#)

HTML 5 web page
X3dom JavaScript library

X3D Use Case: CAD Assembly Animation

Vince Marchetti, KShell

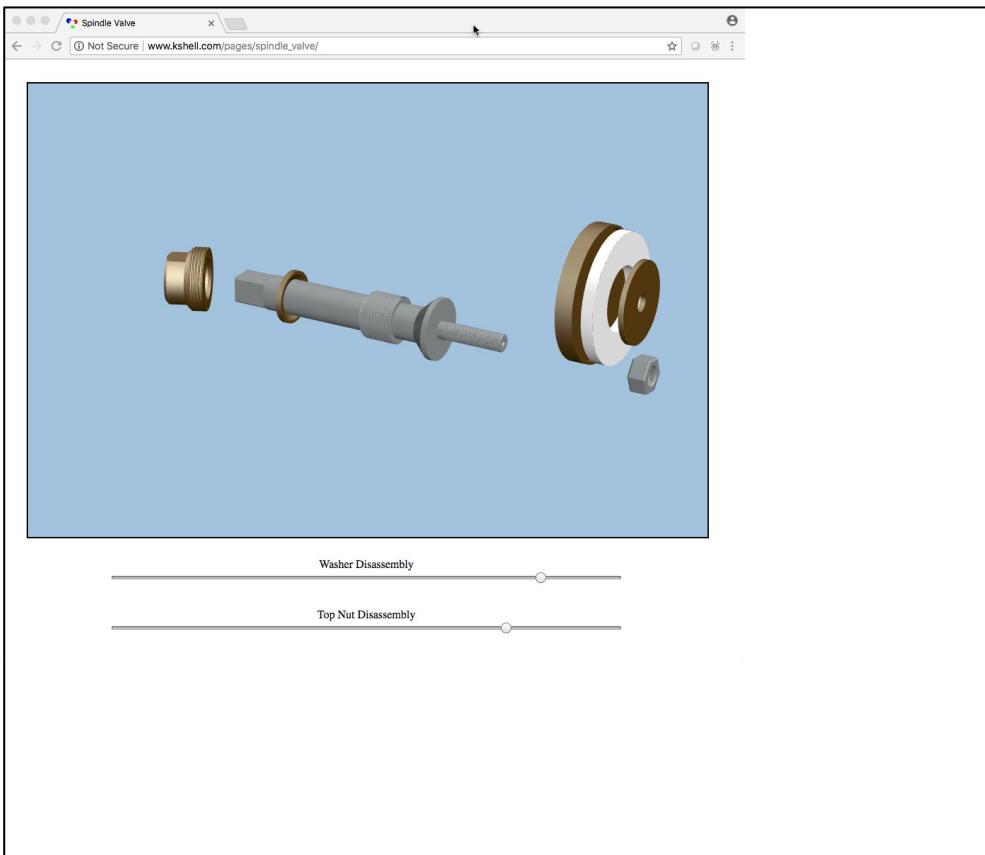
Co-Chair Web3D Consortium

3D Design, Printing, and Scanning (3DPS)

Working Group



Animated Assembly & Disassembly with X3D & HTML 5



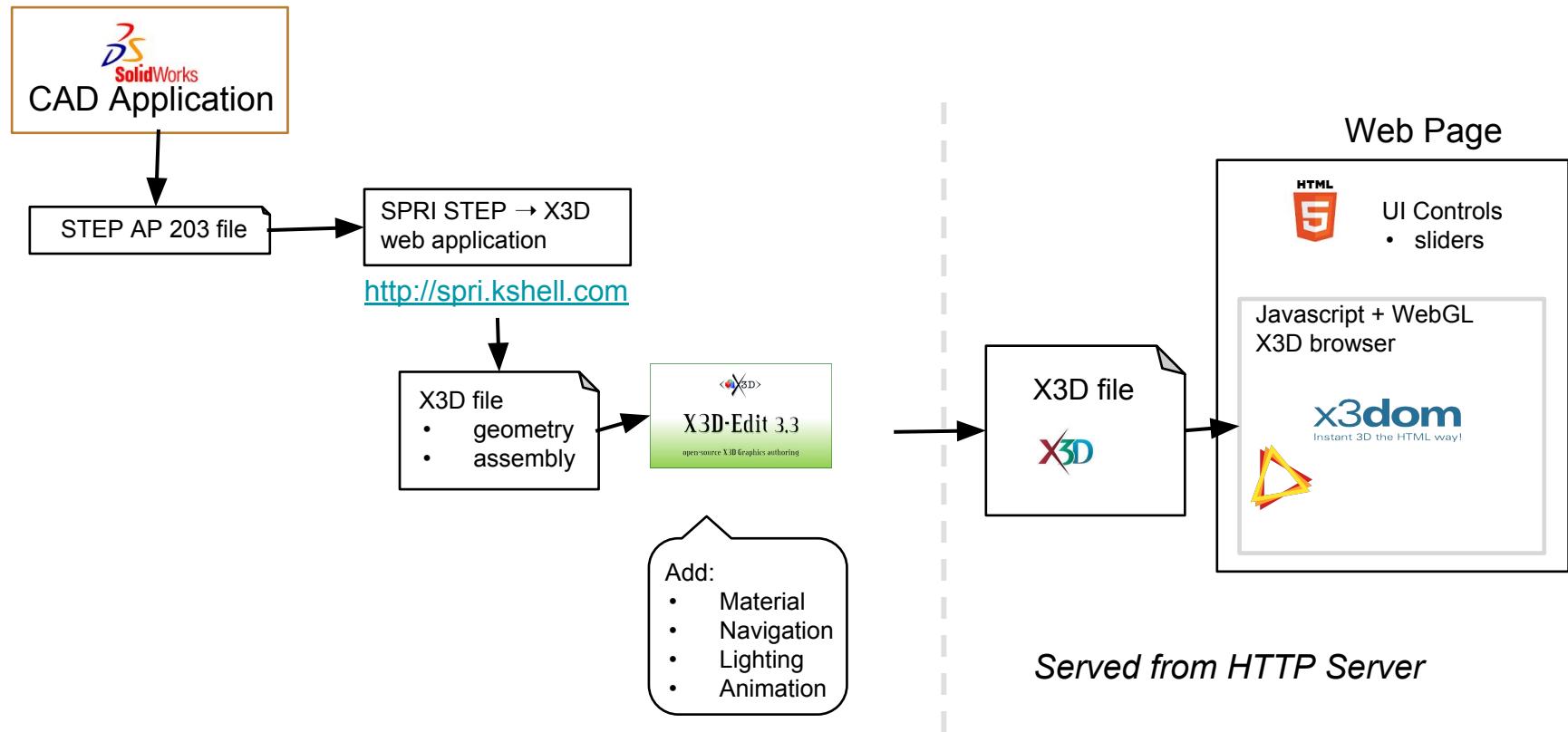
Combining:

- Detailed rendering of CAD assembly model
- Declarative X3D programming of assembly motion sequence.
- Integration with HTML5 UI Controls



http://www.kshell.com/pages/spindle_valve

Workflow and Data Flow for X3D Animated Assembly Model on web page





EDF - Marc Petit



Las 2 X3D

Virginia Tech: landscape scanning

<https://vimeo.com/visionarium2018>



X3D Anywhere



www.web3d.org/join

Join us to Build the Future of 3D

Contact:

Anita Havele, Executive Director

Email: Anita.Havele@web3d.org

Web3D Consortium

650 Castro Street Suite #120-490

Mountain View, CA 94041

Phone: +1 248 342 7662



Discussion

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