

X3D Production Methods using XML

Overview of Current Techniques

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Topics



- Technologies: X3D, XML, XMSF
- X3dToVrml97.xslt, X3dToXhtml.xslt
- AUV Workbench, Sonar Visualization
- XML binary

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Key Technologies



- Extensible Markup Language (XML)
 - Validatable data, binary compression
 - Web Services for message exchange
- Extensible 3D (X3D) Graphics
 - Open-standard open-source interactive visualization
- Our approach
 - Demonstrate real-world value of new technology
 - Collaborate, implement, evaluate, report, repeat

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What is 3D?



- 2½D works for chart-oriented displays
- 3D gives “fly-thru” freedom of viewpoint
 - View physically based propagation paths
 - View depth separation
 - View bottom, surface interactions
 - View multiple overlapping sensors
- Augment (not replace) existing displays

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What is X3D?



- Extensible 3D (X3D) Graphics
 - Virtual Reality Modeling Language (VRML) updated
 - Third-generation ISO specification
 - Compatible XML .x3d and Classic VRML .wrl encodings
- Deliverables
 - Specification updates, with compatible XML tagset
 - Multiple implementations, including open-source
 - Scene Access Interface (SAI) strongly typed API
 - Conformance suite and examples
 - Authoring capability: X3D-Edit, using XML for XML...

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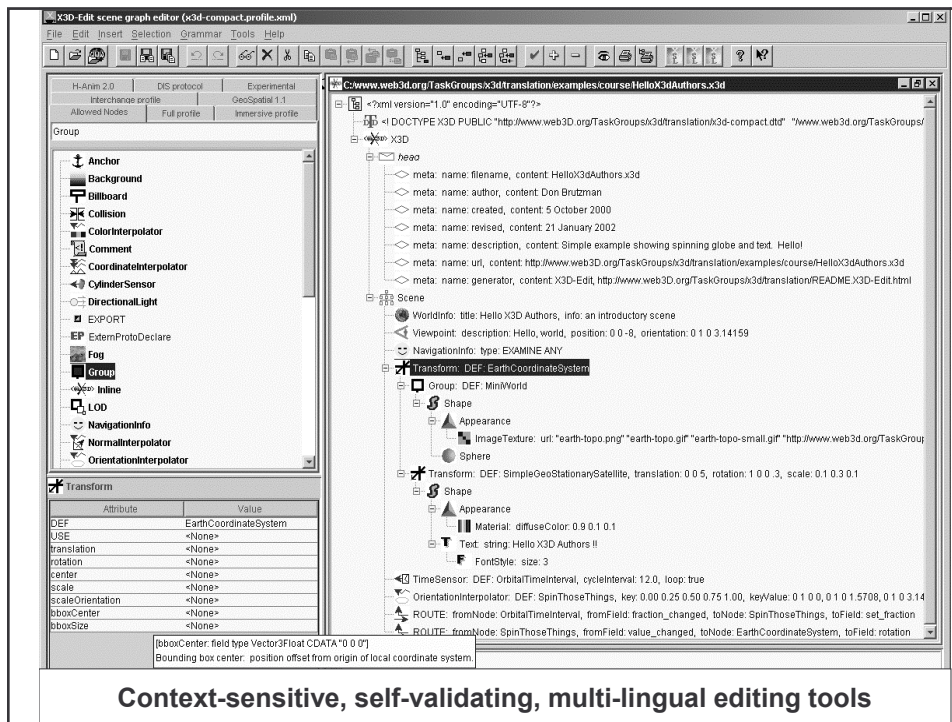
Further X3D motivations



- Authoring is hard, “Content is King”
 - X3D is not competing with specialty formats, instead provide common interoperability/interchange
 - Strong validation checks eliminate most authoring errors before content escapes
 - Plays well with next-generation Web languages

“3D hardware problem” is already solved ☺

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X3dToVrml97.xslt stylesheet

- Convert X3D to VRML97 (what else?)
- Bundled in X3D-Edit
- Also invoked by X3dToX3dvClassicVrmlEncoding.xslt
- Available via batch files

Process XSL

Process source using the stylesheet:

Write result to:

View result with:

X3dToVrml97.bat
 'examples\Vrml2.0Sourcebook\Chapter15-Extrusion\Figure15.07ExtrudedCylinder'
 -same

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```

Programmer's File Editor - [C:\www.web3d.org\x3d\content\x3dToX3d\ClassicVrmlEncoding.xslt]
File Edit Options Template Execute Macro Window Help
1 <?xml version="1.0"?>
2 <xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.1"
3   xmlns:saxon="http://icl.com/saxon" saxon:trace="no">
4 <!--
5 <head>
6   <meta name="filename" content="X3dToX3dClassicVrmlEncoding.xslt" />
7   <meta name="author" content="Don Brutzman" />
8   <meta name="created" content="5 July 2004" />
9   <meta name="revised" content="25 December 2004" />
10  <meta name="description" content="XSLT stylesheet to convert X3D files to ClassicVRML encoding,
11    simply by using X3dToVrml197.xslt" />
12  <meta name="url" content="http://www.web3d.org/x3d/content/X3dToX3dClassicVrmlEncoding.xslt" />
13 </head>
14 -->
15
16 <xsl:include href="X3dToVrml197.xslt"/>
17
18 <xsl:variable name="fileEncoding"><xsl:text>ClassicVRML</xsl:text></xsl:variable>
19 <xsl:variable name="outputDiagnostics"><xsl:text>>false</xsl:text></xsl:variable>
20
21 </xsl:stylesheet>

```

**Pretty easy to invoke one stylesheet from another
and also pass configuration parameters**

X3dToXhtml.xslt stylesheet

- Convert X3D to XHTML (uh, what else?)
- Bundled in X3D-Edit
- Available via a batch file

Process XSL

Process source using the stylesheet:

Write result to:

View result with:

X3dToXhtml.bat
'examples\Vrml2.0Sourcebook\Chapter15-Extrusion\Figure15.07ExtrudedCylinder'
-same


Tools, Animation, Arbitrary Axis Cylinder Sensor Examples - Mozilla Firefox

file:///C:/www.web3d.org/x3d/content/examples/Savage/Tools/Animation/_pages/page011

examples - Table of Contents | VRML 2.0 Sourcebook - Table of Contents | Conformance - Table of Contents | X3D Scene Authoring Hints | Tools, Animation, Arbitrary Axis...

Tools, Animation: Arbitrary Axis Cylinder Sensor Examples

Modified CylinderSensor oriented about an arbitrary axis, relative to peer/child geometry that remains oriented to its original axis.



launch
X3D
X3DV
VRML97
XHTML

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.0//BN" "http://www.web3d.org/specifications/x3d-3.0.dtd">
<X3D profile="Immersive" xmlns:xsd="http://www.w3.org/2001/XMLSchema-instance" xsd:noNamespaceSchemaLocation="http://www.web3d.org/specifications/x3d-3.0.xsd">
  <head>
    <meta name="filename" content="ArbitraryAxisCylinderSensorExamples.x3d"/>
    <meta name="description" content="Modified CylinderSensor oriented about an arbitrary axis, relative to peer/child geometry that remains oriented to its original axis. Click and drag each object to rotate. Originally authored by Don Brutzman's MV4204 class, with modifications by Maj James Breitung USMC to include min/max angles of rotation and object center. Motivation: Modify example shown by Chapter 9 Figure 7 to build a PROTO for a CylinderSensor oriented about an arbitrary axis."/>
    <meta name="warning" content="ArbitraryAxisCylinderSensor operates on its children, NOT on its peers. This variation is necessary in order to accomplish the desired Transform rotation to a new orientation axis."/>
    <meta name="author" content="Don Brutzman"/>
    <meta name="created" content="1 October 1998"/>
    <meta name="revised" content="6 March 2008"/>
    <meta name="image" content="ArbitraryAxisCylinderSensorExamples.png"/>
    <meta name="reference" content="ArbitraryAxisCylinderSensorPrototype.x3d"/>
    <meta name="reference" content="ArbitraryAxisCylinderSensorExampleOriginal.wrl"/>
    <meta name="url" content="http://www.web3d.org/x3d/content/examples/course/ArbitraryAxisCylinderSensorExamples.x3d"/>
    <meta name="url" content="http://web.nps.navy.mil/~brutzman/Savage/Tools/Animation/ArbitraryAxisCylinderSensorExamples.x3d"/>
    <meta name="reference" content="The VRML 2.0 Sourcebook"/>
    <meta name="generator" content="X3D-Edit. http://www.web3d.org/x3d/content/README.X3D-Edit.html"/>
    <meta name="license" content="./../license.html"/>
  </head>
  <!--
    Index for ExternProtoDeclare: ArbitraryAxisCylinderSensor
    Index for DEF nodes: MiddleTransformY, SensorMiddleTransformY
  -->
  <!--
  <Scene>
  </Scene>
  </X3D>
```

Done 0 error / 1 warning

Sample pretty-print output 1

ArbitraryAxisCylinderSensorPrototype.x3d (X3dToXhtml) - Mozilla Firefox

file:///C:/www.web3d.org/x3d/content/examples/Savage/Tools/Animation/ArbitraryAxisCyl...

examples - Table of Contents | VRML 2.0 Sourcebook - Table ... | Conformance - Table of Conte... | X3D Scene Authoring Hints | Tools, Animation, Arbitrary Ax... | ArbitraryAxisCylinderSen...

```
<!-- ProtoBody -->
<!-- Prototype body follows. First rotate local frame about center to axis of interest, then perform the rotation about the desired center. -->
<Transform DEF="ArbitraryAxisTransform">
  <IS>
    <connect nodeField="rotation" protoField="shiftRotationAxis"/>
    <connect nodeField="center" protoField="center"/>
  </IS>
  <!-- RotatedCylinderSensor ROUTE: [from rotation changed to CylinderSensorRotationTransform.set rotation] -->
  <CylinderSensor DEF="RotatedCylinderSensor" description="Click and drag to rotate">
    <IS>
      <connect nodeField="autoOffset" protoField="autoOffset"/>
      <connect nodeField="diskAngle" protoField="diskAngle"/>
      <connect nodeField="enabled" protoField="enabled"/>
      <connect nodeField="minAngle" protoField="minAngle"/>
      <connect nodeField="maxAngle" protoField="maxAngle"/>
      <connect nodeField="offset" protoField="offset"/>
      <connect nodeField="isActive" protoField="isActive"/>
      <connect nodeField="rotation_changed" protoField="rotation_changed"/>
      <connect nodeField="trackPoint_changed" protoField="trackPoint_changed"/>
    </IS>
  </CylinderSensor>
  <!-- CylinderSensorRotationTransform rotation value is overridden by RotatedCylinderSensor, so leave it alone! -->
  <!-- CylinderSensorRotationTransform ROUTE: [from RotatedCylinderSensor.rotation changed to set rotation] -->
  <Transform DEF="CylinderSensorRotationTransform">
    <!-- ROUTED rotation to RestorationTransform negates (and offsets) arbitrary-axis rotation in RestorationTransform, so children geometry is returned to original orientation. -->
    <!-- Perform the rotation about the same center. -->
    <!-- RestorationTransform ROUTE: [from NegationScript.rotationRestore to rotation] -->
    <Transform DEF="RestorationTransform">
      <IS>
        <connect nodeField="center" protoField="center"/>
        <connect nodeField="children" protoField="children"/>
      </IS>
    </Transform>
    <!-- Prototype children field finally appears above... -->
    <!-- ScaleSensorSwitch ROUTE: [from HideSensorShapeScript.choiceScaleSensor to whichChoice] -->
    <Switch DEF="ScaleSensorSwitch" whichChoice="0">
```

Done 0 error / 0 warning

Sample pretty-print output 2

```

ArbitraryAxisCylinderSensorPrototype.x3d (X3dToXhtml) - Mozilla Firefox
file:///C:/www.web3d.org/x3d/content/examples/Savage/Tools/Animation/ArbitraryAxisCyl...
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<!-- HideSensorShapeScript ROUTE: [from choiceScaleSensor to ScaleSensorSwitch.whichChoice] -->
<Script DEF=HideSensorShapeScript>
  <field name='showCylinderSensorShape' type='SFBool' accessType='initializeOnly'/>
  <field name='choiceScaleSensor' type='SFInt32' accessType='outputOnly'/>
  <IS>
    <connect nodeField='showCylinderSensorShape' protoField='showCylinderSensorShape'/>
  </IS>
</Script>

<![CDATA[
ecmascript:
function initialize () {
  if (showCylinderSensorShape == true)
    choiceScaleSensor = 0;
  else
    choiceScaleSensor = -1;
}
]]>

</Script>
</Transform>
<ROUTE fromNode='RotatedCylinderSensor' fromField='rotation_changed' toNode='CylinderSensorRotationTransform' toField='set_rotation'/>
<ROUTE fromNode='NegationScript' fromField='rotationRestore' toNode='RestorationTransform' toField='rotation'/>
<ROUTE fromNode='HideSensorShapeScript' fromField='choiceScaleSensor' toNode='ScaleSensorSwitch' toField='whichChoice'/>
</ProtoBody>
</ProtoDeclare>
<!-- Example use of this prototype is in ArbitraryAxisCylinderSensorExample.x3d, wr1 -->
<NavigationInfo type='EXAMINE' 'ANY'"/>
<Viewpoint description='click message to view example' position='0 0 8'/>
<!-- Redirection text in case a user examines this PROTO file via a 3D browser: -->
<Anchor description='Touch text for example' parameter='target=_blank'
url='ArbitraryAxisCylinderSensorExamples.wrl' "http://www.web3d.org/x3d/content/examples/course/ArbitraryAxisCylinderSensorExamples.wrl"
"ArbitraryAxisCylinderSensorExamples.x3d" "http://www.web3d.org/x3d/content/examples/course/ArbitraryAxisCylinderSensorExamples.x3d" />
<Shape>
  <Appearance>
    <Material diffuseColor='0 1 1' emissiveColor='0 1 1'/>
  </Appearance>
  <Text string='ArbitraryAxisCylinderSensorPrototype.wrl' "is a Prototype (PROTO) definition file." "" "To see an example scene using this new
node." "click this text and view" "ArbitraryAxisCylinderSensorExample.wrl"/>

```

Sample pretty-print output 3

Stylesheet deconstruction

- A series of versions of X3dToXhtml.xslt are provided which build up an XSLT stylesheet
 - X3dToXhtml-1.xslt through X3dToXhtml-5.xslt

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Makefile



- .x3d scenes are primary content format
- Makefile used for catalog creation and conversion of various products
 - Alternatively could produce an Ant build.xml
- Bundled in X3D-Edit distribution
- Multiple large Makefiles
 - X3D basic examples 606 models
 - VRML97 Sourcebook examples 269 models
 - X3D conformance suite 732models
 - SAVAGE content archive 963 models

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Savage - Table of Contents - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://web.rps.navy.mil/~brutzman/Savage/contents.html>

Savage

Scenario Authoring and Visualization for Advanced Graphical Environments

The SAVAGE group is building a large archive of dynamic 3D military models and authoring tools using Extensible 3D (X3D) graphics.

[Zip archive](#) **Lots of models!** 21 Sections, 104 Chapters, 833 Models [Help](#)

[Aircraft Fixed Wing](#) [Aircraft Helicopters](#) [Aircraft Miscellaneous](#) [Amphibious Vehicles](#) [Biologies](#) [Buildings](#) [Communications And Sensors](#) [Environment](#) [Ground Vehicles](#) [Locations](#) [Offices Structures](#) [Robots](#) [Scenarios](#) [Ships](#) [Space](#) [Submarines](#)
[Submersibles](#) [Tools](#) [Weapons](#)

Aircraft Fixed Wing

AV 8 B - Harrier - United States	Bear - Russia	Catalina
F 16 - Fighting Falcon - Turkey	F 18 - Blue Angel - United States	Jhl Heavy Lift
MiG 22 - Osprey - United States	P 3 Orion	

Aircraft Helicopters

AH 1 Super Cobra - United States	Cad Copter	CH 46 E - Sea Knight - United States
CH 53 - United States	Helicopter - United States	Helix - Russia
OH 58 D - Kiowa Warrior - United States	SH 60 - Seahawk - United States	

Aircraft Miscellaneous

Balloon	Blimp	Zeppelin
-------------------------	-----------------------	--------------------------

Amphibious Vehicles

AAAV	AAV	LCAC
----------------------	---------------------	----------------------

Biologies

Dolphin		
-------------------------	--	--

Internet

Catalog builder



- Reads all .x3d source files
 - Java source
 - Checks meta tags for filenames, description
 - Builds XML catalog file
- Stylesheet produces output web pages
 - Blindingly fast (thousands of pages per minute)
- C:\www.web3d.org\x3d\content\dom
ReferenceDocumentationLayout.java and
LayoutReferenceChaptersPages.xslt

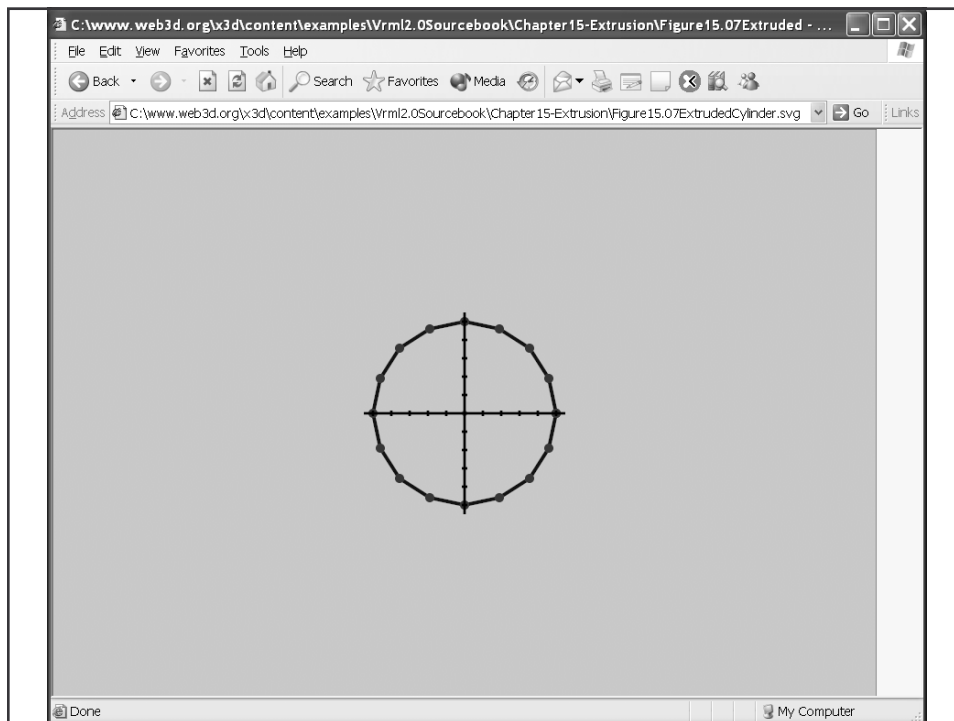
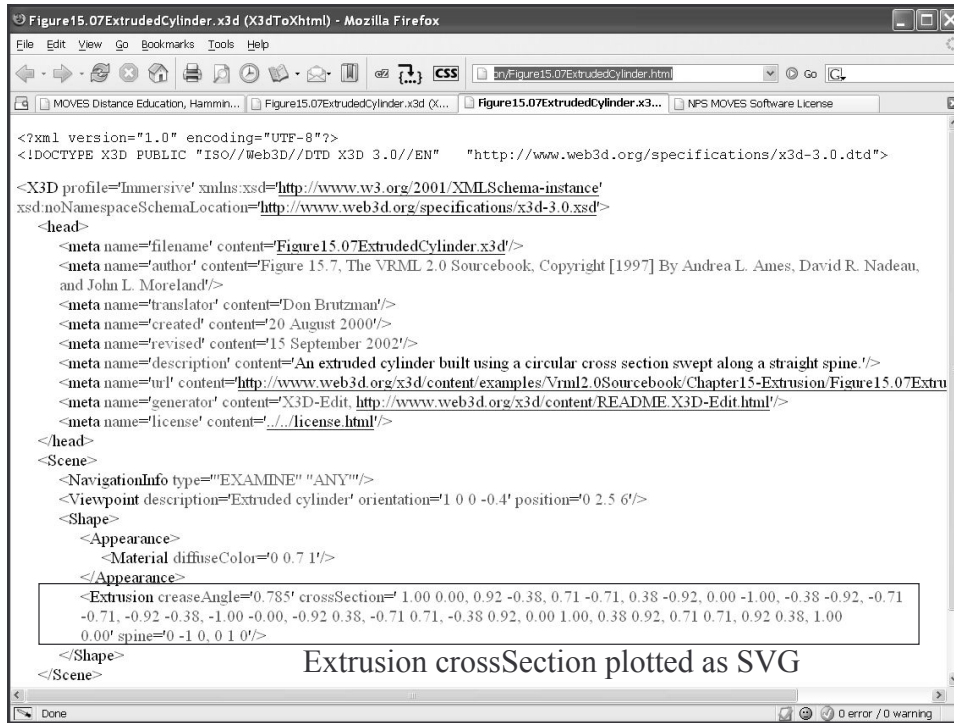
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New: X3dToSvg.xslt



- Starting to produce 2D Scalable Vector Graphics (SVG) plots of X3D constructs
 - Extrusion crossSection now working
 - 2D component nodes next
 - Actually there are few 2D data structures in X3D
- Related upcoming work in Xj3D
 - .svg diagrams as ImageTexture inputs
 - .svg layers
 - .svg screen captures

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Other utilities, also bundled





- X3dDtdChecker.java
 - Converts between transitional, final DTD
- X3dCanonicalizer.java
 - Consistent formatting for binary compression
 - See X3D Binary Specification for details
 - Future work: integrate with CVS on server side
- X3D Scene Authoring Hints
 - NPS authoring practices

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X3D Scene Authoring Hints - Mozilla Firefox

file:///C:/www.web3d.org/x3d/content/examples/x3dSceneAuthoringHints.html

examples - Table of Contents | VRML 2.0 Sourcebook - Table of Contents | Conformance - Table of Contents | X3D Scene Authoring Hints | Savage - Table of Contents

 **X3D Scene Authoring Hints** 

Don Brutzman (brutzman@nps.navy.mil)

A collection of style guidelines and authoring tips to improve the quality, consistency and maintainability of X3D scenes.

[Authoring](#) | [Coordinate Systems](#) | [Credits](#) | [Dates](#) | [Help](#) | [HTML](#) | [Images](#) | [Inlines/Prototypes](#) | [License](#) | [meta Tags](#) | [Naming Conventions](#) | [Scripts](#) | [URL Links](#) | [Viewpoints](#)

Authoring practices

- Actively fix any X3D-Edit [Error], [Warning] and [Hint] messages in each scene. Allowing errors and warnings to persist, even when apparently harmless, can mask further problems. [Info] messages are informational and might not need corrective action by the author.
- Keep a local copy of the X3D Specification on your system and refer to it frequently. (Local copies of all current specifications are bundled with X3D-Edit.)
- Utilize the X3D Tooltips. These are embedded in X3D-Edit popups, and are also available separately in [Chinese](#), [English](#), [French](#), [German](#), [Italian](#), [Portuguese](#) and [Spanish](#).
- If a scene depends on having the default value of a field, it is a good practice to enter that default value in your original scene for emphasis. Note, however, that some optimizers may remove it again.
- Verify that you are using the latest version of X3D-Edit as follows.
Here is the locally installed version number of X3D-Edit.
Here is the latest available version number of X3D-Edit, online at:
 - <http://www.web3d.org/x3d/content/X3D-Edit.zip>
 - <http://www.web3d.org/x3d/content/X3D-Edit.tar.gz>
- Use the correct final specification DOCTYPE/DTD:

```
<?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">
```

The Transitional X3D DOCTYPE/DTD is used by some tools:

```
<?xml version="1.0" encoding="UTF-8"?>
```

Done 0 error / 1 warning

X3D Tooltips



- Written for X3D-Edit tooltip popups
 - Embedded mouse-overs
- Covers all X3D elements and attributes
 - Written by NPS students (questions at least)
 - Translated into other languages by volunteers
- Note that X3D scene vocabulary itself is unchanged, only tooltip descriptions vary

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The screenshot shows a Mozilla Firefox browser window displaying the 'X3D Tooltips' page. The page title is 'Extensible 3D (X3D) Tooltips'. Below the title, there is a paragraph explaining that these tooltips provide summary descriptions and authoring hints for each X3D node and field, and are integrated with the X3D-Edit authoring tool. A long list of X3D node and field names is provided, including Anchor, Appearance, Arc2D, ArcClose2D, AudioClip, Background, Billboard, BooleanFilter, BooleanSequencer, BooleanToggle, BooleanTrigger, Box, Circle2D, Collision, Color, ColorInterpolator, ColorRGBA, component, Cone, connect, Contour2D, ContourPolyline2D, Coordinate, CoordinateDouble, CoordinateInterpolator, CoordinateInterpolator2D, Cylinder, CylinderSensor, DirectionalLight, Disk2D, ElevationGrid, EspdriTransform, EXPORT, ExternProtoDeclare, Extrusion, field, fieldValue, FillProperties, Fog, FontStyle, GeoCoordinate, GeoElevationGrid, GeoLocation, GeoLOD, GeoMetadata, GeoOrigin, GeoPositionInterpolator, GeoTouchSensor, GeoViewpoint, Group, HAnimDisplacer, HAnimHumanoid, HAnimJoint, HAnimSegment, HAnimSite, head, ImageTexture, IMPORT, IndexedFaceSet, IndexedLineSet, IndexedTriangleFanSet, IndexedTriangleSet, IndexedTriangleStripSet, Inline, IntegerSequencer, IntegerTrigger, IS, KeySensor, LineProperties, LineSet, LoadSensor, LOD, Material, meta, MetadataDouble, MetadataFloat, MetadataInteger, MetadataSet, MetadataStrang, MovieTexture, MultiTexture, MultiTextureCoordinate, MultiTextureTransform, NavigationInfo, Normal, NormalInterpolator, NubsCurve, NubsCurve2D, NubsOrientationInterpolator, NubsPatchSurface, NubsPositionInterpolator, NubsSet, NubsSurfaceInterpolator, NubsSweptSurface, NubsSwungSurface, NubsTextureCoordinate, NubsTrimmedSurface, OrientationInterpolator, PixelTexture, PlaneSensor, PointLight, PointSet, Polyline2D, Polypoint2D, PositionInterpolator, PositionInterpolator2D, ProtoBody, ProtoDeclare, ProtoInstance, ProtoInterface, ProximitySensor, ReceiverPdu, Rectangle2D, ROUTE, ScalarInterpolator, Scene, Script, Shape, SignalPdu, Sound, Sphere, SphereSensor, SpotLight, StaticGroup, StringSensor, Switch, Text, TextureBackground, TextureCoordinate, TextureCoordinateGenerator, TextureTransform, TimeSensor, TimeTrigger, TouchSensor, Transform, TransmitterPdu, TriangleFanSet, TriangleSet, TriangleSet2D, TriangleStripSet, Viewpoint, VisibilitySensor, WorldInfo, X3D, XvShell.

	top credits help
↕ Anchor	Anchor is a Grouping node that can contain most nodes. Clicking Anchored geometry loads content specified by the url field. Loaded content completely replaces current content, if parameter is same window. Hint: insert a Shape node before adding geometry or Appearance.
DEF	[DEF ID #IMPLIED] DEF defines a unique ID name for this node, referencable by other nodes. Hint: descriptive DEF names improve clarity and help document a model.
USE	[USE IDREF #IMPLIED] USE means reuse an already DEF-ed node ID, ignoring _all_ other attributes and children. Hint: USEing other geometry (instead of duplicating nodes) can improve performance. Warning: do NOT include DEF (or any other attribute values) when using a USE attribute!

X3D Tooltips in Italiano - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

file:///c:/www.web3d.org/x3d/content/X3dTooltipsItalian.html

MOVES Distance Education, Hammin... Figure15.07ExtrudedCylinder.x3d (X... Figure15.07ExtrudedCylinder.x3d (X... X3D Tooltips X3D Tooltips in Italiano

Extensible 3D (X3D) Tooltips in Italiano


Questi commenti forniscono delle descrizioni riassuntive e dei consigli utili per ogni nodo (elemento) e campo (attributo) di X3D. Essi forniscono supporto dipendente dal contesto per lo strumento di sviluppo X3D-Edit e saranno integrati nel futuro Schema X3D.

[Anchor](#) [Appearance](#) [Arc2D](#) [ArcClose2D](#) [AudioClip](#) [Background](#) [Billboard](#) [BooleanFilter](#) [BooleanSequencer](#) [BooleanToggle](#) [BooleanTrigger](#) [Box](#) [Circle2D](#) [Collision](#) [Color](#) [ColorInterpolator](#) [ColorRGBA](#) [component](#) [Cone](#) [connect](#) [Contour2D](#) [ContourPolyline2D](#) [Coordinate](#) [CoordinateDouble](#) [CoordinateInterpolator](#) [CoordinateInterpolator2D](#) [Cylinder](#) [CylinderSensor](#) [DirectionalLight](#) [Disk2D](#) [ElevationGrid](#) [EspduTransform](#) [EXPORT](#) [ExternProtoDeclare](#) [Extrusion](#) [field](#) [fieldValue](#) [FillProperties](#) [Fog](#) [FontStyle](#) [GeoCoordinate](#) [GeoElevationGrid](#) [GeoLocation](#) [GeoLOD](#) [GeoMetadata](#) [GeoOrigin](#) [GeoPositionInterpolator](#) [GeoTouchSensor](#) [GeoViewpoint](#) [Group](#) [HAnimDisplacer](#) [HAnimHummoid](#) [HAnimJoint](#) [HAnimSegment](#) [HAnimSite](#) [head](#) [ImageTexture](#) [IMPORT](#) [IndexedFaceSet](#) [IndexedLineSet](#) [IndexedTriangleFanSet](#) [IndexedTriangleSet](#) [IndexedTriangleStripSet](#) [Inline](#) [IntegerSequencer](#) [IntegerTrigger](#) [IS](#) [KeySensor](#) [LaneProperties](#) [LineSet](#) [LoadSensor](#) [LOD](#) [Material](#) [meta](#) [MetadataDouble](#) [MetadataFloat](#) [MetadataInteger](#) [MetadataSet](#) [MetadataString](#) [MovieTexture](#) [MultiTexture](#) [MultiTextureCoordinate](#) [MultiTextureTransform](#) [NavigationInfo](#) [Normal](#) [NormalInterpolator](#) [NurbsCurve](#) [NurbsCurve2D](#) [NurbsOrientationInterpolator](#) [NurbsPatchSurface](#) [NurbsPositionInterpolator](#) [NurbsSet](#) [NurbsSurfaceInterpolator](#) [NurbsSweptSurface](#) [NurbsSvungSurface](#) [NurbsTextureCoordinate](#) [NurbsTrammedSurface](#) [OrientationInterpolator](#) [PixelTexture](#) [PlaneSensor](#) [PointLight](#) [PointSet](#) [Polyline2D](#) [Polypoint2D](#) [PositionInterpolator](#) [PositionInterpolator2D](#) [ProtoBody](#) [ProtoDeclare](#) [ProtoInstance](#) [ProtoInterface](#) [ProximitySensor](#) [ReceiverPdu](#) [Rectangle2D](#) [ROUTE](#) [ScalarInterpolator](#) [Scene](#) [Script](#) [Shape](#) [SignalPdu](#) [Sound](#) [Sphere](#) [SphereSensor](#) [SpotLight](#) [StatusGroup](#) [StringSensor](#) [Switch](#) [Text](#) [TextureBackground](#) [TextureCoordinate](#) [TextureCoordinateGenerator](#) [TextureTransform](#) [TimeSensor](#) [TimeTrigger](#) [TouchSensor](#) [Transform](#) [TransmitterPdu](#) [TriangleFanSet](#) [TriangleSet](#) [TriangleSet2D](#) [TriangleStripSet](#) [Viewpoint](#) [VisibilitySensor](#) [WorldInfo](#) [X3D](#) [XtShell](#)

		top credits help
⚡ Anchor	Anchor è un nodo di raggruppamento (Grouping) che può contenere la maggior parte di tipi di nodi. Cliccando su una geometria raggruppata da un Anchor, il contenuto specificato dal campo url viene caricato. Suggerimento: inserire un nodo Shape prima di aggiungere la geometria o un nodo Appearance.	
DEF	[DEF ID #IMPLIED] DEF definisce un nome ID unico per questo nodo, riferibile da altri nodi. Suggerimento: nomi descrittivi migliorano la chiarezza e aiutano a documentare un modello.	
USE	[USE IDREF #IMPLIED] USE permette di riutilizzare (tramite il suo ID) un nodo precedentemente definito (con DEF), senza bisogno di indicare tutti gli altri attributi e figli.	

Done 0 error / 0 warning

X3D Tooltips



Many thanks to our contributors and translators.

- **Chinese tooltips:** [yiqi meng](#) of [Nanjing Art Institute](#), Nanjing China.
- **English tooltips** (primary tooltips document): [Don Brutzman](#) and students of the U.S. [Naval Postgraduate School \(NPS\)](#), Monterey California USA.
- **French tooltips:** [Antony Beis](#), [Frederic Roussille](#), [Adrien Gruneisen](#) et [Yann Henriet](#) of [Ecole Nationale des Ingenieurs de Tarbes \(ENIT\)](#), Tarbes France.
- **German tooltips:** [Raimund Dachzelt](#) and [Johannes Richter](#) of the [Multimedia Technology Group](#), [Dresden University of Technology](#), Germany.
- **Italian tooltips:** [Roberto Ranon](#) of the [L'Universita degli Studi di Udine](#), Italy.
- **Portuguese tooltips:** [Luciano Pereira Soares](#) of the [Laboratório de Sistemas Integráveis](#), [Escola Politécnica - Universidade de São Paulo](#), Brasil.
- **Spanish tooltips:** [Guadalupe Munoz Martin](#) of [University Rey Juan Carlos](#), Madrid Espana.

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X3D Tooltips: future work



- More languages – any volunteers?
- Integrating into master X3D schema so that one big happy documented record exists

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License



- We've placed all of our X3D contributions under an open-source license
 - OpenBSD style
 - Free for any use, including commercial
 - <http://c:/www.web3d.org/x3d/content/examples/license.html>
- Requirements simple
 - Include license, no guarantees
 - Prior written permission needed for endorsements
- Rights are retained by authors
 - Including possible repurposing, cross licensing
- Further contributions welcome

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(lest we forget) X3D Schema



- Written in XML, so same techniques apply
 - Specifically written in XML Schema language
- Lists all X3D definitions (in XML syntax)
 - nodes (elements)
 - fields (attributes)
 - data types (simpleTypes)
 - node types (complexTypees)
- Possibility: autogenerate an X3D application using X3D schema and data binding

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Extensible Markup Language



XML in 10 Points

<http://www.w3.org/XML/1999/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

350+ member companies & institutions in World Wide Web Consortium (W3C) already understand the business case

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Extensible Modeling & Simulation Framework



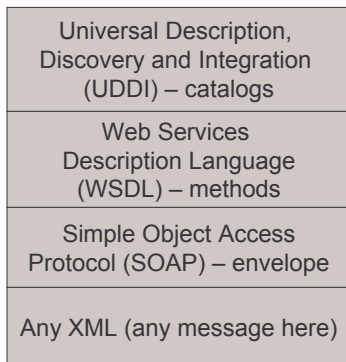
- XMSF is Web services for all manner of M&S
- A composable set of standards, profiles, and recommended practices for web-based M&S
- Foundational precepts: Internet network technologies, Extensible Markup Language (XML)-based languages, and service-oriented architectures for simple messaging
- Enable a new generation of distributed M&S applications to emerge, develop, interoperate with tactical systems
- Many easily repeatable exemplars using Web Services



<http://www.MovesInstitute.org/xmsf>

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Web Services “Stack”



Language- and system-independent messaging, APIs defined and discoverable via XML over the Web

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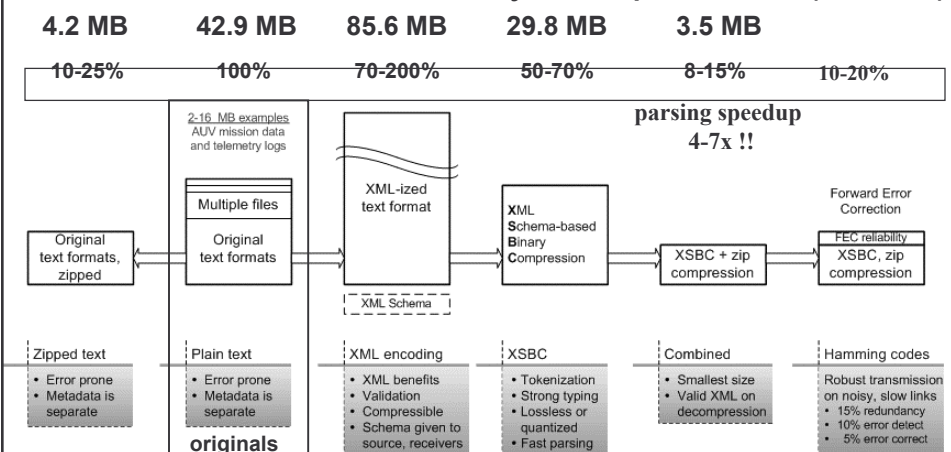
XML Schema-based Binary Compression (XSBC)

- XML encoding for validation benefits
- XML schema contains adequate information
- Tokenization of elements, attributes
- Strong data typing of value payloads
- Lossless
- More efficient than compressed numeric text

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XML Schema-based Binary Compression (XSBC)



Conclusion: XSBC performance already better than zip!

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X3D Binary



- ISO committee draft specification
- Fast Infoset compression of
 - Tokenization of element/attribute names
 - Type-specific compression for each data item
- Geometric Compression
 - Default: Java3D compression, royalty free
 - Pluggable replacement of other algorithms possible (hence still extensible)
- Future
 - W3C Binary XML (if any), XML Encryption + Signature
 - Xj3D implementation imminent

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sonar-visualization project



- Visualize multipath 3D sonar propagation
 - Situational awareness, sensitivity analysis
 - Multiple models: path, transmission loss, P_D ...
 - Operator familiarization, training, experience
- Enhance Tactical Decision Aids (TDAs) for at-sea operators
 - Reachback using Web services messaging, accessing both computational and data assets
 - Open source open standards: Java, X3D, XML

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Sonobuoy field visualization

SH-60B Seahawk orbit
00:07:39, course 315, pitch 0
location -780 780, altitude 100m

SH-60B Seahawk orbit
00:03:57, course 135, pitch 16
location 5772 5228, altitude 191.3m

XML web services for METOC data 1

- Query panel and plotted response

Temperature vs Depth

Sound Speed Profile

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XML web services for METOC data 2



- Monitoring initial query/response sequence

TCP Tunnel/Monitor: Tunneling localhost:80 to localhost:8080

From localhost:80

To: localhost:8080

IP: 127.0.0.1:80 to 127.0.0.1:8080

Port: 80 to 8080

Length: 1024

Time: 14 Apr 2004 22:14:58 GMT

Direction: In

Connection: Close

From localhost:8080

HTTP/1.1 200 OK

Content-Type: text/xml

Content-Length: 1024

Date: Wed, 14 Apr 2004 22:14:58 GMT

Server: Tomcat/5.0.28

<?xml version="1.0" encoding="UTF-8" ?>

<Time Tue Apr 13 16:08:22 PDT 2004 />

<Location>

<Latitude 15.0 />

<Longitude -145.0 />

</Location>

<SoundSpeed model="OTIS_GLOBAL" units="m/s" levelType="dpth_sfc" levelUnits="m">

2000.0 2500.0 3000.0 4000.0 5000.0

</SoundSpeed>

<SeawaterTemperature model="OTIS_GLOBAL" units="K" levelType="dpth_sfc" levelUnits="m">

1750.0 2000.0 2500.0 3000.0 4000.0 5000.0

</SeawaterTemperature>

<WindComponent_U model="NOGAPS" units="m/s" levelType="ht_sfc" levelUnits="m">

10.0

</WindComponent_U>

<WindComponent_V model="NOGAPS" units="m/s" levelType="ht_sfc" levelUnits="m">

10.0

</WindComponent_V>

<SignificantWaveHeight model="WV3_GLOBAL" units="m" levelType="surface" levelUnits="m">

0.0

</SignificantWaveHeight>

<Bathymetry model="ETOPO2" units="m" reference="hr" Resolution="0.031333333333333333">

5114.0 5109.0 5089.0 5078.0 5073.0 5070.0 5068.0 5050.0 5053.0 5116.0 5278.0 5277.0 5255.0 5218.0 5189.0 5186.0 5206.0 5216.0 5236.0 5246.0 5264.0 5134.0 4983.0 4813.0 4876.0 4940.0 4996.0 5026.0 5081.0 5128.0 5174.0 5200.0 5210.0 5083.0 5080.0 5074.0 5093.0 5132.0 5236.0 5216.0 5188.0 5157.0 5156.0 5190.0 5218.0 5234.0 5249.0 5274.0 5309.0 5318.0 5260.0 5138.0 5003.0 4916.0 4907.0 4957.0 5083.0 5040.0 5111.0 5160.0 5166.0 5164.0 5160.0 5081.0 5111.0 5048.0 5124.0 5068.0 4991.0 5064.0 5201.0 5177.0 5167.0 5161.0 5172.0 5193.0 5211.0 5213.0 5200.0 5210.0 5248.0 5272.0 5232.0 5136.0 5047.0 4998.0 4988.0 5005.0 5010.0 5043.0 5110.0 5112.0 5167.0 5088.0 5044.0 5096.0 5115.0 5106.0 5043.0 5062.0 5038.0 5216.0 5208.0 5209.0 5203.0 5187.0 5168.0 5170.0 5151.0 5116.0 5111.0 5148.0 5177.0 5180.0 5113.0 5084.0 5078.0 5065.0 5054.0 5055.0 5062.0 5133.0 5169.0 5123.0 5066.0 5065.0 5038.0 5077.0 5007.0 4977.0 5015.0 5205.0 5283.0 5243.0 5183.0 5094.0 5053.0 5035.0 5005.0 5020.0 5062.0 5086.0 5059.0 5051.0 5087.0 5127.0 5120.0 5074.0 5067.0 5071.0 5112.0 5149.0 5147.0 5130.0 5083.0 5073.0 5074.0 5041.0 4990.0 4966.0 5081.0 5010.0 5277.0 5285.0 5297.0 5216.0 5094.0 4999.0 4954.0 4921.0 4970.0 5037.0 5077.0 5027.0 5024.0 5081.0 5129.0 5111.0 5047.0 5049.0 5033.0 5110.0 5189.0 5203.0 5192.0 5153.0 5136.0 5099.0 5058.0 5088.0 4999.0 5013.0 5457.0 5430.0 5392.0 5358.0 5315.0 5252.0 5197.0 5102.0 5023.0 5067.0 5049.0 5092.0 5050.0 5048.0 5079.0 5089.0 5063.0 4985.0 4985.0 5182.0 5195.0 5163.0 5126.0 5099.0 5060.0 5048.0 5048.0 5044.0 5369.0 5373.0 5362.0 5361.0 5324.0 5315.0 5350.0 5270.0 5163.0 5109.0 5086.0 5086.0 5072.0 5072.0 5098.0 5107.0 5080.0 4965.0 4894.0 4901.0 4972.0 5049.0 5075.0 5054.0 5011.0 5083.0 5009.0 5005.0 5075.0 5077.0 5089.0 5181.0 4933.0 4914.0 5228.0 5228.0 5193.0 5282.0 5378.0 5246.0 5191.0 5136.0 5108.0 5094.0 5102.0 5159.0 5124.0 5193.0 5141.0 5045.0 4960.0 4907.0 4917.0 4968.0 4988.0 4960.0 4933.0 4914.0 4934.0 4985.0 5054.0 5100.0 5123.0 5020.0 5050.0 5034.0 5053.0 5074.0 5194.0 5234.0 5305.0 5240.0 5175.0 5138.0 5130.0 5106.0 5119.0 5251.0 5240.0 5297.0 5225.0 5131.0 5081.0 5047.0 5040.0 5074.0 4987.0 4937.0 4901.0 4909.0 4967.0 5039.0 5090.0 5114.0 4934.0 4922.0 4917.0 4947.0 4988.0 5070.0 5152.0 5161.0 5126.0 5099.0 5086.0 5116.0 5088.0 5104.0 5286.0 5385.0 5388.0 5360.0 5318.0 5274.0 5213.0 5150.0 5116.0 5083.0 5078.0

XML web services for METOC data 3



Server-side supercomputer response

C:\Documents and Settings\Administrator\Desktop\Wetcast Ideal.xml - Microsoft Internet Explorer

Address: C:\Documents and Settings\Administrator\Desktop\Wetcast Ideal.xml

<?xml version="1.0" encoding="UTF-8" ?>

<Time Tue Apr 13 16:08:22 PDT 2004 />

<Location>

<Latitude 15.0 />

<Longitude -145.0 />

</Location>

<SoundSpeed model="OTIS_GLOBAL" units="m/s" levelType="dpth_sfc" levelUnits="m">

2000.0 2500.0 3000.0 4000.0 5000.0

</SoundSpeed>

<SeawaterTemperature model="OTIS_GLOBAL" units="K" levelType="dpth_sfc" levelUnits="m">

1750.0 2000.0 2500.0 3000.0 4000.0 5000.0

</SeawaterTemperature>

<WindComponent_U model="NOGAPS" units="m/s" levelType="ht_sfc" levelUnits="m">

10.0

</WindComponent_U>

<WindComponent_V model="NOGAPS" units="m/s" levelType="ht_sfc" levelUnits="m">

10.0

</WindComponent_V>

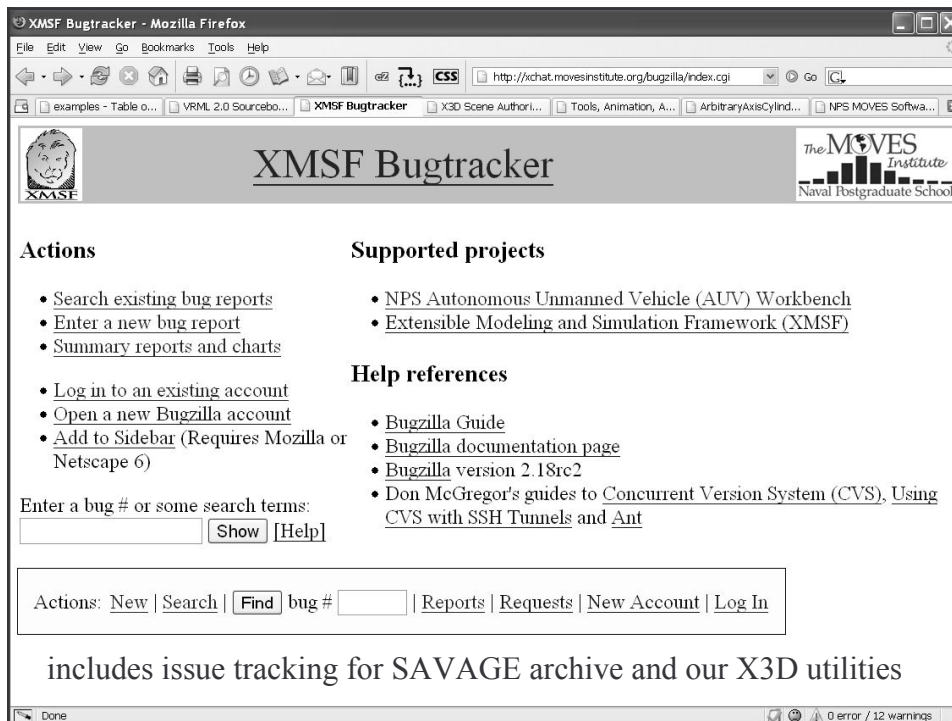
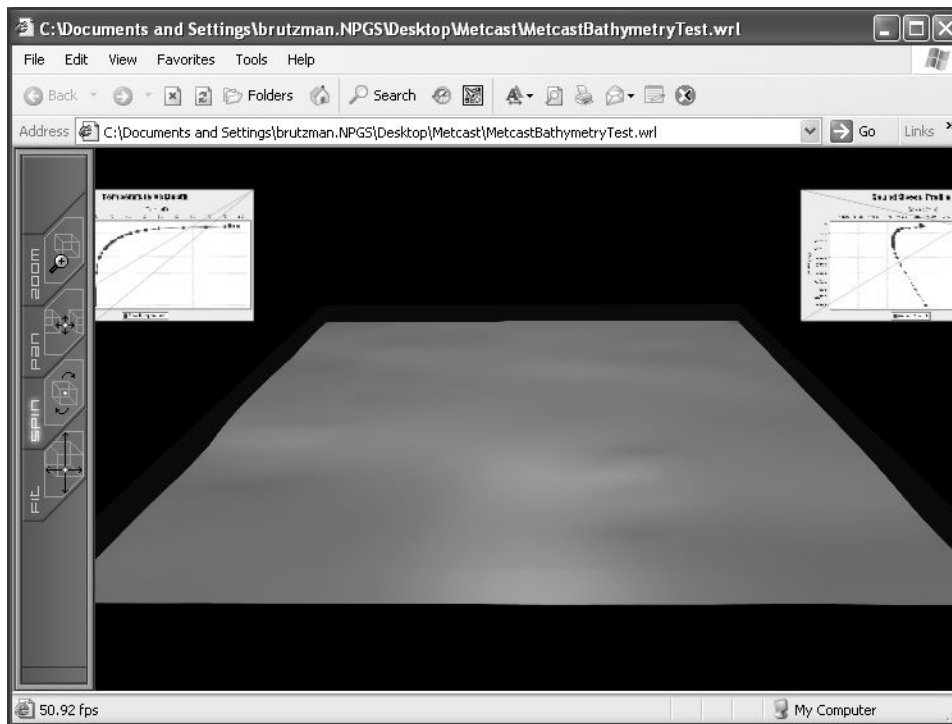
<SignificantWaveHeight model="WV3_GLOBAL" units="m" levelType="surface" levelUnits="m">

0.0

</SignificantWaveHeight>

<Bathymetry model="ETOPO2" units="m" reference="hr" Resolution="0.031333333333333333">

5114.0 5109.0 5089.0 5078.0 5073.0 5070.0 5068.0 5050.0 5053.0 5116.0 5278.0 5277.0 5255.0 5218.0 5189.0 5186.0 5206.0 5216.0 5236.0 5246.0 5264.0 5134.0 4983.0 4813.0 4876.0 4940.0 4996.0 5026.0 5081.0 5128.0 5174.0 5200.0 5210.0 5083.0 5080.0 5074.0 5093.0 5132.0 5236.0 5216.0 5188.0 5157.0 5156.0 5190.0 5218.0 5234.0 5249.0 5274.0 5309.0 5318.0 5260.0 5138.0 5003.0 4916.0 4907.0 4957.0 5083.0 5040.0 5111.0 5160.0 5166.0 5164.0 5160.0 5081.0 5111.0 5048.0 5124.0 5068.0 4991.0 5064.0 5201.0 5177.0 5167.0 5161.0 5172.0 5193.0 5211.0 5213.0 5200.0 5210.0 5248.0 5272.0 5232.0 5136.0 5047.0 4998.0 4988.0 5005.0 5010.0 5043.0 5110.0 5112.0 5167.0 5088.0 5044.0 5096.0 5115.0 5106.0 5043.0 5062.0 5038.0 5216.0 5208.0 5209.0 5203.0 5187.0 5168.0 5170.0 5151.0 5116.0 5111.0 5148.0 5177.0 5180.0 5113.0 5084.0 5078.0 5065.0 5054.0 5055.0 5062.0 5133.0 5169.0 5123.0 5066.0 5065.0 5038.0 5077.0 5007.0 4977.0 5015.0 5205.0 5283.0 5243.0 5183.0 5094.0 5053.0 5035.0 5005.0 5020.0 5062.0 5086.0 5059.0 5051.0 5087.0 5127.0 5120.0 5074.0 5067.0 5071.0 5112.0 5149.0 5147.0 5130.0 5083.0 5073.0 5074.0 5041.0 4990.0 4966.0 5081.0 5010.0 5277.0 5285.0 5297.0 5216.0 5094.0 4999.0 4954.0 4921.0 4970.0 5037.0 5077.0 5027.0 5024.0 5081.0 5129.0 5111.0 5047.0 5049.0 5033.0 5110.0 5189.0 5203.0 5192.0 5153.0 5136.0 5099.0 5058.0 5088.0 4999.0 5013.0 5457.0 5430.0 5392.0 5358.0 5315.0 5252.0 5197.0 5102.0 5023.0 5067.0 5049.0 5092.0 5050.0 5048.0 5079.0 5089.0 5063.0 4985.0 4985.0 5182.0 5195.0 5163.0 5126.0 5099.0 5060.0 5048.0 5048.0 5044.0 5369.0 5373.0 5362.0 5361.0 5324.0 5315.0 5350.0 5270.0 5163.0 5109.0 5086.0 5086.0 5072.0 5072.0 5098.0 5107.0 5080.0 4965.0 4894.0 4901.0 4972.0 5049.0 5075.0 5054.0 5011.0 5083.0 5009.0 5005.0 5075.0 5077.0 5089.0 5181.0 4933.0 4914.0 5228.0 5228.0 5193.0 5282.0 5378.0 5246.0 5191.0 5136.0 5108.0 5094.0 5102.0 5159.0 5124.0 5193.0 5141.0 5045.0 4960.0 4907.0 4917.0 4968.0 4988.0 4960.0 4933.0 4914.0 4934.0 4985.0 5054.0 5100.0 5123.0 5020.0 5050.0 5034.0 5053.0 5074.0 5194.0 5234.0 5305.0 5240.0 5175.0 5138.0 5130.0 5106.0 5119.0 5251.0 5240.0 5297.0 5225.0 5131.0 5081.0 5047.0 5040.0 5074.0 4987.0 4937.0 4901.0 4909.0 4967.0 5039.0 5090.0 5114.0 4934.0 4922.0 4917.0 4947.0 4988.0 5070.0 5152.0 5161.0 5126.0 5099.0 5086.0 5116.0 5088.0 5104.0 5286.0 5385.0 5388.0 5360.0 5318.0 5274.0 5213.0 5150.0 5116.0 5083.0 5078.0



Results Summary



- Open standards: X3D, XML, XMSF, etc.
- Significant collected capabilities
 - Growing every day
 - Repeatable
- Open source + commercial compatibility
 - So please get started!

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 - Ph.D. research
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 - USN, USMC, USA, USAF: ~1300
 - International student officers: ~350
 - Faculty ~300
- Research efforts significant
 - FY2004 reimbursables: \$100M

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NPS MOVES Institute



- Modeling, Virtual Environments & Simulation
- Accredited Master's and Ph.D. degrees
 - Combines computer science, operations research, and multidisciplinary studies
 - Over 70 affiliated faculty
 - Typically 30-40 active-duty students on board
 - Research agenda
 - Grand challenges, 10-year time frame
 - Open House: 16-18 August 2005
 - <http://www.MovesInstitute.org>

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