

3D Image Processing Formats & Standards

Rita Turkowski

Executive Director

Web3D Consortium



Real-Time

Web-Ready

ISO-Approved



INTERACTIVE
INTERNET READY
ISO STANDARD

The Rich Media Strategy

Many Formats but Few Standards

An Overview of X3D and related formats

- Current State of the Art
- 3D for the Web
- 3D for Documents
- 3D for Applications
- 3D Production Pipelines for web viewing
- Web3D - Get Involved

X3D - Animated, Interactive 3D Graphics

- 3D graphics
- Animation
- User interaction-sensors allow users to interact with scene; trigger events
- Video and Spatialized audio
- Navigation-a model for navigation
- Programmable shaders - work with GPUs
- 3D and Cube Map Textures - texturing the inside of something.
- Scripting-user created code (eg. Javascript)
- User-defined extensions - prototypes

The Web3D Consortium

X3D – Third Generation Web3D Standard

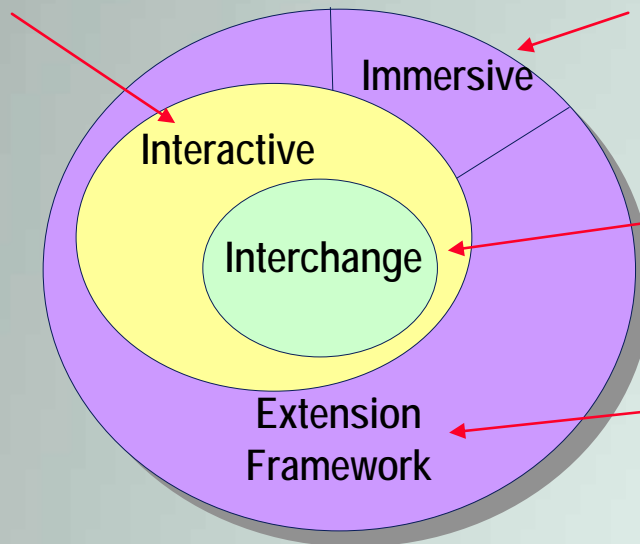
- Started in 1995 with VRML1
- VRML2 or VRML97 Second Generation
- X3D NOW and In the foreseeable future
 - Liaisons to other consortia encourage new ideas, concepts and features, reduce useless reinventing of the wheel

X3D – Third Generation Web3D Standard

- Extensible – profiles are adaptable in size and functionality
- Tightly integrated with XML - .wrl and .xml encodings

Adds sensors and some lights – enough for most Web3D applications today,
Adopted by MPEG-4

Adds scripting and VR capabilities,
upgrade path for VRML97 content



Small download,
Supports geometry, texturing, and basic
lighting and animation

Extension framework to
implement and distribute future
components and profiles

Hardware Independent



X3D Features

XML Integrated
Componentized
Extensible
Real Time
Profiled
Conformance
ISO 1977X family-
Royalty-free

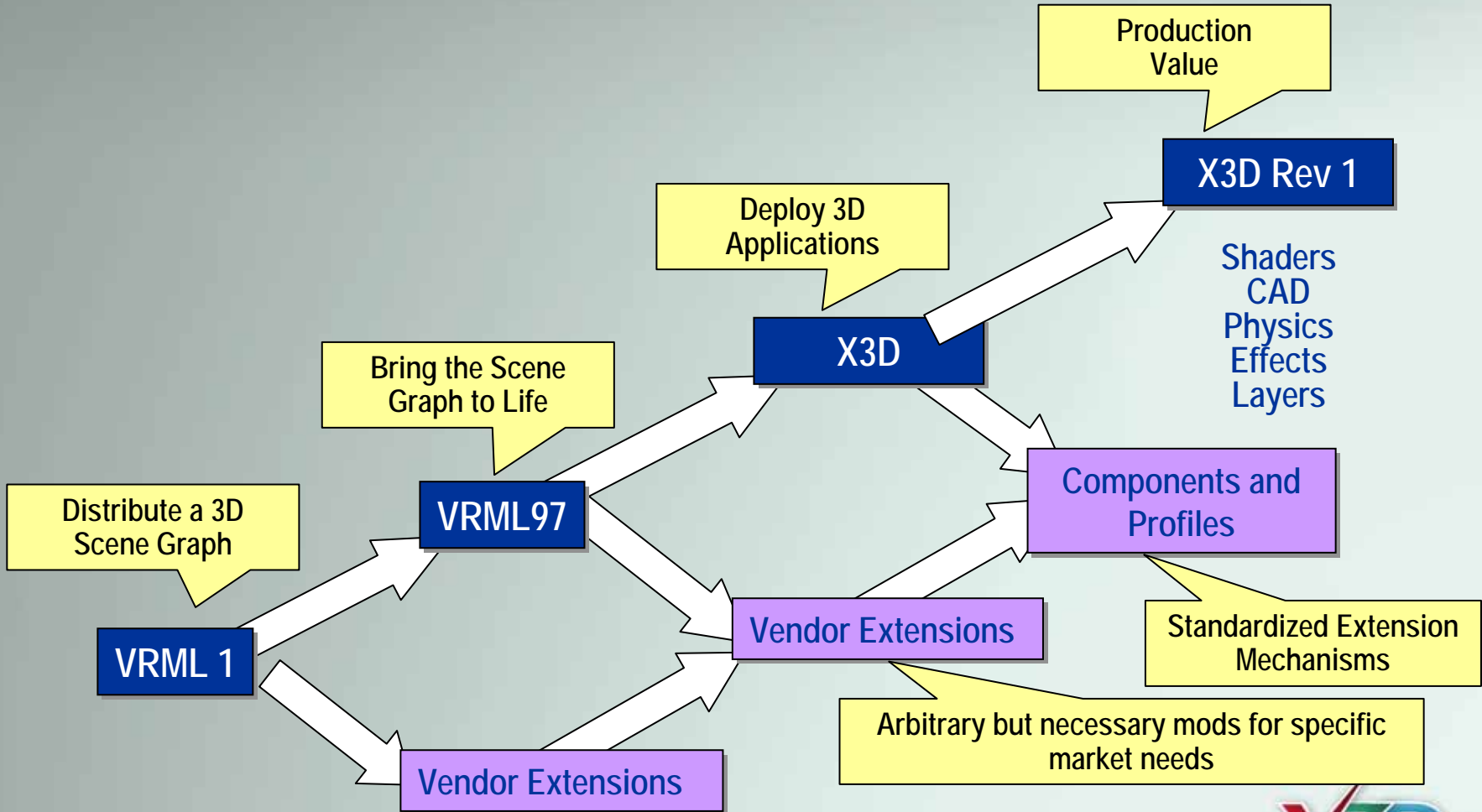
X3D Ancillary Support:

- Encodings supported
 - XML
 - VRML Classic
 - Binary compressed
- File formats supported
 - jpg, png, gif, cgm
 - wav, midi
 - GeoSpatial reference frames
- Protocols
 - http
 - Distributed Interactive Simulation (DIS)
- Languages
 - Java (optional)
 - ECMAScript (required)
 - Preliminary work on C/C++ bindings
- Graphics
 - NURBS, Shaders

The ISO Standard for 3D on the Web



The Road to X3D



OPEN STANDARDS FOR XML 3D

1994

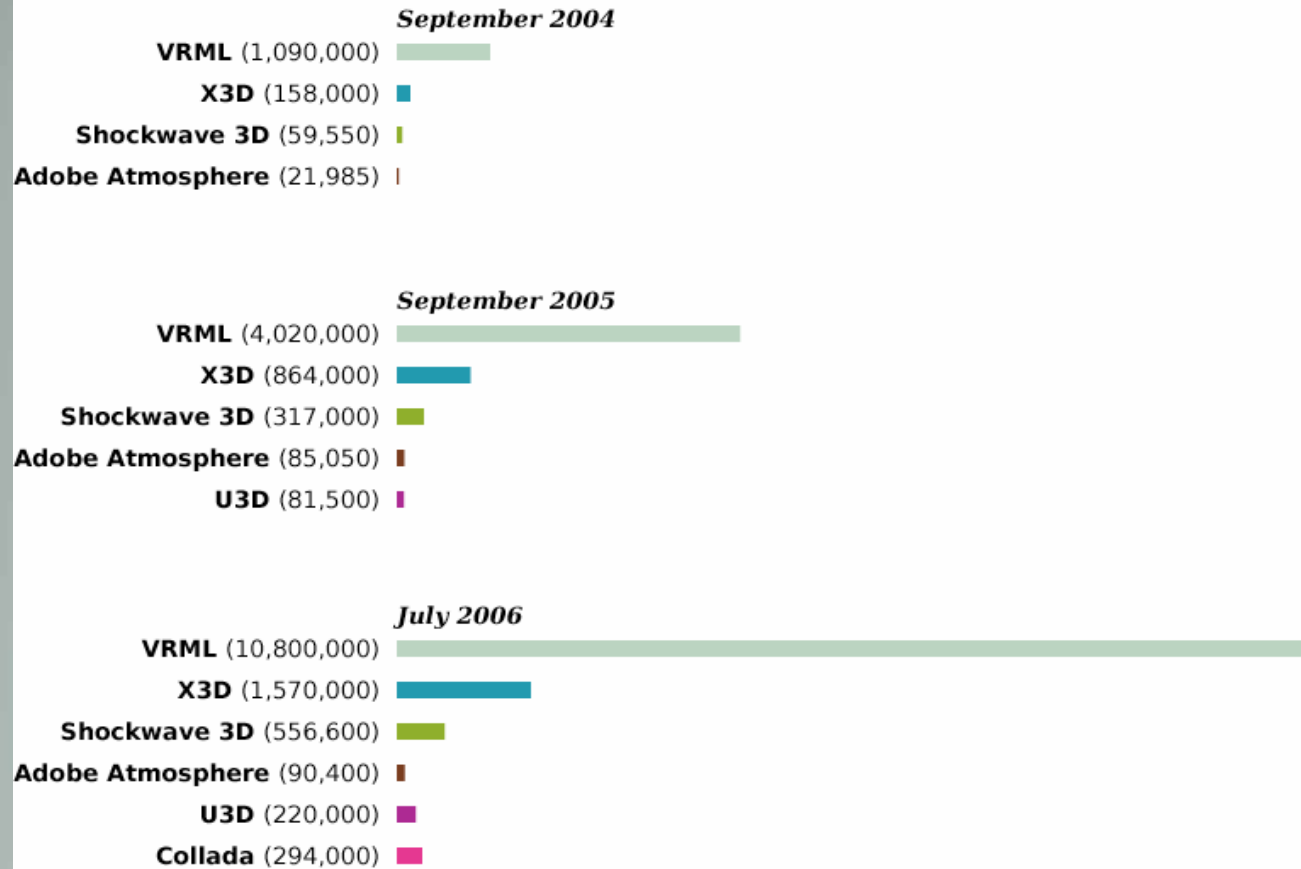
1997

2004

2005

2006

Google hits for pages mentioning various Web3D formats



Data and charts courtesy of Viveka Weiley, ping.com.au

X3D - The Technology of a 3D Standard

- Real-time 3D scene graph
- Meshes, lights, materials, textures, shaders
- Integrated video, audio
- Animation
- Interaction
- Behaviors
- Scripts
- Application programming interfaces

X3D - What is its strength?

- Archival 3D standard
 - 3D Data which requires significant resources to obtain and are needed for reference purposes
 - Anatomy
 - Molecular structure (e.g., drug discovery, med research)
 - Terrain
 - GIS layers
 - Astronomical data
 - High value long usability products
 - Spacecraft, aircraft, buildings, automobiles
- Web Services
 - Natively encoded for the semantic web

X3D for the Web

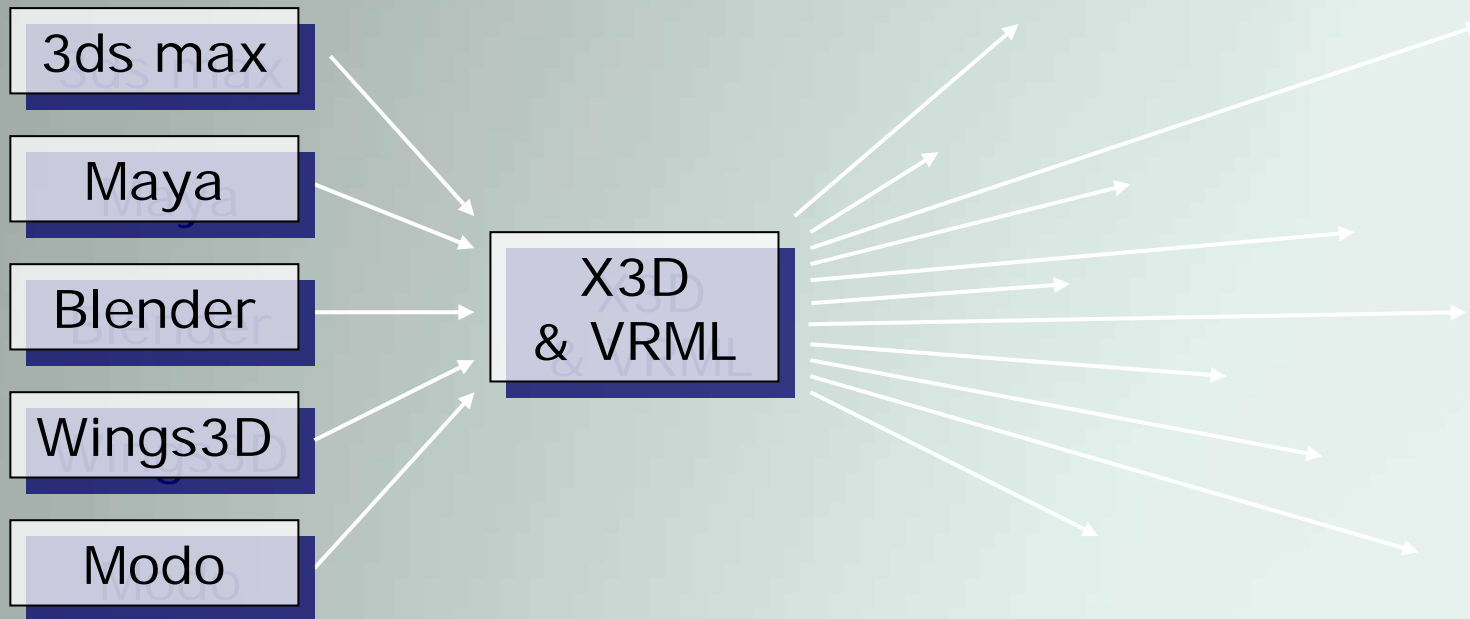
- Lightweight plug-ins for browsers
 - FLUX™ Player, Xj3D™, Octaga™, BS Contact™
- Visual integration with existing web browsers (IE)
- Data integration with standard web infrastructure (XML)
- An open way to build on-line “worlds,” 3D documents
 - Highly scalable
 - Interoperable
 - Open to experimentation

International Industry Adoption

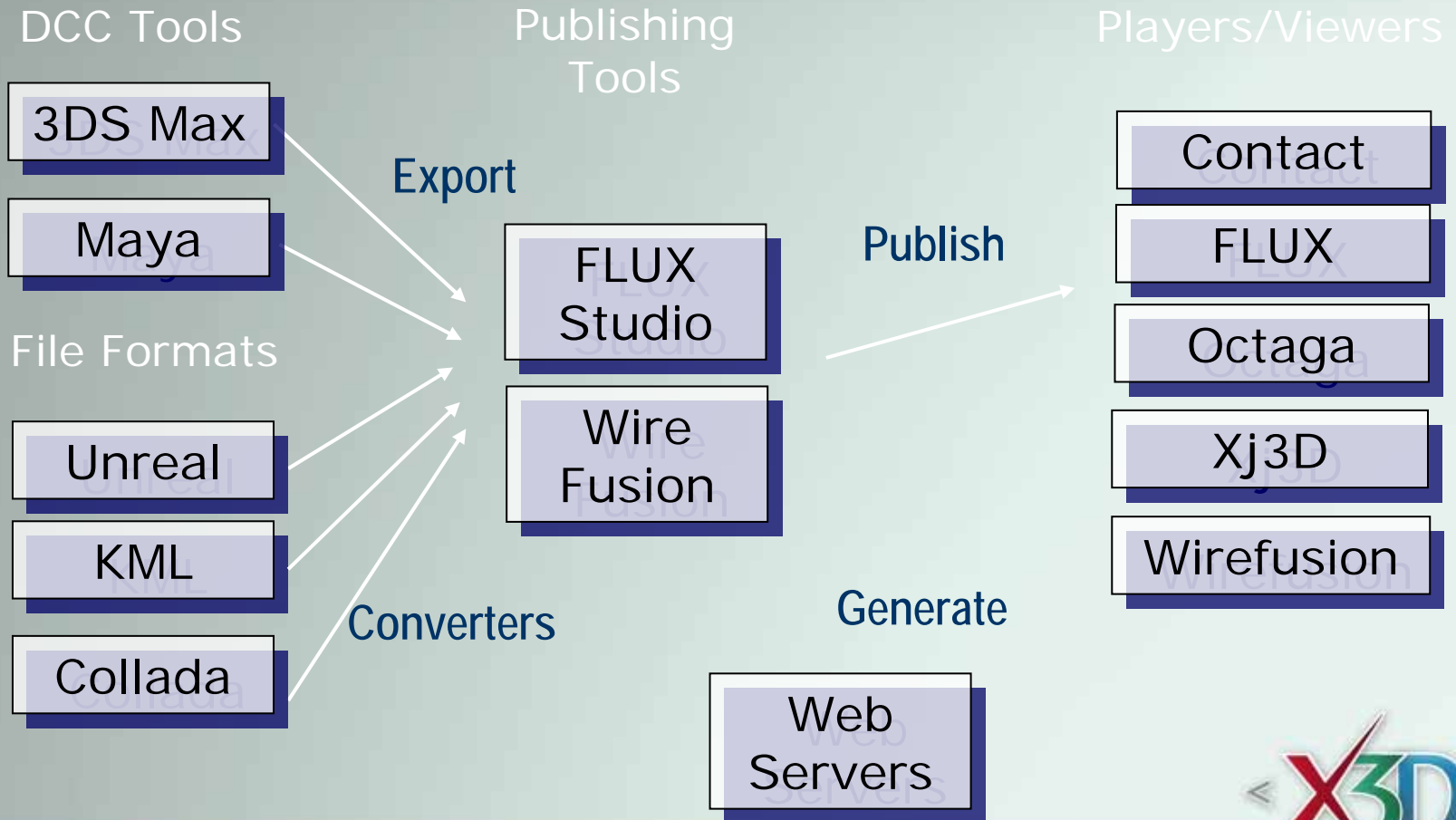


Tool Independent Workflow

Content Authoring + Robust ISO Standards + X3D Browser & Scene tools = Rich Media 3D Applications



X3D Production Pipelines



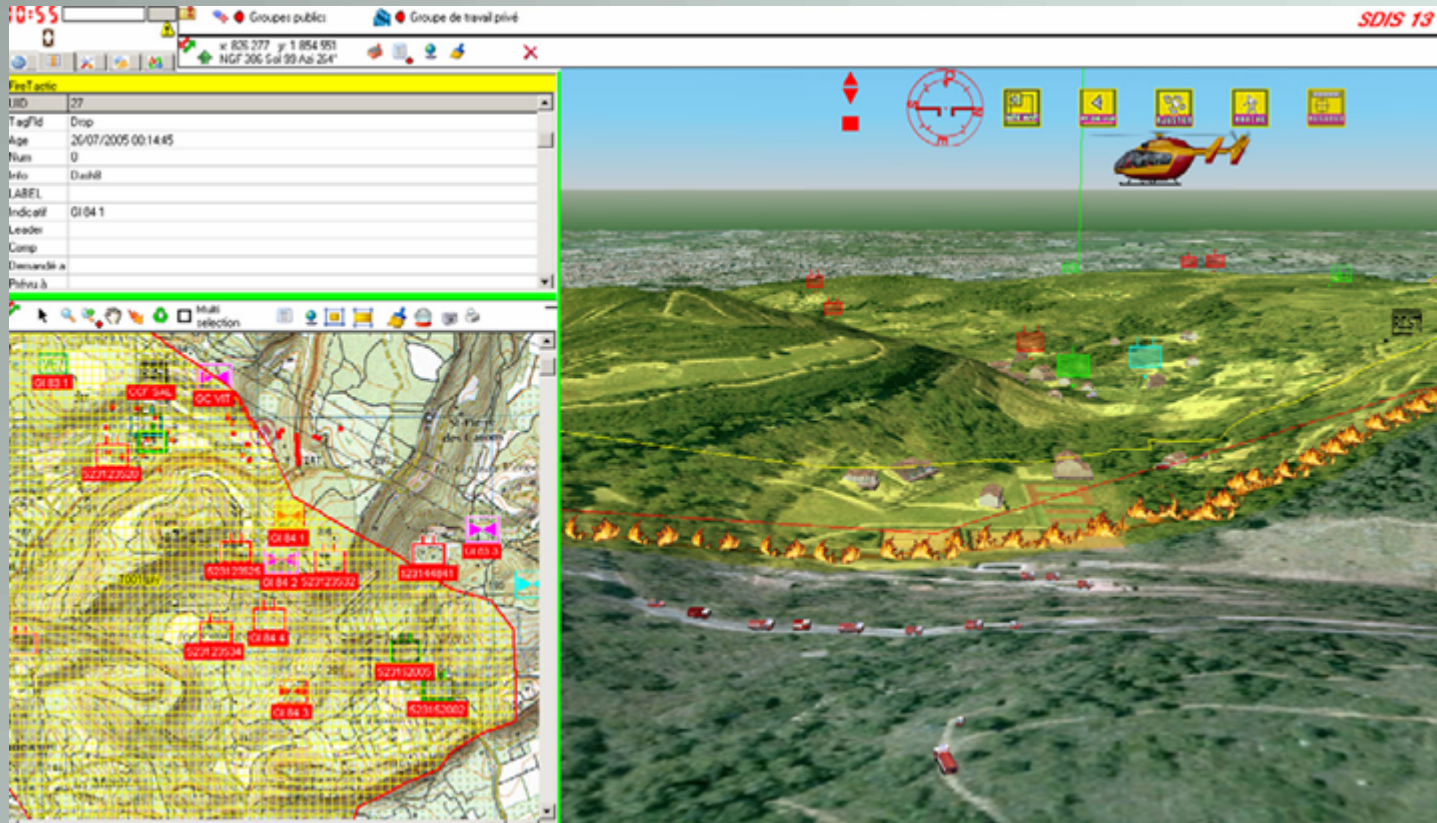
Interactive Marketing



Architecture and Urban Planning

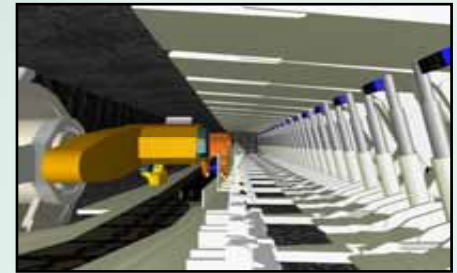


Geography



Industry and Engineering

- Siemens
 - E-Commerce process integration with SAP R/3
- German Mining
 - Virtual training
 - E-learning
- Volkswagen
 - factory process simulation



Automotive Industry



Mobiles and PDAs

The screenshot shows the TIM website's MMS service interface. At the top, there is a navigation bar with the TIM logo and the slogan "Vivere senza confini". Below this, there are several menu items: Shop, 119 Self Service, Clienti Privati, Per le Aziende, Investor Relations, and TIM & Stampa. A secondary navigation bar includes HOME, FAI DI TIM LA TUA HOME PAGE, TIM NEWS, MILLEUNATIM, CERCANEGOZIO, TARIFFE E PROMOZIONI, ROAMING ESTERO, and TELEFONINI. The main content area features a search bar with "CERCA CON TIM" and buttons for "NEL SITO" and "NEL WEB". There are also sections for "LA TUA MAIL CON TIM" (i.box), "REGISTRATI" (TELEFONINO, PASSWORD, OK), and "SELF SERVICE" (I tuoi servizi interattivi). A red banner highlights various services: VIDEOGAME, CALCIO, LOGHI E SUONERIE, MMS, VIDEO, and VOCE, with a dropdown menu for "altre aree". Below this, there is a section for "Gli altri Servizi" and a disclaimer: "L'invio di ogni MMS costa 1 euro (iva inclusa). Puoi inviare l'MMS sia a clienti TIM sia a clienti di altri operatori." The main form is divided into three columns: "SCEGLI PERSONAGGIO" (with a selection of Anja), "SCEGLI CARATTERISTICHE" (with dropdowns for Vestito: Nero, Occhiali: No, Capelli: Neri, and Cappello: No), and "Oggetto del messaggio" (with a text input field containing "Laptop und Lederhose :-"). Below the subject field, there is a section for "Inserisci il testo" with a text area containing ":-@". To the right of the text area, there is a "Caratteri disponibili" counter and a row of emoticon icons. Below the text area, there is a "Destinatari" field with a dropdown menu for "Modello di terminale" (set to Nokia 6600). At the bottom, there are buttons for "Aiuto", "Anteorima", and "Invia".

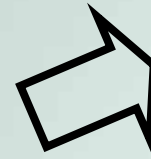
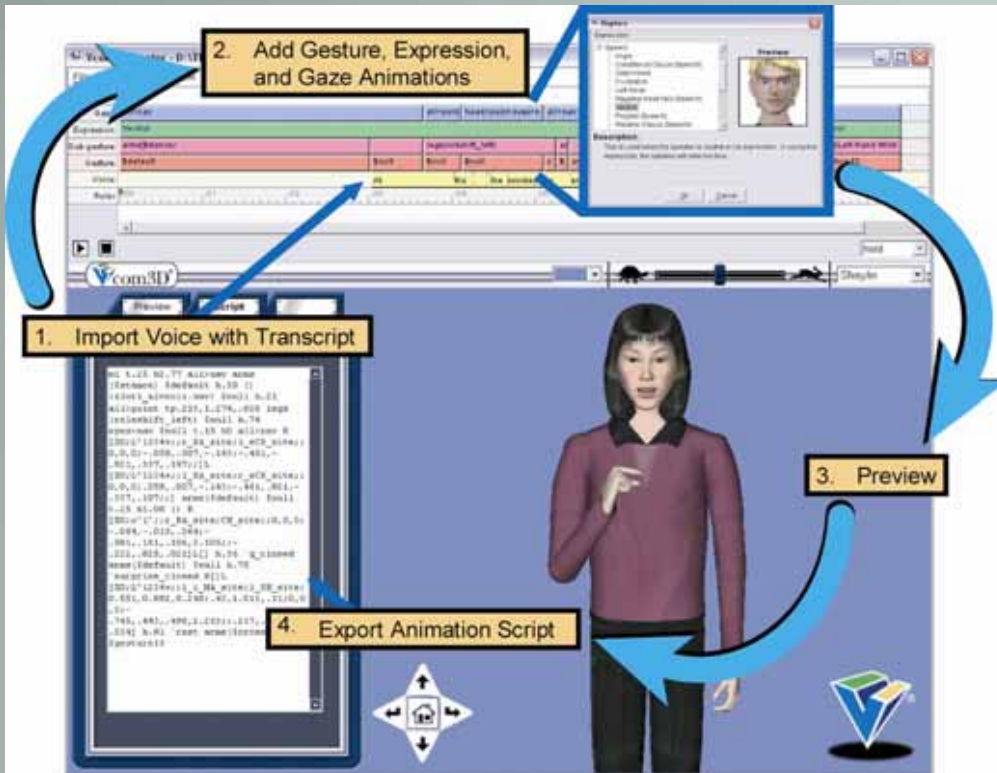
“State of the Art” Rich Media

- Real-time Shaders
- Lighting and Shadows
- Real-time Physics
- Stereoscopic Rendering
- Standalone or web plug-in
 - Xj3D, IE, Firefox, Opera, Safari



Authoring Virtual Human Mentors & Actors

- The Need:
 - Lifelike Human Tutors enhance motivation and retention in e-Learning
 - Up to 93% of human communication is non-verbal (Koneya & Barbour)
- The Problem:
 - Character Animation is expensive to create and edit
- The Solution:
 - Use Web3D's X3D and H-Anim standards to provide libraries of reusable, interchangeable Virtual Humans, Behaviors, and Simulation Objects
 - Vcommunicator® Authoring Tool provides automated, multi-lingual lip-sync plus rapid composition of gestures and object interactions



Language & Culture



Equipment Operation

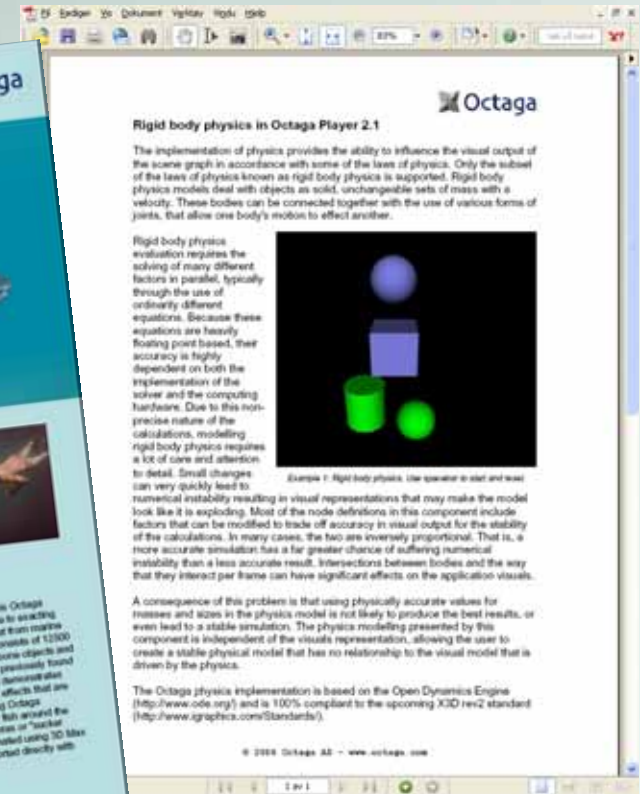
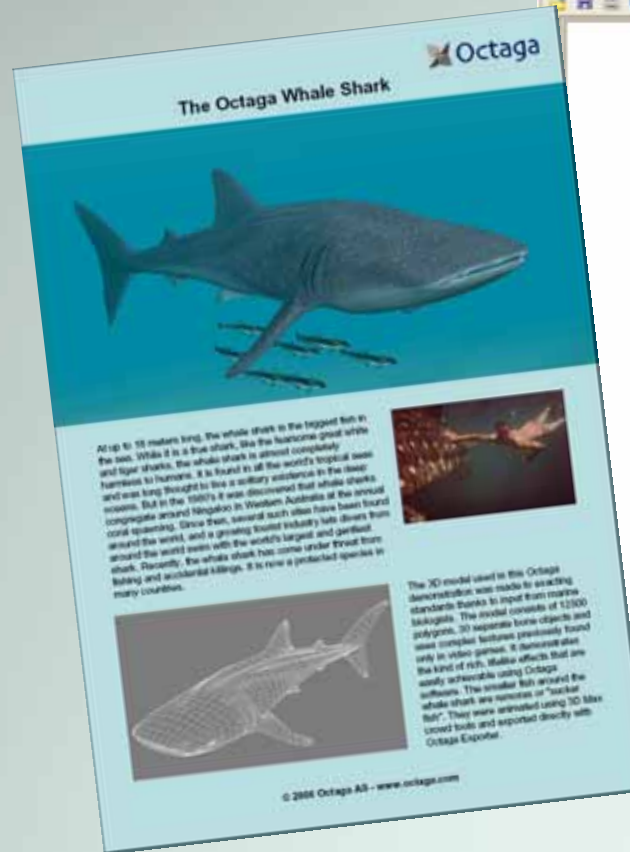
- Rapid composition and animation of interactive scenarios
- 40 reusable characters; 100s of composable behaviors



X3D for Documents

Applications:

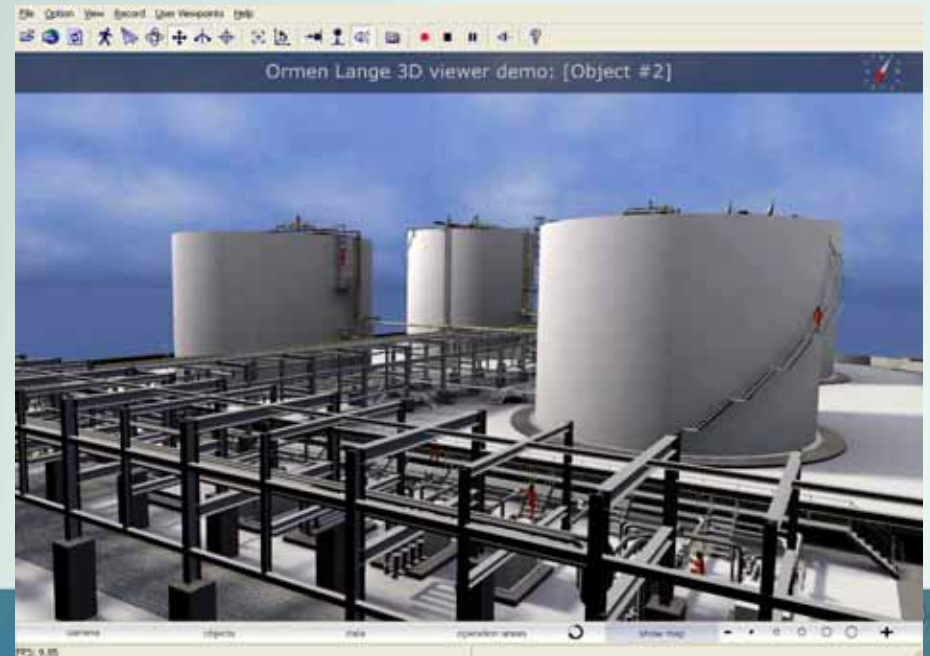
- Technical publishing
- Sales documents
- Education
- Maintenance manuals
- Project execution
- Entertainment
- Game manuals



X3D for Documents

- Octaga Player Acrobat plug-in for Windows
 - displays X3D models embedded in PDF document
- X3D content embedded in PDF as annotation
- Octaga PDF Reference document for PDF syntax
- Textual content can be linked to 3D content through hyper-links
- More info at www.octaga.com

X3D within Oil and Gas industry



Octaga Production Pipeline

Preproduction

- Converting and importing CAD models in different formats to 3D studio Max.
- Setting up 3D scene with all CAD models.
- Polygon reduction. Combination of redrawing and the use of polygon reduction before and after model import.
- Design of additional models not provided by customer.

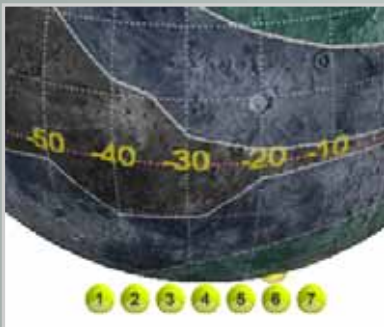
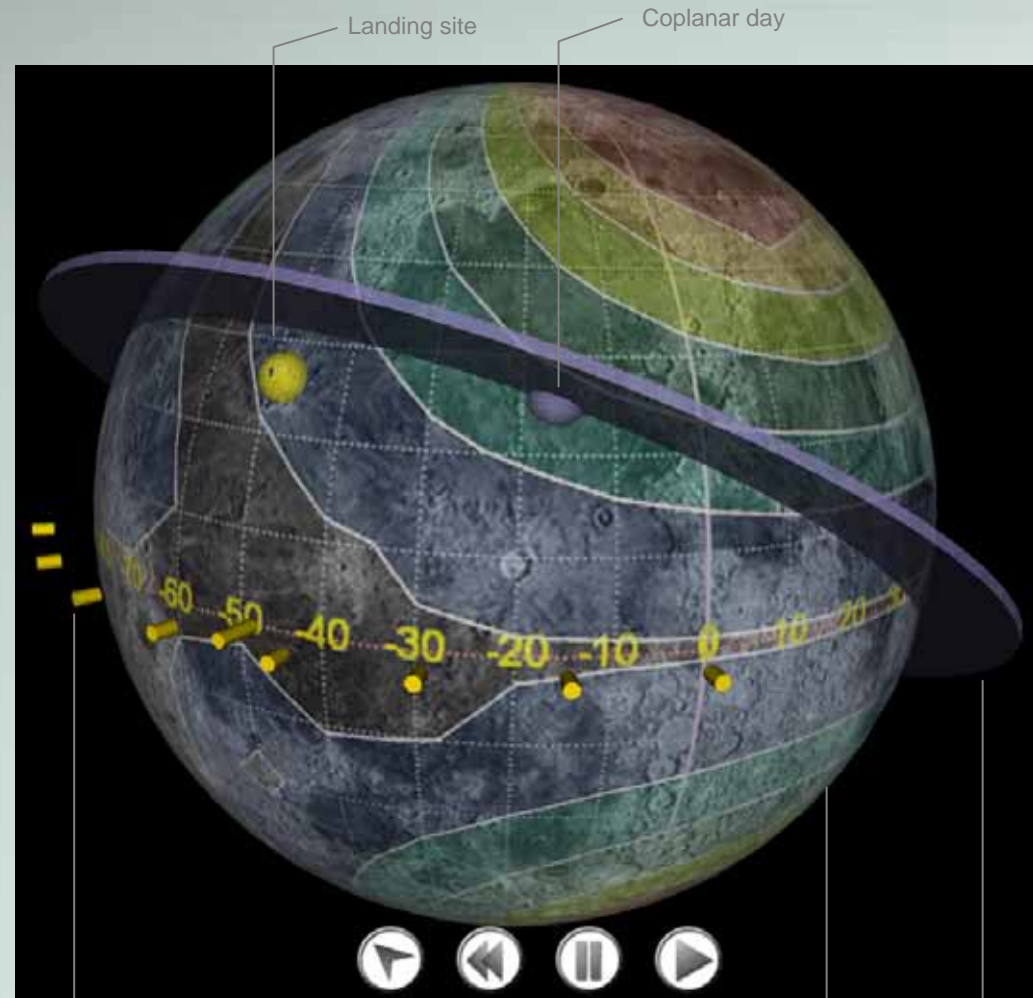
Visual Design

- Adding environment – landscape/seascape, skydome, fish, trees, other details.
- Adding textures and materials to all 3D geometry.
- Setting up lights and rendering to texture.
- Animating the scene.
- Preparing scene for *Octaga Interaction Framework*.
- Octaga Exporter.

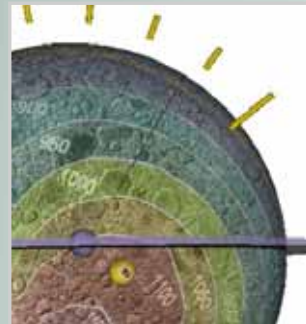
Interaction/SFX

- *Octaga Interaction Framework*.
- Setting up chapters and scenes according to storyboard.
- Adding camerapaths.
- Linking animations and camerapaths to buttons and clickable objects.
- SFX – Animated textures, pixelshaders, advanced fog and backgrounds, particles for fire, rain, etc.

- A Web-based X3D application was deployed within the lunar study team
- X3D browser plug-ins enable the user to see the application embedded in a web page annotated with data specific to each scene
- Straightforward UI elements eliminate learning curve



Map scene links to a different world for each landing site



Stored views look at the orbit edge-on



Heads Up Display Controls

Time markers (24 hrs ea.)

Data overlaid on globe features

UAS Training Enterprise Concepts



communications
Link Simulation & Training

Real World Complexity

GLOBAL HAWK
60 - 65 KFT ALTITUDE
>300 KTS AIRSPEED

KU SAT COM
UHF SAT COM

LOS AND RELAY
SENSOR DATA
1.5 - 274 Mbps

SENSOR DATA
1.5 - 28 Mbps

DCGS In Garrison or In Theater

Auto of DCGS



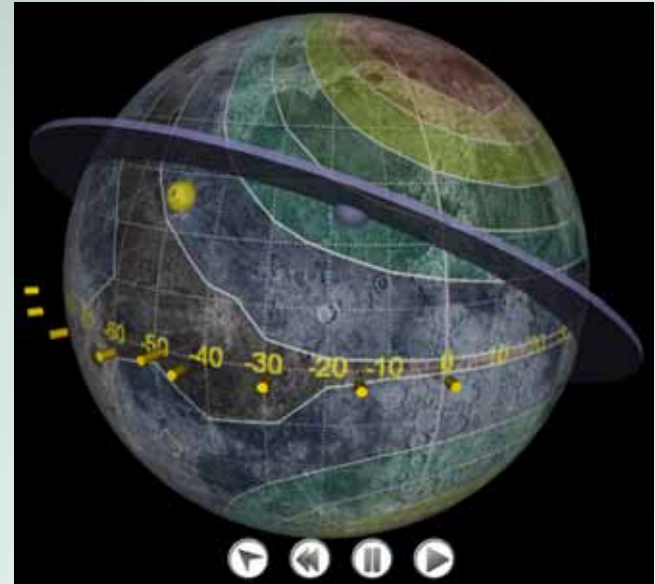
OPEN STANDARDS FOR XML 3D

Partnerships are path to progress

- The hardest parts of the technical infrastructure are already proven possible
- Siggraph support
- Web3D X3D specifications
- W3C Recommendations
- OpenGIS Consortium (OGC) specifications
- Simulation Interoperability Standards Organization (SISO) standards
- Open Management Group (OMG) approaches
- Khronos Collada and OpenGL specifications

X3D Earth: what is it

- X3D model of Earth
- Publicly available terrain datasets
- Publicly available imagery
- X3D Geospatial Component
- Linkable locations for any place
- Provide hooks for 3D models
- Open standards, extensions and process



Web3D 2007 Symposium

- 15-18 April 2007
- University of Perugia, Umbria, Italy
- Sponsored by ACM SIGGRAPH
 - in cooperation with EuroGraphics, Web3D
- <http://www.web3d.org/web3d2007>



Topics of interest

- 3D Graphics for PDAs, cell phones
- Innovative 3D graphics applications and integration with Web standards
- User interface, interaction methods in real-time virtual environments
- High-performance 3D for distributed environments
- Animated humanoids, characters

Deadlines

- Full papers December 4
- Short papers December 4
- Tutorial proposals December 4
- Workshop proposals December 4