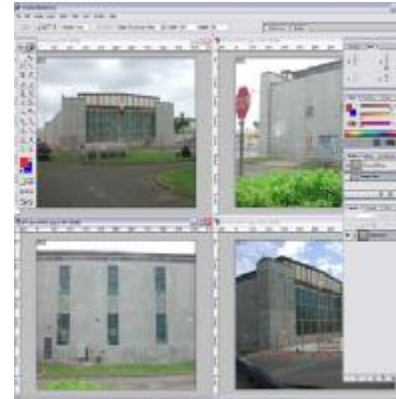


Web-Based 3D Geospatial Facility Model Data Interfaces



Federal Facilities Council Symposia
October 31, 2006
BIM: Grass Root Experiences

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Naval Facilities Engineering Command
Washington Navy Yard, DC

Mr. Viana is an engineer with the Naval Facilities Engineering Command. The views presented are those of the speaker and do not necessarily represent the views of DoD or its components.

Working Goals

- Ø Pilot project begun in 1996 to evaluate if web-based, 3D component models could be useful as a field training aid for the Navy's Underwater Construction Teams. The work has since progressed to construction of virtual 3D waterfront facility models.
- Ø Translate existing geospatial data sets from the Navy's built waterfront environment into an interoperable, web-based building information model (BIM) graphical interfaces linked to associated facilities engineering and management data.
- Ø Meet the Office of the Secretary of Defense's strategic goals for the DoD's Infrastructure Information Environment by facilitating the accessibility of standardized asset data.
- Ø This presentation describes a step by step processes utilized to produce virtual 3D waterfront facility models of the Navy's built environment from paper drawings, existing 2D CAD files, and other geospatial data sets. The facility models have been created in open source, ISO-based standards format for 3D web graphics.
- Ø The work presented has been a collaborative effort conducted over the last 10 years in partnership with other Governmental agencies, academia, and the private sector.

Raster Image Vectorization

- Ø Hitachi Tracer – www.hsqt.com

Computer Aided Design (CAD)

- Ø AutoDesk AutoCad & 3D Studio Max – www.autodesk.com

Image Editing

- Ø Photoshop – www.adobe.com

Geographic Information System (GIS)

- Ø Global Mapper – www.globalmapper.com

3D Translation

- Ø PolyTrans – www.okino.com

VRML Programming

- Ø VrmIPad – www.parallelgraphics.com

Visual Basic software

- Ø Chisel – <http://www2.hrp.no/vr/tools/chisel/install.htm>

X3D & VRML Authoring, Editing and Validation

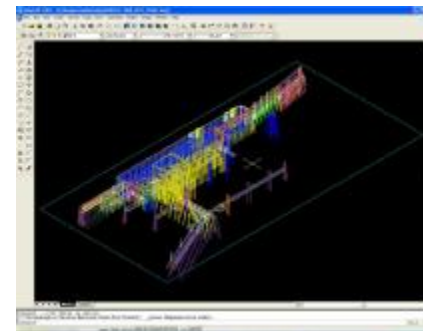
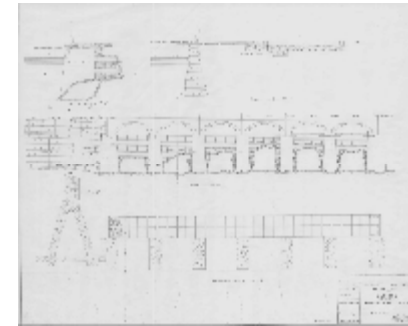
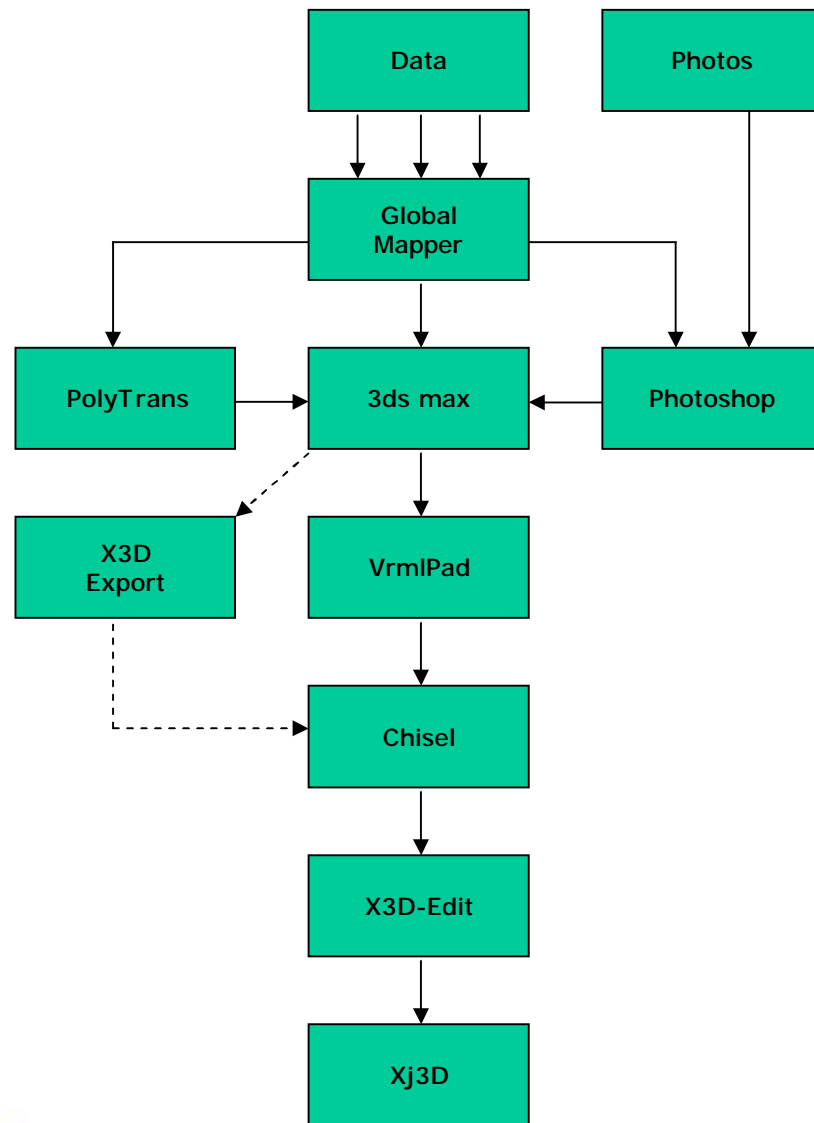
- Ø X3D-Edit – <http://www.web3d.org/x3d/content/README.X3D-Edit.html>

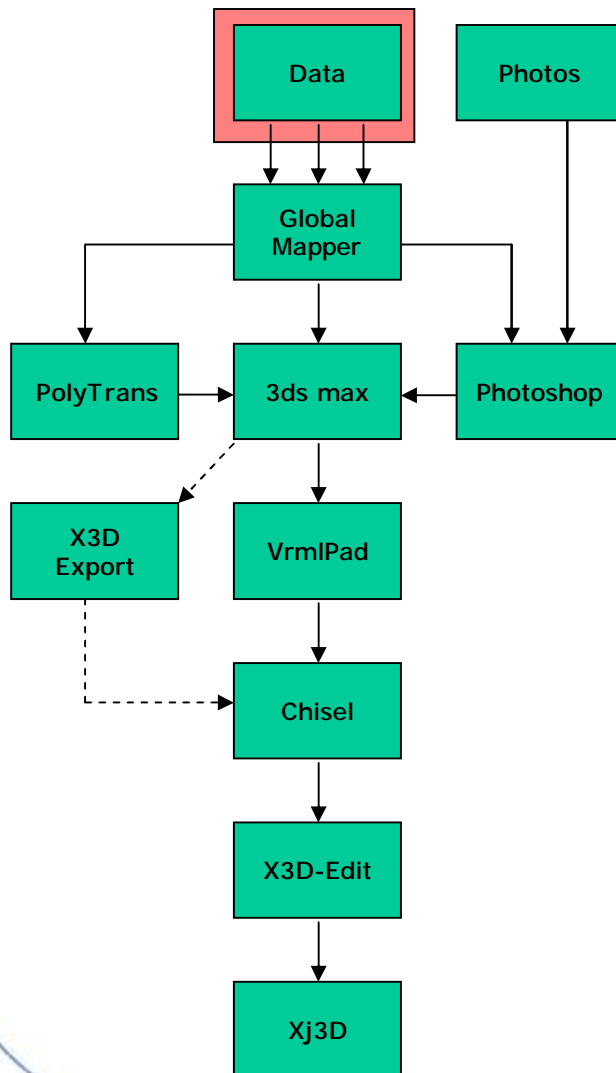
3D Web Browser Viewer

- Ø Xj3D – <http://www.web3d.org/x3d/applications/xj3d/>

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3D Model Production Process





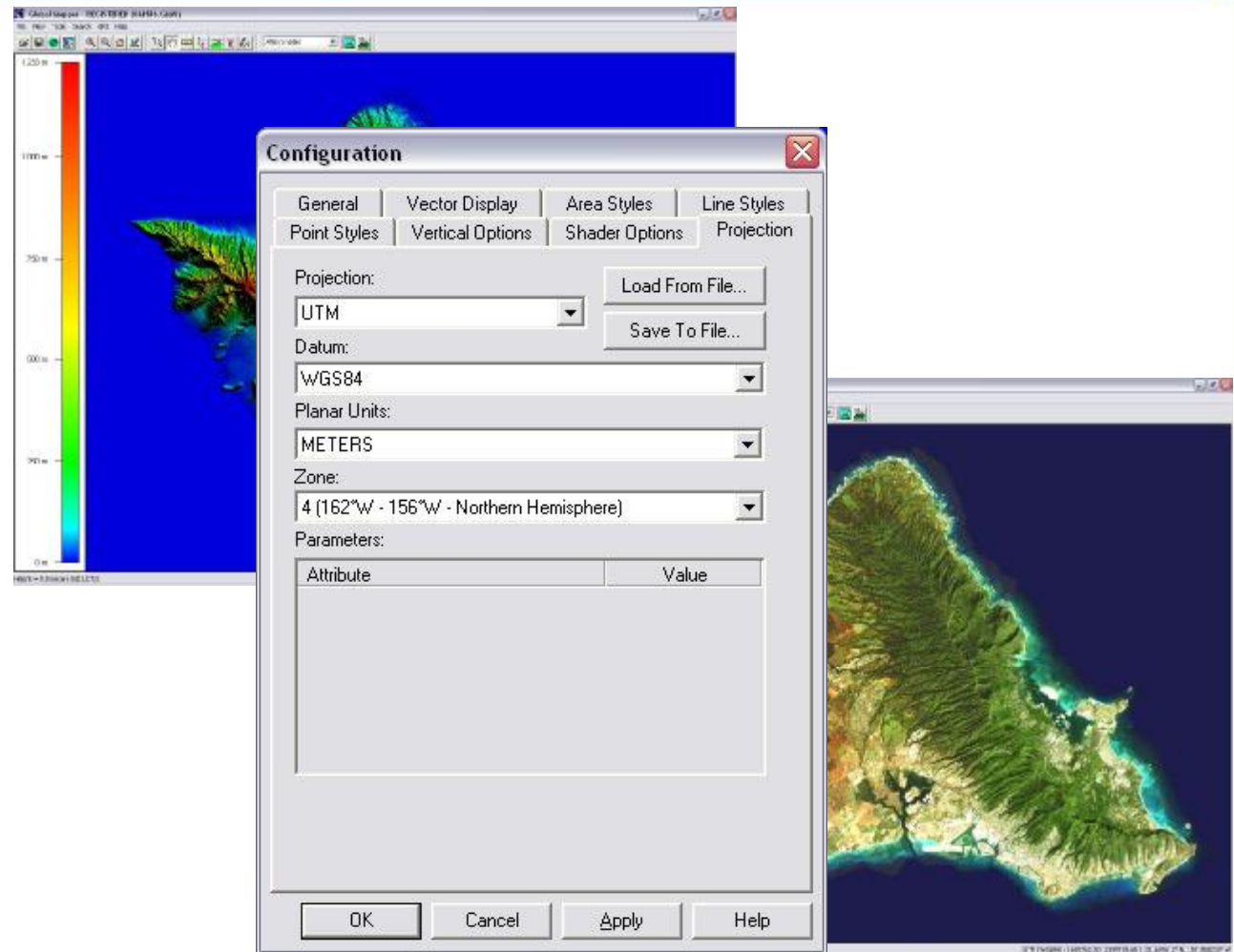
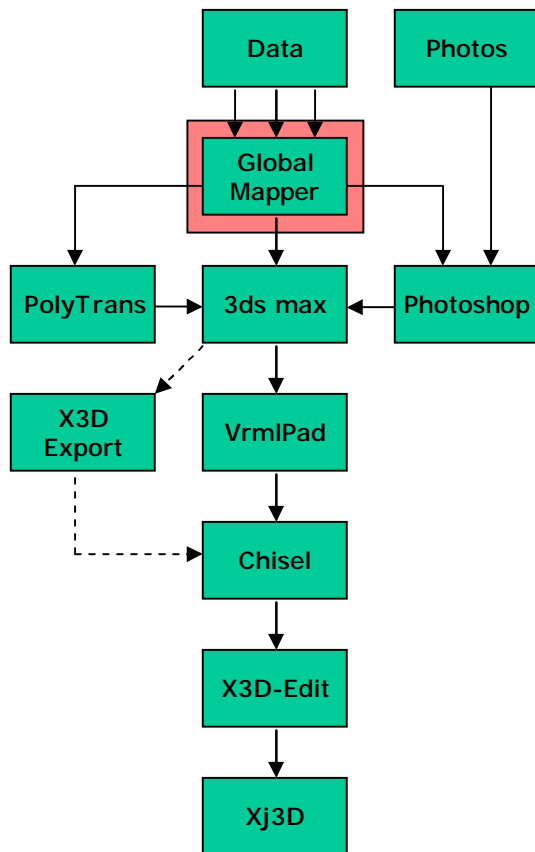
Types of Data

- ü Terrain: DEM, DTED2, Contours
- ü Imagery: MrSID, GeoTIFF
- ü CAD Drawings: DXF , DWG
- ü GIS Data: ESRI, ERDAS, etc.
- ü Bathymetry: Contours, Soundings
- ü Photos: JPEG
- ü Paper Drawings: Raster Images

Data Sources

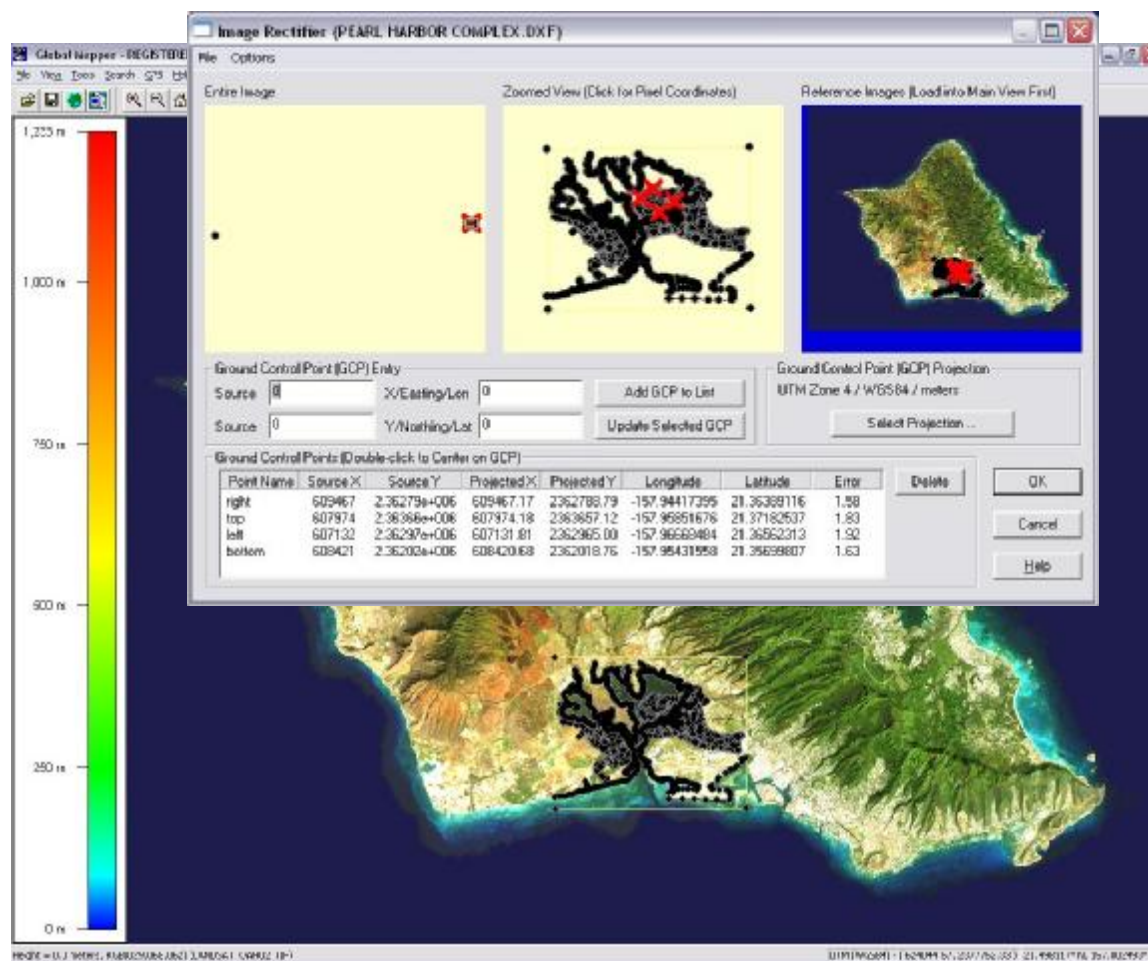
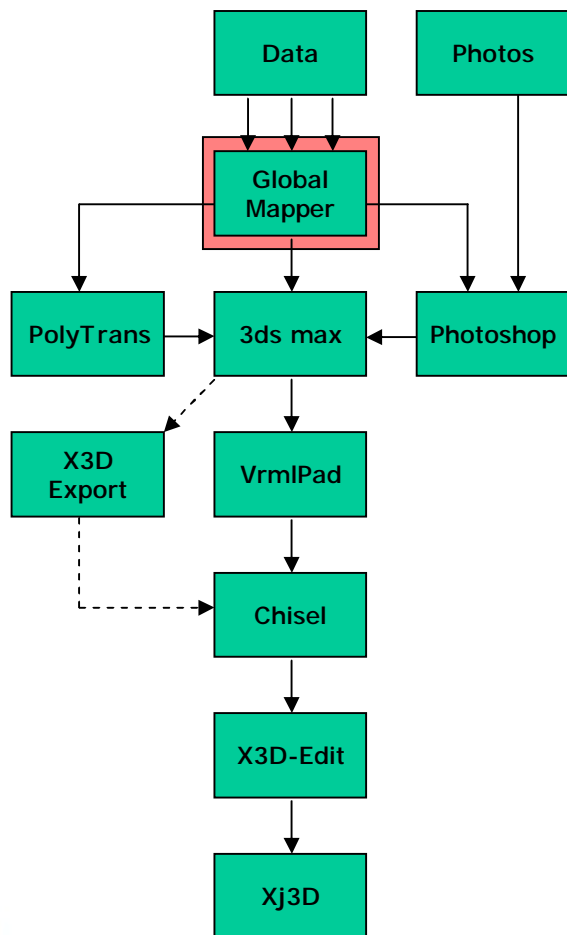
- ü USGS
- ü NGA
- ü Navy Region GIS Centers of Excellence
- ü Local Base: Engineering Division
- ü Commercial (Space Imaging, etc.)
- ü Internet (beware copyright, Ref. only)

Import Terrain & Imagery Data

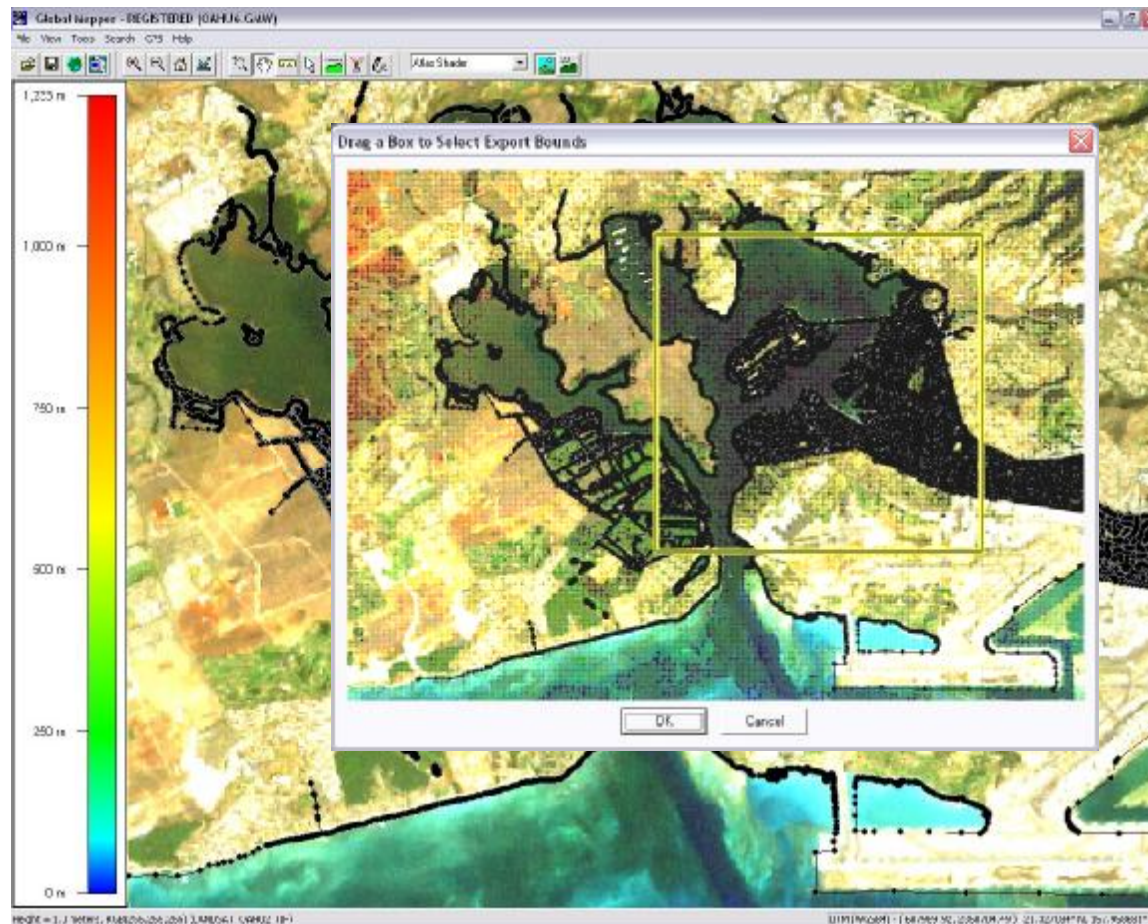
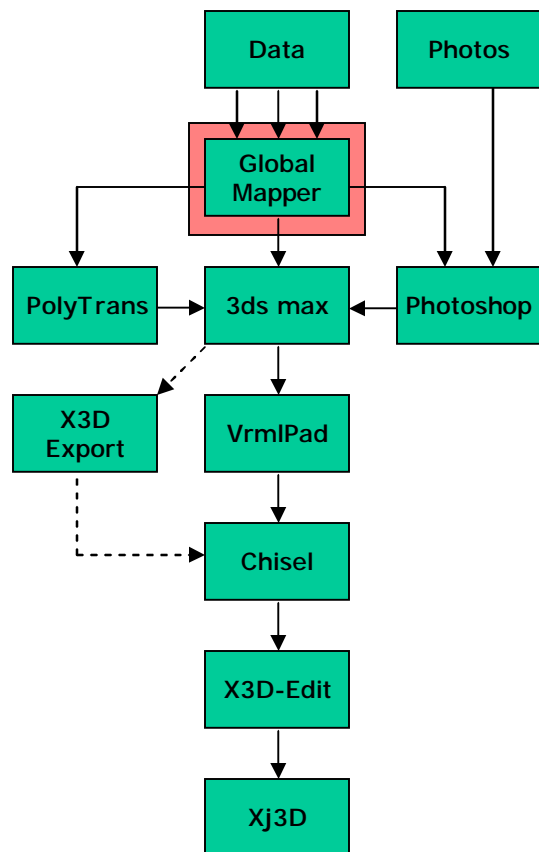


- Ø Projection – Latitude/Longitude vs. UTM
- Ø Datum – NAD27, NAD83, WGS84
- Ø Units – Inches, Feet, Meters

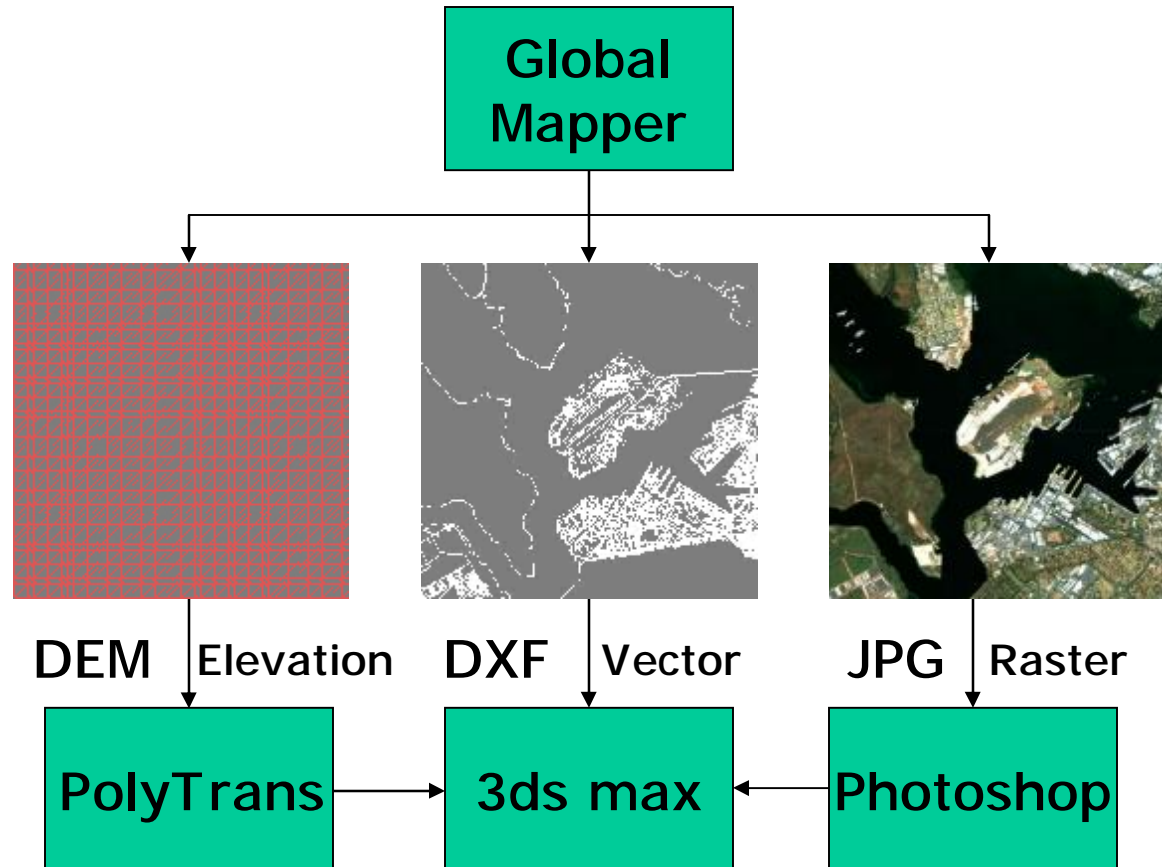
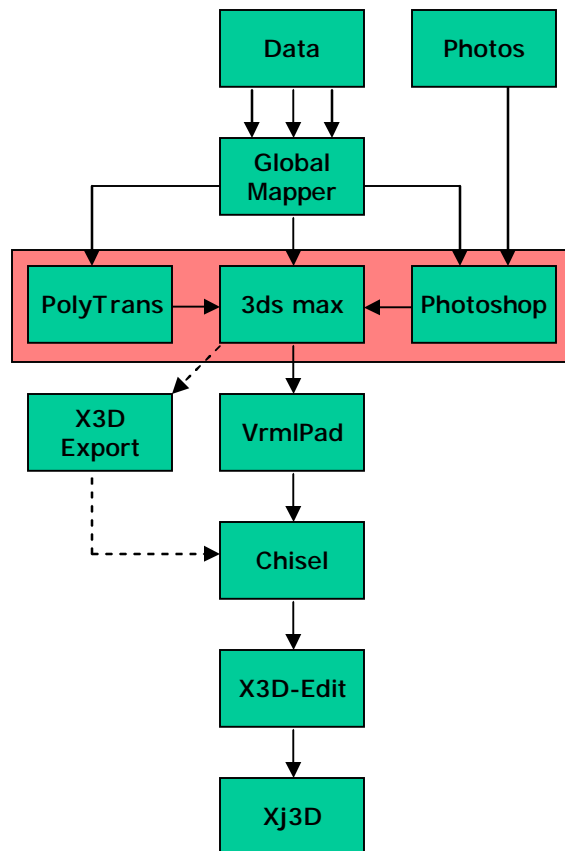
Import & Rectify CAD Base Map Drawings



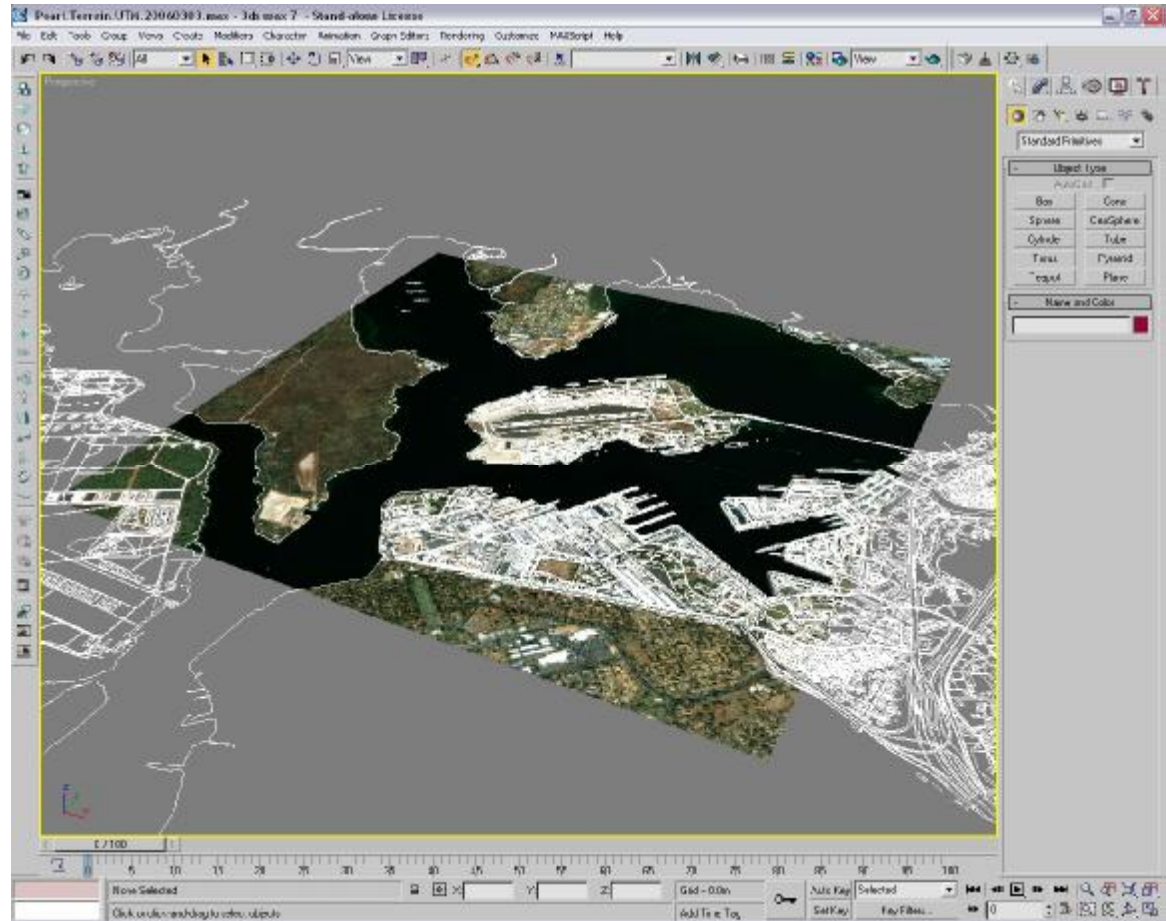
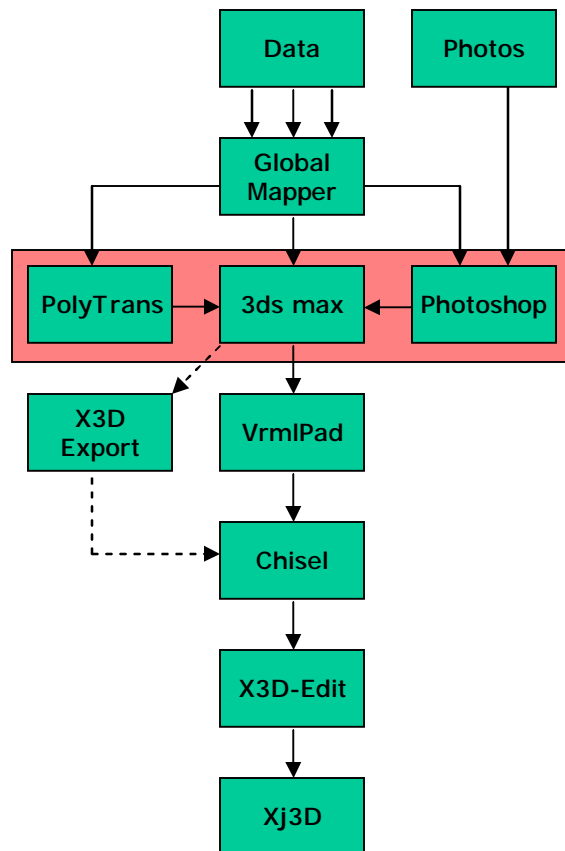
Zoom to Area of Interest and Define Export Bounds



3D Spatial Modeling

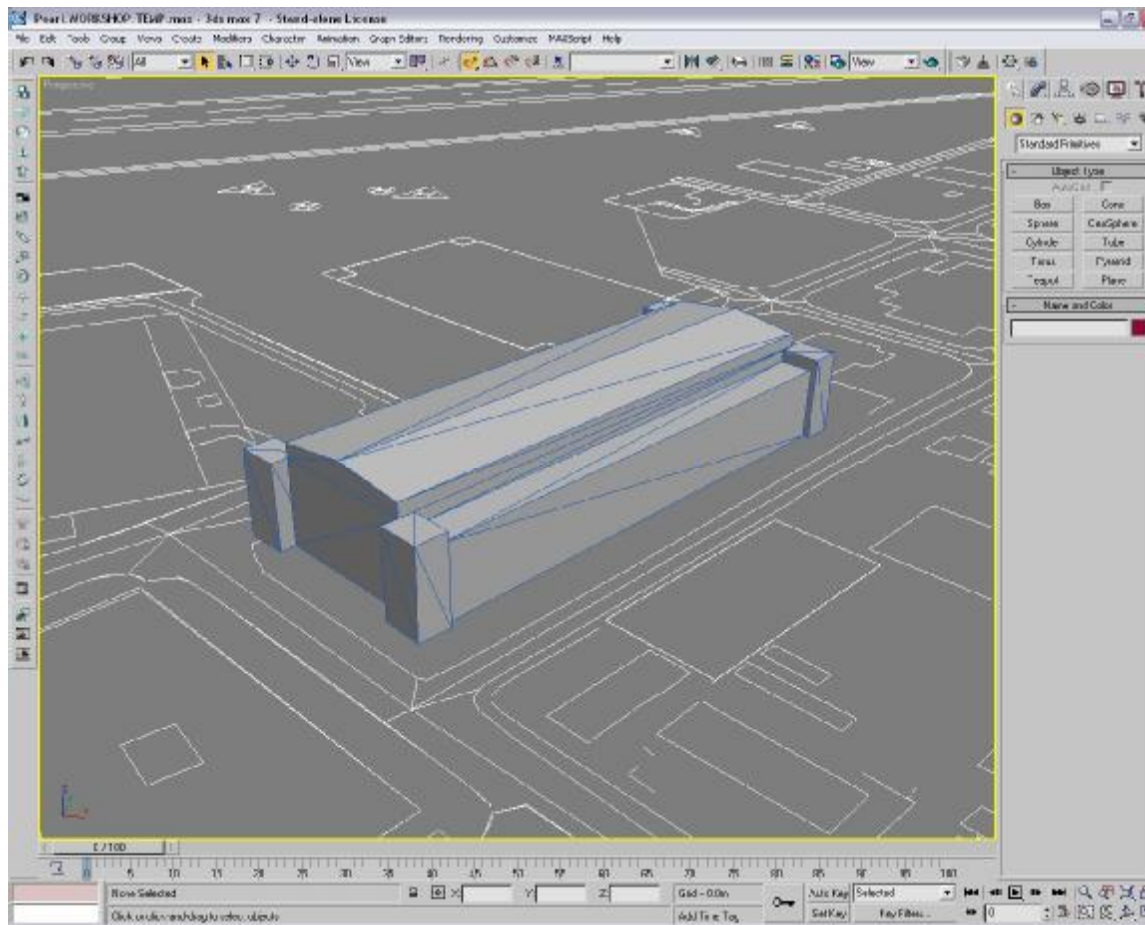
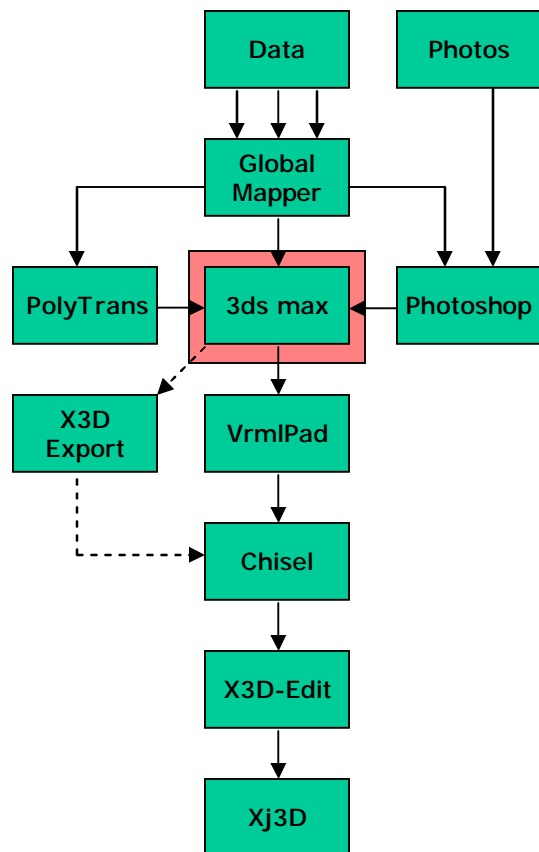


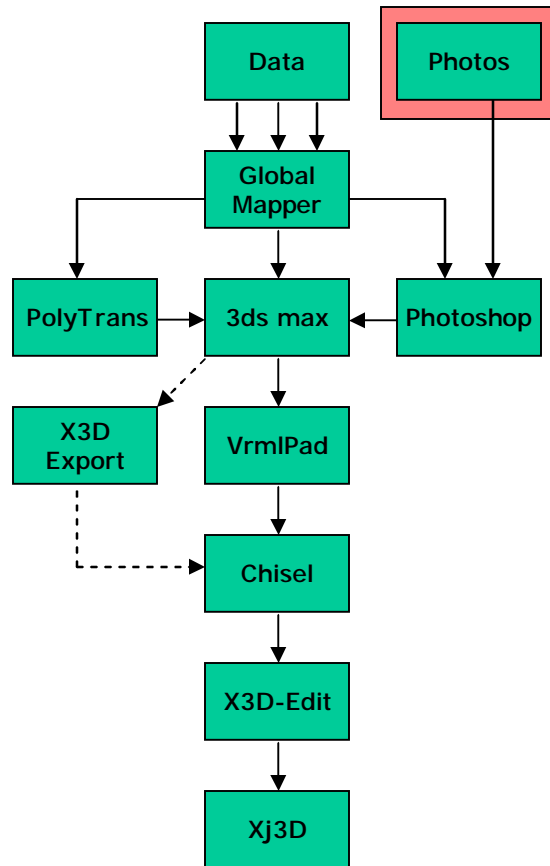
3D Spatial Modeling



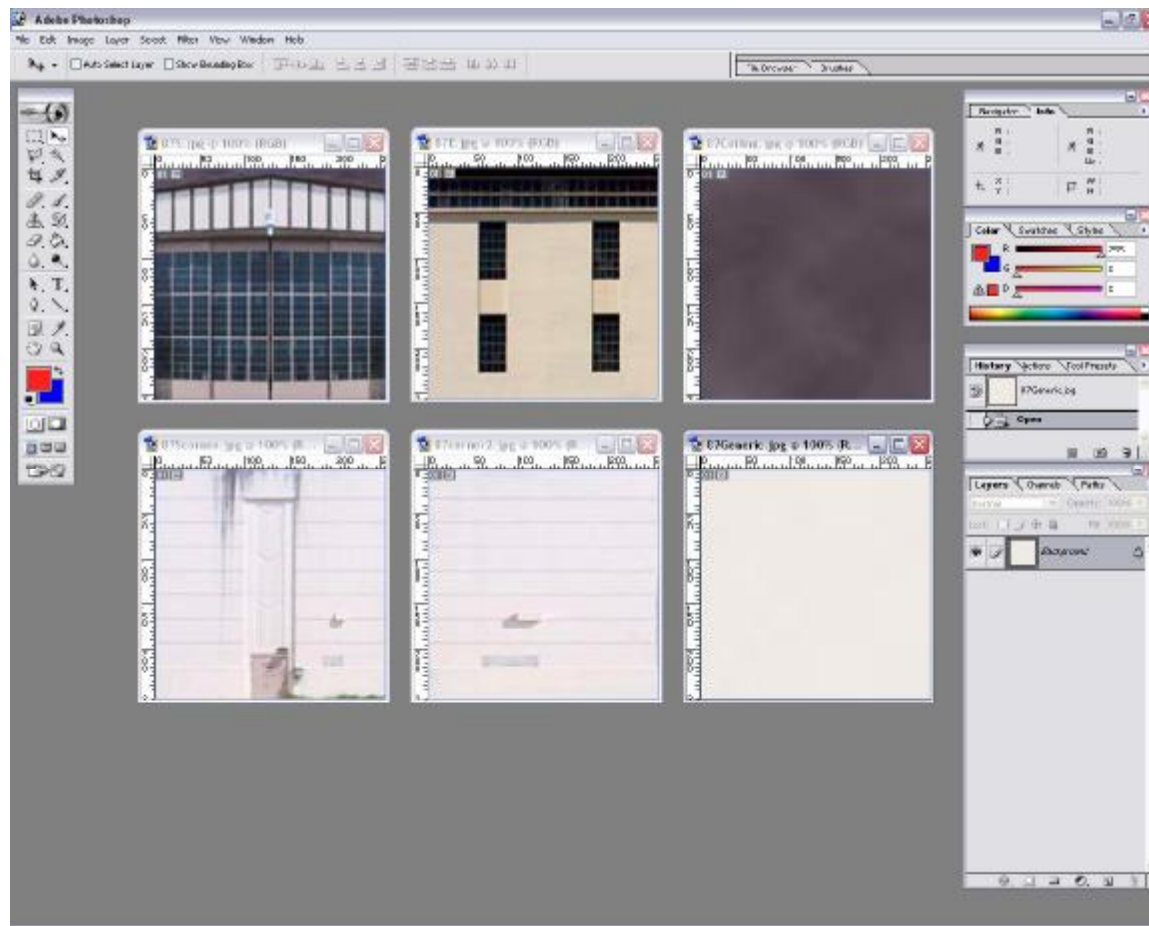
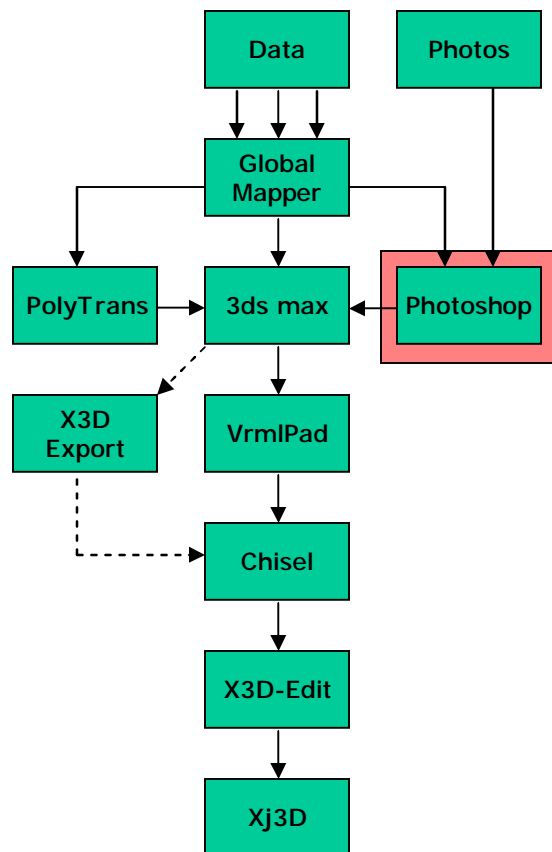
Elevation (DEM) + Raster (JPG) + Vector (DXF)

Zoom to Building Level and Extrude Footprint

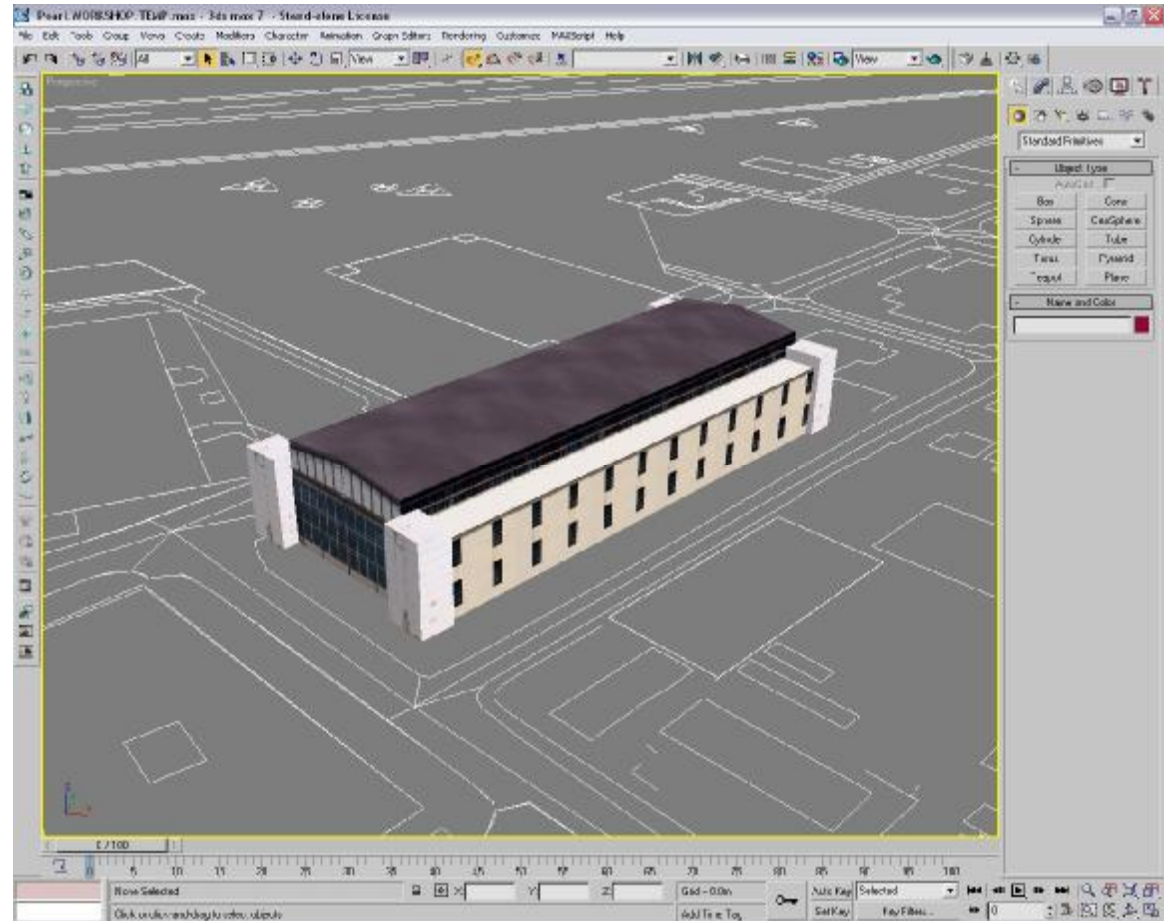
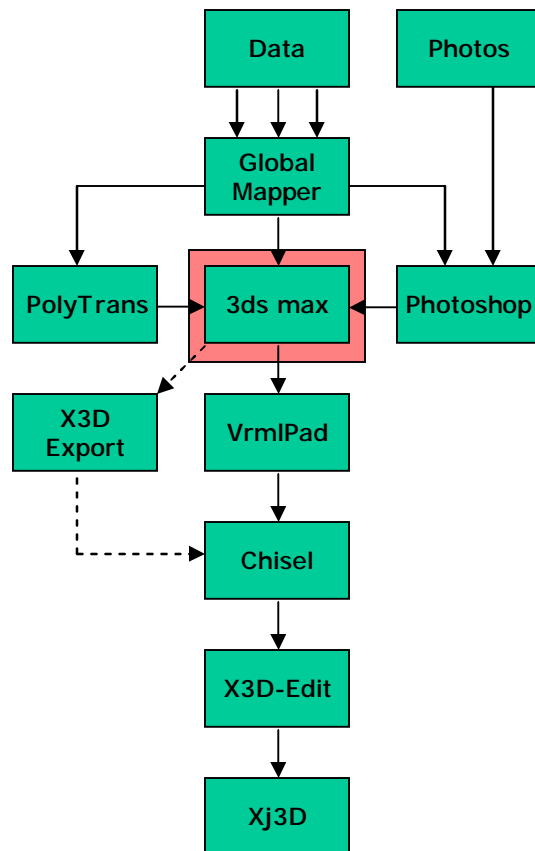


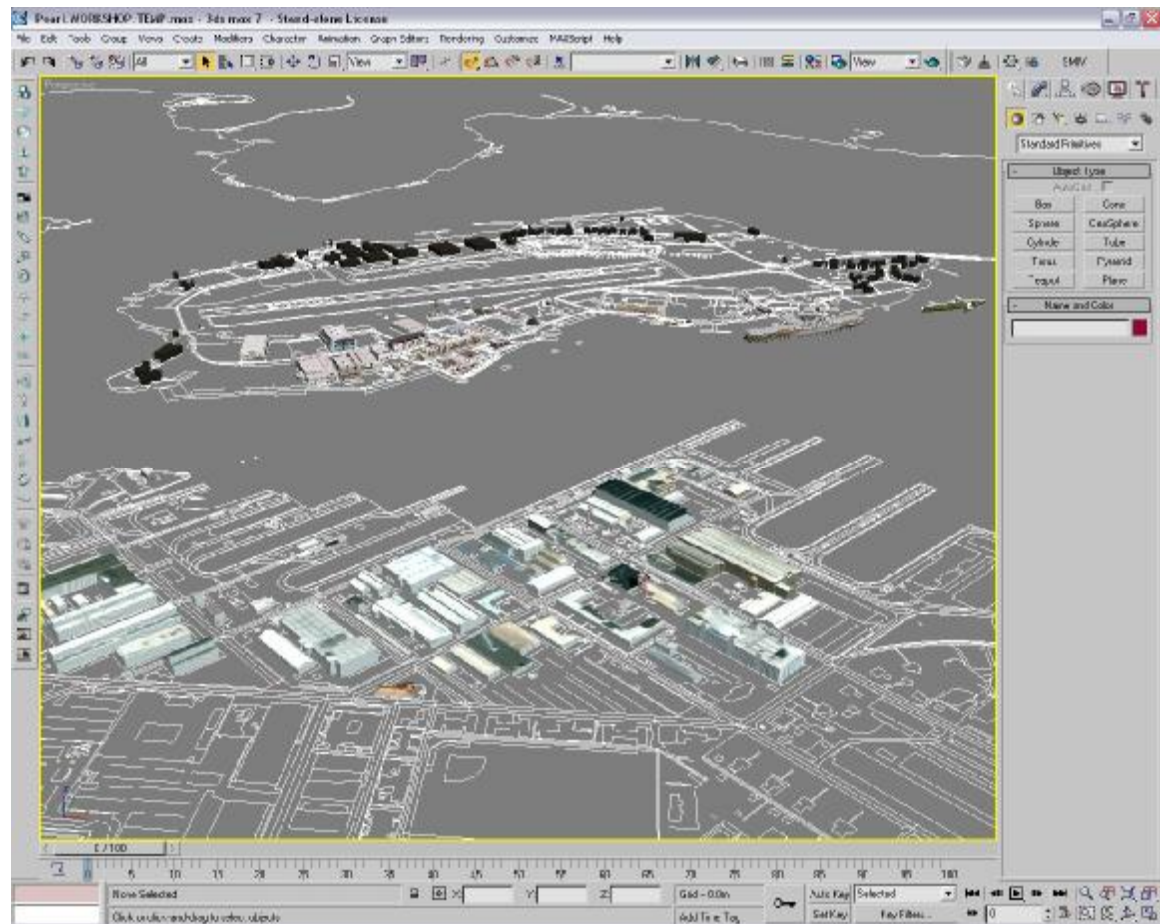
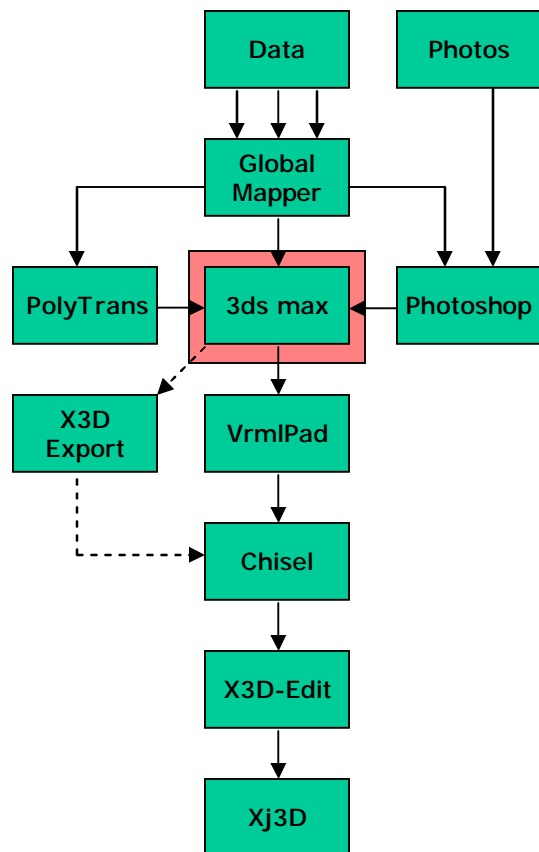


Edit and Extract Texture Maps from Reference Photos

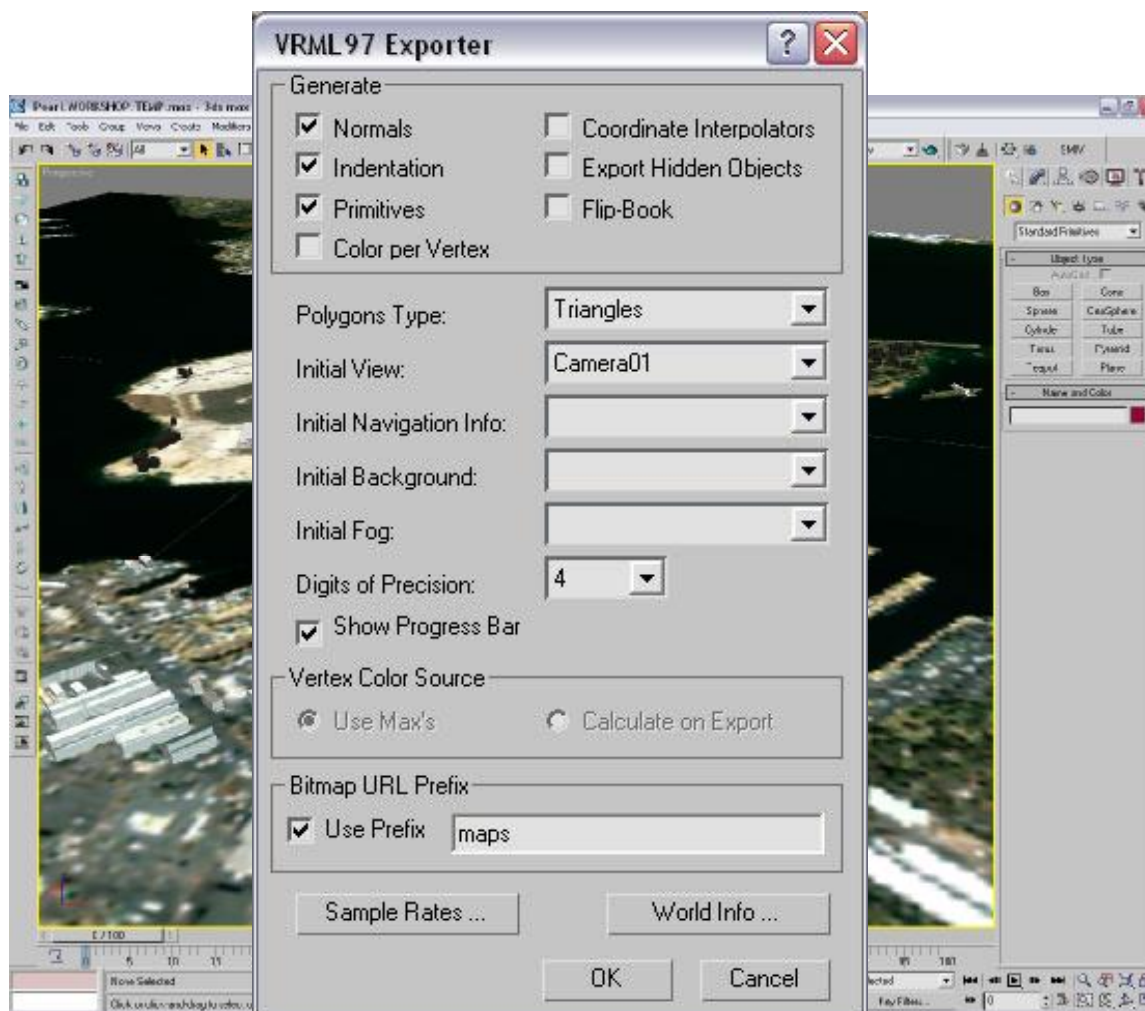
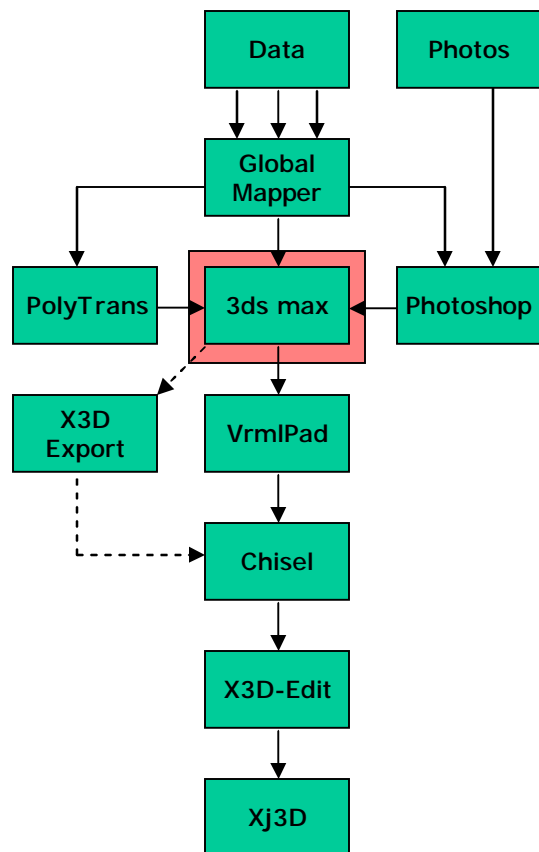


Apply Texture Maps to 3D Models

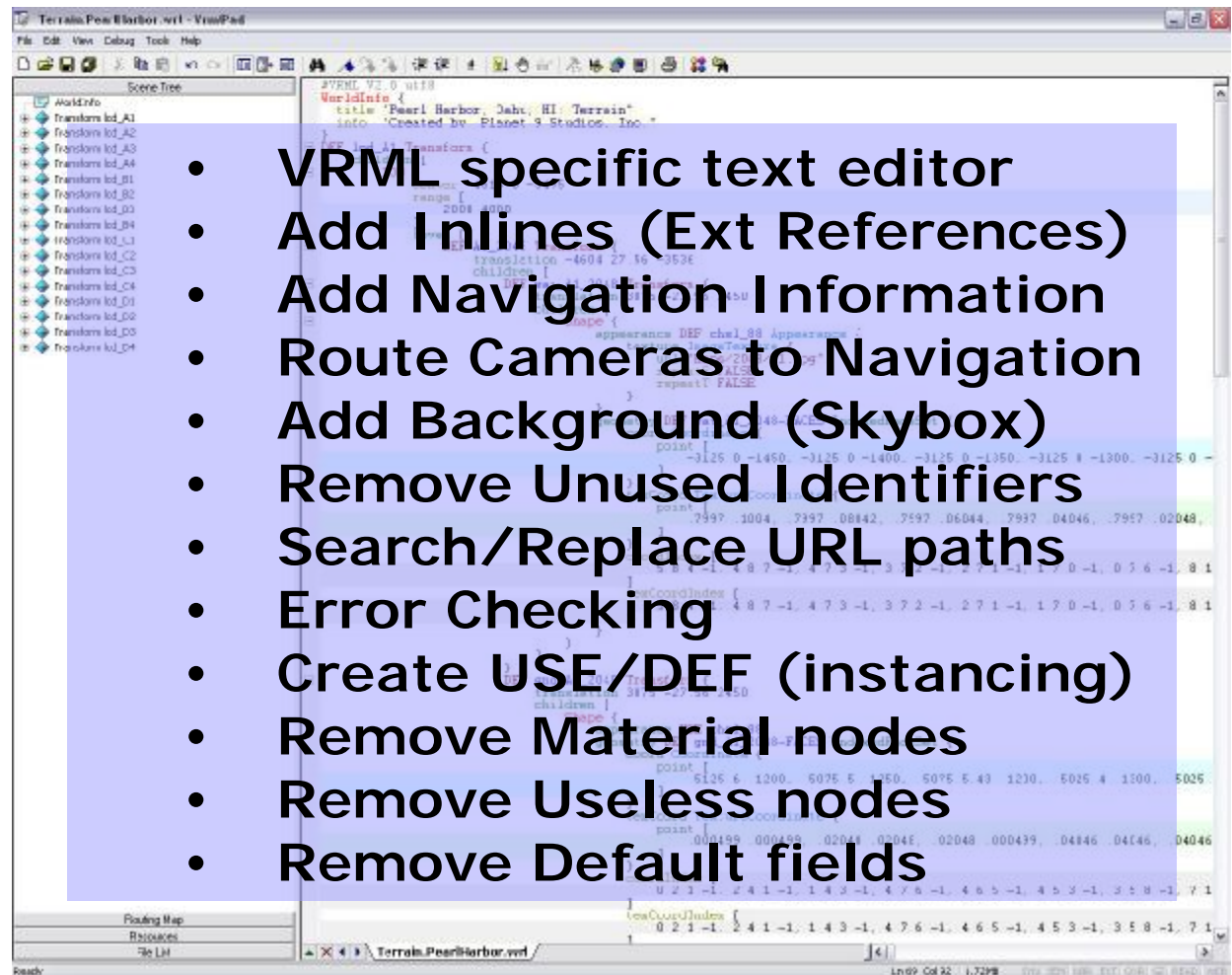
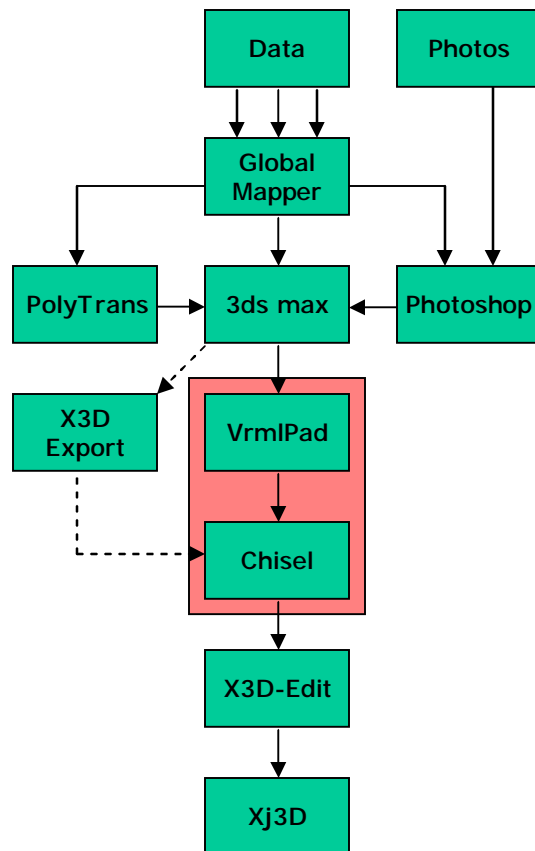




Export Data to VRML97

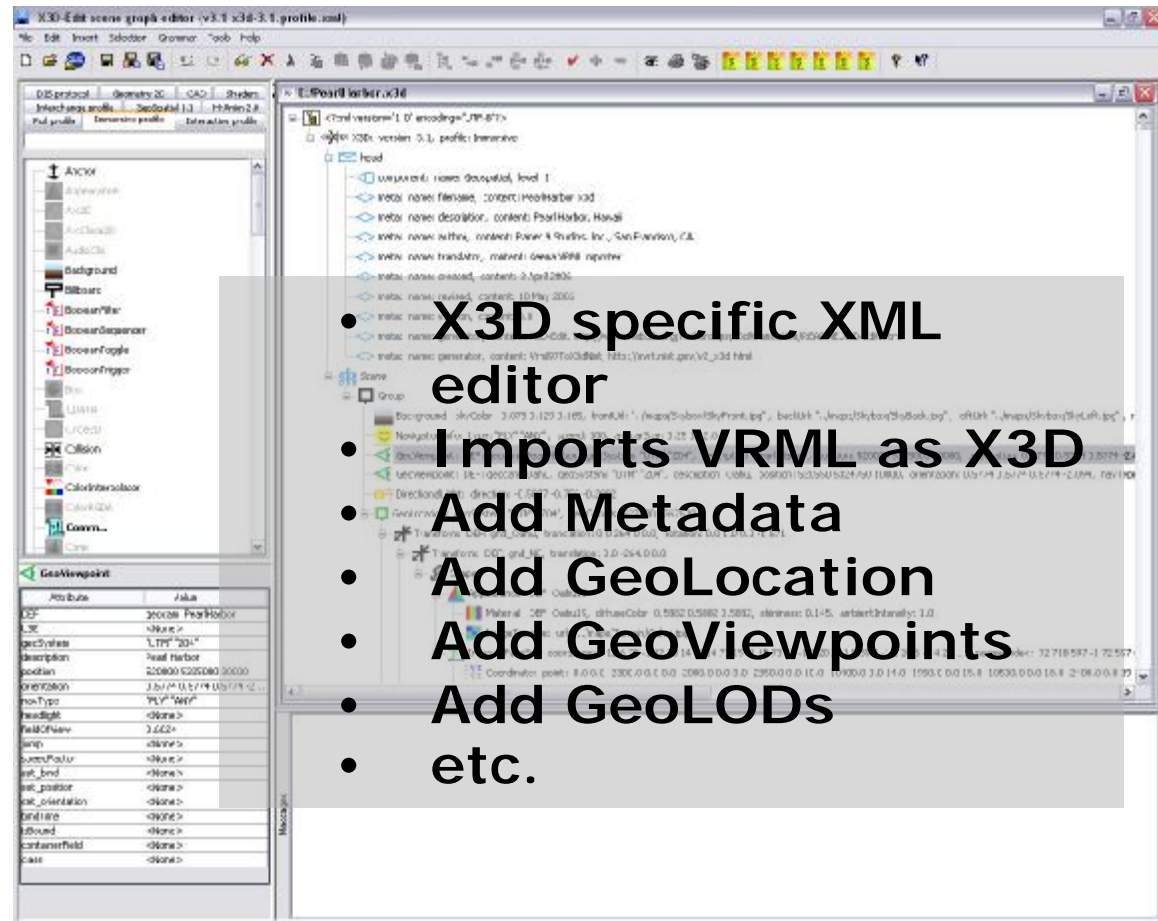
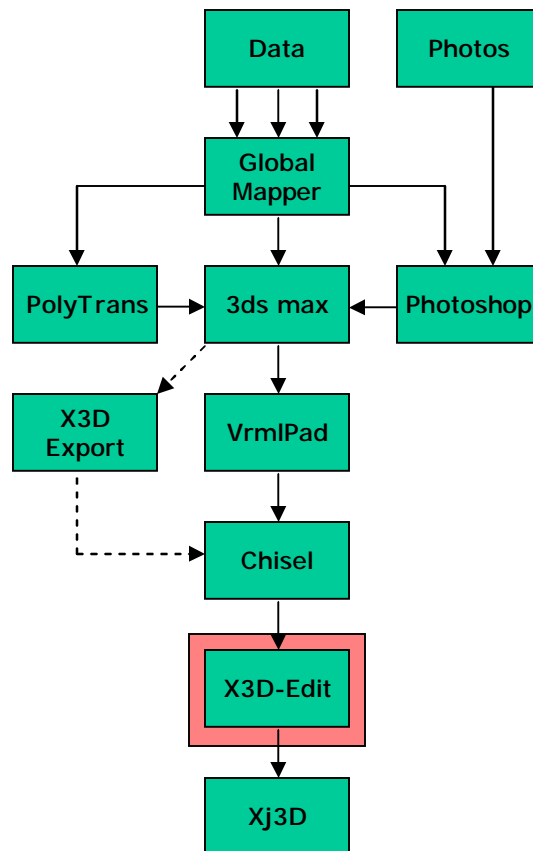


Edit & Optimize VRML File

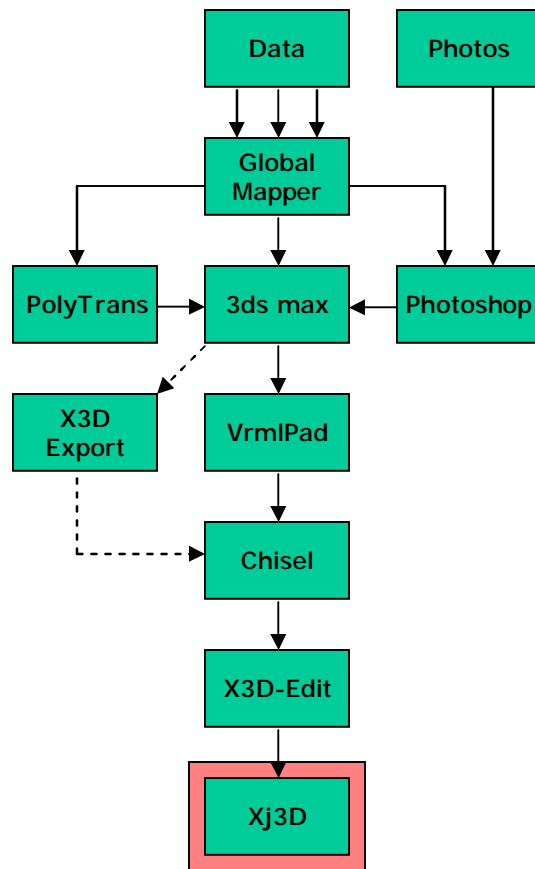


- VRML specific text editor
- Add Inlines (Ext References)
- Add Navigation Information
- Route Cameras to Navigation
- Add Background (Skybox)
- Remove Unused Identifiers
- Search/Replace URL paths
- Error Checking
- Create USE/DEF (instancing)
- Remove Material nodes
- Remove Useless nodes
- Remove Default fields

Import VRML into X3D Code and Edit



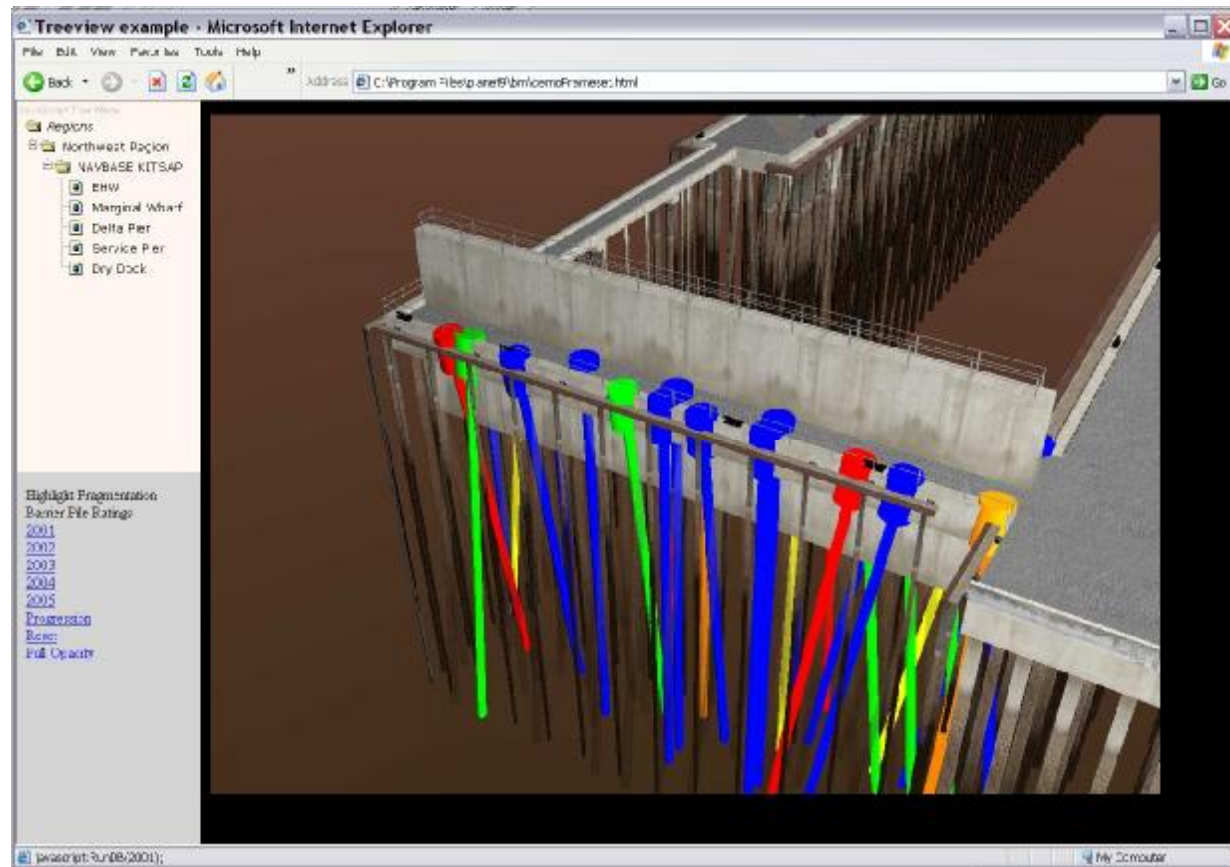
Finalize 3D Model Interface



Example Projects



Inspection Data Interoperability



This waterfront facility BIM has links to individual structural elements, which are populated by inspection data and color coded to represent current and future structural conditions.



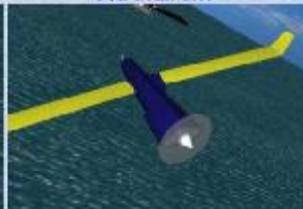
Anti-Terrorist Force Protection

SAVAGE - Scenario Authoring & Visualization for Advanced Graphical Environments

Terrorist Threat



Sea Scan UAV



Sea Fox USV



Harbor Planning



Force Protection



Threats Neutralized



Extensible 3D (X3D) Visualizations
Design large-scale simulation experiments
Analysis guides AT/FP planners, defenders

Agent-based tactics for defenders, attackers, neutrals
Physics-based sensors, collisions, damage assessments
Support for harbor planning, defense & visiting ships in port

**Naval
Postgraduate School**

Waterside Security Project



THE MOVES INSTITUTE
NAVAL POSTGRADUATE SCHOOL

contact: smazman@nps.navy.mil

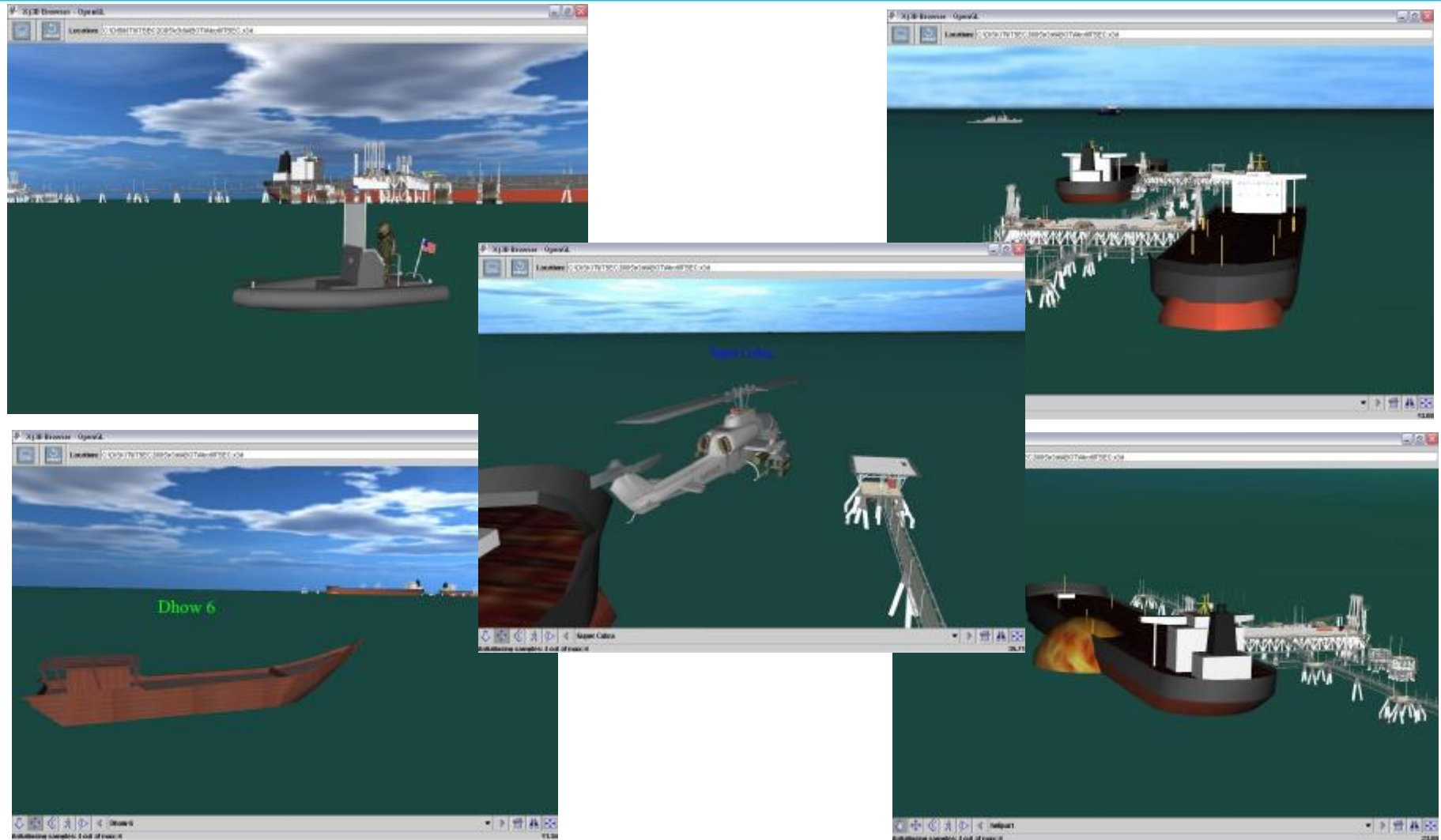


夢 Yumetech

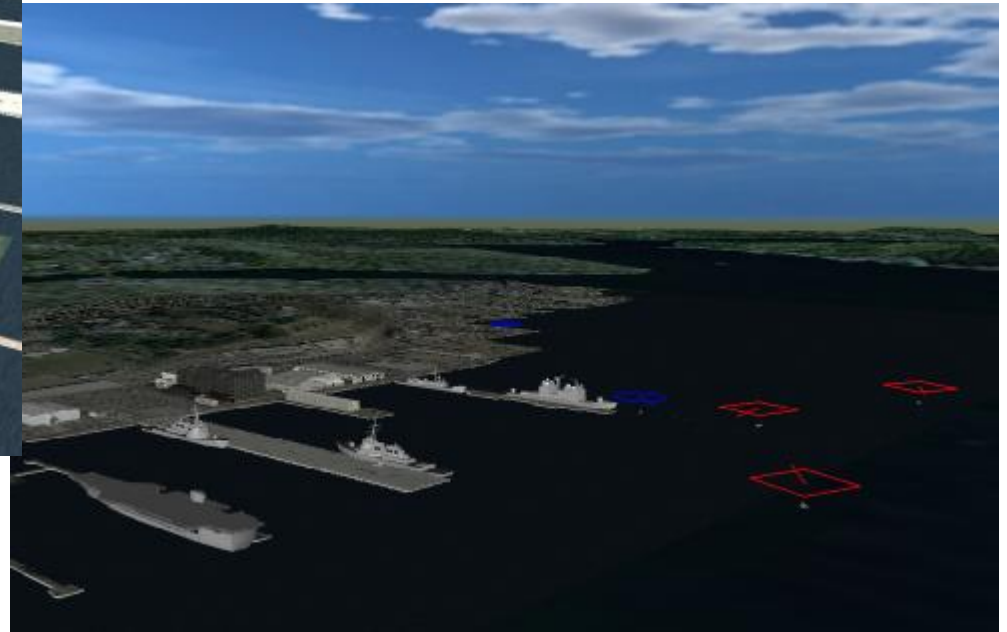


web 3D
CONSORTIUM

Port Threat Assessment



Gulf Oil Platform – Anti-Terrorist Trainer



Navy Base Anti-Terrorist Trainer



Virtual Friday Harbor – Port Management Tool

Virtual Earth Viewer for Navy Waterfront Facilities

COMMANDER NAVY INSTALLATIONS
MSF Yokosuka

VIEWPOINTS
MSF Overview
J-530 Overhead
J-530 #1
J-530 #2
Yokosuka #1
Yokosuka #2
Fly_Through
Linked Object Viewpoints:
Deagussing Range

Engineering Data Planning Status Photos Plan View Help

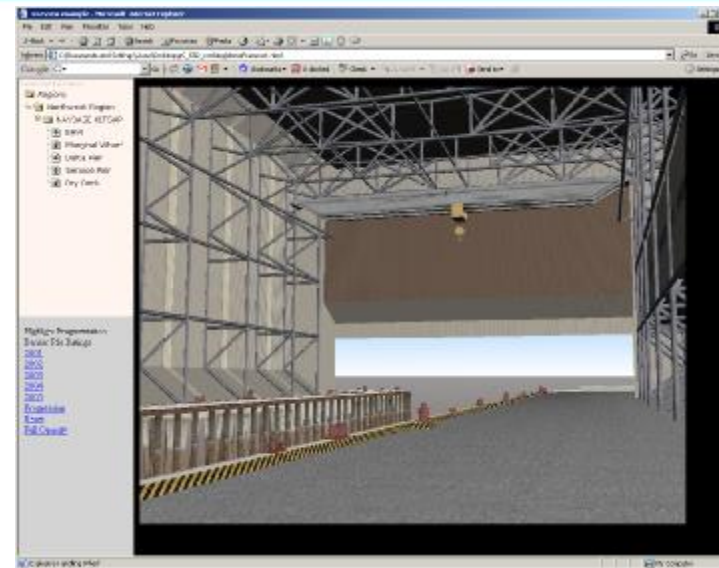
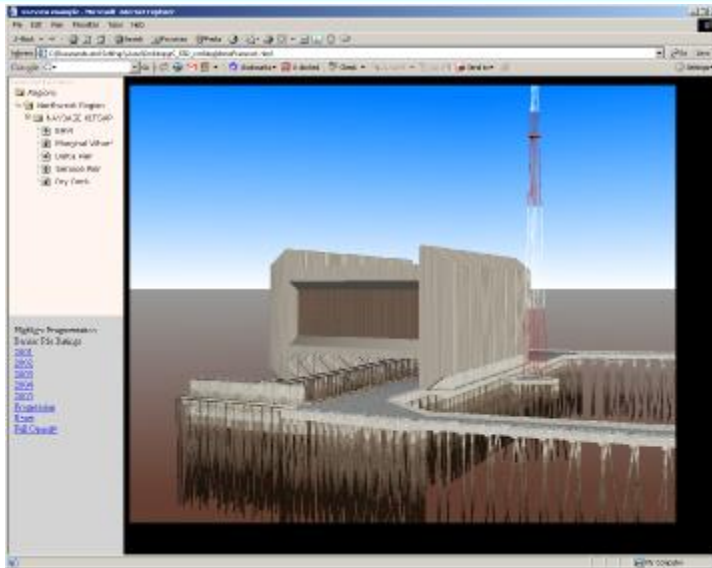
Configuration Item #5
Magnetometer Support Device (MSD)
[CI-05_MSD.pdf](#)
[\(CS\) Details.pdf](#)
[Project Completion Report](#)

Design Details

Vendor Information

Inspection Reports

Lessons Learned



- Ø Existing geospatial data sets from the built environment can be translated into interoperable, web-based 3D BIM data interfaces.
- Ø Production costs are level of detail dependent, and have ranged from \$15K for a single facility to \$150K for a waterfront complex.
- Ø Next step is to enable integration with facility lifecycle process data sources.
- Ø Open source formats play well with others.
- Ø Scalable and distributable data interface tool that can support A/E/C, FM and AT/FP simulation.
- Ø Build the BIM graphical data interfaces on the front end of the A/E/C process!

Thank You!



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