State & Synchrony in Web VWs: 2012 Update
Virtual Worlds on the Web: Web3D 2012 Workshop
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Networked Computer Culture

• Its Possible: ‘Cyberspace’
• Its Cool: ‘Metaverse’
  – Facebook, Second Life, ...
• Its Here:
  – Virtual Worlds
  – Mobile devices & situated awareness

– **BUT IT’S NOT!**
Virtual World Content

Decades of innovation
• Art, Engineering, Consumer

The ISO standards
• X3D
• H-Anim
• VRML
Scene graph for real-time interactive delivery of virtual environments over the web:

- Meshes, lights, materials, textures, shaders
- Integrated video, audio
- Animation
- Interaction
- Scripts & Behaviors

- Multiple encodings (ISO = XML, VRML-Classic, Binary)
- Multiple Application Programming Interfaces (ISO = ECMA, Java)

- X3D 3.3 includes examples for Volume rendering, CAD and Geospatial support!
Sharing Online

A shared world requires:

• scene updates are passed among participants via messages describing:
  – Entities
  – Events
• updates to be managed by regions and filtered by LOD or some other criteria
• considering update rate
Frontiers (circa 1998)

- Vnet
- DeepMatrix v1
Colonizing

- ColonyCity, Cybertown
- Canal++
Empire Building

- Vivaty
  -> Microsoft

- DarkStar (Sun)
  -> RedDwarf
MPEG-4 BIFS

• Binary Interchange Format for Scenes:
• A patented streaming protocol using compressed (binary) X3D content
Populating

- Avatar Studio
- Vivaty Studio
- Seamless3D
Populating

- H-Anim 1.0 vs.
  - segmented
- H-Anim 1.1 (proposed)
  - Bones and skin
- Avatar structure bound to VRML and X3D and its runtime APIs
  (EAI, SAI via EcmaScript and Java)
Easter Island...

- Where did they go?
- Lost civilizations
Wild Wild West (again)

Nature abhors a vacuum...

- a new generation of colonizers
  - Be There (RIP)
  - Second Life
  - Teleplace
  - Vastpark
  - OLIVE
  - Avaya
  - ...

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State of the Art

• Participants & Communities
  – FCVW
  – V-Gov
  – Immersive Education
  – ...

• Technology (VRML and X3D content still working!)
  – DeepMatrix
  – BitManagement
  – OpenDIS
• V-Gov
• USDA hosting 4 different VW engines for US Federal Agencies (none are SL)
• Corresponding conference event @ National Defense University (4 years+)
• Neither worlds nor avatars are portable – the pain is real!
Other Action

• Immersive Education initiative helping SL Refugees:

• IEEE WG on Best Practices for model interchange:
  – [http://www.metaversestandards.org](http://www.metaversestandards.org)
MMORPGs

• Leelh.com – over 30,000 players!
RayGun™ is a White Label Software Platform for Navigation, Social Networking and Friend Finding Running on PC’s, In Car Systems, PND’s and Cell Phones
RayGun on iPhone with THE DARK DESIGN Game

Kyoto, Japan

San Francisco, with Clue

London
Mobile Multi-user X3D on IPad (Raygun)
COVISE / OpenCover

- A proven and mature platform for distributed (VRML and X3D based) VR for HPC and VR visualization
  - [http://www.hlrs.de/organization/av/vis/covise/](http://www.hlrs.de/organization/av/vis/covise/)
Distributed Interactive Simulation (DIS)

DIS is an IEEE standard (IEEE-1278.1) developed by the Simulation Interoperability Standards Group (SISO) and approved by IEEE. It is very widely used in real time, virtual world military simulations.
DIS

- DIS is a network protocol. It describes the exact layout of a few dozen Protocol Data Units (PDUs) that contain information about the position and orientation of entities in the world, and more

- ESPDU refers to Entity-State PDUs

- Articulated Parameters provide space for other messages (eg OpenSim?)
DIS

- Velocity field allows for dead-reckoning
- DIS is supported in X3D Edit, Xj3D
- X3D-Edit has DIS recording and playback
- Demonstrated w/ DarkStar / Red Dwarf and Multi-cast
X3D specification: DIS support

DIS component includes following X3D nodes:
- EspduTransform, ReceiverPdu, SignalPdu, TransmitterPdu, DISEntityTypeManager, DISEntityTypeMapping

DIS PDU message types
- Collision, Detonate, Entity State, Fire, Receiver, Signal and Transmitter
- Numerous other DIS PDUs defined by DIS protocol, but corresponding X3D mappings are not defined.
Open-DIS

- DIS examples in X3D examples archive
- BSD license
- Java, C++, C#, Objective C
- http://open-dis.sourceforge.net/Open-DIS.html
Open-DIS on Mac

Objective C version of Open-DIS able to run on iPhone, iPad

Screen snapshot shows PDU tracks superimposed on Google Maps using iPhone Simulator
Red Dwarf

- Enterprise–scale multi-user game server
- Originally developed by Sun (Dark Star), now on SourceForge
- Protocol-agnostic (and map-able!)
- Integrates messages across several ports
- Demonstrated with DIS & X3D (NPS)
For More

• See References at end

• DIS slides in Advanced X3D at:
  – www.x3dgraphics.com
Virginia Tech

- Collaboration Services for HPC users
- A common infrastructure
- Testing DeepMatrix and Bitmanagement’s Collaborate
DeepMatrix.org

- Thanks Gerhard Reitmayr, Geometrek
- GPL in 2003
- Uses Java EAI
- Newly updated
- Current distro works with Instant Reality
Bitmanagement

Add to file:

• BSCollaborate {
  – connection NetConnection {
    address “metagrid1.edu”
    port 14140  protocol 3
  – }
• + Scripts for authentication, avatar management, chat
Goals

+ Ease of Publication
+ Ease of Client install
+ Ease of content distribution
+ Ease of avatar & gesture creation

Challenges

- Licensing
- “Put that there”
Collaborate

• Web3D Consortium Strategies
  – Protocol-agnostic nodes
  – Improve use of HTTP

• Other notable efforts RE Avatars:
  – VastPark OpenAvatar SDK
  – Evolver.com
  – OpenSim
Embrace Protocols

- Distributed Interactive Simulation
- ...
- SWAMP
- Bubblecloud
- OpenSim

- Red Dwarf can bridge between several protocols and ports!
Improve X3D’s use of HTTP

9.3.2 X3DUrlObject

X3DUrlObject {
  MFString [in,out] url [] [URI]
  SFBool [in,out] load TRUE
  SFTime [in,out] refresh -1
}


Privacy & Security

• A major concern in virtual worlds
• Authenticating participants and their roles
• With the logs and transcripts?
• Position X3D Binary as data-centric security layer with authentication and encryption
Opportunities

• Participant = Consumer + Producer
• Babelization has reached the point of pain for many VW customers
• WebSockets and services
• Engage other efforts:
  – VastPark’s OpenAvatar SDK
  – OpenSim
  – ...
References

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References

\textit{X3D: Extensible 3D Graphics for Web Authors}
by Don Brutzman and Leonard Daly, Morgan Kaufmann Publishers, April 2007, 468 pages.
\begin{itemize}
\item \url{http://x3dGraphics.com}
\end{itemize}

\textbf{X3D Resources and X3D Basic Examples Archive}
\begin{itemize}
\item \url{http://www.web3d.org/x3d/content/examples/X3dResources.html}
\item \url{http://www.web3d.org/x3d/content/examples/Basic/DistributedInteractiveSimulation}
\end{itemize}
References

X3D-Edit Authoring Tool
• https://savage.nps.edu/X3D-Edit

X3D Scene Authoring Hints
• http://x3dgraphics.com/examples/X3dSceneAuthoringHints.html

X3D Graphics Specification
• http://www.web3d.org/x3d/specifications
• Also available as help pages within X3D-Edit
References 3

SISO Digital Library for DIS

– SISO-REF-020-2008: DIS Plain and Simple Guide
– The Complete DIS PDU Guide (also database)
– Variable Parameter Record Guide (VPRG)
– DIS Version Difference Guide
– SISO-REF-010-2010-RC1 Enumeration and Bit Encoded Values for DIS (500 pages)
References 4


Discussion

- Recent Work
- Consortium Priorities
  - H-Anim WG
  - Motion capture data
  - Alt skeletons (Kinect, etc)