



The 3D Media Internet

Challenges & Solutions

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The Internet Goes 3D Graphics and Media

- **The Web browser**
 - A powerful & ubiquitous application environment – everywhere
- **Everything going 3D and Media**
 - VOIP, TV, cinema, displays, new input devices, ... – everywhere
- **Many-core 3D graphics & media processors**
 - Enables powerful 3D graphics & media processing – everywhere
- **Interactive 3D graphics in Web – coming soon**
 - Must be tightly integrated into the browser – everywhere
 - Our proposal: XML3D – Major success at CeBIT this year
 - New requirements on the networking layers
- ➔ **Major Research Challenges for Future 3D/Media Internet**
 - Scalability, Predictability, Reliability, Adaptivity, Security, Metering, ...

Challenges & Solutions

- **Robust 3D support in the Web browser (XML3D)**
 - Embed 3D in HTML/DOM, enables 3D for ALL Web developers
 - Combine 3D, 2D, and streaming media in one system
 - Provide full interactivity: Presentation, collaboration, simulation, ...
- **Service-oriented communication architecture**
 - Create dynamic adaptive communication flows at app/net layer
 - Integrate security and dependability into the core
 - Embed generic architecture for metering, accounting, and billing
- **Optimized transport protocols**
 - Provide predictable reliability and delay (Adaptive Hybrid EC)
 - Inherently multicast enabled, evolutionary move to smarter routers
 - Provide cross-layer interfaces and optimizations

Optimized Transport Protocols

- **3D Media – the „Core Application“ of the Future Internet**
 - Requirements: High bandwidth + low and guaranteed delay
 - Highly mixed traffic: small, lossy packets – huge, reliable files
 - Likely to exceed Internet infrastructure by 60% to 70%^(*)
- **Transport must follow new paradigm**
 - Predictable Reliability under Predictable Delay (PRPD)
 - Inherently multicast enabled – reduces bandwidth
 - Requires even new theory (capacity for predictable reliability)
- **Our proposals**
 - New AHEC approach: theory and practical implementation
 - Extensions for link-2-link implementation
 - Intelligent routers required, but evolutionary (each single one helps !!!)
 - Cost-based routing and SLAs easily implementable

* Source: http://www.nemertes.com/internet_singularity_delayed_why_limits_internet_capacity_will_stifle_innovation_web



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mpis



Max Planck Institute
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Software Systems

Service-Oriented Network Architecture

- **Current Internet Structure**
 - Fixed mapping of data & requirements to protocols within apps
 - Security and metering added on top and on later
- **Goals: Dynamic & adaptive communication flows**
 - App: Specify data to be transmitted & its network requirements
 - Adaptively mapped to specific network protocols at runtime
 - Isolates applications from changes in network (IPv4 → IPv6)
 - Requires more flexible APIs: To network and within its layers
- **Security and dependability integration**
 - Must support security and dependability as optional requirements
- **Metering, accounting and billing (MAB)**
 - Provide hooks to measure network access at different layers

XML3D: Interactive 3D Media for FI

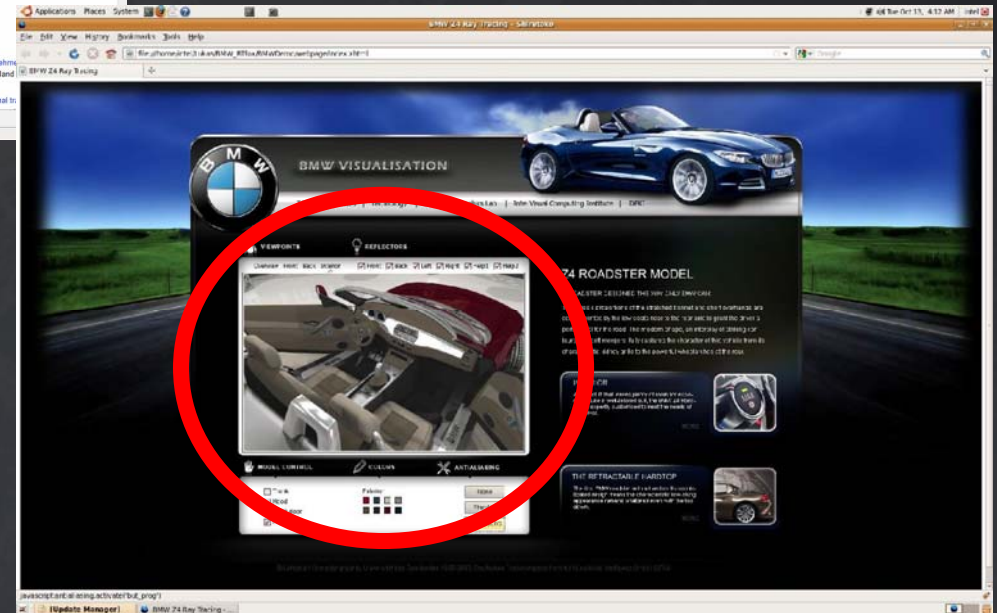
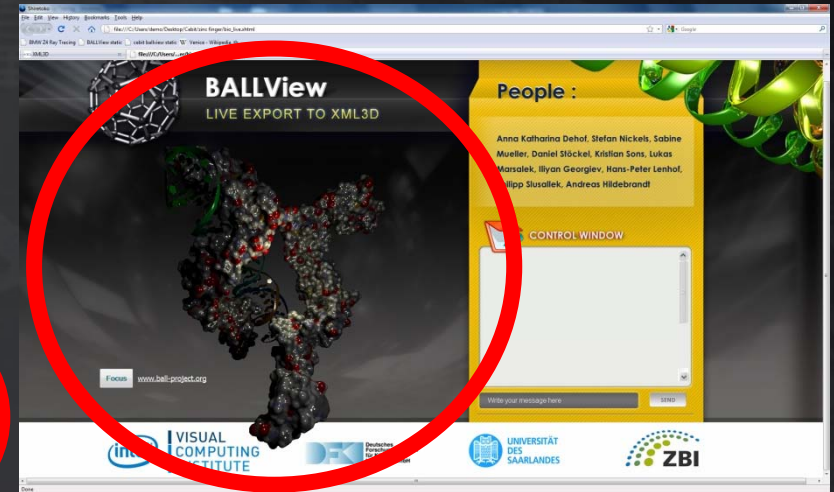
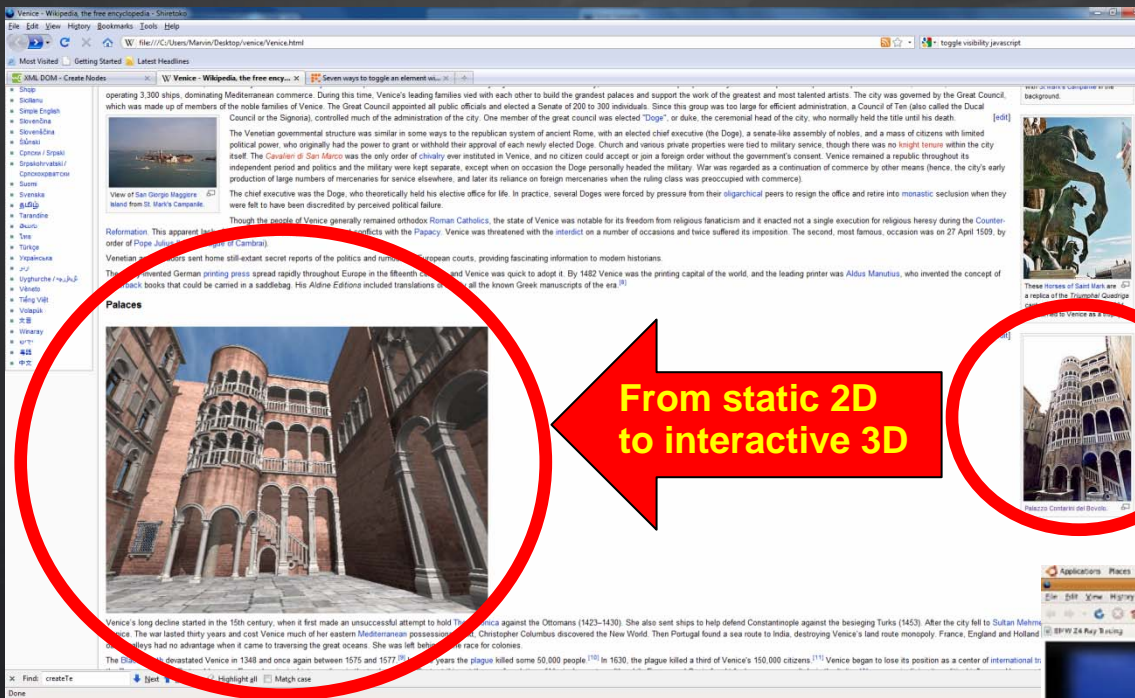
- **3D Media Browser opens the “Next Dimension” for the Internet**
 - Provide common platform for 3D & media integration and interaction
 - Extend HTML directly, but only where required (few new 3D elements)
- **XML3D: Build on top of today’s Web standards (HTML-5)**
 - Reuse current Web standards: DOM, CSS, Ajax, scripting, events, ...
 - Enable all Web programmers to make direct use of new technology
 - Design for today’s GPUs (programmable shading, data layout)
 - Provide industrial-strength graphics (ray tracing, portable shading)
 - Provide common 3D user interaction (touch, gesture, AR, ...)
 - Support for collaborative environments (engineering, games, ...)
- **Build-in support for Server-based Rendering in the Cloud**
 - Used for: Thin client, large model/low bandwidth, IP issues
 - Hybrid content coding: Full spectrum between 3D and image data



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XML3D Prototype in Modified Firefox



Interactive 3D Exploration
of Venetian Palace

→ Could also be the hotel
for your next summer vacation

→ Or your next car experience



The 3D Media Internet

- **Creates Completely new Applications**
 - High-quality interactive 3D product presentations
 - Collaboration engineering & communicating worlds
 - Entertainment & social experiences, ...
- **New Markets: From Gamers only – to all Web Users**
 - Enable new 3D/media capabilities for everyone, everywhere
 - Interactive 3D graphics as a core Web data type
 - Industrial-strength common 3D technology platform
 - Integrate EU research with support for entrepreneurs (via VCs)
- **Enhance Network Layer for new Application**
 - Scalability, Predictability, Reliability, Adaptivity, Security, Metering, ...

→ **EU research and industry is in a unique position to**



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