



Collaviz<sup>®</sup>

# Collaborative Visualization Current Systems and Future Trends

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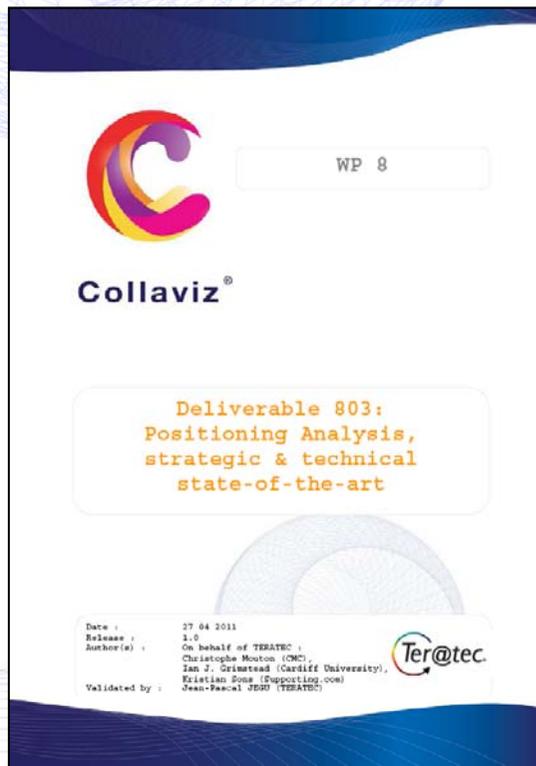
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# A TERATEC report

- An ANR Collaviz Project deliverable
- A scientific paper accepted and presented at the 2011 Web3D ACM conference, june 20-22, Paris





# Agenda

- Positioning of the « collaborative visualization »
- Brief state-of-the-art
- Common issues and challenges
- Towards NextGen Collaborative Visualization



# The tale of being (virtually) here without being there (really) ...

F2F meeting with foreign collaborators



Domestic constraints





# Is a reality ... Almost...

F2F meeting with foreign collaborators



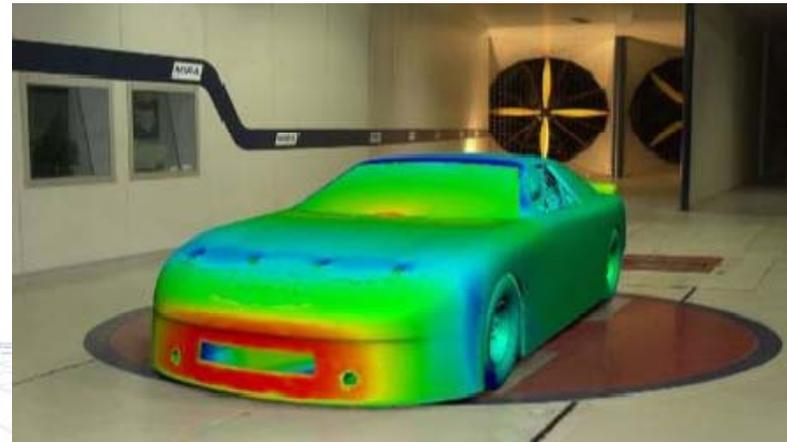
Domestic constraints





# Telepresence and Videoconferencing are great!

- But collaborative tools and visualization are still the key for remote collaboration
- A question of usage and needs :
  - Sharing Office tools : Excel, Word, PowerPoint
    - WebConferencing!
  - What is feasible for CAE?
    - Especially for 3D realtime and interactive software?





# Let's get deeper inside collaborative tools

1. Take your favorite CAE software
2. Try to answer the question :  
"What do I need to share?"





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Case 1 :  
Sharing a point of view on  
a CAD model with an  
engineer in the plant?





# Let's get deeper inside collaborative tools

1. Take your favorite CAE software
2. Try to answer the question :  
"What do I need to share?"

Case 2 :  
Working together with  
another team member on  
the same software?





# Let's get deeper inside collaborative tools

1. Take your favorite C
2. Try to answer the qu  
"What do I need to

Case 1 :  
Sharing a point of view o  
model with an engineer?



her  
e software?





# 2000 : peer to peer collaboration

- NetMeeting – T120 standards
  - Based on local resources and performance
    - OK for Office apps
  - Poor network
    - Not enough bandwidth -> not enough frames per second
      - Forget for Collaborative CAE and videos ☐

BUT

- Have led to recently successful Webconferencing systems : Webex...
  - Around 1-2 images per second for desktop sharing
  - Fit perfectly for remote presentation
  - Not P2P ;-)

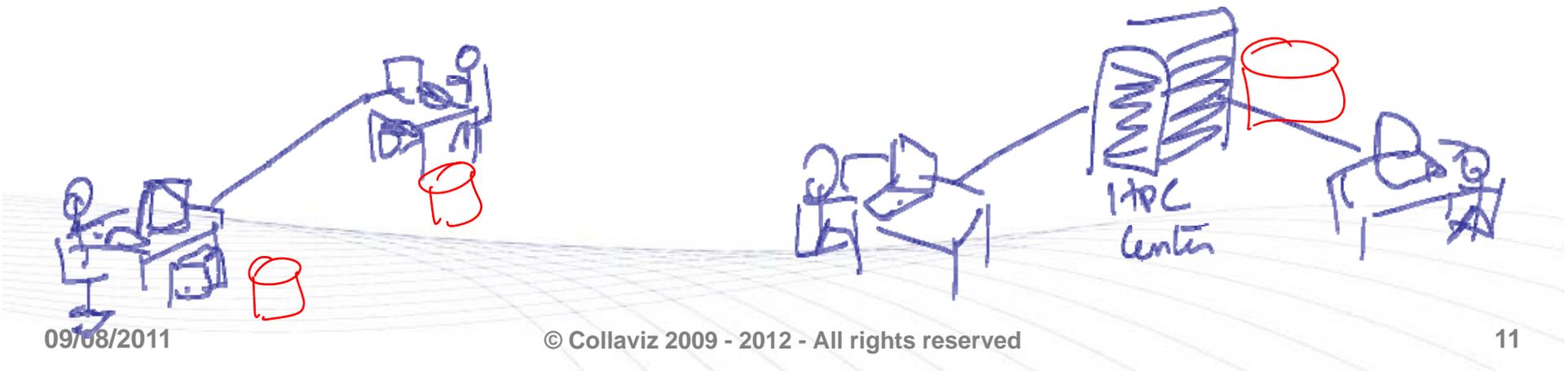


# The collaborative viz challenges

- Remote shared and realtime interactions for CAE software
  - How to achieve 17 fps for Realtime 3D interaction?
- First steps towards collaborative Viz :

CovisE 2000

OPENGL VIZSERVER 2001





# Resource Aware Visualization Environment (“RAVE”) : e-Science and HPC

- A 2005 ~~Cloud~~ <sup>GRID</sup> Computing Project: Test Web Services for collaborative viz.



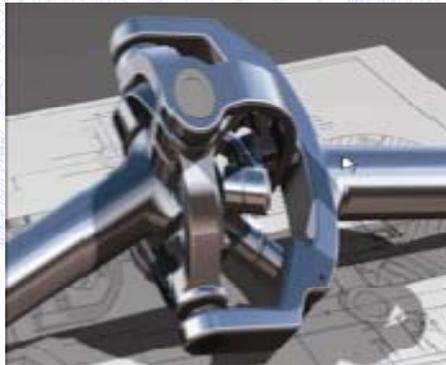


# RAVE: Issues / Lessons Learnt

- Incompatibility with existing applications
  - RAVE “imported” many “standard” data formats
  - But there are many standards...
- People wish to use their existing application
  - Familiarity of use
  - Domain specific controls
- Ideally:  
People want remote resource access / collaboration all through existing application



# 2005-2011 : Lets get the power to meet real business models



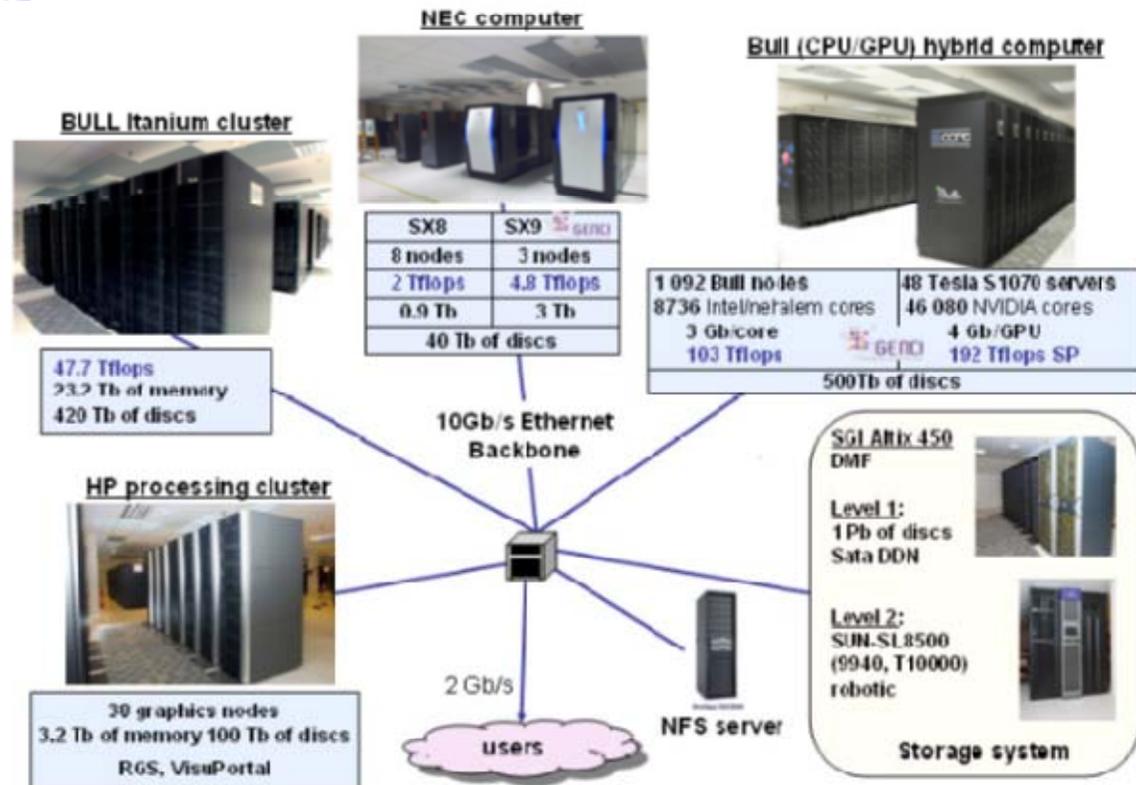
2D + 3D  
✓  
1-2 FPS  
OR  
17 FPS ⚠





# Collab Vis for (Optimising) Business As Usual 1/3

- HPC : Visualizing simulations
  - From 100 000 to x Millions users





# Collab Vis for (Optimising) Business As Usual 1/3

- HPC : Visualizing simulations
  - From 100 000 to x Millions users



**HP processing cluster**

48 Tesla S1070 servers  
16,000 NVIDIA cores  
4 Gb GPU  
102 Tflops SP  
Tb of discs

**38 graphics nodes**  
**3.2 Tb of memory 100 Tb of discs**  
**RGS, VisuPortal**

47.7 Tflops  
23.2 Tb of memory  
420 Tb of discs

30 graphics  
3.2 Tb of memory  
RGS, VisuPortal

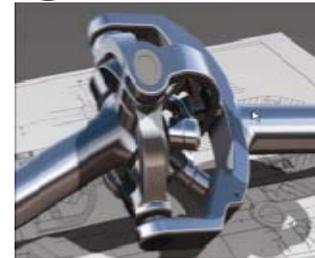
LAB 150  
level 1:  
Tb of discs

storage system



# Collab Vis for (Optimising) Business As Usual 2/3

- CAE : sharing and optimising hardware
  - 100000 - xx Millions users

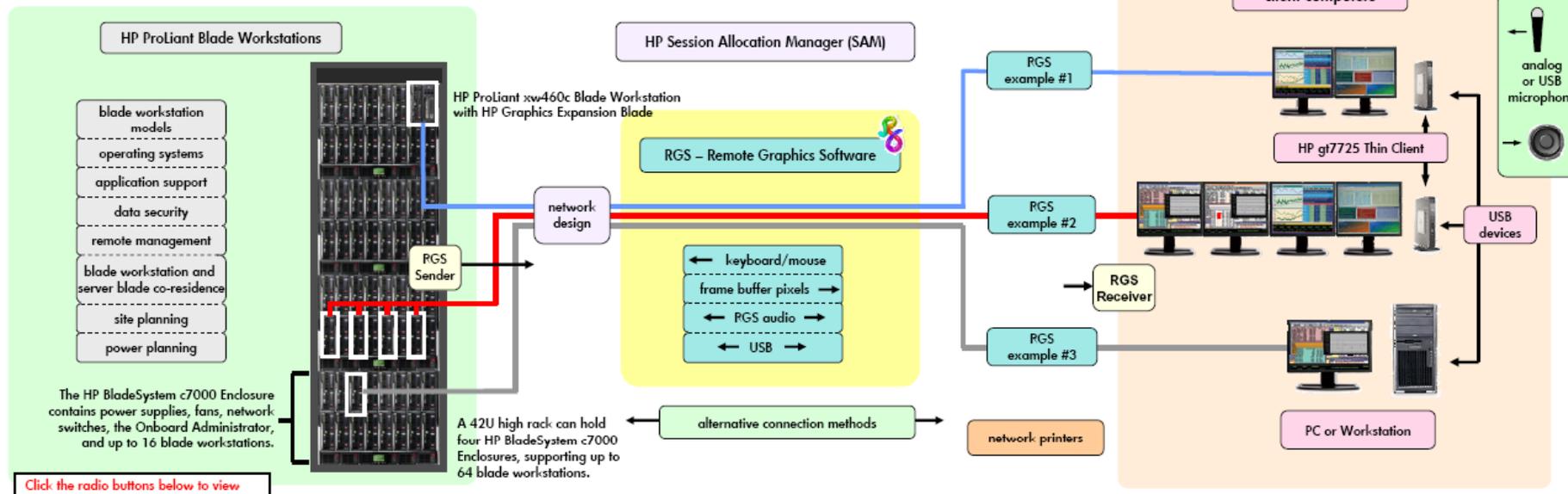


To view additional information, place your mouse over any rounded rectangle button.

Start Here

HP Blade Workstation Solution Architecture

Figure 3-2



Click the radio buttons below to view



# Collab Vis for (Optimising) Business As Usual 3/3

- Gaming : your remote gaming console(s)
  - 100 Millions - x Billions users

THE **ONLIVE** GAME SERVICE  
ANY GAME. ANYTIME. ANYWHERE.

TV  
via  
OnLive MicroConsole

PC  
via  
browser plug-in

MAC  
via  
browser plug-in

The advertisement features a central image of a television displaying the OnLive interface with buttons for 'Arena', 'Profile', 'Games', 'Showcase', 'My Club', 'Last Played', 'Brag Clips', and 'Friends'. Below the TV is an OnLive MicroConsole and a game controller. To the right, a laptop and a smartphone are shown, both displaying the game service interface. The smartphone screen shows a first-person shooter game in progress.

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## VizWorld Video

June 27th, 2011

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0:14 VizWorld

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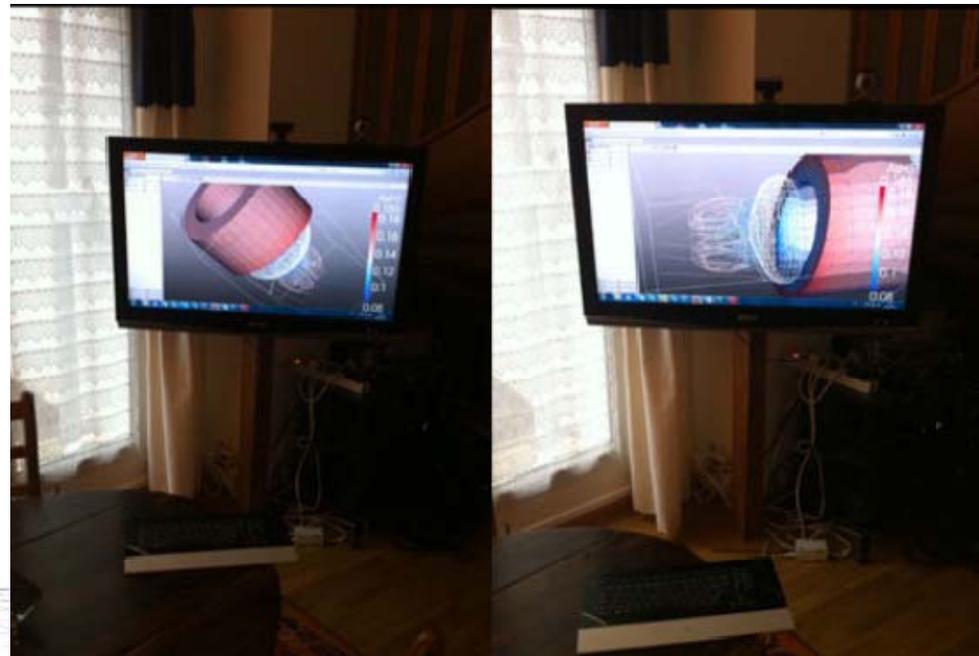
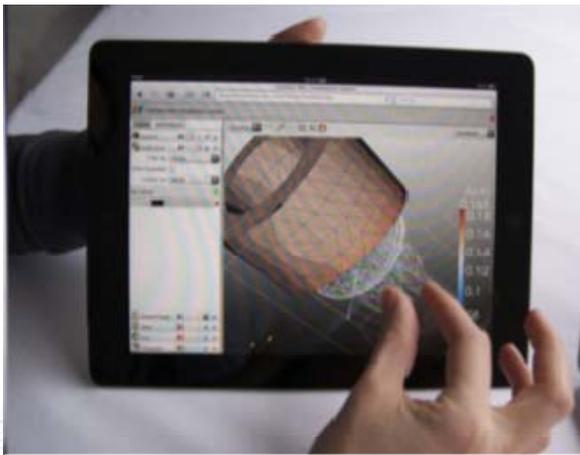
### VizWorld Store

- High Dynamic Range Imaging, Second Edition**  
Erik Reinhard, Wol...  
New \$72.35  
Best \$58.99
- CUDA by Example**  
Jason Sanders, Edw...  
New \$27.26  
Best \$27.26
- Physically Based Rendering, Second Edition**  
Matt Pharr, Greg H...  
New \$44.56  
Best \$37.00
- OpenGL SuperBible**  
Richard S. Wright, ...  
New \$44.56  
Best \$37.00



# ...remote collab viz doesn't mean always « copying » the screen!

- Huge needs of adapting GUI and tasks to support remote collaborative work
  - Dedicated tools depending on the case
  - Various user devices even lightweight ones :





# Dedicated tools : Towards Web3D services?

- Since VRML :
  - Lots of projects and... not so much success
- Still a good idea :
  - I just want to publish the right level of data!

But :

- « my data » : engineering, GIS, medical...

– Needs for a publishing lightweight format :

- Proprietary ones... ☹
- Standards to the rescue : X3D (new VRML), U3D, KML...

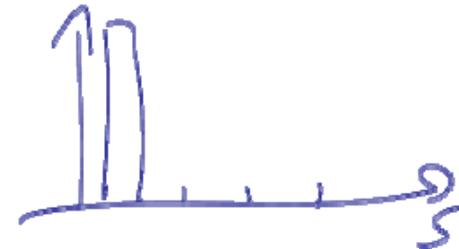
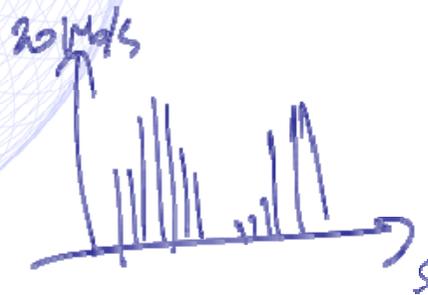
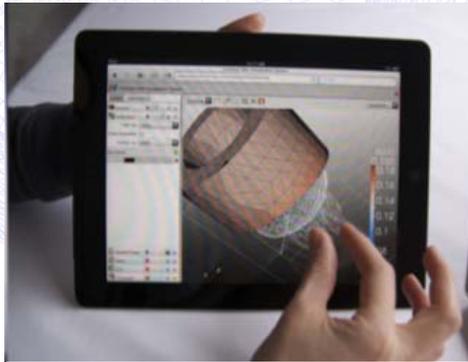
But :

Each vendor or consortium have their own format



# Common issues and challenges for Collab Viz

- Image/Video streaming vs 3D data streaming



- Latency vs Computing costs for preparing/reducing data
- Data compression
  - Dedicated compression
  - Standard compression as On-the-Fly GZIP, next EXI ?

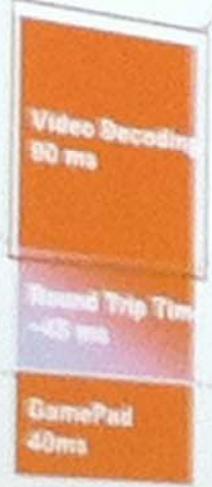
# Management Case with SFR

End-to-end latency

~300 ms



<200 ms



Next step: reducing video decoding latency on the GPU

Reduction of back-end latency (RTT) by 75 ms



Before

After back-end optimization



# Technology trends

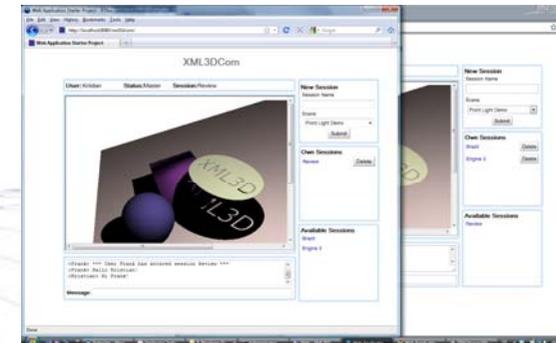
- No more supercomputer at home needed
  - Let's go to the ~~Grid!~~ *CLOUD*
    - On demand and ready!
    - HPC : x86 and GPGPU platforms available
- You have one in your pocket (or your hand...)
  - Your smartphone is as powerfull as an 80's HPC supercomputer
- New user experiences :
  - Difficult to type or write with a stylus with only one hand or two thumbs
    - Touch, multitouch
    - Responsivness for interactions!



# Collab Viz in the Web browser

- Web browsers tends to become a « virtual » OS
- No more need for third-party software
- Use web techniques for collaboration (e.g. AJAX)
- WebGL:
  - Exposing GPU instructions to JavaScript
  - But could give malicious code access to hardware
  - « limited » to OpenGL ES 2.0 (2007)
- DOM-based scene description: XML3D & X3DOM
  - Use CSS3, DOM Events etc. to interact with scene

=> Web Browser vs. App?



# 3D on the Web

- No plugins!!!
- Bandwidth and latency
- The web, not the OS, is your platform
- Combination of: JS speed, chip performance, available bandwidth makes it feasible

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DESIGNUMAGE

Web 2.0

THE 16<sup>th</sup> INTERNATIONAL  
ACM CONFERENCE  
ON 3D WEB TECHNOLOGIES

June 20-22, 2008  
PARIS - FRANCE

[www.acmweb3d08.org](http://www.acmweb3d08.org)

ACM SIGGRAPH &

ACM WEB 3D

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# NextGen Collab Viz tools

- Highly specialised Apps with HTML5 and standardized frameworks for Cloud Computing
  - Viz for your needs
    - Same data but different cases if uses
    - Better efficiency!
- Hybrid Rendering :
  - Local resources for Interactivity
  - Remote resources for massive data rendering



# Conclusion

- Collaborative Viz is no longer a myth
  - Even Console Gaming is remote now!
- As Webconferencing, collaborative Viz as a service is now feasible in the Cloud.
- Mashups could now be produced from multiple services/sources.



**Collaviz<sup>®</sup>**

**Thank you for your attention**

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