Tour d'horizon sur les solutions de Remote Display

Quelle solution choisir?

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Collaborative visualization: current systems and future trends

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Collaborative Visualization: Current Systems and Future Trends

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Figure 1: *Transatlantic Collaborative Visualization with ParaViewWeb. From left to right: In New York on an iPad (with multi-touch navigation) and on a MacBook, in Paris on a Desktop PC*

Abstract

Collaborative visualization is becoming more and more important, given the distributed and mobile nature of teams. Current visualization systems are often still monolithic and not flexible enough for todays users; they have not kept pace with improvements in other areas of information technology (mobile networking, compute-on-demand). With this in mind, we review current visualization systems (covering CAE collaborative visualization, multi-user online games and solutions to bring collaboration to existing applications / processes) and contrast against the latest related advances in technology: new hardware platforms, availability of cloud computing, mobile network capabilities and web browser functionality. We then analyse how these advances could impact on future collaborative visualization systems and discuss potential areas of improvement to existing systems.

CR Categories: H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces—Computer-supported cooperative work; I.3.2 [Computer Graphics]: Graphics Systems—Distributed/network graphics

Keywords: CAE, Collaborative, Scientific Visualization, Web3D, 3D-Internet

1 Introduction

Over the last year, there has been an explosion in mobile computing—making stories from science fiction suddenly every day reality, such as remotely controlling your house (switching off lights, increasing the temperature of the heating) through your smartphone, all whilst walking along the street. Suddenly - there is an app for that. The ubiquitous nature of mobile computing is changing the way we work and live, whilst being accompanied by new business models for HPC such as pay per use. Now, we can easily work remotely with teams of people, pulling in the compute power needed for a special project—without investing in a complete HPC solution of our own. Given the recent advances in mobile networking, hand-held devices and rendering hardware, it is timely to review current approaches to collaborative visualization and compare against these latest advances. In this paper, we present a review in the next section of the current state-of-the-art in collaborative visualization, covering CAE collaborative / distributed visualization, multi-user online gaming, integration of collaborative support into existing applications / processes, and the common issues these systems all face. The next section then examines the recent trends in technology, covering hardware platform, networks, and web browsers. This information is reviewed and brought together in the following section projecting how these trends will merge with collaborative visualization to produce the next generation of visualization facilities. We then finish our report with our conclusions regarding the future direction of collaborative visualization.

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2 Current Collaborative Visualization Systems

Looking back at a previous review of distributed visualization [Grimstead et al. 2005] taken in 2005 (at the start of Grid/Web Service development), it was noted that most systems were designed for less than 100 simultaneous users, relying on single or multiple servers to support the users. This pattern was explained by providers wishing to ensure quality of service, and to maintain security. The exception was collaborative VR systems, where peer-to-peer networking was often used to support in excess of one thousand simultaneous users. Each system required a custom client, with each system operating in isolation and not interoperating with other systems. With this context in mind, we now wish to review recent advances in the field and note significant changes at the end of this section.

2.1 Computer-Aided Engineering (CAE) Collaborative / Distributed Visualization

The COVISE (COllaborative VIsualization and Simulation Environment) system has continued to evolve [Wössner et al. 2002; Niebling et al. 2010], moving from a specific client program to the latest release supporting a WebGL and HTML5 client, which runs natively in a web browser. The WebGL client requires no local installation, and connects to existing COVISE sessions with other more complex clients. However, the full polygonal scene graph must be downloaded for display, which is slow due to slow text

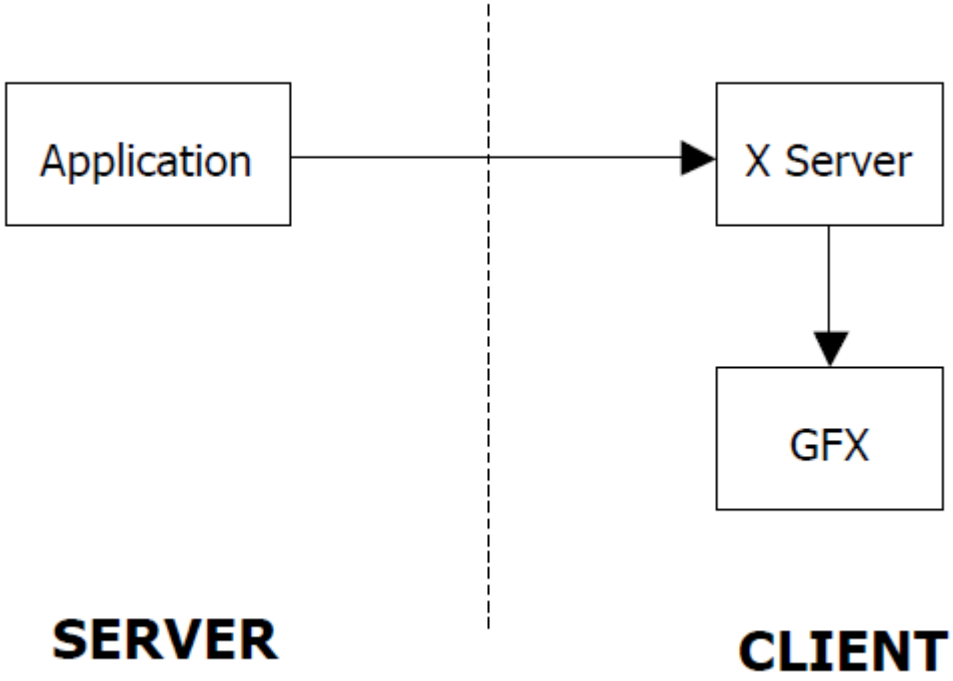
Sommaire

- Les précurseurs des années 2000
- Une décennie a passé
- Mais au final… Pourquoi faire?
- Et comment?
- Conclusion

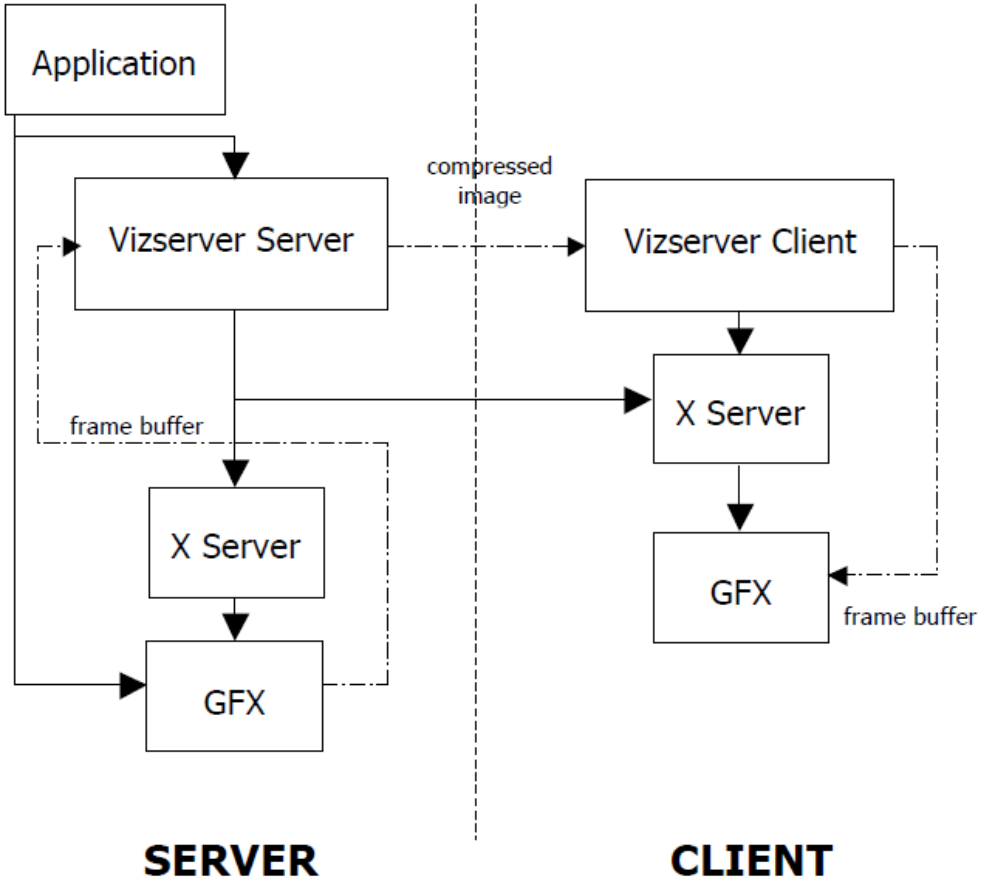
Les précurseurs : les années 2000

- Des Reality Centers au bureau de l'utilisateur : SGI OpenGL Vizserver

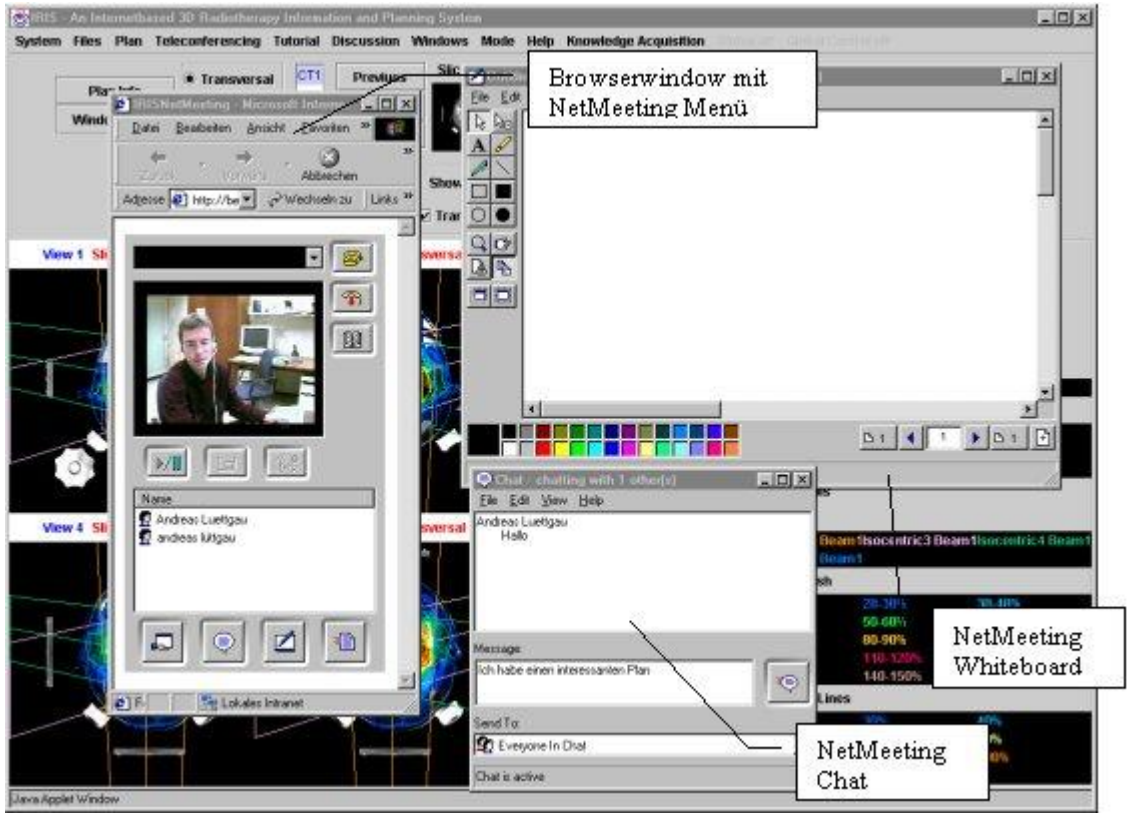
Au-delà de l’export display…



…l’envoi d’images



Et… Microsoft Netmeeting



- Norme ITU T120
- « implémenté » par
  - Microsoft
  - Lotus…
- Partage de bureau distant!!!
  - Les prémices de RDP

Prometteurs mais…

- Inutilisables
  - Réseau à bande passante réduite
  - Puissance de calcul encore insuffisante
- Une expérience utilisateur « unique »
  - Faute de grives…

- Un logiciel émergent…
  - D'un laboratoire Olivetti de Cambridge
  - Racheté en 1999 par AT&T

VNC

Une décennie passe…

?

Une décennie passe…

VDI

RemoteFX

VNC

?

VirtualGL

ICA

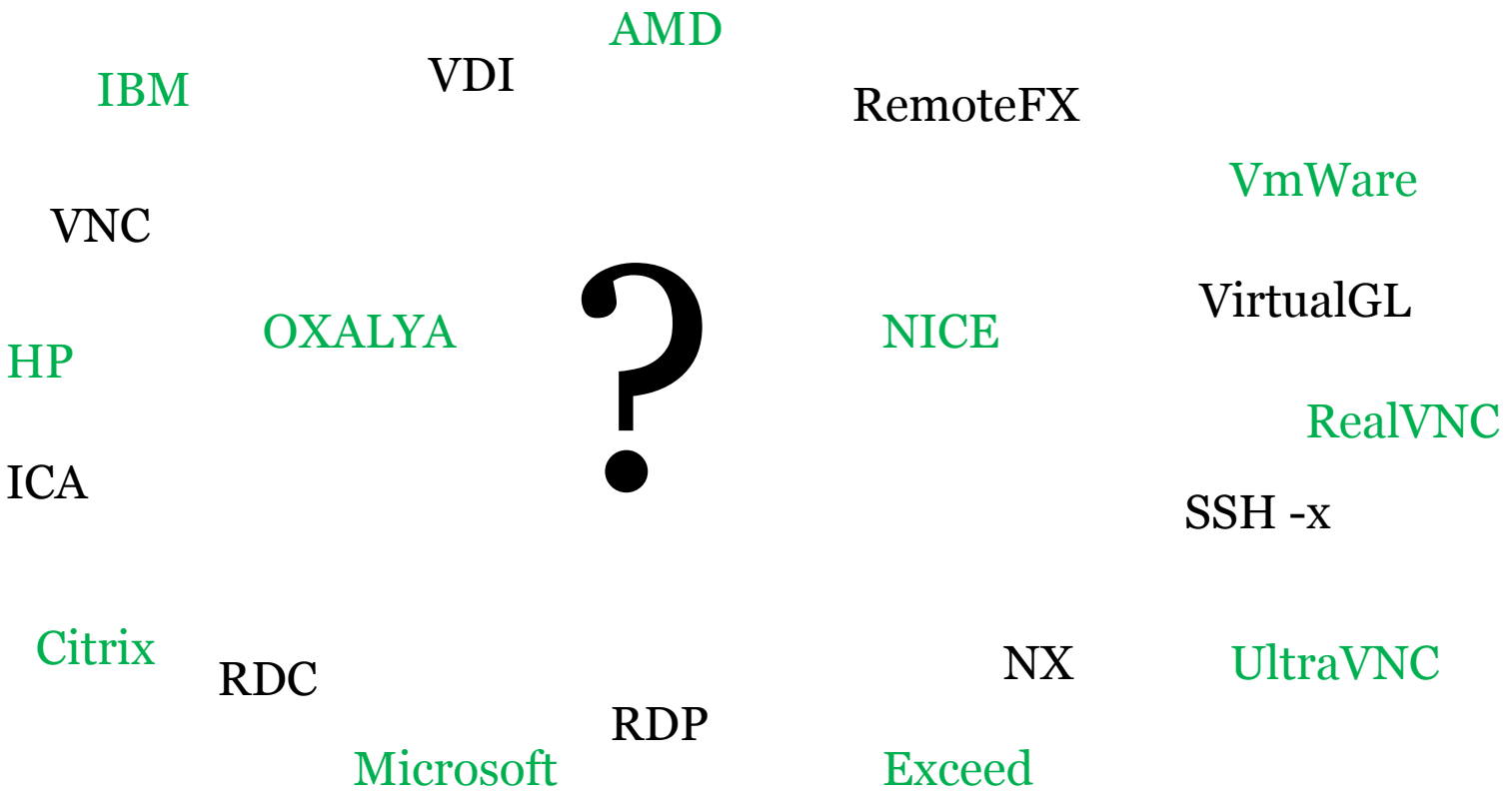
SSH -x

NX

RDC

RDP

Une décennie passe…



Rien n’a changé

- Ou si peu
  - Pléthore de successeurs à Vizserver et Netmeeting
    - La norme T128 : RDP, ICA…
      - Citrix, MS etc.
    - Compression des ordres graphiques z(ssh –x)
    - VNC ++ (Image streaming accéléré matériel)
      - VNC + VirtualGL

      -> flux Jpeg
      - HP RGS

      -> Ondelettes


www.virtualgl.org
VirtualGL
Recent Changes - Search:
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About VirtualGL
A Brief Introduction
In-Depth Background
Press
Videos
Reports
License
Sponsors Needed!
Sponsors List
TurboVNC or TigerVNC?
Documentation
Installing on Red Hat Enterprise Linux 6
Downloads
VirtualGL
TurboVNC
Developer Info
Subversion Access
Pre-Release Builds
libjpeg-turbo
Library
Images
The VirtualGL Project
View Edit History Print
VirtualGL
3D Without Boundaries
sourceforge Project Page
Mailing Lists
Latest Releases
Contact Project Admin via SourceForge
Contact Project Admin via Direct E-Mail
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Support this project
NEWS
Santos
We have the energy
VirtualGL
Red Hat Innovator of the Year 2011

VirtualGL
TurboVNC

Developer Info
Subversion Access
Pre-Release Builds
libjpeg-turbo

Library
Images

accelerated. Thus, organizations that would like to move toward a more centralized, managed model of application deployment have been constrained by their inability to move key 3D applications off of the user's desktop.

The Old School Approach: Indirect Rendering

The problem of how to remotely display a 3D application with hardware-accelerated rendering is a thorny one. 3D applications that are built on Unix or Linux typically use the OpenGL application programming interface (API) to do the actual 3D rendering and the GLX API to manage the relationships between OpenGL rendering contexts and application windows. GLX is an extension to the X-Windows protocol, and it can take advantage of that protocol's inherent remote display capabilities. In this mode of operation, referred to as "indirect rendering", the OpenGL commands are encapsulated inside of the X-Windows protocol stream and sent to an X-Windows server running on a remote machine. The X server then passes the OpenGL commands to the local 3D rendering system, which may or may not be hardware-accelerated (Figure 1.) So, the 3D rendering is still occurring on the user's desktop machine, even though the application is actually running on a machine located elsewhere.

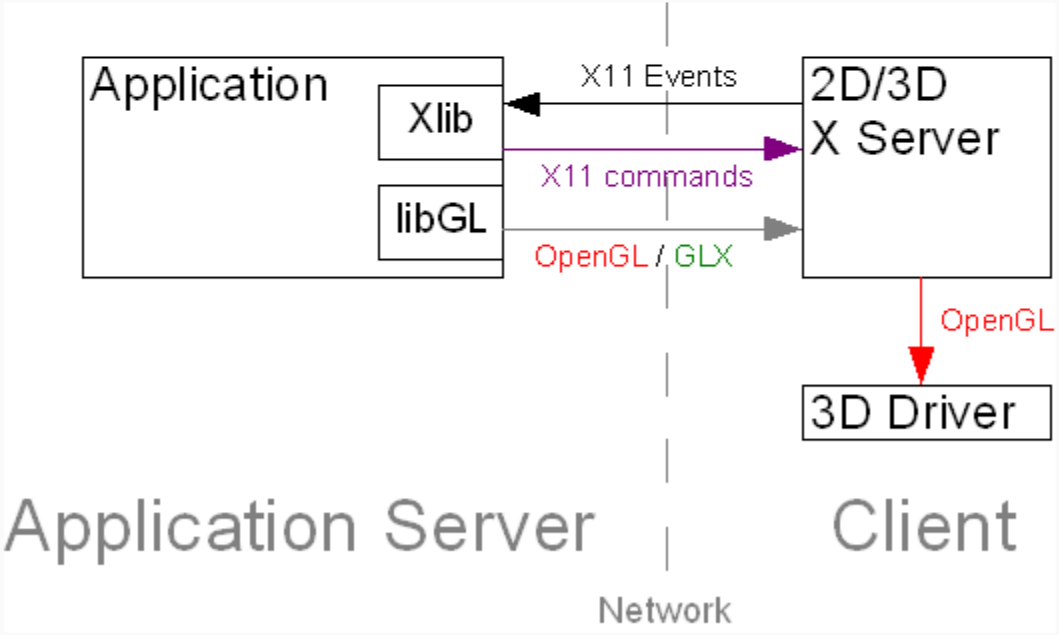


FIGURE 1: Indirect OpenGL Rendering Using GLX

This works OK (not great) if the data being rendered is small and static, if display lists are used, and if the network has high bandwidth and low latency. For a variety of reasons, though, most applications do not use display lists. In some

1. The VGL Transport (In-Process Image Encoding)
2. TurboVNC (Out-of-Process Image Encoding)

The VGL Transport

When using the VGL Transport, VirtualGL's GLX interposer encodes or compresses the rendered 3D images inside of the application process and sends the encoded images through a dedicated TCP socket to a VirtualGL Client application running on the client machine (Figure 6.) The VirtualGL Client is responsible for decoding the images and re-compositing the pixels into the appropriate X window. Meanwhile, the 2D elements of the application's GUI are sent over the network using the standard remote X-Windows protocol. Since their original paper, S/M/E's remote rendering solution has been modified to include an architecture similar to the VGL Transport (see: "Widening the Remote Visualization Bottleneck", ISPA 2003.) Examples of this architecture exist in industry as well.

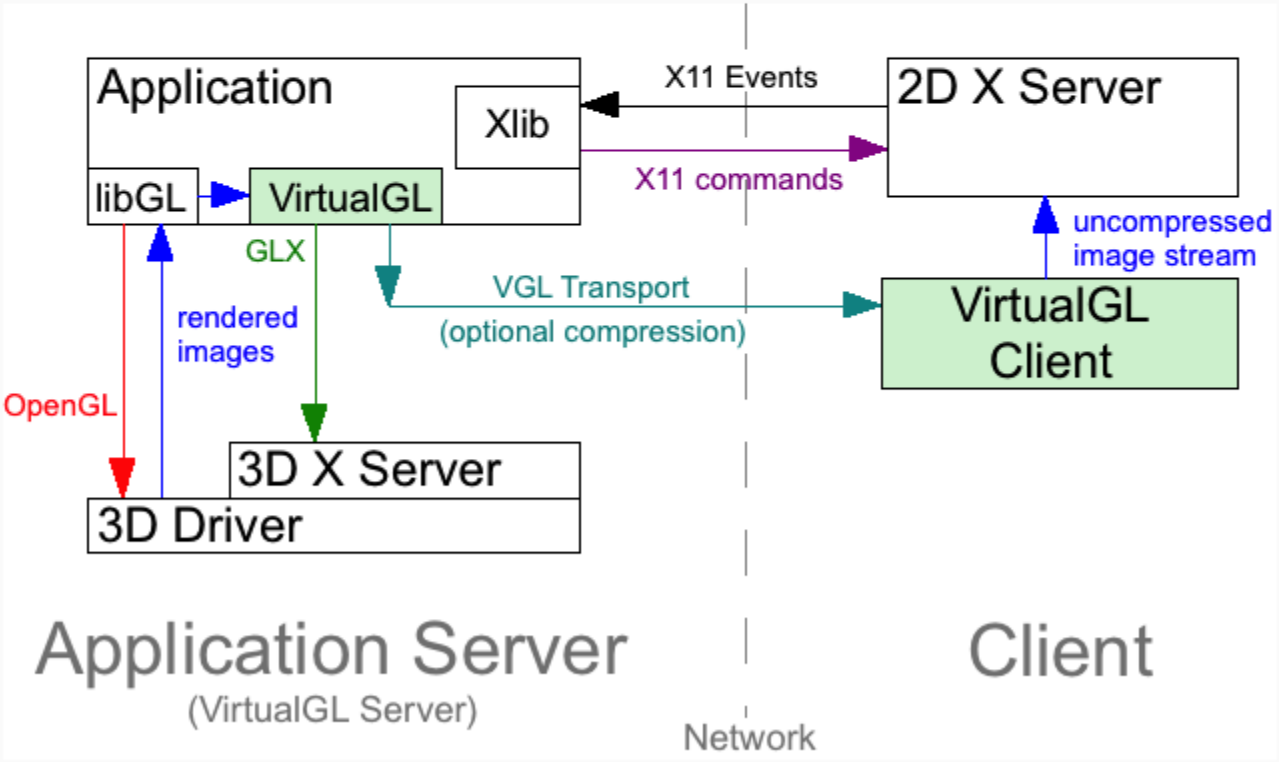
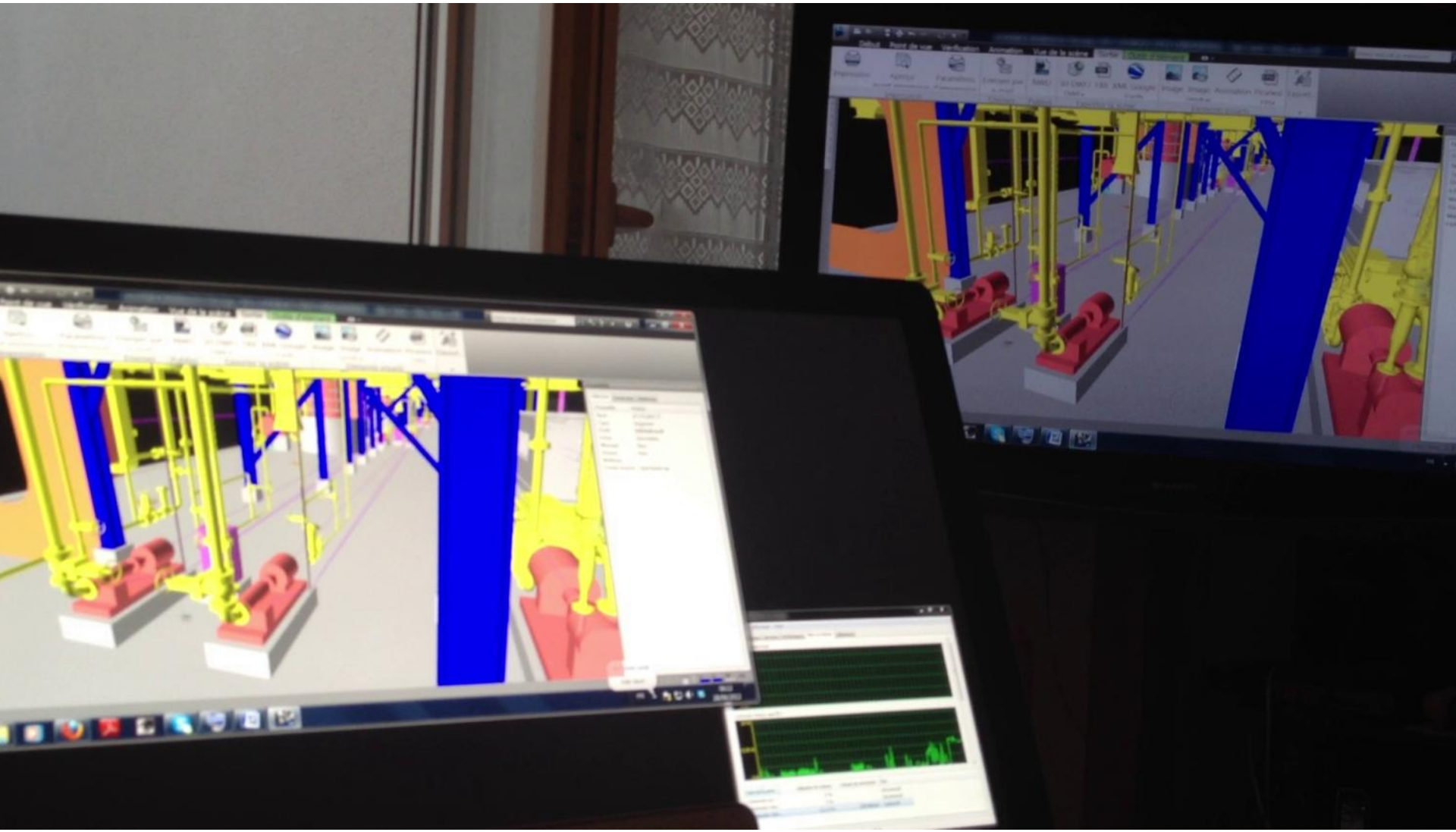


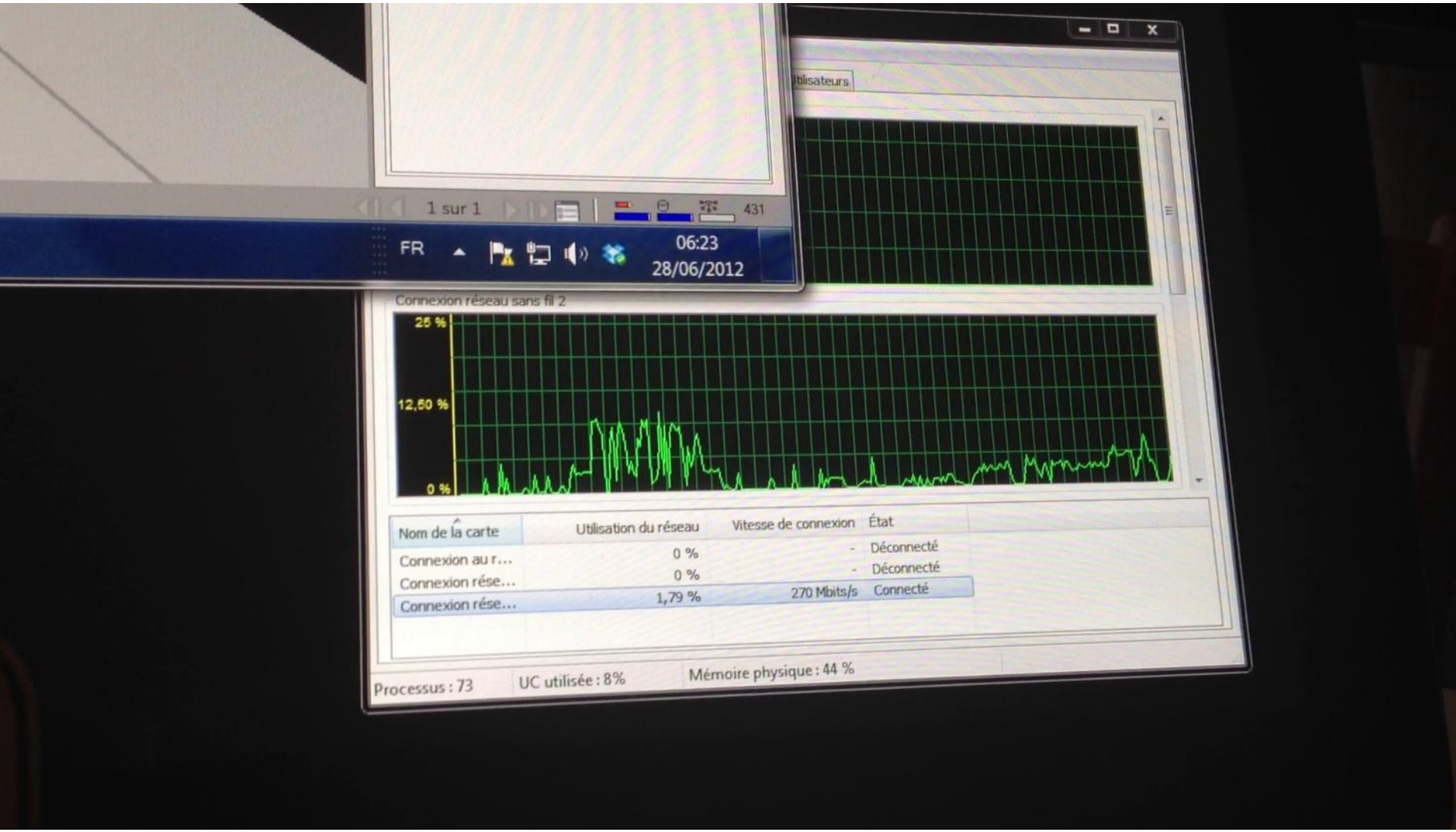
FIGURE 6: The VGL Transport: In-Process GLX Forking and Image Encoding

This approach definitely has drawbacks. It requires that an X server be present on the client machine, and it can be

Remarque(s)

- Les outils de WebConferencing
  - Les performances de VNC des années 2000
  - Outils web
- Une R&D très active sur les encodeurs vidéos temps réel
  - … pour la vidéo… TNT, webcams…
  - Le jeu vidéo!!!
- Besoins réseau de faibles à…
  - Très faibles pour ICA mais bureautique
  - Gourmands par intermittence pour
    - la CAO, la visualisation scientifique

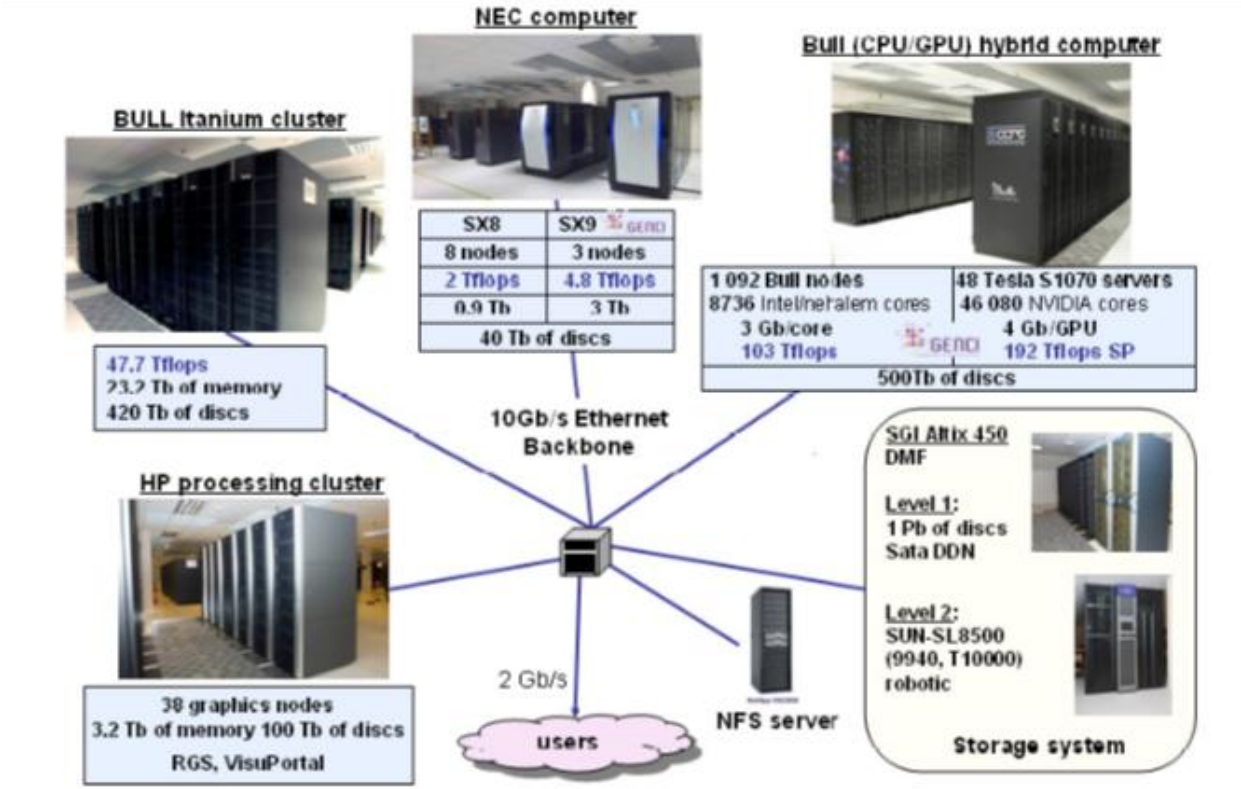



1 sur 1
431
FR
06:23
28/06/2012
Connexion réseau sans fil 2
25 %
12,50 %
0 %
Nom de la carte
Utilisation du réseau
Vitesse de connexion
État
Connexion au r...
0 %
-
Déconnecté
Connexion rése...
0 %
-
Déconnecté
Connexion rése...
1,79 %
270 Mbits/s
Connecté
Processus : 73
UC utilisée : 8%
Mémoire physique : 44 %

Mais pourquoi faire?

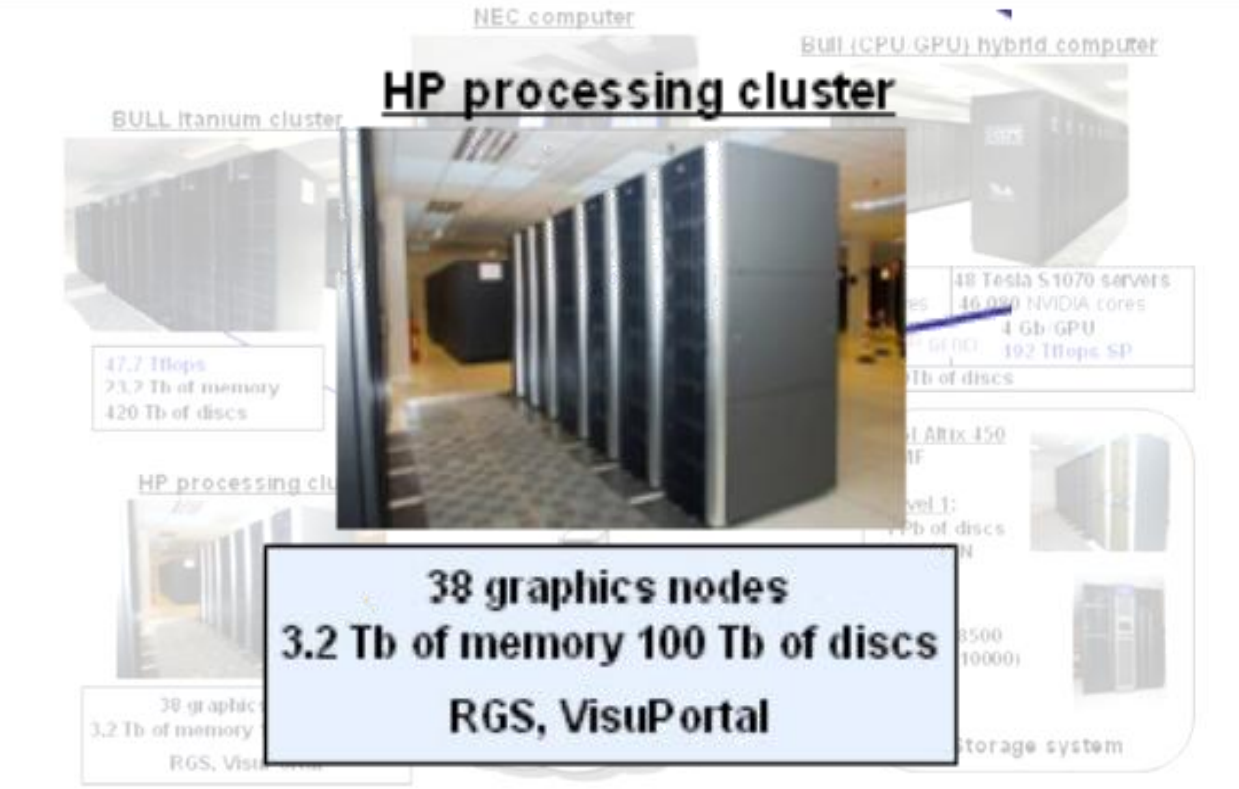
Offrir des services

- De visualisation à distance



Offrir des services

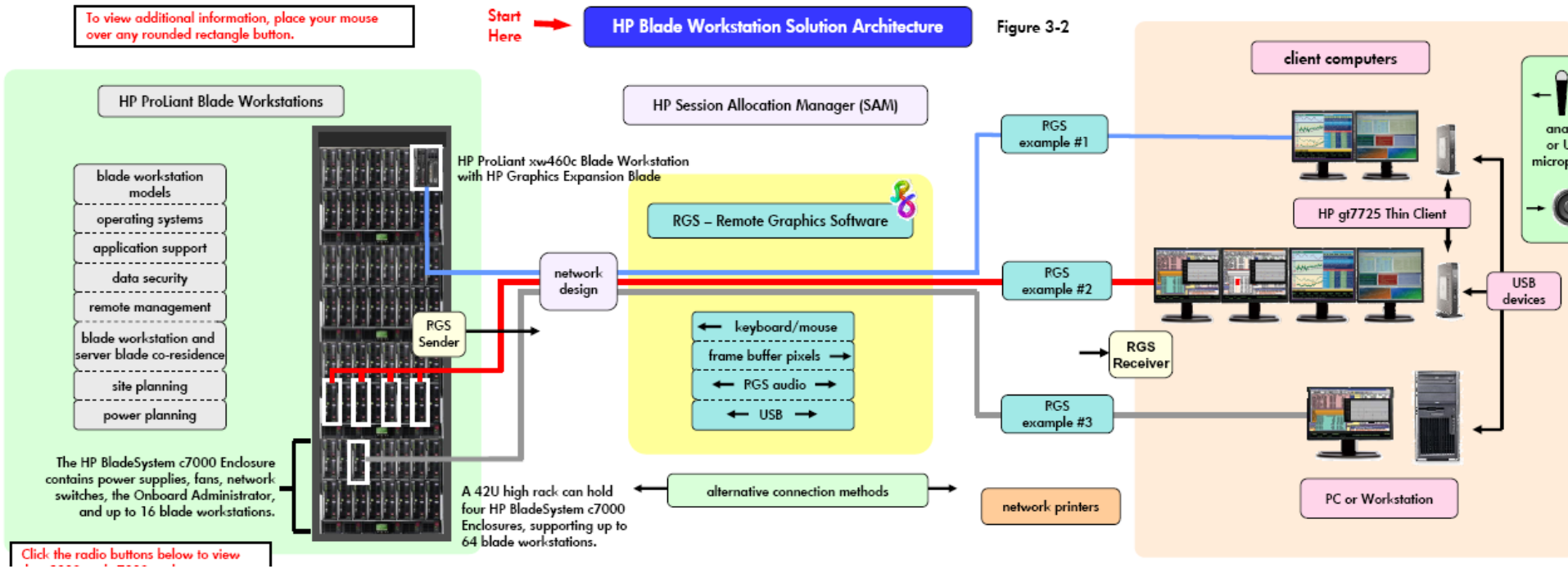
- De visualisation à distance



Sécuriser et optimiser un SI

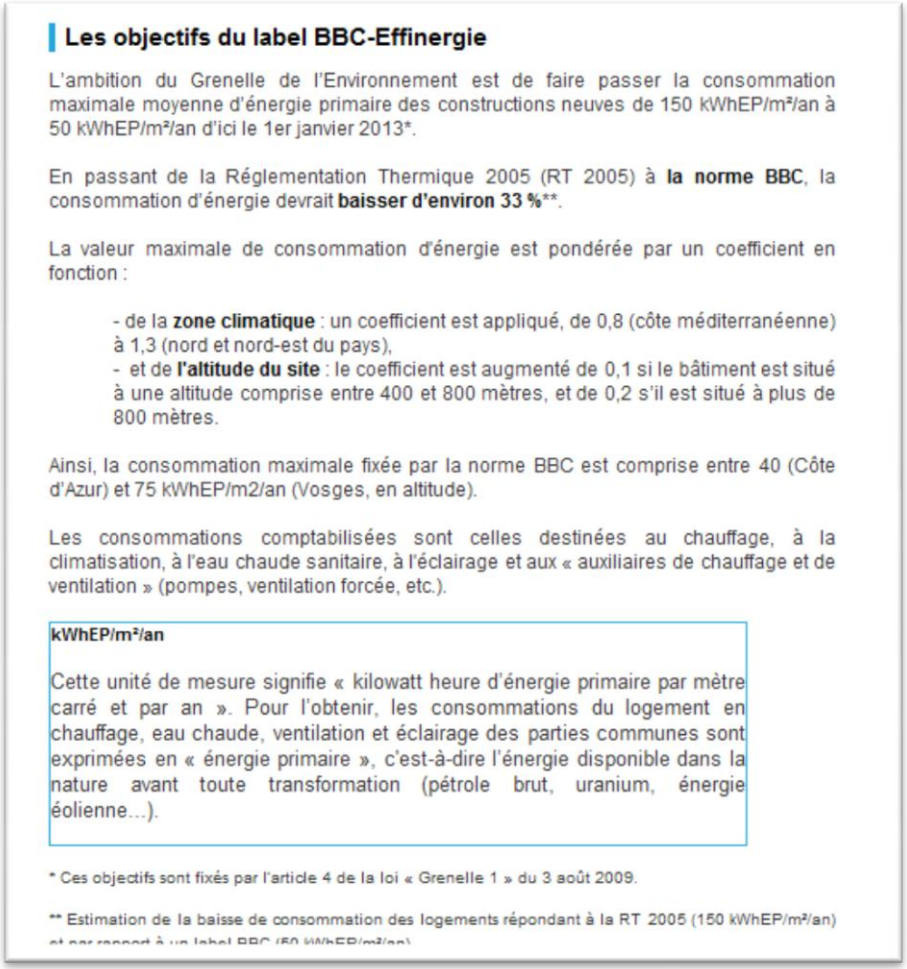
- Places boursières, traders

Sécuriser et optimiser un SI



Respecter normes environnementales

- Ah… le Green…
- Un ordinateur portable consomme 85% de moins qu'une station de travail



Les objectifs du label BBC-Effinergie

L'ambition du Grenelle de l'Environnement est de faire passer la consommation maximale moyenne d'énergie primaire des constructions neuves de 150 kWhEP/m²/an à 50 kWhEP/m²/an d'ici le 1er janvier 2013*.

En passant de la Réglementation Thermique 2005 (RT 2005) à **la norme BBC**, la consommation d'énergie devrait **baisser d'environ 33 %****.

La valeur maximale de consommation d'énergie est pondérée par un coefficient en fonction :

- de la **zone climatique** : un coefficient est appliqué, de 0,8 (côte méditerranéenne) à 1,3 (nord et nord-est du pays),
- et de **l'altitude du site** : le coefficient est augmenté de 0,1 si le bâtiment est situé à une altitude comprise entre 400 et 800 mètres, et de 0,2 s'il est situé à plus de 800 mètres.

Ainsi, la consommation maximale fixée par la norme BBC est comprise entre 40 (Côte d'Azur) et 75 kWhEP/m2/an (Vosges, en altitude).

Les consommations comptabilisées sont celles destinées au chauffage, à la climatisation, à l'eau chaude sanitaire, à l'éclairage et aux « auxiliaires de chauffage et de ventilation » (pompes, ventilation forcée, etc.).

kWhEP/m²/an

Cette unité de mesure signifie « kilowatt heure d'énergie primaire par mètre carré et par an ». Pour l'obtenir, les consommations du logement en chauffage, eau chaude, ventilation et éclairage des parties communes sont exprimées en « énergie primaire », c'est-à-dire l'énergie disponible dans la nature avant toute transformation (pétrole brut, uranium, énergie éolienne…).

* Ces objectifs sont fixés par l'article 4 de la loi « Grenelle 1 » du 3 août 2009.

** Estimation de la baisse de consommation des logements répondant à la RT 2005 (150 kWhEP/m²/an)

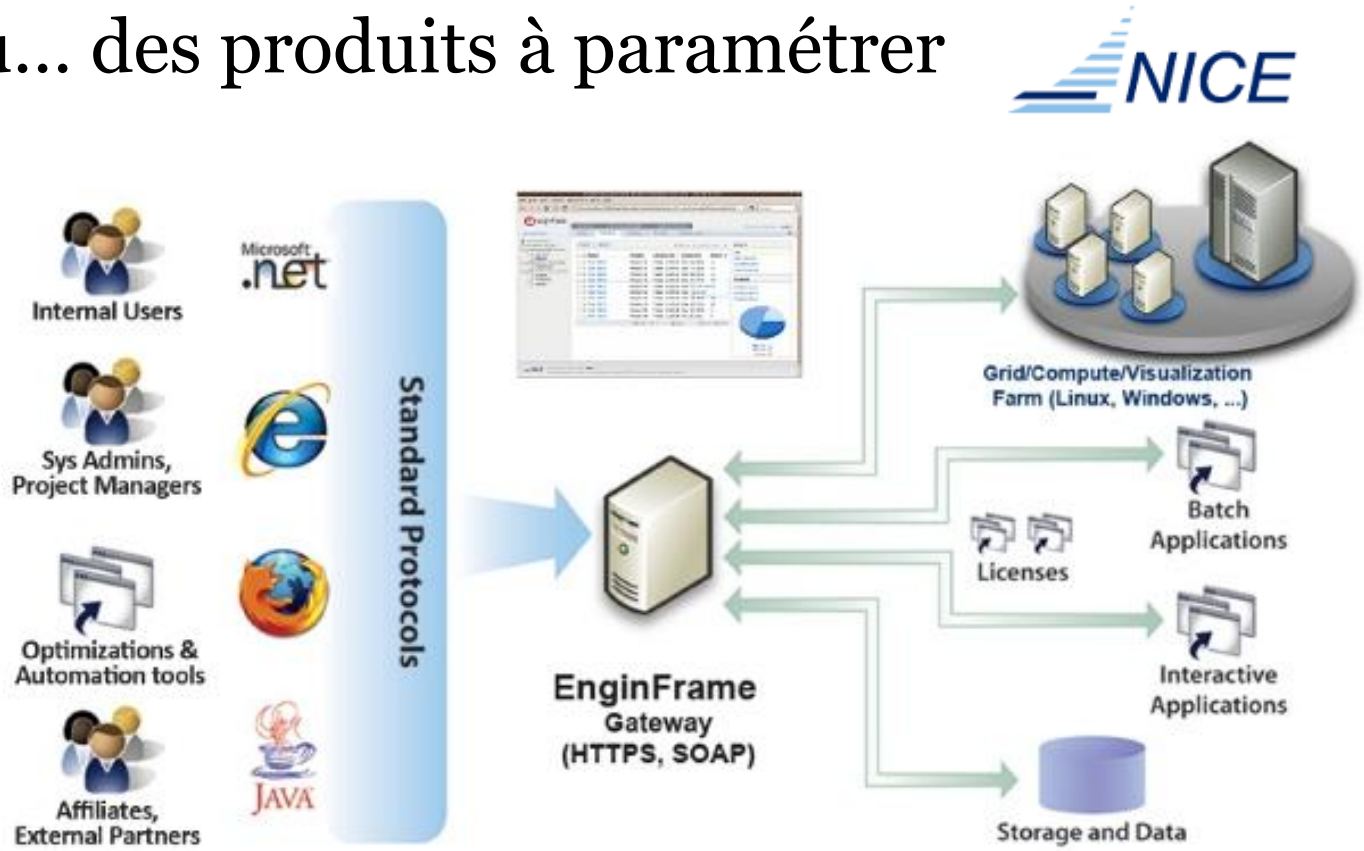
Comment faire?

Différentes solutions existent

- A la « main », ah… le « home made »…

Différentes solutions existent

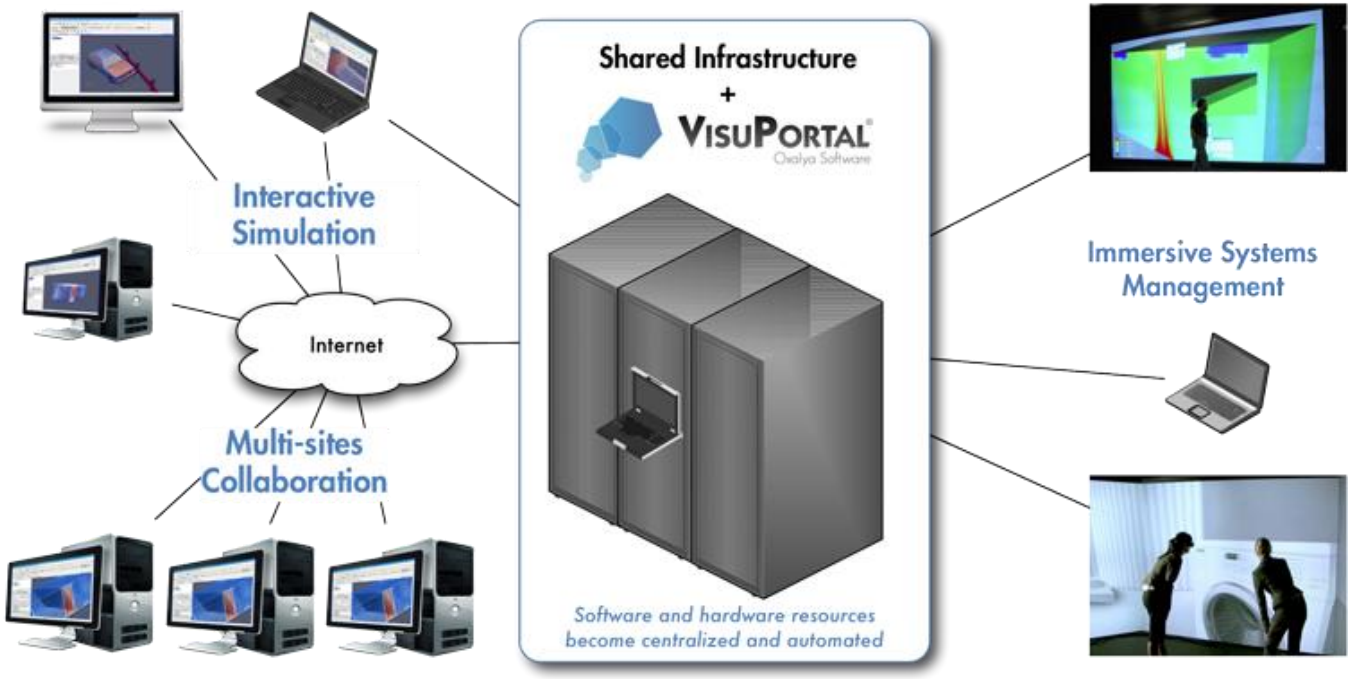
- Ou… des produits à paramétrer



http://www.nice-software.com/home

Différentes solutions existent

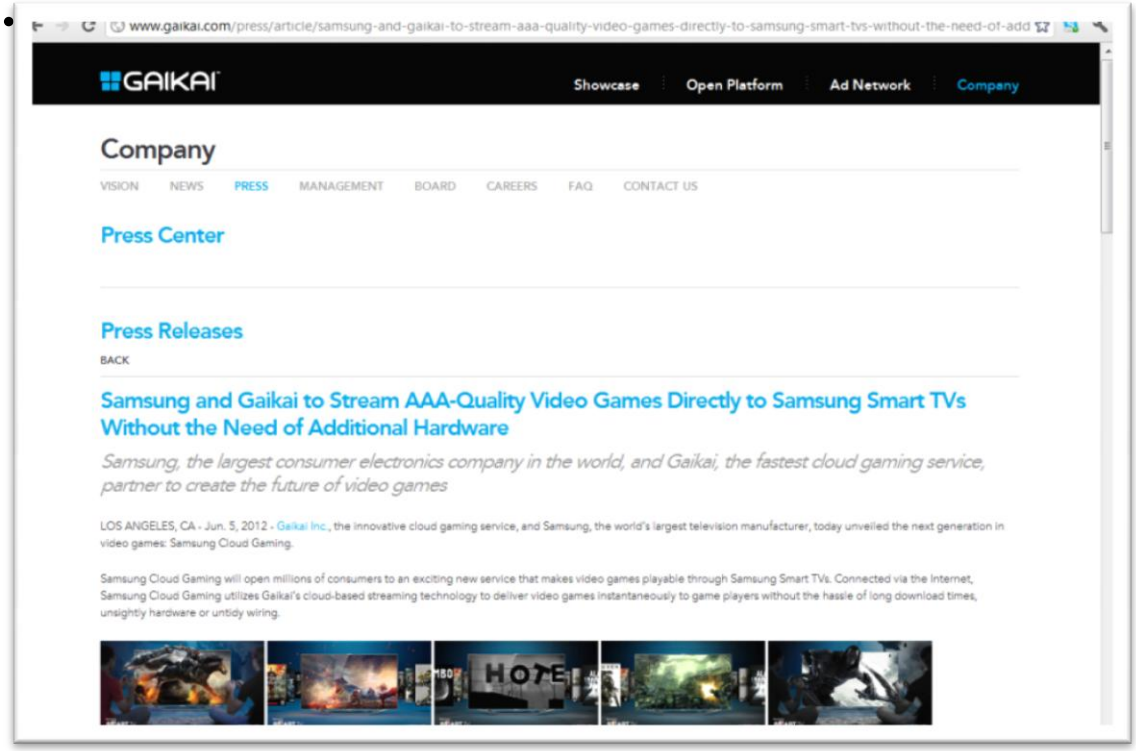
- Ou… des produits à paramétrer



http://www.visuportal.com/about.php

Une révolution?

- Plus tôt que prévu chez vous…
- Oui à la maison…
- les enfants…
- Les jeux vidéos
- Les adultes aussi… il paraît…



Les experts savent de quoi ils parlent.

Conclusion

- Une révolution? Bientôt chez vous!
- Des opportunités en entreprise
  - Nouvelles offres de services
  - Sécurisation du SI pour le BYOD et la mobilité
- Respect des normes environnementales (BBC, RT2012)
- Mais :
  - Besoin d'une architecture réseau de bonne qualité
  - Virtualisation et graphique 3D :
    - peut encore mieux faire.

Merci de votre attention

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Convention Center, California, in August 04-05, 2012. Co-Located with SIGGRAPH 2012 and in Cooperation with Web3D Consortium & ACM SIGGRAPH.

Multimedia technologies such **WebGL and HTML5, Flash/ Stage 3D, X3D (VRML), COLLADA, and the MPEG family**.

and deployment of open, royalty-free standards that enable the communication of real-time 3D across applications, networks, and XML web services.