VC in HEP
Status and Perspectives
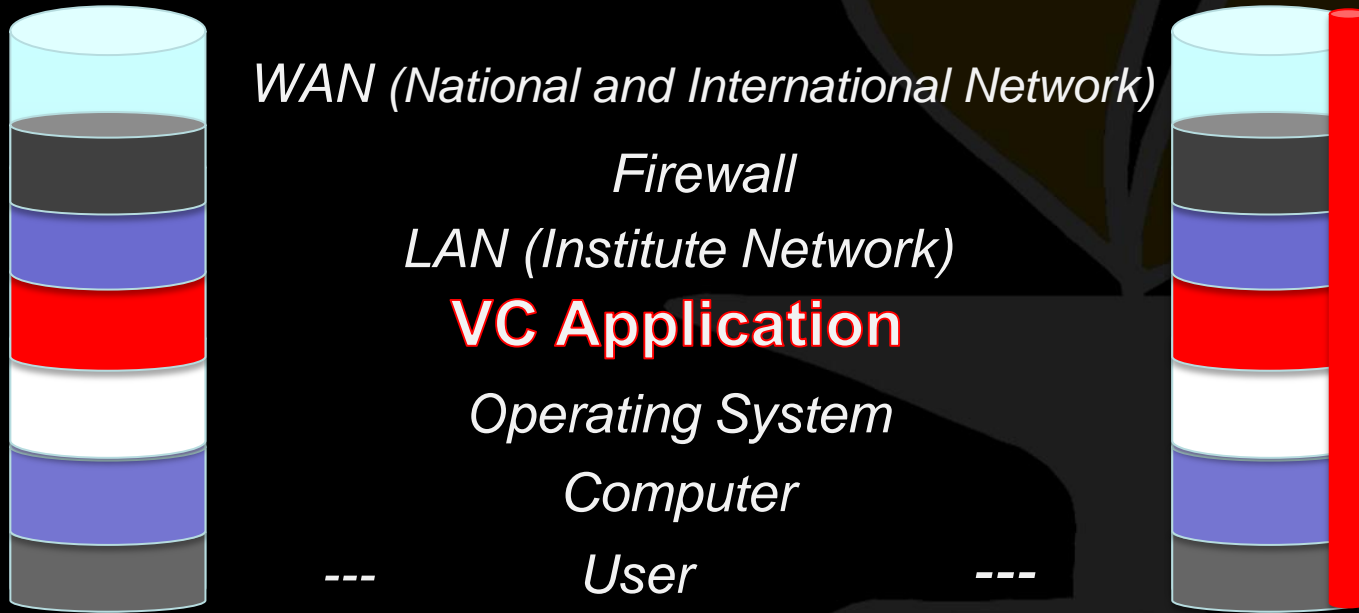
Philippe Galvez, Caltech

Outlines

- Challenge in VC, Real-time communication
- The HEP Challenge
- History of VC within HEP
- Current State as of today
- Perspectives for the future
- EVO to SeeVogh

Challenges in VC

Anything can go wrong

The VC is in control of only 20% of the elements which are part of a collaborative session. Difficult to accept but **no one can guarantee a successful session**

WAN (National and International Network)

Firewall

LAN (Institute Network)

VC Application

Operating System

Computer

--- User ---

But we can architect a VC system that has some visibility and control over these unpredictable elements and take dynamic correctives actions to maximize the user's collaborative experience

Challenges in VC

While a collaborative session is sharing with others, the user is always alone during a session and especially during issues. …. It becomes very emotional … !

… And we tend to lose rationality when handling the situation

His/her failure should be **everyone failure** or…..
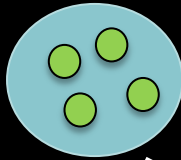**His/her success** should be **everyone success**

Challenges in VC for HEP
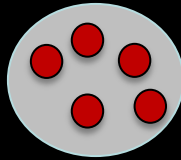
Experiments
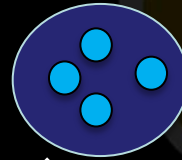(CMS, Atlas, Star,…)

Institutes
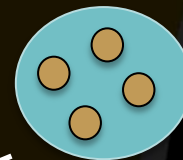(CERN, BNL, ..)

Countries
(USA, Brazil, ..)

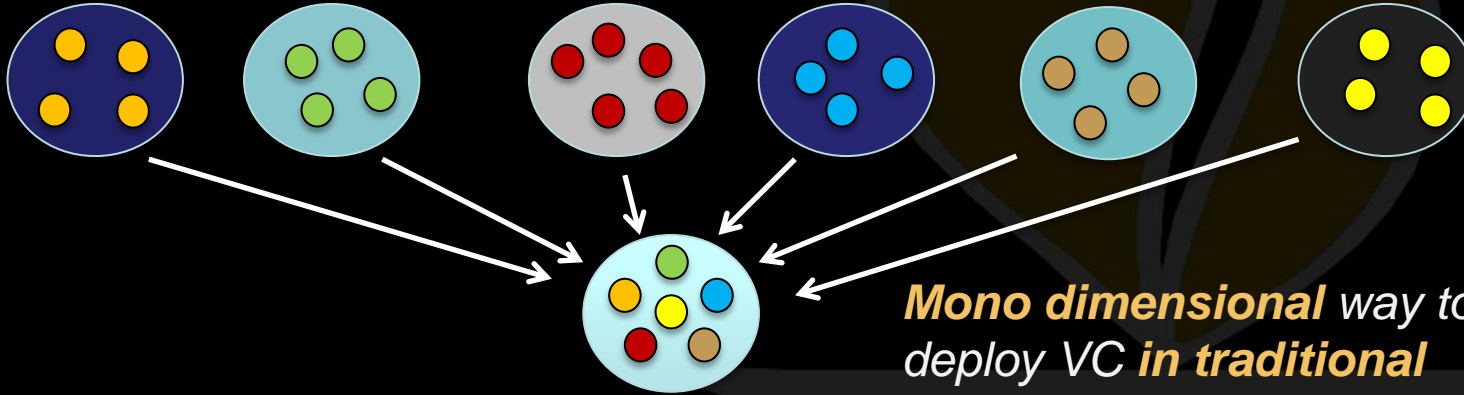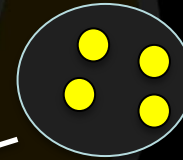**Op. Systems**
(Win, Mac, ..)

VC Protocols
(Desktop, H.323/SIP,..)

Funding
(NSF, DOE, EU,..)

Mono dimensional way to deploy VC *in traditional organizations*

HEP is a **multi-layer** and **multi-levels** community

A **top down solution** is a **non-solution**

Some History

The HEP community has always been a pioneer and pushed the frontier of VC before anybody else.
(you should be proud of it)

Some key dates:

- VRVS released in end-1996 (ended in 2006)
    - Hosted more than 20 Millions of VC minutes for HEP
    - Developed by the HEP community for the HEP community

- Microsoft NetMeeting released in 1998
    - First implementation of H.323

- WebEx first release in 2000
    - (still) using phone for audio communications

- Skype released the first public beta in August 2003

More recent History

A lot of Web conferencing and video service are now available in the market place but no one emerged as well adapted for the HEP (as explained in previous slides)

Also some people are always expecting the killer video commercial application that will work perfectly *in all situation for our research* community. So far, no success yet despite large companies (> $B) financial support.

- Skype/Microsoft group video calling (10 max)
- Google Hangout (10 max)

Current VC Service used by HEP

• **Dedicated H.323 Services** (Tandberg/Cisco, Polycom, Codian MCU,..) operated by:

   • Most of the National Research Education Networks operate an H.323 service allowing between 20 to 150 concurrent ports connections

   • Some Research Organizations such as ECS (ESnet), RMS (Renater/IN2P3/INRA/Inserm/CNRS).

Vidyo operated by CERN.

• Starting in 2008, Vidyo was presented as a possible product to serve the LHC and CERN related experiments by CERN/IT who was mandated to look for commercial alternative to EVO.

• As of today, it appears that the product is still missing some key functionalities to be a full release candidate.

Nevertheless, some research groups at CERN are starting to use the service.

Current VC Service used by HEP

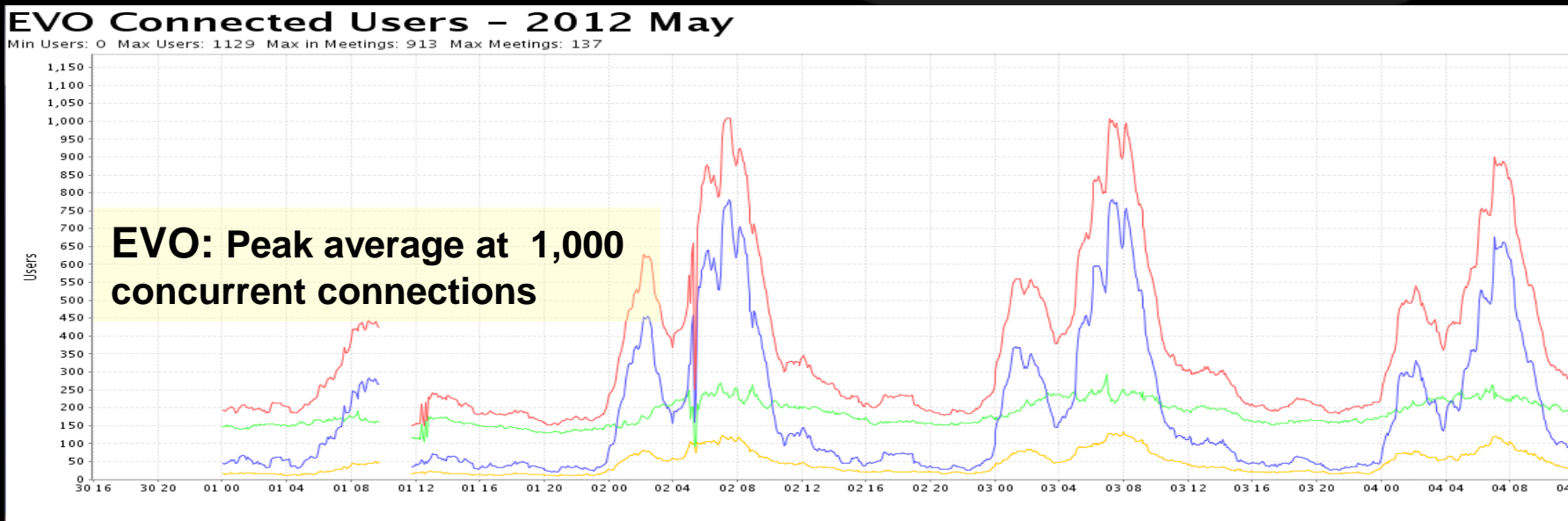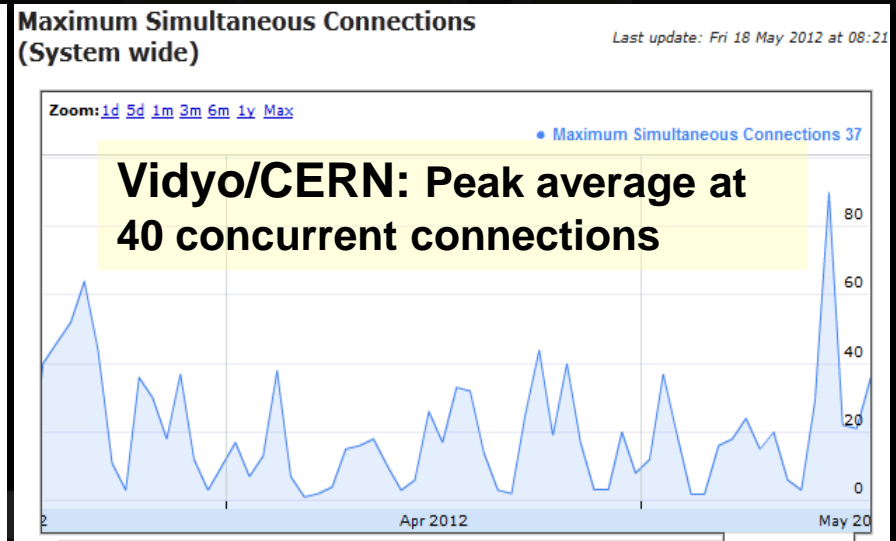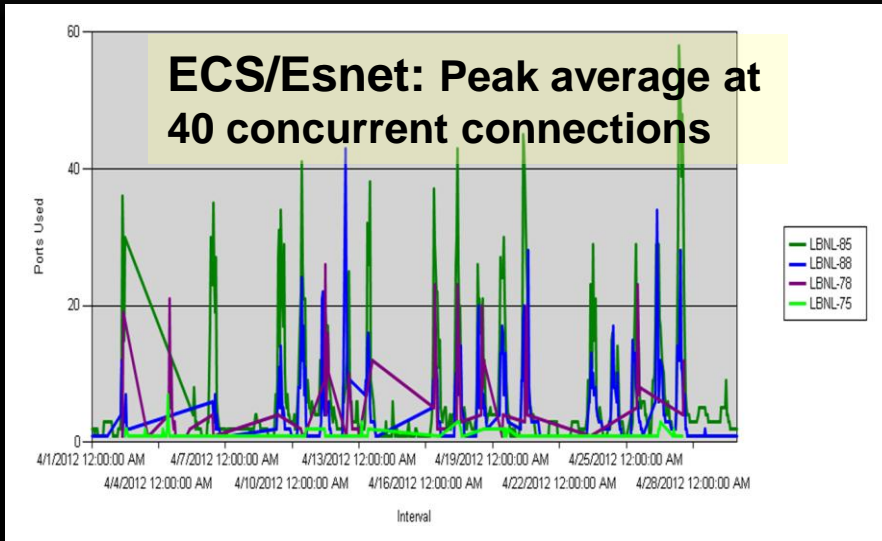• **EVO** **(Enabling Virtual Organization) released in 2007 and operated by Caltech and used by:**

CMS, ATLAS, ALICE, LHCb, PHENIX, LIGO, STAR, Belle, CTA, D0, Double Chooz, EMI, HAWC, HERMES, IceCube, LBNE, LUX, Pierre Auger Observatory, SXS, T2K, ALPHA, Angra, APAG, APS, Astro-H, ATRAP, BABAR, Belle II, BESIII, CALICE, CBM, CDF, CEES, CI-TRAIN, CLEO, CTEQ, Daya Bay, DESY, CERN, COMBINE, COMET, CQUeST, CSIRO, CTA, EGI, EIC, ETSF, FERMI, FOPI, GlueX, GridPP, H1, HAWC, HADES, HESS, ILC, ISU, JCAP, JEM-EUSO, KAREN, KEK, KATRIN, LBNE, LMI-EFRC, LSST Camera, LTER Network, LUX, MAGIC, MINERvA, MPP Munich, NA49, NA61, NIMBios, NINJA, NOVA, Panda, PHENIX, Phyloseminar, PIENU, POLAR, SuperB, SuperCDMS, SXS Collaboration, SuperNEMO, Terascale, WLCG, XENON, XFEL, XDEDE, ZEUS…..

See next slides for more details
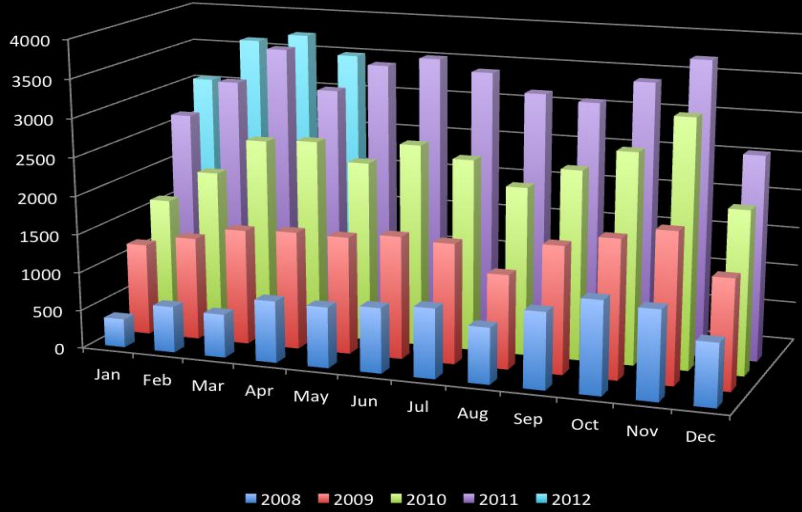
Current VC Service used HEP

ECS/Esnet: Peak average at 40 concurrent connections

Vidyo/CERN: Peak average at 40 concurrent connections

EVO: Peak average at 1,000 concurrent connections

EVO LHC Usage
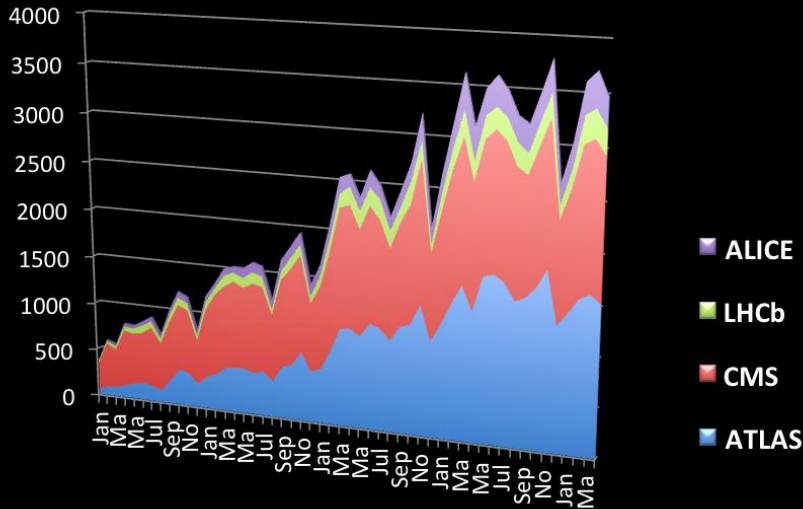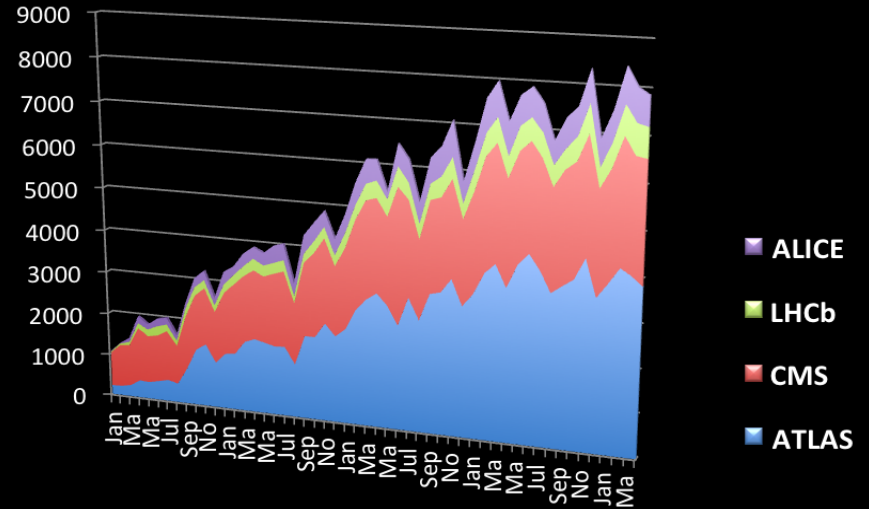
EVO VC Service in HEP

EVO usage for the month of April 2012

- 9,400 meetings
- 4,317 phone calls total 170 days (4,080 hours)
- 12,780 participants to meetings total 3,146 days (75,504 hours)
- 804 Skype connections total 28 days (672 hours)

Assuming a constant usage, we have an average of 60 Millions minutes / Year.

A cheap phone call $0.02/min
X 60M ⟶ $1.2M / Year
(~ $100/User/Year)

Architecture, Features, Functionalities

EVO Architecture

Distributed — Clients

EVO Architecture

Controlled, Administrated and Distributed — Infrastructure

Peer-to-Peer servers

Centralized — H.323 or similar — Centralized Architecture (old model)
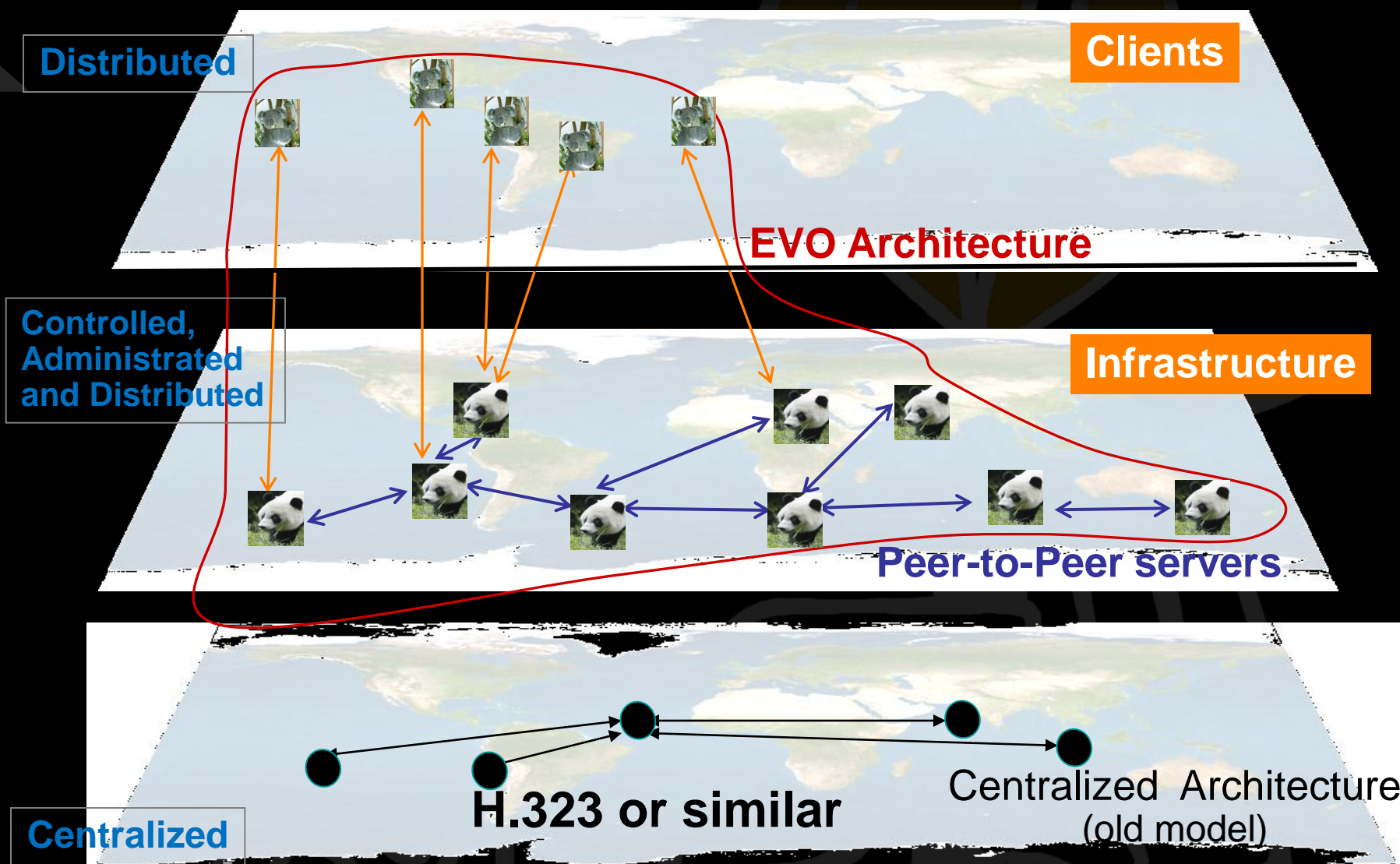
Self Managed Infrastructure

EVO uses MonALISA :

- **66 servers** spread in **25 countries**

- **Detects any network cut** or peer down : **Automatically reconnect** the topology of servers to face the problem.

- Reduce the **support burden** by a good order of magnitude

http://monalisa.caltech.edu

drag red spot to rotate earth

Self Managed Infrastructure
Average of 1,200 connected sites during peak time
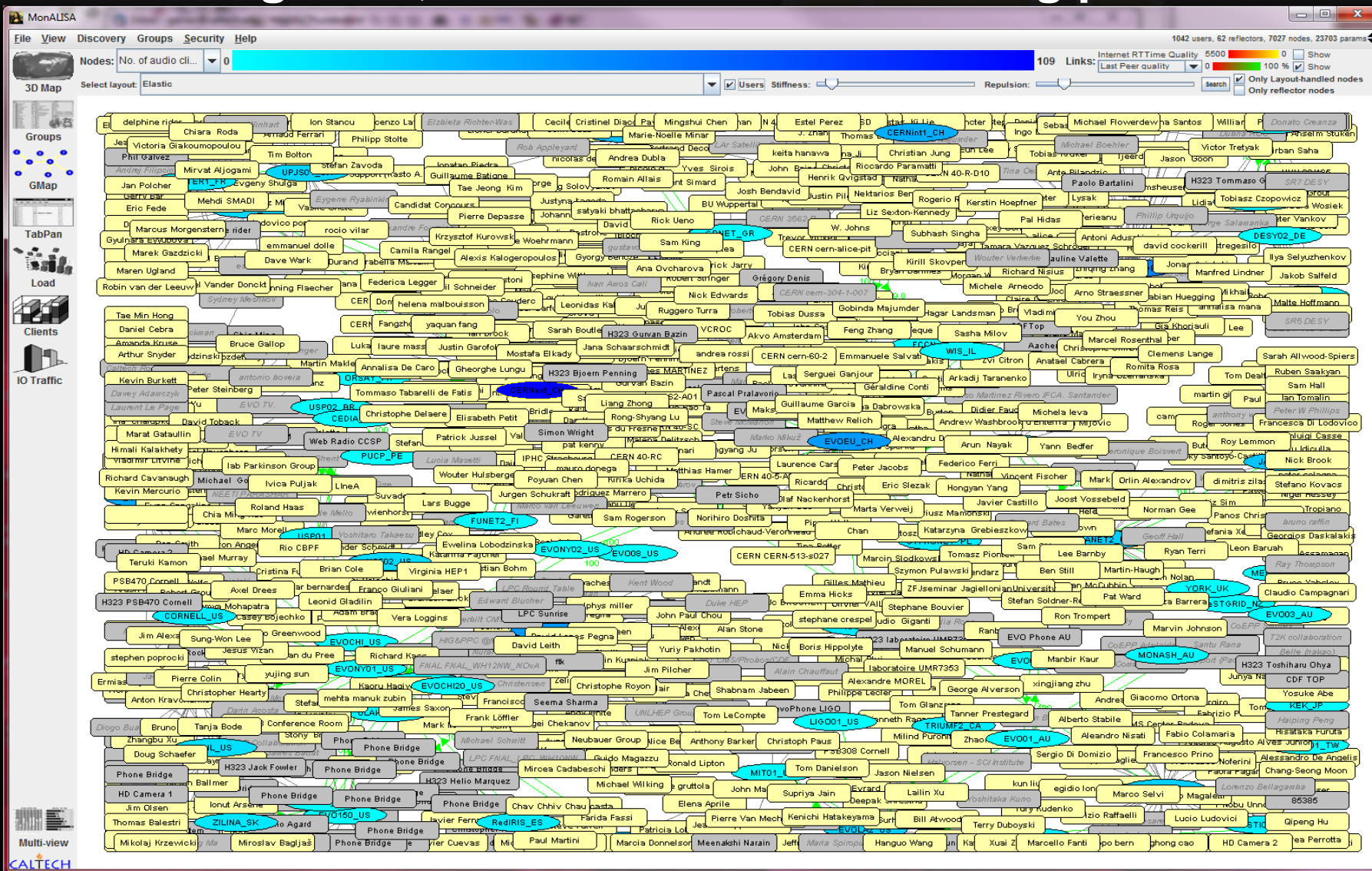
Some EVO functionalities

- Works on MS Windows, Mac OS X, Linux!

- Connects to H.323 client, H.323 MCU, SIP client, SIP MCU, IP telephone, Standard Telephone

- EVO is tunneling all communications into one Port and is firewall and NAT friendly

- EVO GUI is available in 11 languages! and available in all time zones!

- Support H.261, H.263 and H.264 video codecs up to 1080 HD resolution

- INDICO integration: auto booking, auto-modification, auto-join meeting. (CERN, DESY, BNL).

- LDAP/Shibboleth Integration

Perspectives for VC in HEP

Perspectives

When looking for VC solutions we have to investigate:

(1) The Product and Technology

(2) Who will deploy and operate the service

(3) Who will provide end-user support for the service

(4) Who can access the service

ECS (ESnet)
and similar H.323 services

(1) The Product and Technology
- H.323 (currently Tandberg/Cisco or Polycom)

(2) Who will deploy and operate the service
- ESnet or similar organization

(3) Who will provide end-user support for the service
- ESnet or similar organization

(4) Who can access the service
- User must be affiliated with DOE Office of Science programs, projects and experiments

Vidyo (CERN)

(1) The Product and Technology
- Vidyo

(2) Who will deploy and operate the service
- CERN

(3) Who will provide end-user support for the service
- CERN+Contractors

(4) Who can access the service
- Need to have a valid CERN user account
- Possibility to have Guest access to join a meeting

EVO (Caltech)

(1) The Product and Technology
- EVO Technology

(2) Who will deploy and operate the service
- EVO Team

(3) Who will provide end-user support for the service
- EVO Team

(1) Who can access the service
- Primarily serving the LHC and LIGO collaborations
- Open to any research collaborations with limited usage

Current VC Service usage in HEP

ECS: Funded by DOE/ESnet
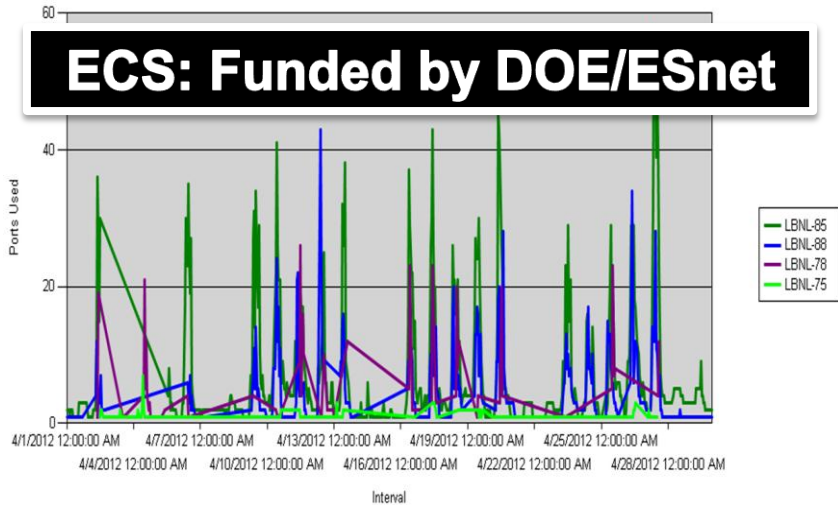
Maximum Simultaneous Connections (System wide)

Last update: Fri 18 May 2012 at 08:21

Vidyo Service: Funded by CERN
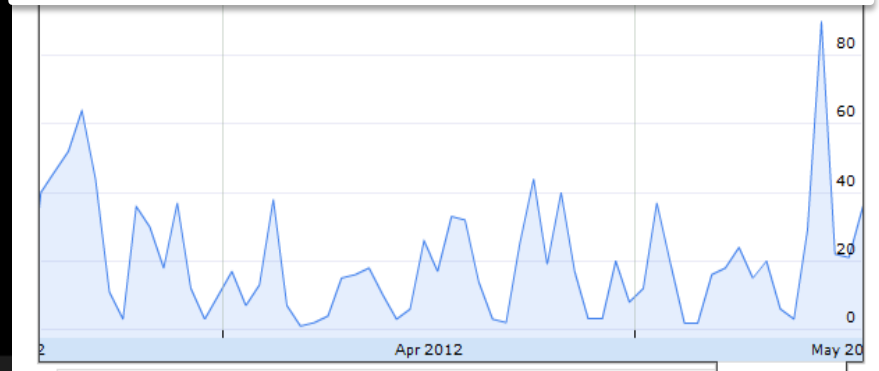
EVO Connected Users – 2012 May

Min Users: 0 Max Users: 1129 Max in Meetings: 913 Max Meetings: 137

EVO: Funding Unknown after Dec 2012
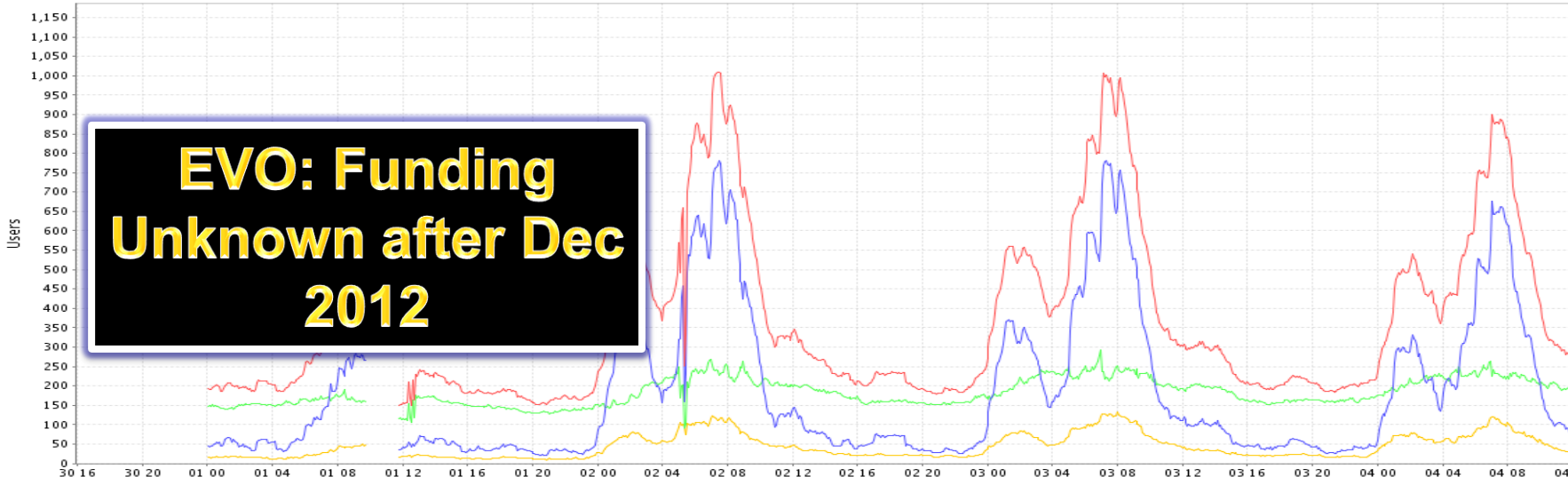
From EVO to SeeVogh

In order to continue to expand and operate the current EVO service and provide enhancements, private funding is now needed.

→ **Evogh, Inc**. was formed

- Evogh, Inc. will take over all EVO activities and will be in charge of the operation and the development of the technology going forward.

- SeeVogh, a hybrid cloud video collaboration service (the 3rd generation of architecture, software based on EVO technology) will be offered by Evogh, Inc.

From EVO to SeeVogh

Internet2 NET+ Services **expand to help universities address research, education, big data and innovation challenges**

Arlington, VA—April 24, 2012—Internet2 and some of the nation's most prominent high-tech firms announced today partnerships that would expedite the delivery of cloud services to college campuses nationwide, and address research, big data and innovation challenges. Internet2, the world's most advanced networking consortium led by the U.S. research and education community, is pleased to be joined by **Aastra; Adobe; Box; CENIC; Dell; Desire2Learn; Duo Security; DuraSpace; Evogh; HP; Level 3 Communications; Merit Network, Inc.; Microsoft; Savvis, a CenturyLink Company; SHI International; and The Solution Design Group** in this initiative. The Internet2 NET+ Services' announcements were made at the Spring 2012 Internet2 Member Meeting.

http://internet2.edu/news/pr/2012.04.24.cloud-services-partnerships.html

From EVO to SeeVogh

What does it means for you ?

- Transitioning from EVO to Evogh, Inc. with enhanced functionalities, with access to only authorized organizations/experiments from the research community

- Service will be branded the *SeeVogh Research Network* and will be accessed through the commercial Web portal and supported through Evogh, Inc.

- The *SeeVogh Research Network* will use the same network infrastructure already in place preserving our community's investment in Panda servers, phone bridges, scheduler interfaces, client systems, H.323 bridges and user adoption.

- The user interface for meeting will provide the persistence services that everyone is familiar with including community meeting schedules, chat, among others, but will use the new SeeVogh client with simplified controls and on-going enhancements like mobile device support, H.323/SIP servers and much more in development.

From EVO to SeeVogh

What does it means for you ?

• Pricing to access the *SeeVogh Research Network* will be highly affordable for every research experiments and projects.

• All current EVO research communities will be entitled
  - o To subscribe to the *SeeVogh Research Network*
  - o To subscribe to the SeeVogh Hybrid Cloud offering if that fit better their needs

• When ?
  - o The SeeVogh Hybrid Cloud offering is available now
  - o The *SeeVogh Research Network* will be available to interested research experiments this summer at no cost.
  - o The SeeVogh Research Network will be available only to paying customers by January 2013

Simplified SeeVogh GUI

- Simple Controls
- Upper/Lower Display Area for configurable layout
- Expandable, Detachable Video Tiles for viewing documents or people
- Ideal for Large Meetings
- Multiple Monitor Support

SeeVogh New Functionalities

- H.323 and SIP video <u>call-in</u> and <u>call-out</u> capabilities to all SeeVogh meetings

- International call-in Phone to SeeVogh meetings

- Telepresence Capability

  - ✓ Possibility to send and receive 3 or more 1080p video streams
  - ✓ Build a SeeVogh telepresence system for less than **$10k**
  - ✓ Support for TIP (Telepresence Interoperability Protocol) from Cisco ➡ Possibility to call a Cisco Telepresence room (> $300k)

- Android and IOS (iPad, iPhone) support

Conclusion (1)

- The HEP community has unique collaborations requirements

- The HEP community is composed of diverse groups, experiments and interests. ➡ A top down solution is a non solution

- The VC client is important to provide the necessary features/functions

- But much more important are the infrastructure and architecture that support the service:
    - Should be highly scalable
    - Should be cost effective to deploy and support
    - Should allow ubiquitous connectivity (any devices)
    - Should support any VC standard based clients (H.323, SIP, MCU)
    - Should provide easy access for the end-user

- There is no free service, but cost is minimal if the community comes together and share resources.

Conclusion (2)

• Several VC services are currently offered to the community. Among them EVO being by far the service which as the broader reach among and across the experiments as well as the most used.

• EVO is moving commercial and will transition to SeeVogh driven by high interest for the research community at large and in order to build a sustainable financial model going forward.
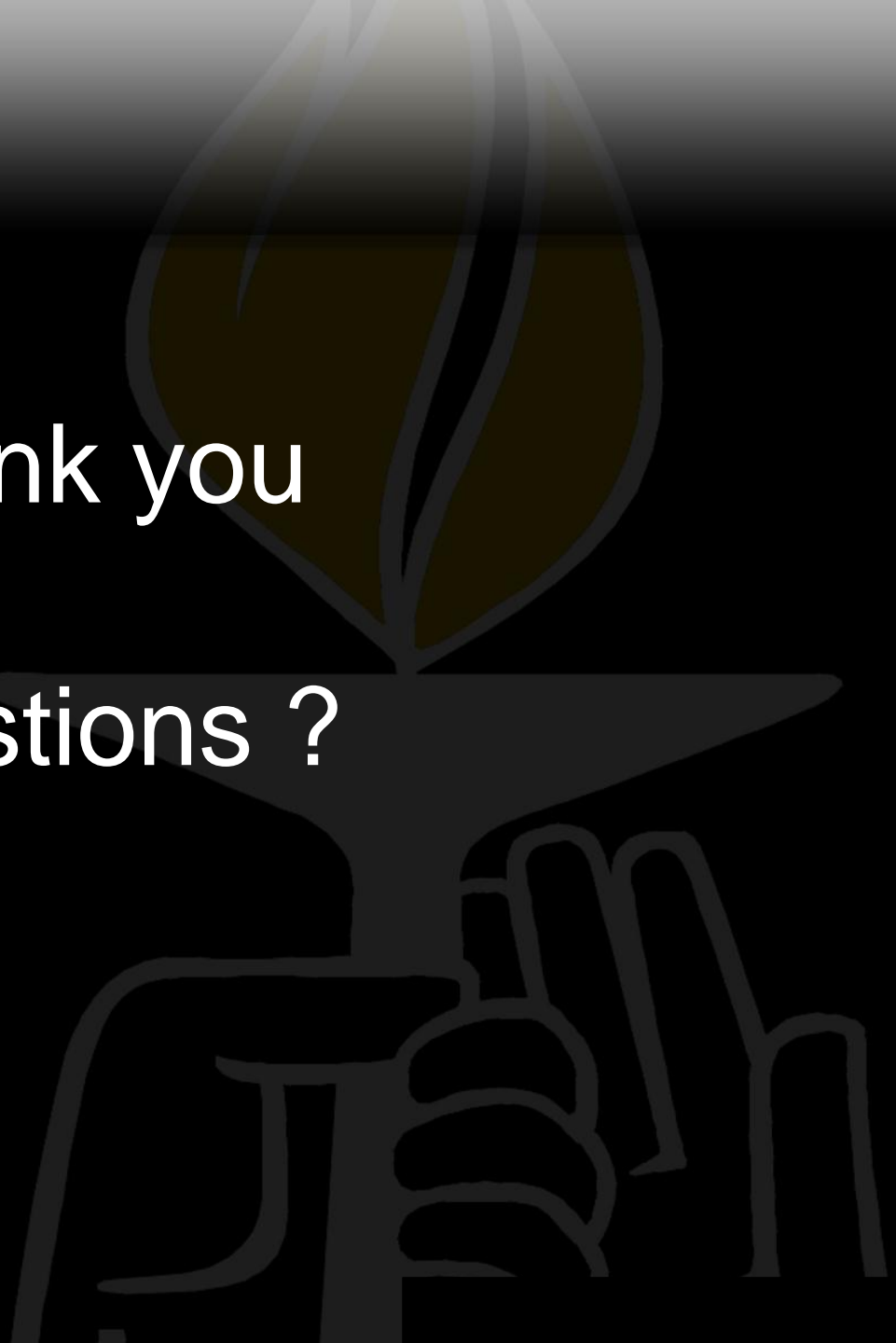
At the end what really matters is **your experiment** ?

Can you perform your research efficiently ? How reliable and easy can you collaborate with your remote colleagues and have productive meetings ? Which collaboration services and tools work best for you ?

Your experiment is the only decision maker so it is time to provide your feedback

Thank you

Questions ?

Extra Slides

Multi-camera support

A Unique End-to-End Self Managed & Secure Infrastructure for Collaboration; Integrating all protocol and conferencing system

H.323

Phones

Multicast/AG

H.323 MCU

Physics Control Centers

Handheld

SIP

Monitoring/MonALISA

Desktops

Desktops eMac +
eMac from $799
Windows XP
redhat

Full HD

Shibboleth
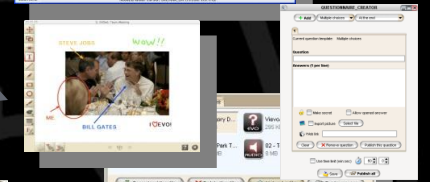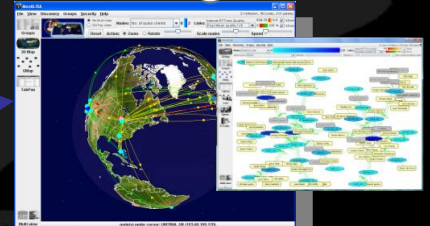
IPv6

APIs

Record/Playback

OpenGL Video

IM / Chat

Whiteboard/ Shared Files

ViEVO features

- All videos are shown in a single window
- Use GPU (Graphical Processor Unit) instead of CPU
- Real time:
  - Transparency
  - Text over video
  - 2D and 3D special effects (shadows, etc...)
  - Title of the meeting
- All resolutions from QCIF to HD 1080p
- Codec: H.261, H.263 and H.264

Web Conferencing/Phone service

Subscribe to hosted web or phone conference service such as WebEx, Adobe Connect, GoToMeeting, etc…

• While it could be appropriate for small groups, it will not fulfill the requirements for large scale international scientific experiments.
   ✓   Lack of scalability, interoperability, etc..

• In addition to limited functionality and incompatibility with standards, the cost would be very high
(~ $500/person/year)

EVO Objectives

- Provide a global-scale, robust, real-time, collaboration service to the LHC experiments and other major research and education programs

- Support and foster much more effective collaboration, across the full range of working environments *from laptop to conference room to control room and auditorium*

- Build and operate a system that can support the entire research and education community, *on a global scale*

- Design, build and evolve a system that can do all this, Operated by a *Small team, with the required high level of functionality, and Low Cost*

Some EVO functionalities

- Works on MS Windows, Mac OS X, Linux!

- Connects to H.323 client, H.323 MCU, SIP client, SIP MCU, IP telephone, Standard Telephone

- Works on Unicast and Multicast!

- EVO is tunneling all communications into one Port and is firewall and NAT friendly

- A/V Streams could be encrypted on the fly

- EVO GUI is available in 11 languages! and available in all time zones!

- Accepts CIF, VGA, 4CIF, 720p, 1080 resolutions!!

- Support H.261, H.263 and H.264 video codecs

Strong Integration

- Built-in powerful booking: meeting via invitation, Had-Hoc meeting, booked meeting, recurrent meetings, permanent meeting

- **INDICO** integration: auto booking, auto-modification, auto-join meeting. (CERN, DESY, BNL).

- LDAP/Shibboleth Integration

- Conference room integration: special room account, special room setup, administration privileges