

**Cees de Laat** 

**On behalf of the CineGrid Amsterdam Collaboration**

**Many slides from partners &  
Laurin Herr, Pacific Interface Inc.  
CineGrid.org**



# What is CineGrid?

---

- ❑ Formed 2004 – non-profit international membership organization
- ❑ Members – media arts schools, research universities, scientific labs, post-production facilities & hardware and software developers around the world
- ❑ Connected – via 1 G - 100 G Photonic - Ethernet networks
- ❑ For – research & education, experimentation, prototyping



# CineGrid Mission

To build an interdisciplinary **community** that is focused on the **research, development, and demonstration** of **networked** collaborative tools to enable the production, **use** and **exchange** of very-high-quality digital media over **photonic networks**.

<http://www.cinegrid.org/>



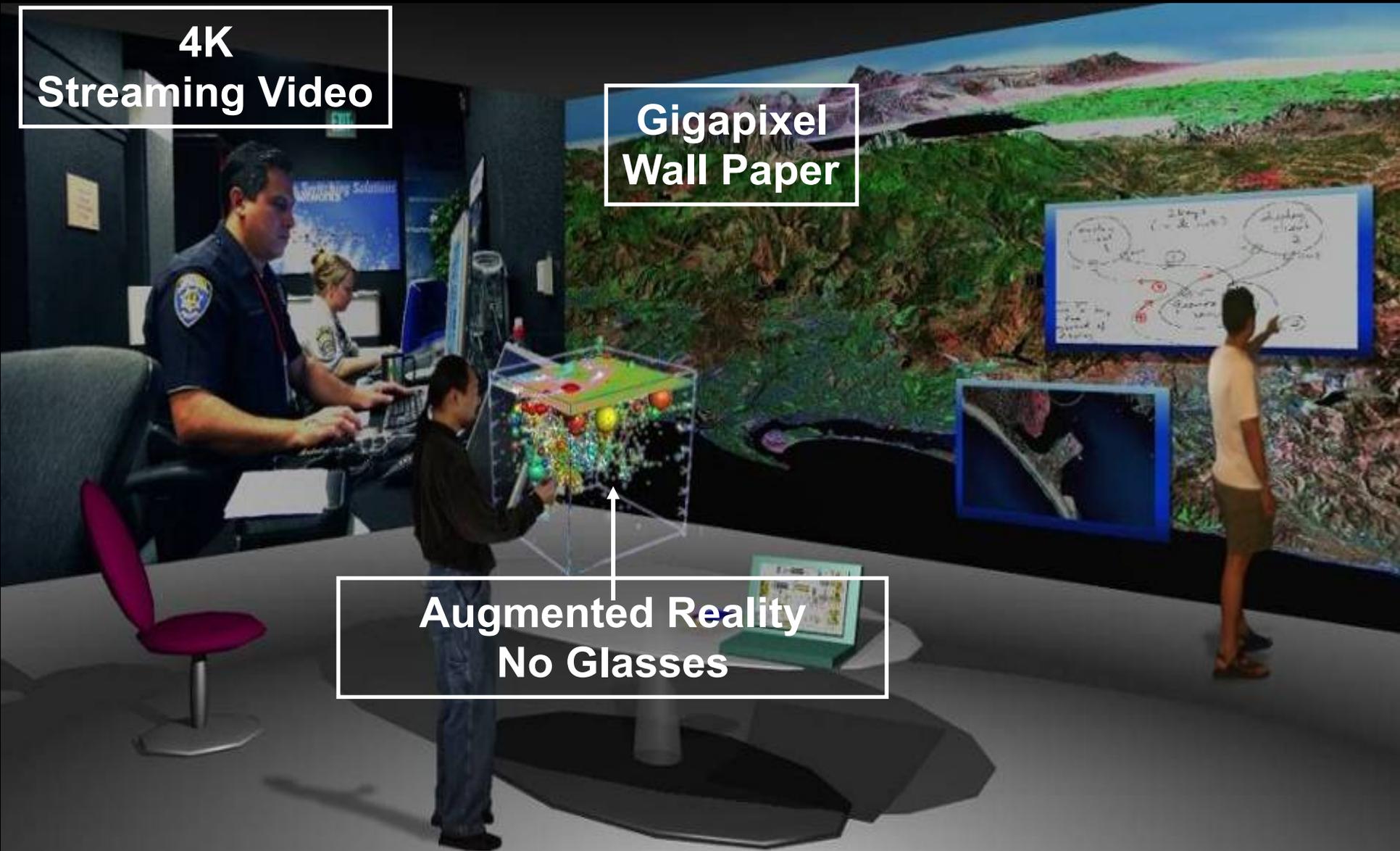
# 2004 OptIPuter Vision for the Next Decade

## Gigapixels @ Terabits/sec

4K  
Streaming Video

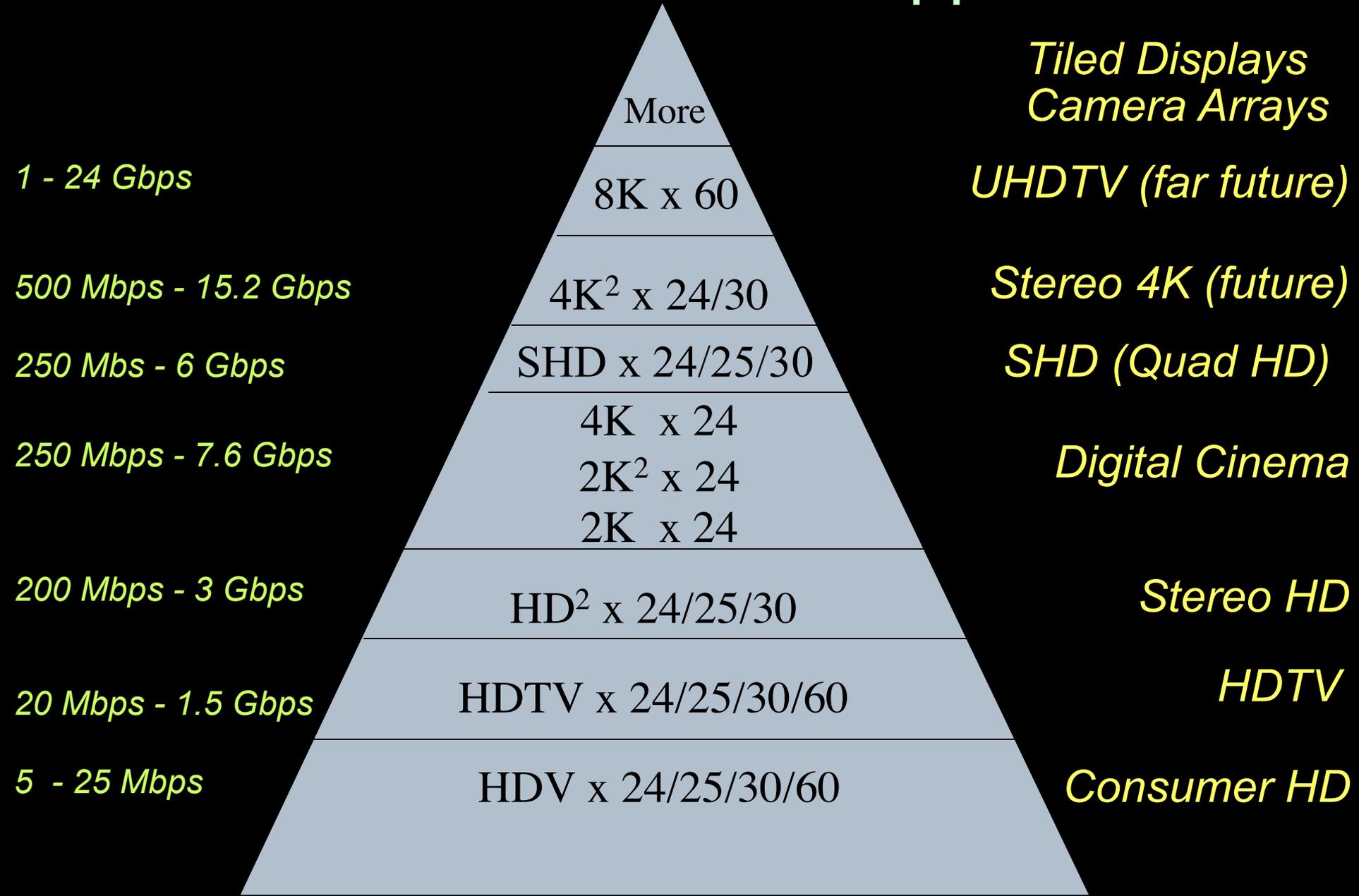
Gigapixel  
Wall Paper

Augmented Reality  
No Glasses



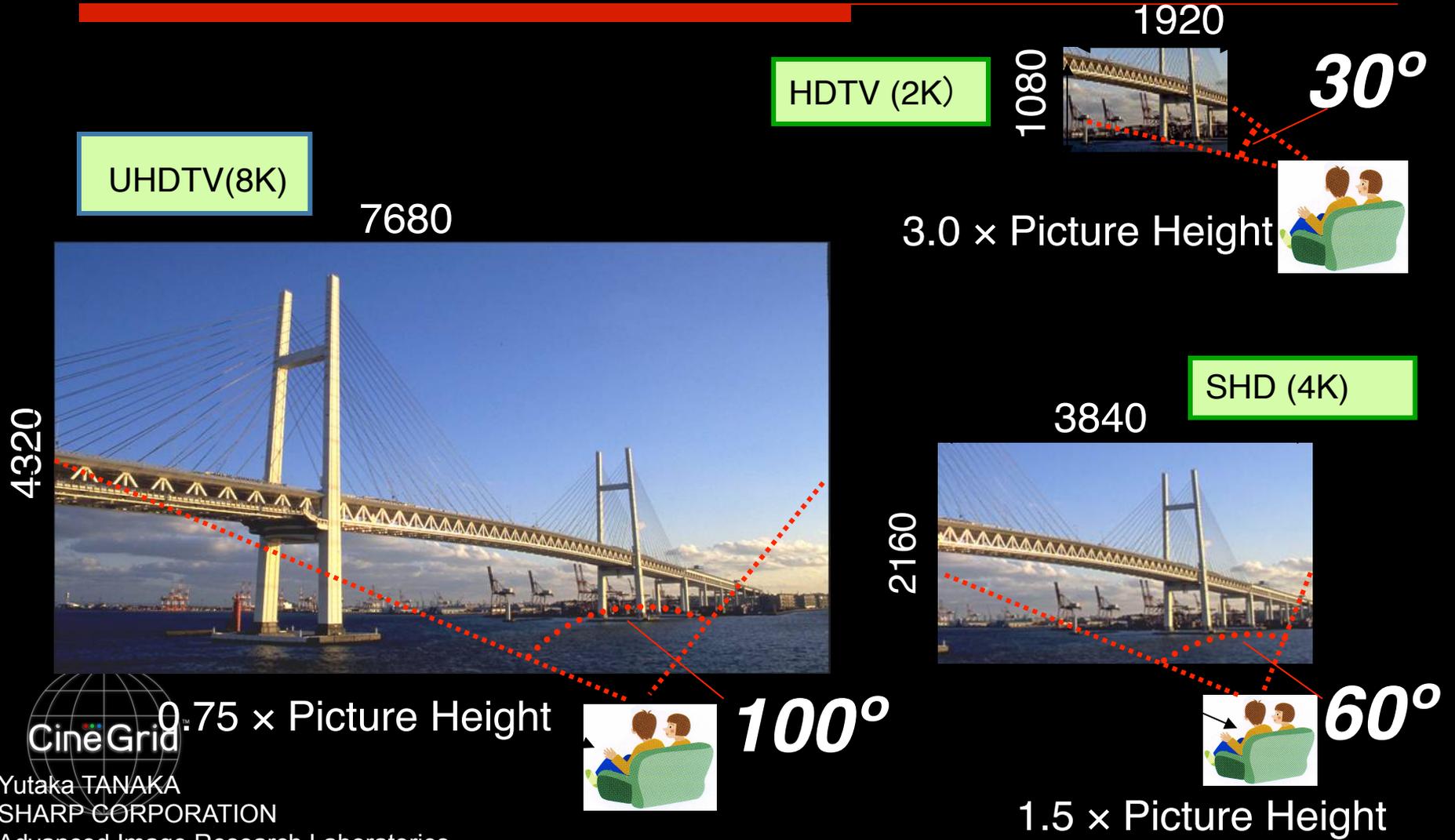


# CineGrid: A Scalable Approach



# Why is more resolution is better?

1. More Resolution Allows Closer Viewing of Larger Image
2. Closer Viewing of Larger Image Increases Viewing Angle
3. Increased Viewing Angle Produces Stronger Emotional Response



# Moving Big Data Objects Globally

## ❑ Digital Motion Picture for Audio Post-Production

- 1 TV Episode Dubbing Reference ~ 1 GB
- 1 Theatrical 5.1 Final Mix ~ 8 GB
- 1 Theatrical Feature Dubbing reference ~ 30 GB

## ❑ Digital Motion Picture Acquisition

- 4K RGB x 24 FPS x 10bit/color: ~ 48MB/Frame uncompressed (*ideal*)
- 6:1 ~ 20:1 shooting ratios => 48TB ~ 160TB digital camera originals

## ❑ Digital Dailies

- HD compressed MPEG-2 @ 25 ~ 50 Mb/s

## ❑ Digital Post-production and Visual Effects

- Gigabytes - Terabytes to Select Sites Depending on Project

## ❑ Digital Motion Picture Distribution

- Film Printing in Regions
  - ❑ Features ~ 8TB
  - ❑ Trailers ~ 200GB
- Digital Cinema Package to Theatres
  - ❑ Features ~ 100 - 300GB per DCP
  - ❑ Trailers ~ 2 - 4GB per DCP

# “Learning by Doing” Early CineGrid Projects



CineGrid @ iGrid 2005



CineGrid @ AES 2006



CineGrid @ Holland Festival 2007

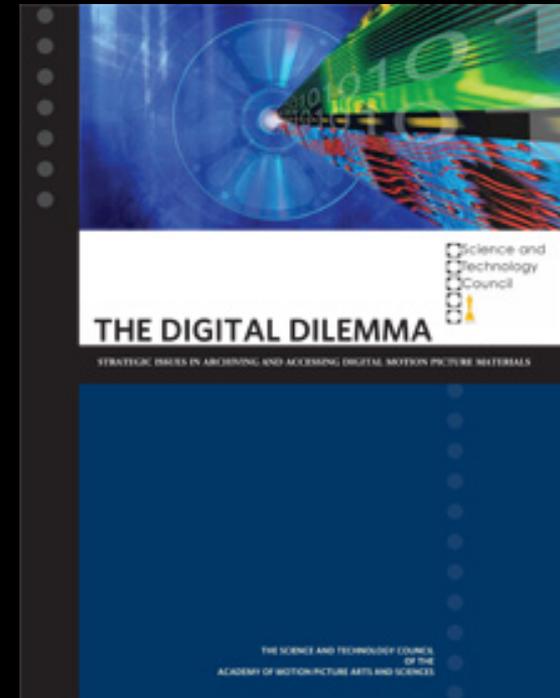


CineGrid @ GLIF 2007



# CineGrid Exchange

- ❑ TERABYTES PILING UP. To store & distribute its own collection of digital media assets. Members access materials for experiments and demonstrations.
- ❑ Create global-scale testbed = high quality media assets + distributed storage + fast networks.
- ❑ Enable exploration of strategic issues in digital media storage, access, distribution and preservation – for cinema, scientific visualization, medical imaging, etc.
- ❑ THE DIGITAL DILEMMA. Report published by Academy of Motion Picture Arts and Sciences 2007





4K/2K multipoint interactive telepresence

live 4K JPEG 2000 streaming over IP

Keio@Tokyo ◀.....▶ EVL@Chicago ◀.....▶ Calit2@San Diego



8K x 2K x 60p live remote sensing  
dual 4K/60p cameras & dual 4K JPEG 2000 codecs  
synchronized 4K JPEG 2000 streaming over IP

Monterey Bay Aquarium .....→ NPS@Monterey .....→ Calit2@San Diego



4K interactive digital cinema color grading  
realtime 4K uncompressed streaming over IP

CinePOST@Prague



Calit2@San Diego



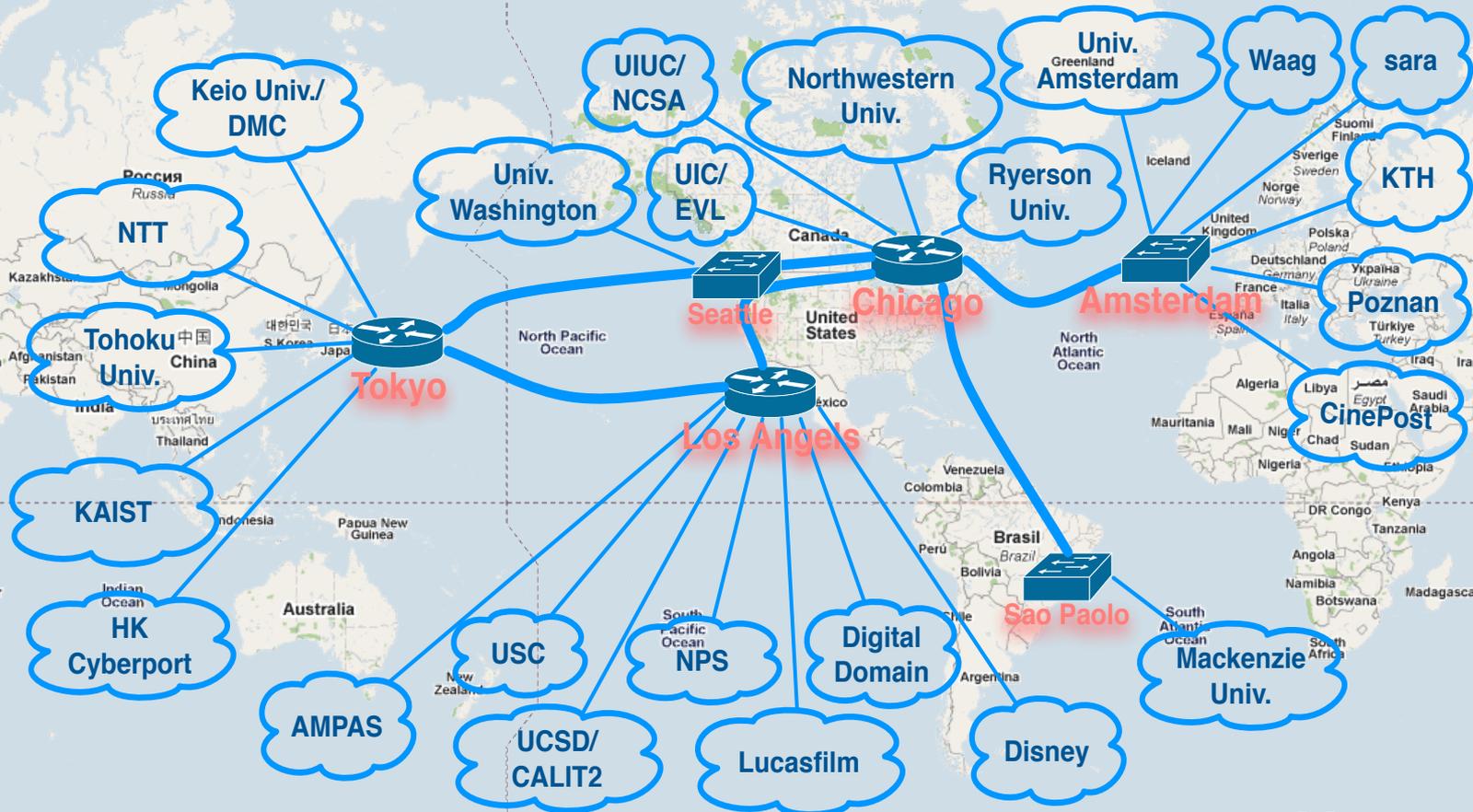
Tele-collaboration for audio post-production  
realtime picture and sound editing synchronized over IP

Skywalker Sound@Marin



Calit2@San Diego

# CineGrid Network 2011



Network Resources are kindly provided by:

AMPATH, C-Wave, CANARIE, CaveWave, CENIC, CESNET, CzechLight, GEMNET, Internet2, JANET, JGN2plus, NetherLight, NLR, NORDUnet, PacificWave, PNWGP, RNP, StarLight, SOL, SURFnet, TransLight/StarLight, T-LEX, WIDE

kaneko@dmc.keio.ac.jp, as of 2011/02/14

# CINEGRID AMSTERDAM

Research-, development- and outreach facility  
for production, transport and projection of  
digital cinema:

- Digital projection and sound in very high quality
- Editing and capture facilities
- Rendering & disk space
- Extremely high quality networks

In the center of Amsterdam

International context

- Focus on spin-offs & lasting value



# CINEGRID AMSTERDAM GOALS

Assemble technology, science, art and education to create new concepts, pilots & business models that result in:

- New forms of storytelling
- New domains for scientific exploration
- Transformation of workflows in creative media production
- Better education
- Enhanced economic growth



# PARTNERS

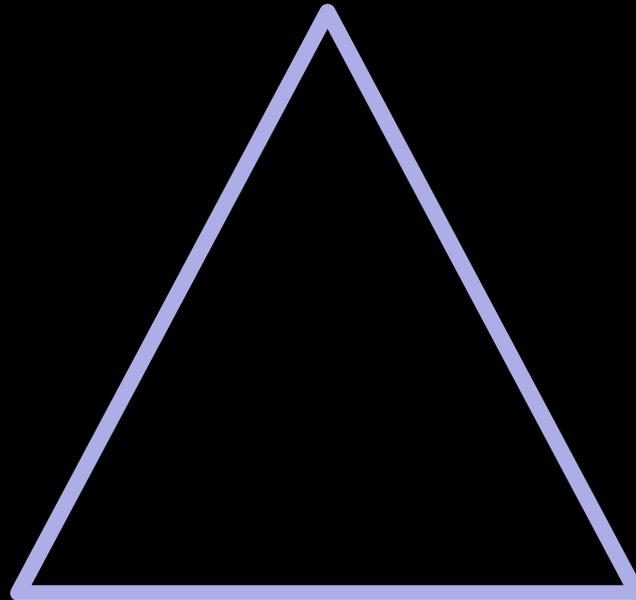
## CONSORTIUM PARTNERS

SURFnet, UvA, SARA, Dutch Film- and Television Academy, DELL, TNO, Holland Festival, Blender Institute, Sandberg Institute, MediaGuild, Waag Society

## COLLABORATORS

Poznan Supercomputing Center, Amsterdam Innovatie Motor, UCSD, University of Illinois, NHK, KTH, KEIO University, Pathé Benelux, Filmmuseum, Salto, Nationale Computer Faciliteiten, IDFA, BeamSystems, ISOC, IDFA, DutchView, PICNIC, GridForum and many more

**Blender**  
**Film and TV Academy**  
**Holland Festival**  
**Sandberg Institute**  
**Waag Society**



**DELL**  
**Media Guild**  
**TNO**

**SARA**  
**SURFnet**  
**University of  
Amsterdam**

# RESOURCES

CineGrid Studio for 4K postproduction

- 100 TB of Highly Connected Storage Space
- High Performance Render Cluster
- 3 \* 4K Screens and
- 1 – 10 Gb/s light path connections

Expertise in

- Production
- Encoding
- Transmission
- Screening



# SO FAR

Mediapark Jaarcongres '08 '09 '10  
Holland Animation Film Festival  
Holland Festival '07 & '10  
Content, content content..  
Educational contest  
4K How to Cookbook  
PICNIC '08 & '09  
SURFnet GigaPort  
Workshops 4K  
ICT Delta '09  
BeamLab





**Red End**  
**Robin Noorda & Bethany de Forest**



*Hey, sit still.*



*We're almost done. Sshh...*





Why?



I want to:

“Show Big Bug Bunny in 4K on my Tiled Display using green Infrastructure”

- Big Bugs Bunny can be on multiple servers on the Internet.
- Movie may need processing / recoding to get to 4K for Tiled Display.
- Needs deterministic Green infrastructure for Quality of Experience.
- Consumer / Scientist does not want to know the underlying details.  
→ His refrigerator also just works.

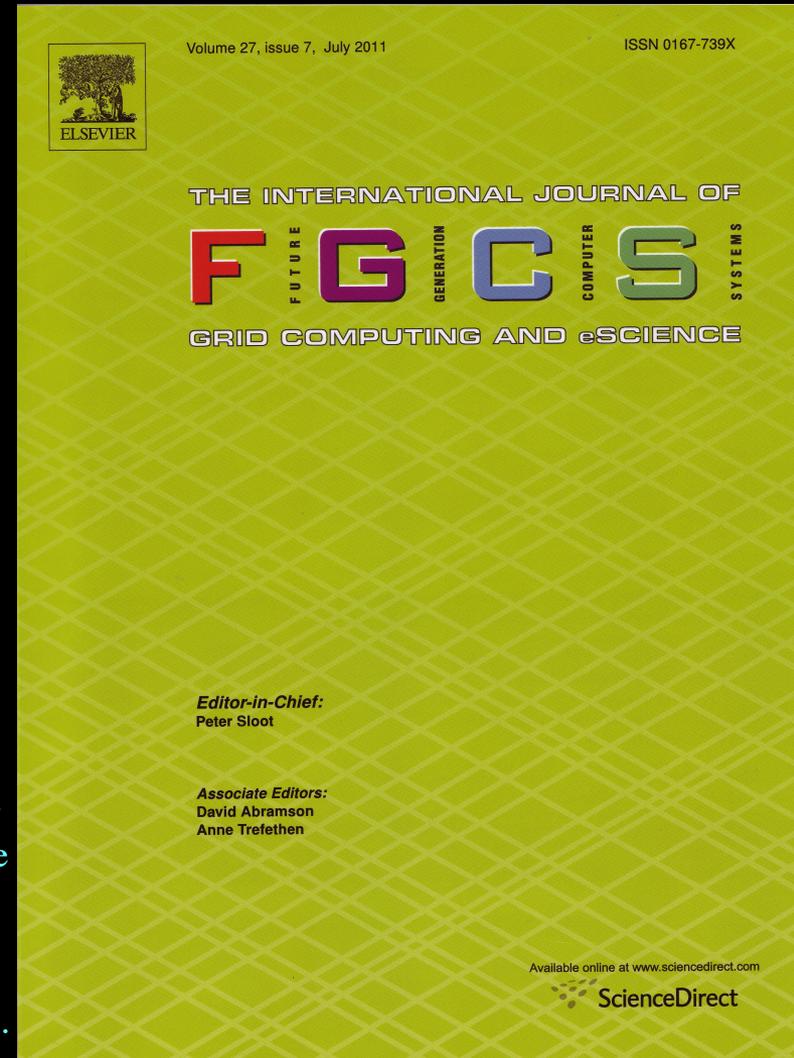
# Scientific Publications: FGCS Special Issue on CineGrid!

Volume 27, Issue 7, June 2011

Guest Editors: Naohisa Ohta & Paul Hearty & Cees de Laat

Editorial: CineGrid: Super high definition media over optical networks.

1. Real-time long-distance transfer of uncompressed 4K video for remote collaboration.
2. Media Network (HPDMnet): An advanced international research initiative and global experimental testbed.
3. Producing and streaming high resolution digital movies of microscopic subjects.
4. Enabling multi-user interaction in large high-resolution distributed environments.
5. Tri-continental premiere of 4K feature movie via network streaming at FILE 2009.
6. A collaborative computing model for audio post-production.
7. Design and implementation of live image file feeding to dome theaters.
8. Beyond 4K: 8K 60p live video streaming to multiple sites.
9. Using ontologies for resource description in the CineGrid Exchange.
10. CineGrid Exchange: A workflow-based peta-scale distributed storage platform on a high-speed network.
11. CSTEP: A parallel data transfer protocol using cross-stream coding.
12. Multi-point 4K/2K layered video streaming for remote collaboration.



# WORKPACKAGES

## 1. Center of Excellence

- UvA, SURFnet, SARA, Waag Society

## 2. Research

- UvA, SURFnet, SARA

## 3. Content

- Blender, Holland Festival, Waag Society

## 4. Education & Outreach

- Dutch Film- and TV Academy, Sandberg Institute, SURFnet

## 5. Business Cases

- TNO, Media Guild

## 6. Dissemination

- All partners

# CineGrid-Amsterdam is supported by

City of Amsterdam, Pieken in de Delta

EFRO / Kansen voor West, Province of Noord-Holland



**X**  
**X**  
**X** Gemeente  
Amsterdam



[www.cinegrid.nl](http://www.cinegrid.nl)



CineGrid 2012 in San Diego  
December