CineGrid @ GLIF 2009

Building a New User Community for Very High Quality Media Applications On Very High Speed Networks

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What is CineGrid?

- CineGrid is a non-profit international membership organization.
- CineGrid's mission is to build an interdisciplinary community 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 high-speed photonic networks.
- Members of CineGrid are a mix of media arts schools, research universities, scientific laboratories, post-production facilities and hardware/software developers around the world connected by 1 Gigabit Ethernet and 10 Gigabit Ethernet networks used for research and education.

CineGrid Founding Members

- Cisco Systems
- Keio University DMC
- Lucasfilm Ltd.
- NTT Network Innovation Laboratories
- Pacific Interface Inc.
- Ryerson University/Rogers Communications Centre
- San Francisco State University/INGI
- Sony Electronics America
- University of Amsterdam
- University of California San Diego/Calit2/CRCA
- University of Illinois at Urbana-Champaign/NCSA
- University of Illinois Chicago/EVL
- University of Southern California, School of Cinematic Arts
- University of Washington/Research Channel

CineGrid Institutional Members

- Academy of Motion Picture Arts and Sciences, STC
- California Academy of Sciences
- Cinepost, ACE Prague
- Dark Strand
- i2CAT
- JVC America
- Korea Advanced Institute of Science and Technology (KAIST)
- Louisiana State University, Center for Com and Tech
- Mechdyne
- Meyer Sound Laboratories
- Nortel Networks
- Northwestern University, iCAIR
- Naval Postgraduate School
- Renaissance Center North Carolina (RENCI)
- Royal Swedish Institute of Technology
- SARA
- Sharp Corporation Japan
- Sharp Labs USA
- Tohoku University/Kawamata Lab
- University of Manitoba, Experimental Media Centre
- Waag Society

CineGrid Network/Exchange Members

- AMPATH
- CANARIE
- CENIC
- CESNET
- CzechLight
- Internet 2
- JA.NET
- Japan Gigabit Network 2
- National LambdaRail
- NetherLight
- NORDUnet
- Pacific Wave
- Pacific North West GigaPOP
- PIONEER
- RNP
- Southern Light
- StarLight
- SURFnet
- WIDE

Historic Convergence Motivates CineGrid

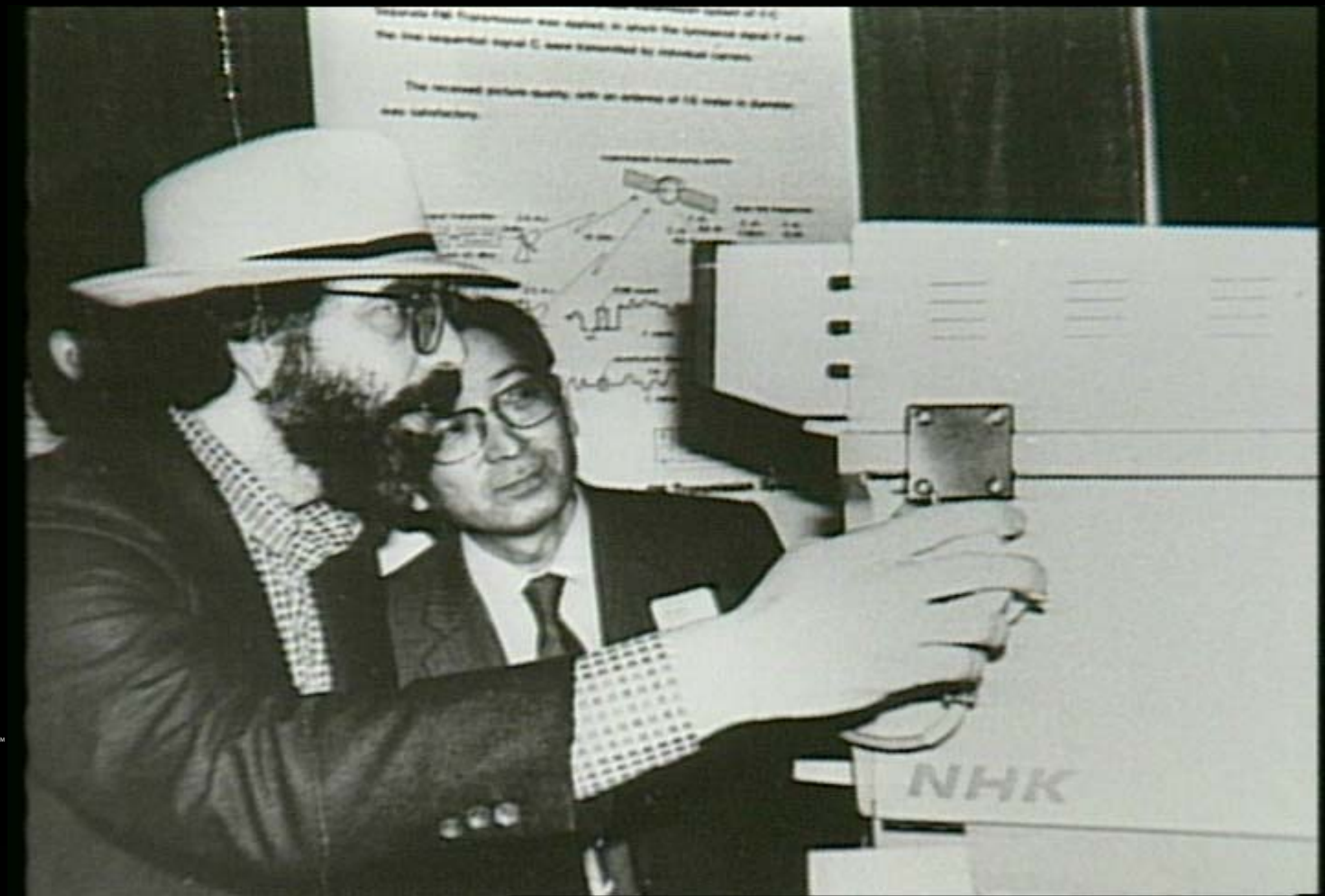
- State of the art of media applications is historically driven by three communities
  - Entertainment, media, art and culture
  - Science, medicine, education and research
  - Military, intelligence, security and police

- Adoption of digital media means their requirements are converging
  - Fast networking with similar profiles
  - Access shared instruments, specialized computers and massive storage
  - Collaboration tools for distributed, remote teams
  - Robust security for their intellectual property
  - Higher media quality, greater speed, more distributed applications
  - A next generation of trained professionals

1981

Francis Ford Coppola with Dr. Takashi Fujio

“First Look” at HDTV Electronic Cinema



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2001

NTT Network Innovations Laboratory

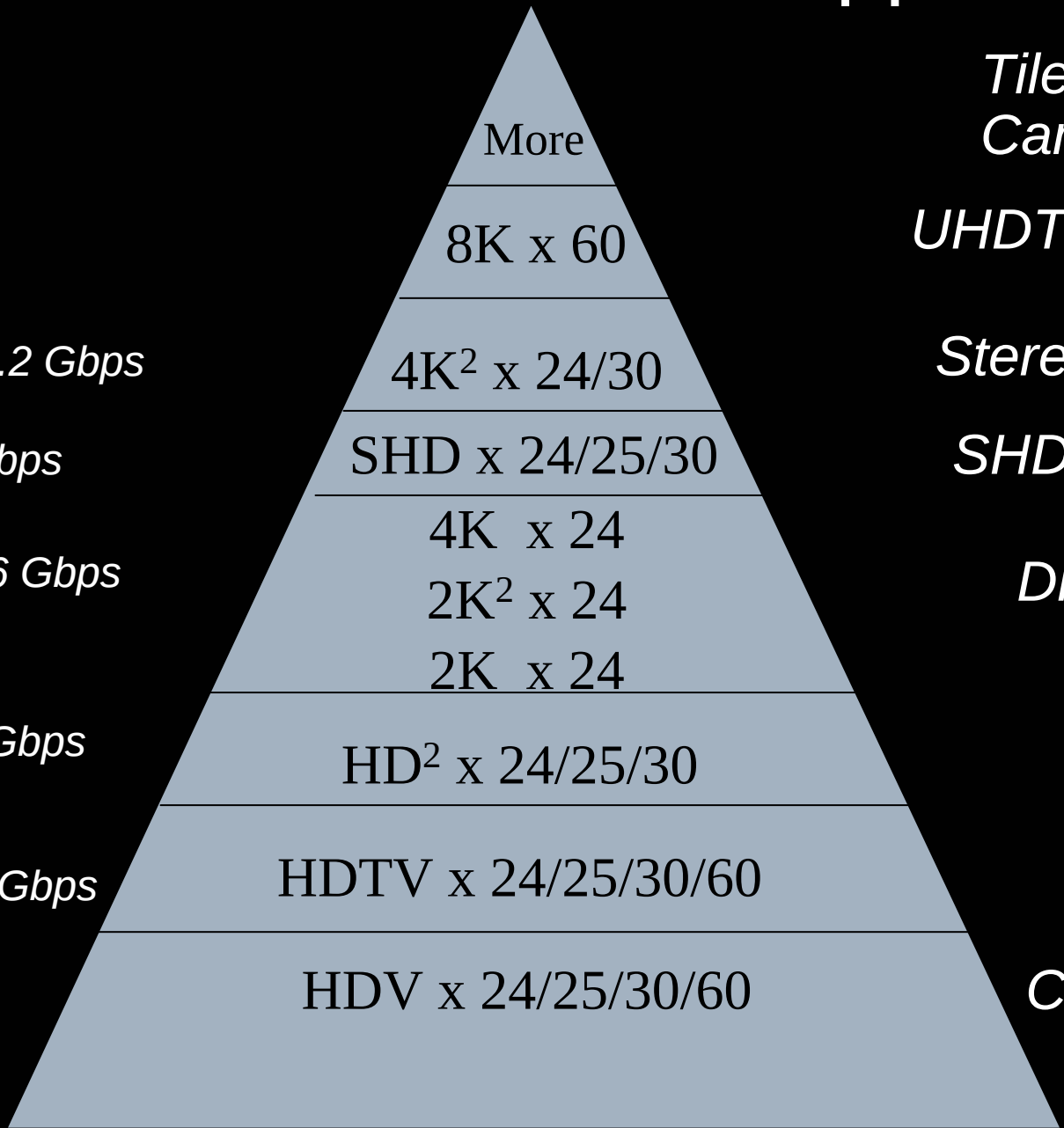
“First Look” at 4K Digital Cinema

CineGrid™

2004
“First Look” at 100 Mpixel OptIPortal
Scientific Visualization and Remote Collaboration

evl electronic visualization laboratory

CineGrid: A Scalable Approach



Tiled Displays
Camera Arrays

1 - 24 Gbps — *UHDTV (far future)*

500 Mbps - 15.2 Gbps — *Stereo 4K (future)*

250 Mbs - 6 Gbps — *SHD (Quad HD)*

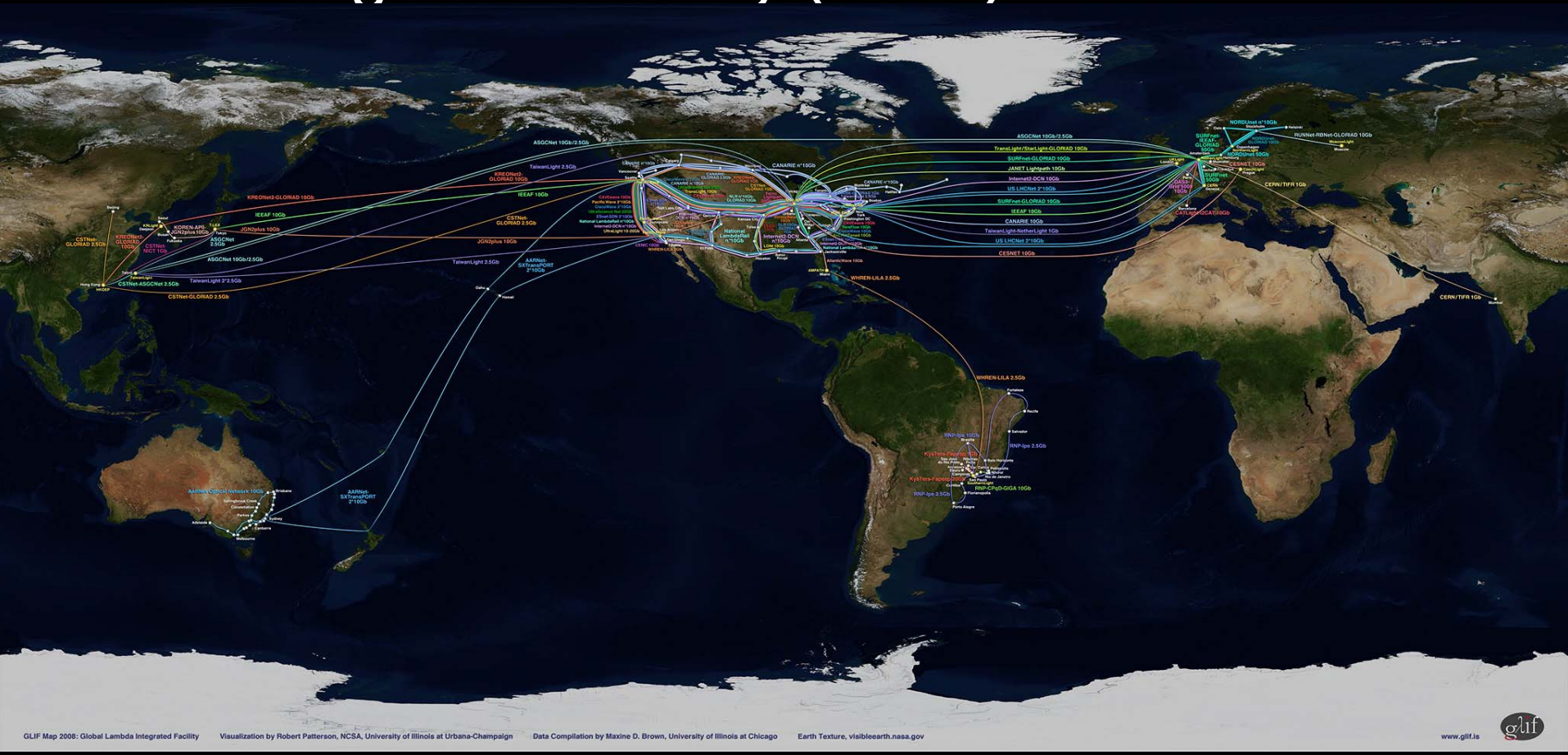
250 Mbps - 7.6 Gbps — *Digital Cinema*

200 Mbps - 3 Gbps — *Stereo HD*

20 Mbps - 1.5 Gbps — *HDTV*

5 - 25 Mbps — *Consumer HD*

CineGrid Project Run over the Global Lambda Integrated Facility (GLIF) Backbone



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2008 GLIF Visualization by Bob Patterson, NCSA/UIUC

Need to Move 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
  - Web Download to Consumers
    - Features ~ 1.3GB
    - TV Shows ~ 600MB

CineGrid Projects: “Learning by Doing”

CineGrid @ iGrid 2005

CineGrid @ AES 2006

CineGrid @ Holland Festival 2007

CineGrid @ GLIF 2007

CineGrid Exchange

- CineGrid faces a growing need to store and distribute its own collection of digital media assets. The terabytes are piling up. Members want access to the materials for their experiments and demonstrations.
- Pondering “The Digital Dilemma” published by AMPAS in 2007, we studied the lessons learned by NDIPP and NARA, as well as the pioneering distributed storage research at Stanford (LOCKSS) and at UCSD (SRB and iRODS).
- CineGrid Exchange established to handle CineGrid’s own practical requirements AND to create a global-scale testbed with enough media assets at high enough quality, connected with fast enough networks, to enable exploration of strategic issues in digital archiving and digital library distribution for cinema, scientific visualization, medical imaging, etc.

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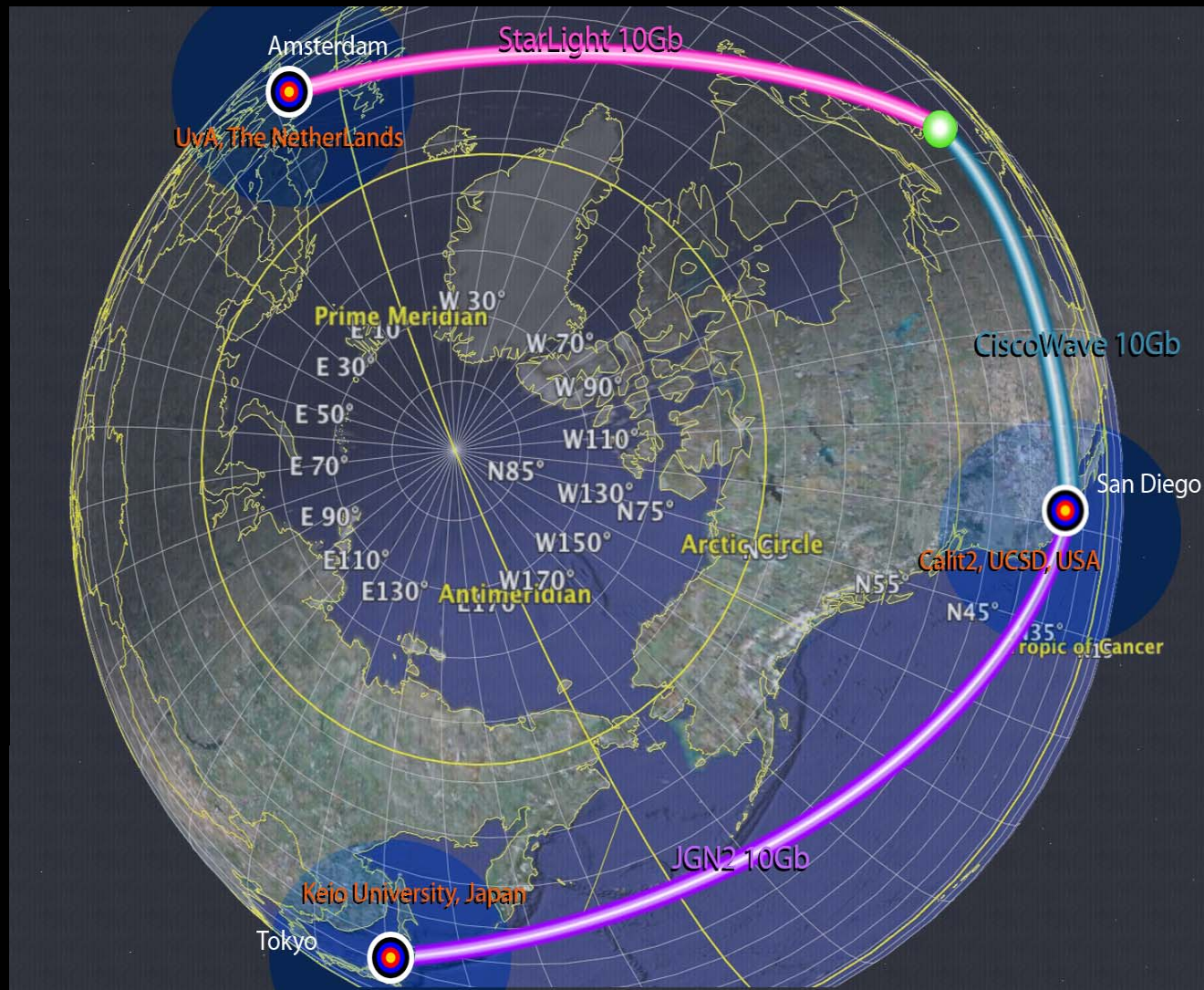
CineGrid Exchange 2008

Geographically Distributed Repositories Linked by Fast Networks

CineGrid Exchange holds high quality digital media assets, including 4K, 2K, HD, mono & stereo, still & motion pictures, plus audio.

- San Diego @ UCSD/Calit2
  40 TB with 10Gbps connectivity
- Amsterdam @ UvA
  30 TB with 10Gbps connectivity
- Tokyo @ Keio/DMC
  6 TB with 10 Gbps connectivity

Total Storage = 76 TB



CineGrid Exchange 2009

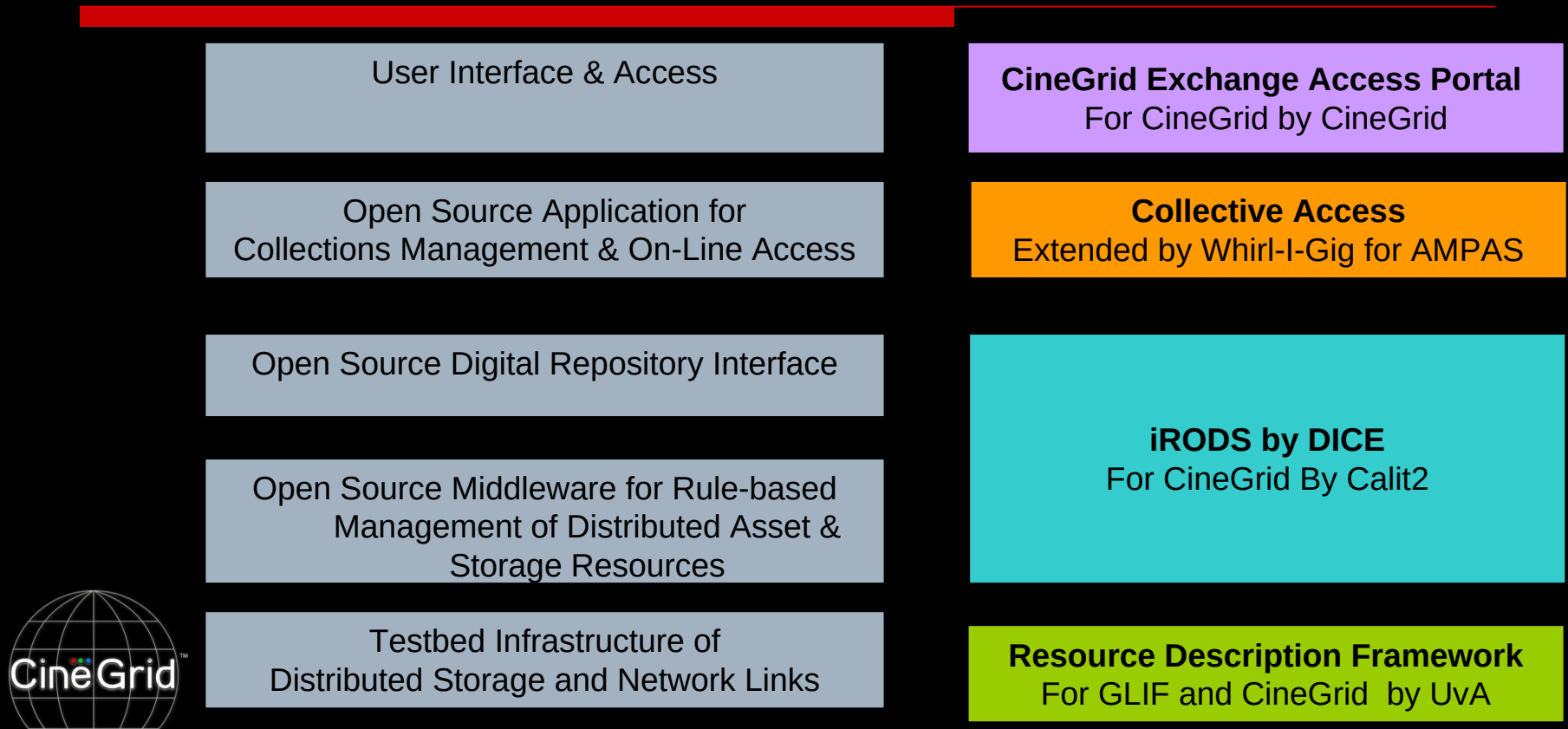
- 96 TB repository added by Ryerson in Toronto
- 48 TB repository added by CESNET in Prague
- 10 TB repository added by UIC/EVL in Chicago
- 10 TB repository to be added by AMPAS in Hollywood
- 16 TB repository to be added by NPS in Monterey

- By end of 2009, global capacity of CineGrid Exchange will be 256 TB connected via 10 GigE cyberinfrastructure

- Initiated CineGrid Exchange Project (CXP 2009) to implement multi-layer open-source asset management and user access framework for distributed digital media repository
- Funding for CXP 2009 from AMPAS STC
- Working Group: AMPAS, PII, Ryerson, UCSD, NPS, UW, UvA, Keio, NTT, CESNET, UIC

CineGrid Exchange Architecture

Multi-layer Open Software Stack Concept



Maintaining and Growing Collaborative Capabilities

- Basic value proposition, of course, is providing local talent with marketable skills
  - Talent with production skills
  - Schooled in remote collaborative environments
  - Capable of working internationally
- Regional and international networks become “infrastructure incentives” to complement tax credits, other economic advantages, etc.
  - Reduce time/speed impacts of distance
  - Enable effective and efficient creative collaboration
  - Enhance competitiveness of media companies in the global marketplace, allowing them to attract projects (jobs) and deliver results worldwide

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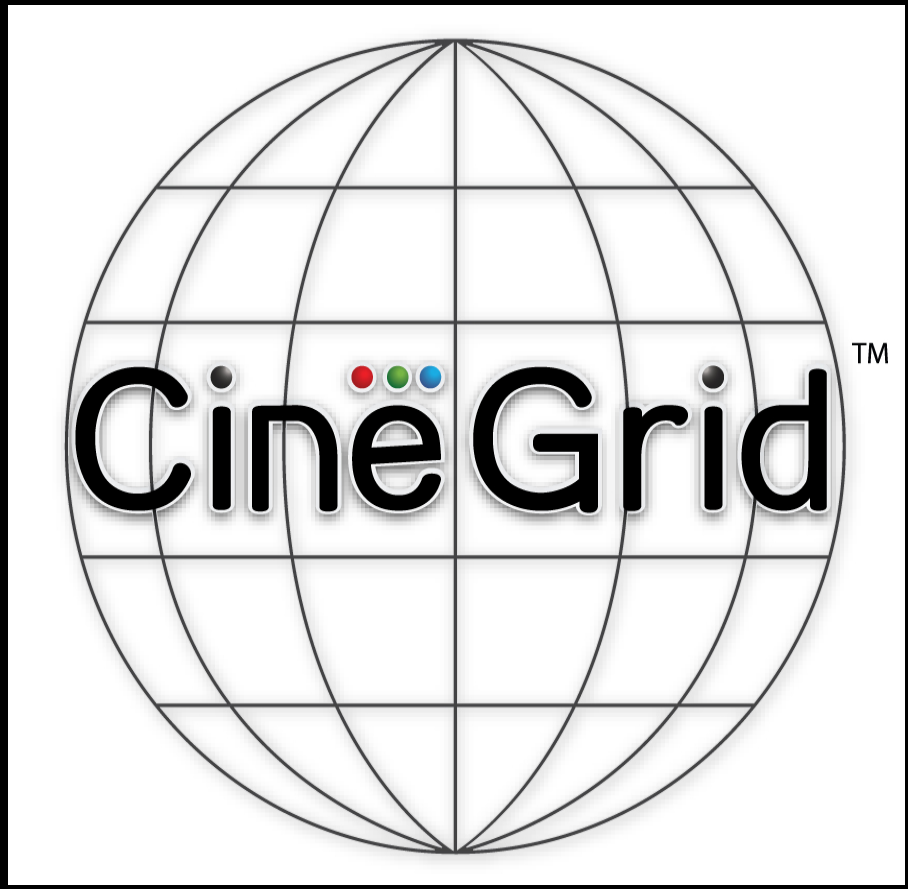
CineGrid International Workshop 2008 @ UCSD/Calit2 in San Diego

Save the Date: December 6-9, 2009



www.cinegrid.org