CineGrid

Global Experimental Facility for very high quality digital Cinema

CineGrid R&D in Holland

Cees de Laat

CineGrid.org founding member

University of Amsterdam

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/

Cinema combines art and science, culture and commerce, increasingly digital

- In California alone, movie industry employed 245,000 with $17 billion payroll in 2005.
- Movie-making is going global. Local talent is key!
- Regional and international networks become “infrastructure incentives” for media companies to attract cinema jobs and deliver results worldwide.

Photo: Naohisa Ohta

What is 4K ?

- Most broadly, “4K” describes any new format for motion pictures with 8+ Megapixels per frame

- Some “4K” is really Quad HDTV (*also known as* SHD)
  3840 x 2160; 24/25/30fps; 4:2:2/4:4:4; 10-bit Rec 709; Progressive Scan; Square Pixels; multiple codecs

- Strictly speaking, “4K” is one of two new SMPTE DC-28 standard formats for Digital Cinema Theatrical Distribution as recommended by Digital Cinema Initiatives (DCI)
  4096 x 2160; 24 fps; 4:4:4; 12-bit SMPTE XYZ, Progressive Scan; Square Pixels; JPEG 2000 codec only

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

HDTV (2K)

1920

1080

30°

3.0 × Picture Height

UHDTV(8K)

7680

4320

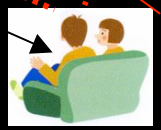
0.75 × Picture Height

100°

SHD (4K)

3840

2160

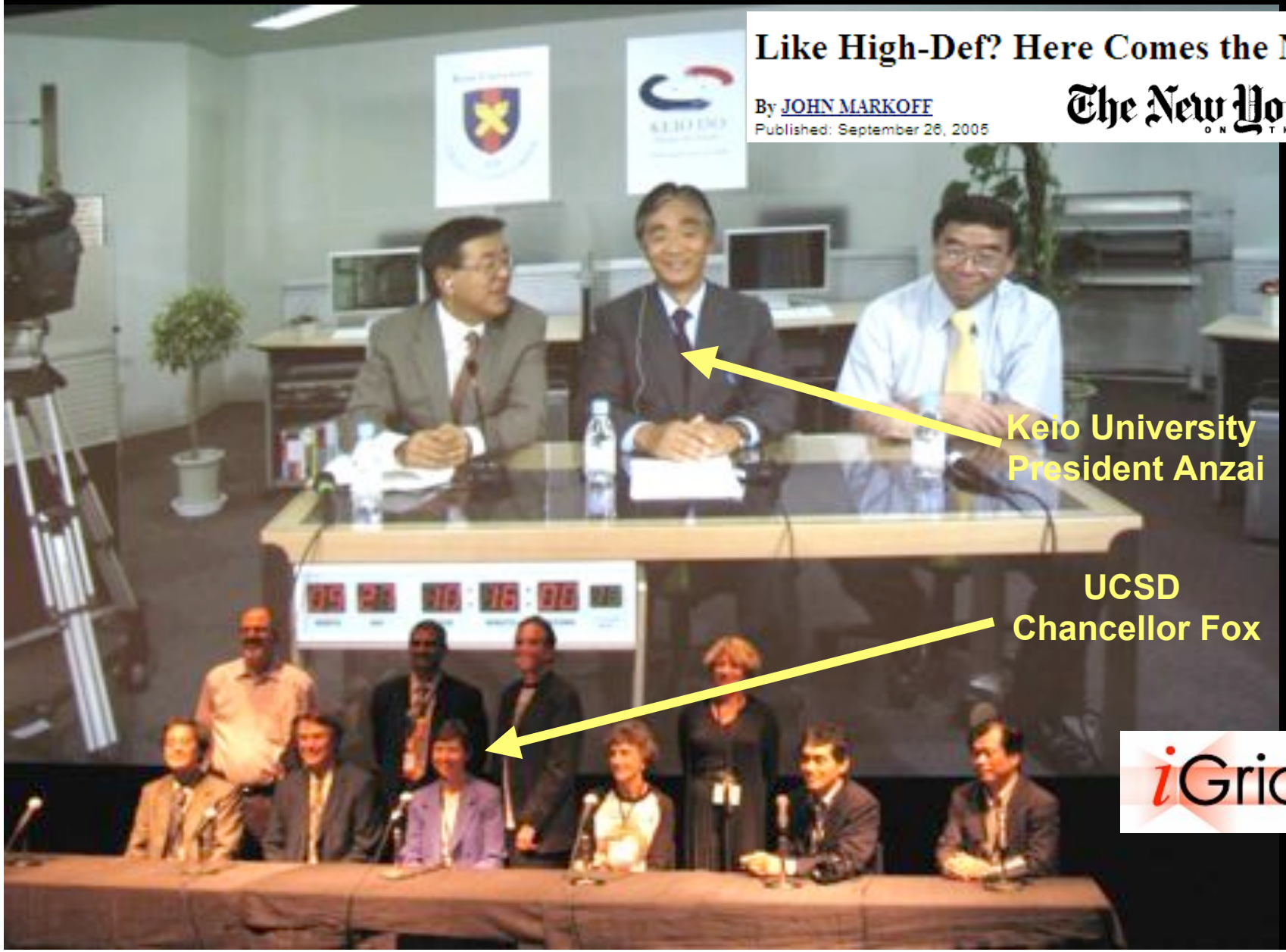


60°

1.5 × Picture Height

Yutaka TANAKA
SHARP CORPORATION
Advanced Image Research Laboratories

Keio/Calit2 Collaboration: Trans-Pacific 4K Teleconference



Like High-Def? Here Comes the Next Level

By JOHN MARKOFF
Published: September 26, 2005

The New York Times ON THE WEB

Keio University President Anzai

UCSD Chancellor Fox

Used 1Gbps Dedicated

Sony
NTT
SGI

iGrid 2005

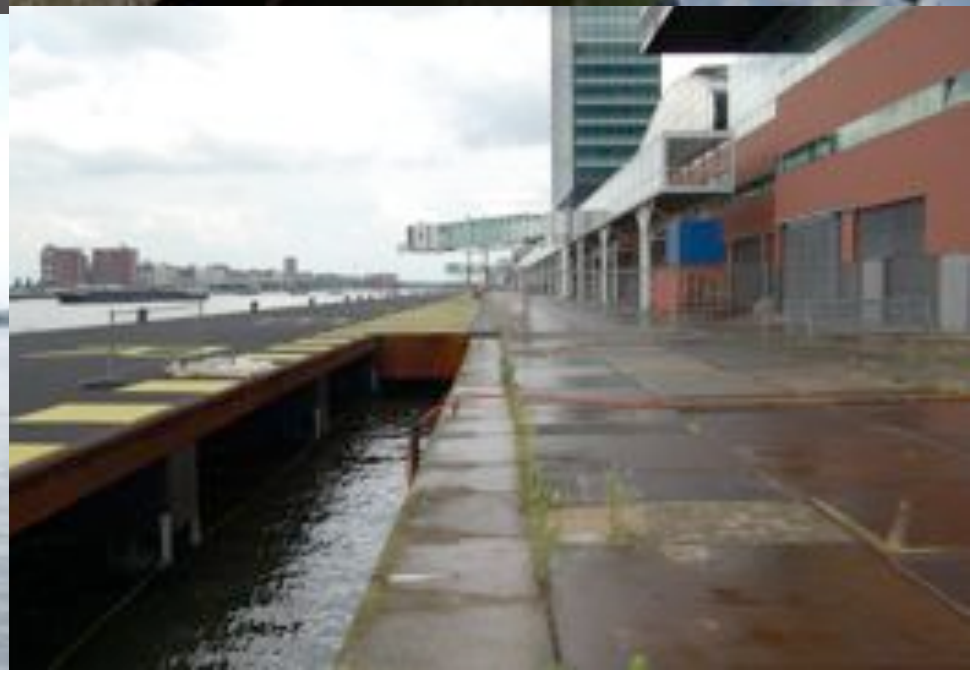
CineGrid@SARA

CineGrid @ Holland Festival 2007

Era la Notte, June 20-21, 2007 (Live!)

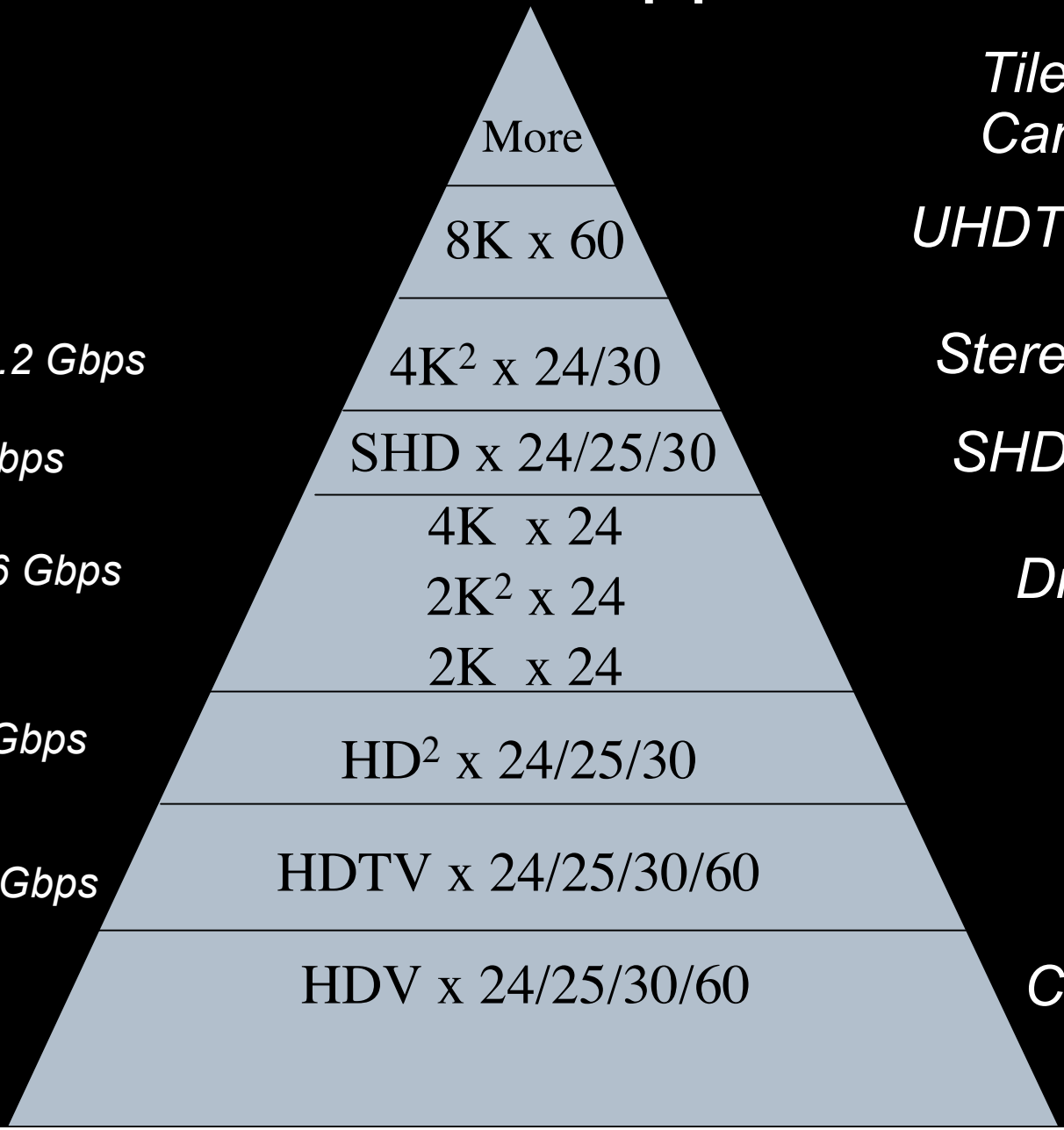
CineGrid @ Holland Festival 2007

Swimming Fiber the Last 500m



CineGrid @ GLIF 2007 (Prague)

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*

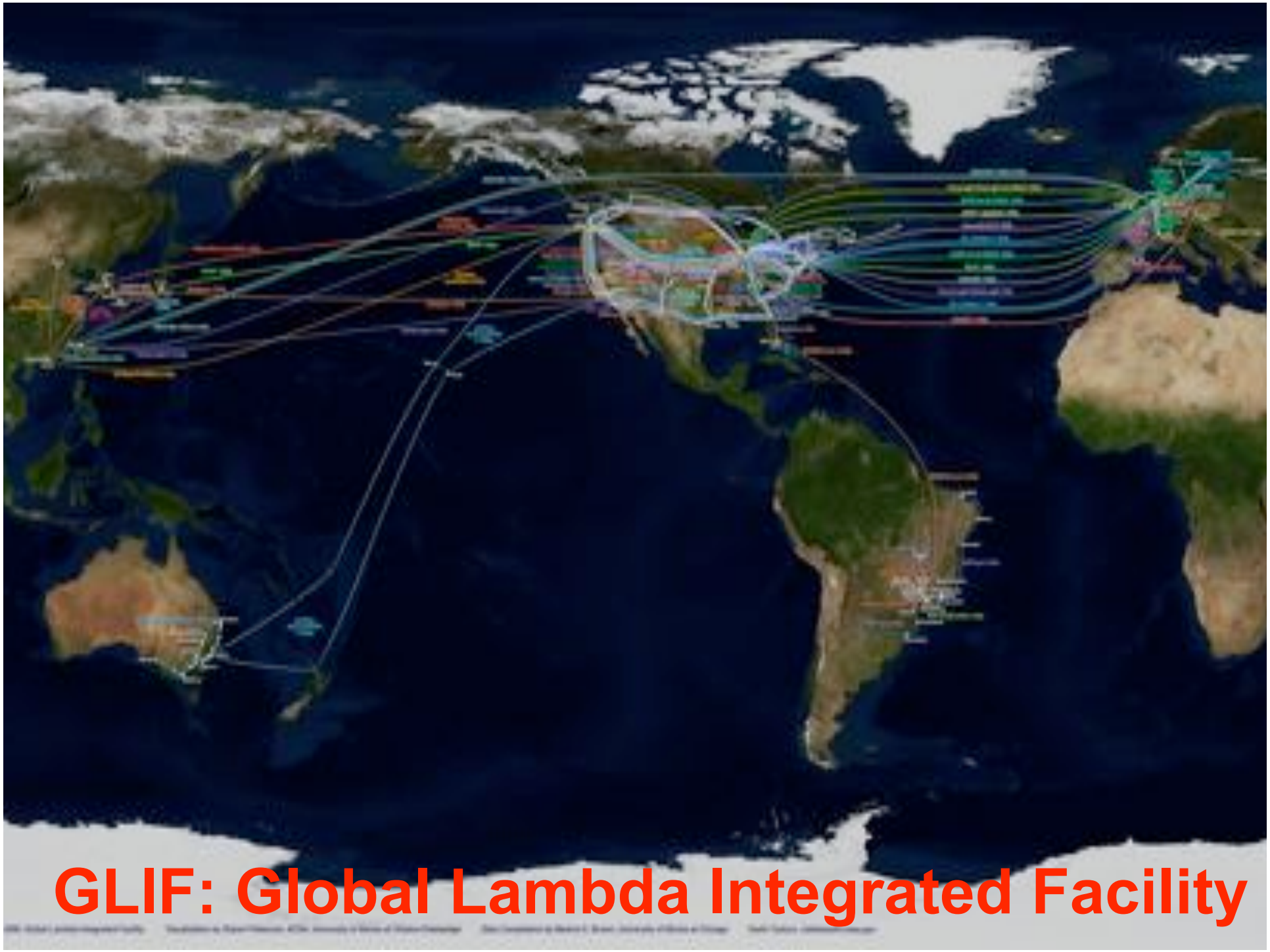
Format - Numbers - Bits (examples!)

Format	X	Y	Rate	Color bits/pix	Frame #pix	Frame MByte	Flow MByt/s	Stream Gbit/s
720p HD	1280	720	60	24	921600	2.8	170	1.3
1080p HD	1920	1080	30	24	2073600	6.2	190	1.5
2k	2048	1080	24 48	36	2211840	10	240 480	1.2 2.4
SHD	3840	2160	30	24	8294400	25	750	6.0
4k	4096	2160	24	36	8847360	40	960	7.6

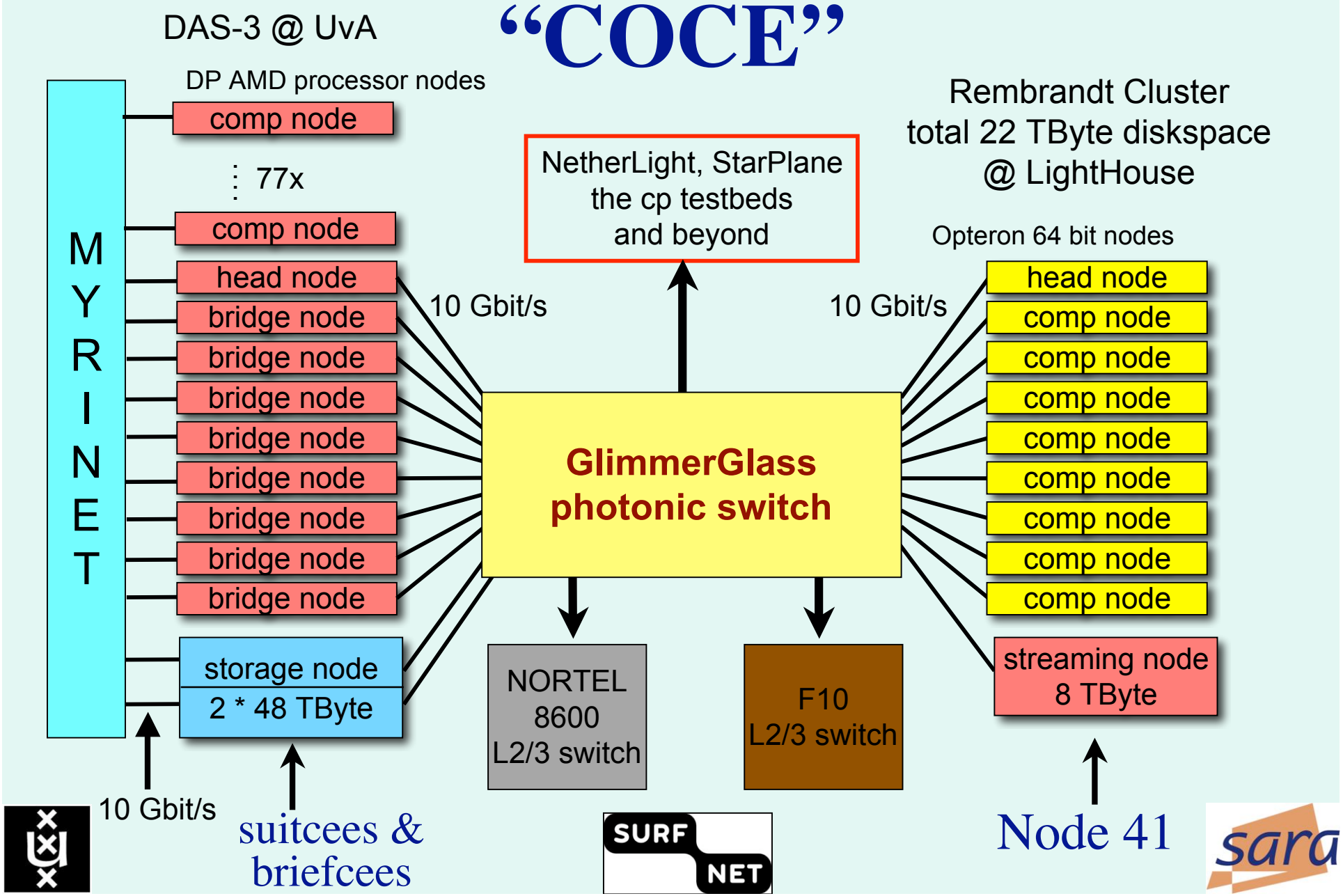
Note: this is excluding sound!
Note: these are raw uncompressed data rates!

Number, numbers and more numbers!

- **Digital Motion Picture for Audio Post-Production** — 40 GB
  - 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** — 8 TB
  - 6:1 up to 20:1 shooting ratios
  - 4k @ 24 FPS @ 10bit/color: ~48MB/Frame uncompressed
  - ~8TB for Finished 2 Hr Feature
- **Digital Dailies** — 22 GB
  - HD compressed MPEG-2 @ 25Mb/s
  - Data Size: ~22GB for 2 Hours
- **Digital Post-production and Visual Effects** — ~ TB
  - Terabytes, Gigabytes, Megabytes To Select Sites Depending on Project
- **Digital Motion Picture Distribution** — 8 TB
  - Film Printing in Regions — 200 GB
    - Features ~8TB
    - Trailers ~200GB
  - Digital Cinema to Theatres — 300 GB
    - Features ~200 - 300GB DCP
    - Trailers ~2 - 4GB DCP
- Online Download — 1 GB
  - Features ~1.3GB
  - TV Shows ~600MB


GLIF: Global Lambda Integrated Facility

Amsterdam CineGrid S/F node "COCE"



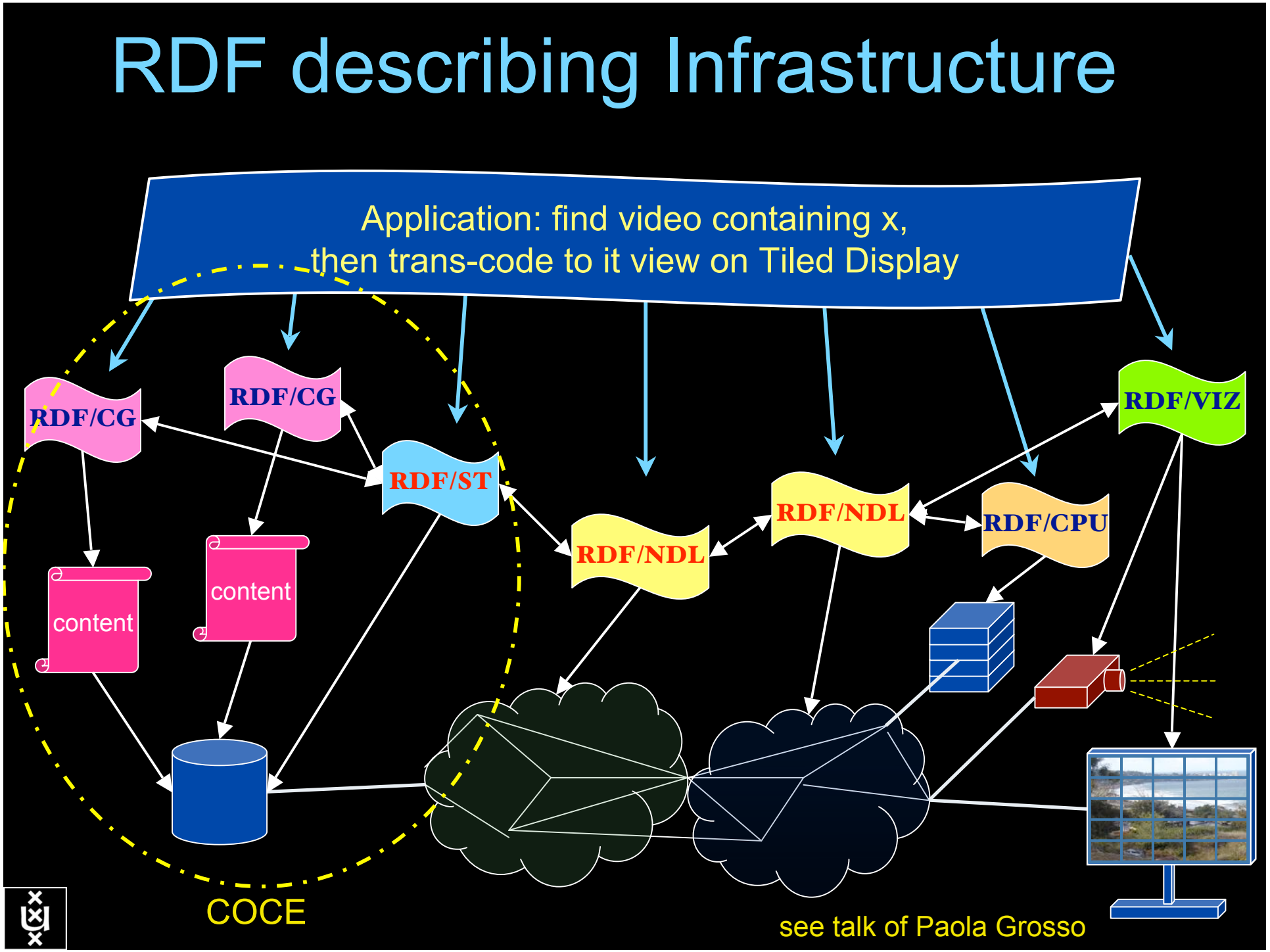
Role of UvA

- Founding member CineGrid
- Linking communities (CALIT(2), EVL, NTT, Keio University) to local organizations (SURFnet, SARA, de Waag, you!)
- System and Network Engineering
  - optical photonic networks
  - store & forward (100 terabyte experimental server)
  - AAA & security
  - grid for processing
- Metadata and make it searchable (MM)

R & D

- interface portal to storage (supertube.org)
- interface portal to PBT enabled testbed and Netherlight / SURFnet_6.0
- near real time transcoding on DAS-3
- scalable streaming via bridgenodes
- embedding in semantic web
- Access control / security
- content management / deep storage / repositories
- Disk -> network performance

RDF describing Infrastructure



Questions ?

www.cinegrid.org
www.cinegrid.nl
www.supertube.org
www.science.uva.nl/~delaat