

CineGrid

Global Experimental Facility for very high
quality digital Cinema



CineGrid in need of Phosphorus

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

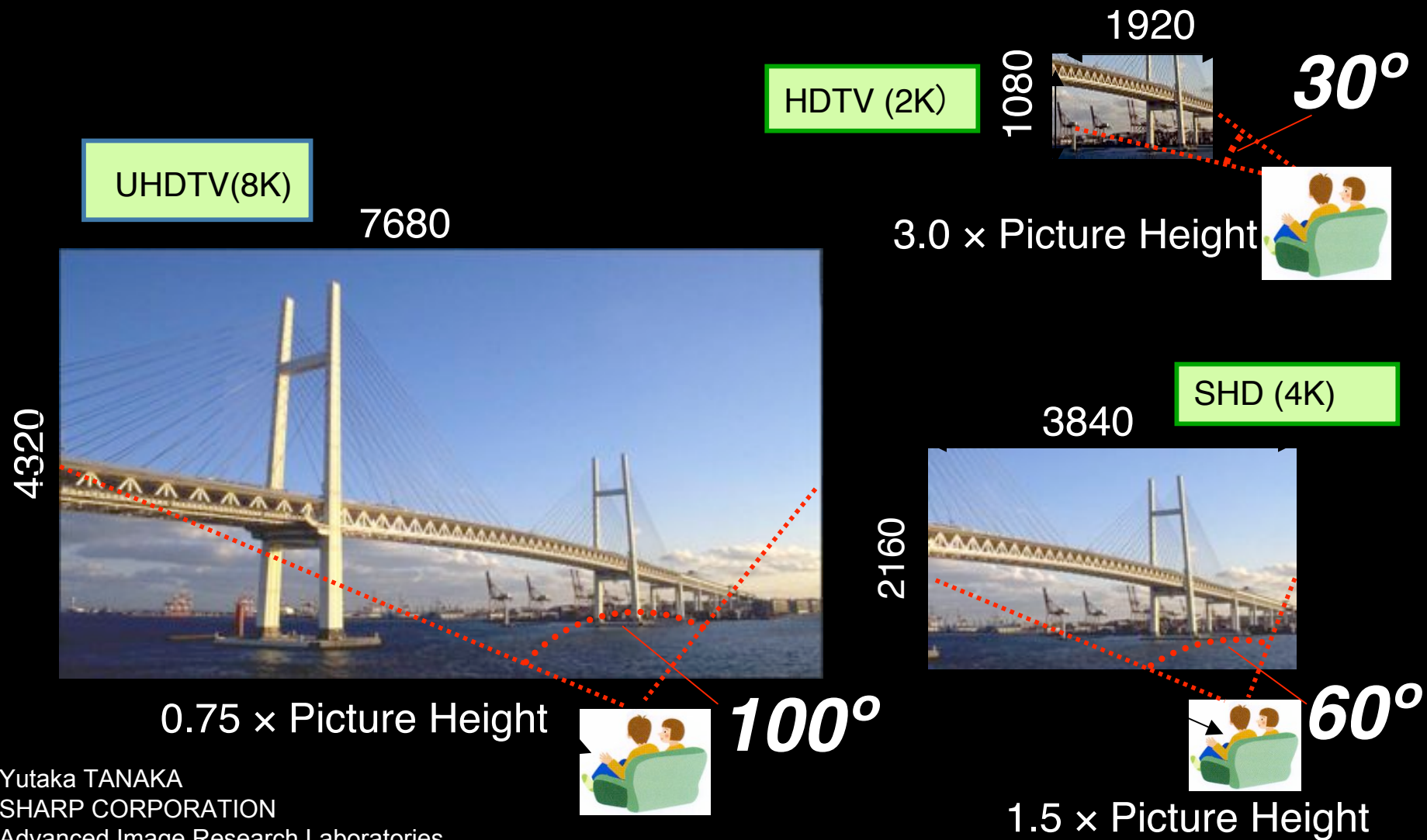
What is 4K ?

- ❑ 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



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

Used
1Gbps
Dedicated

Sony
NTT
SGI

Keio University
President Anzai

UCSD
Chancellor Fox

iGrid 2005



CineGrid@SARA



CineGrid @ Holland Festival 2007



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



CineGrid @ Holland Festival 2007

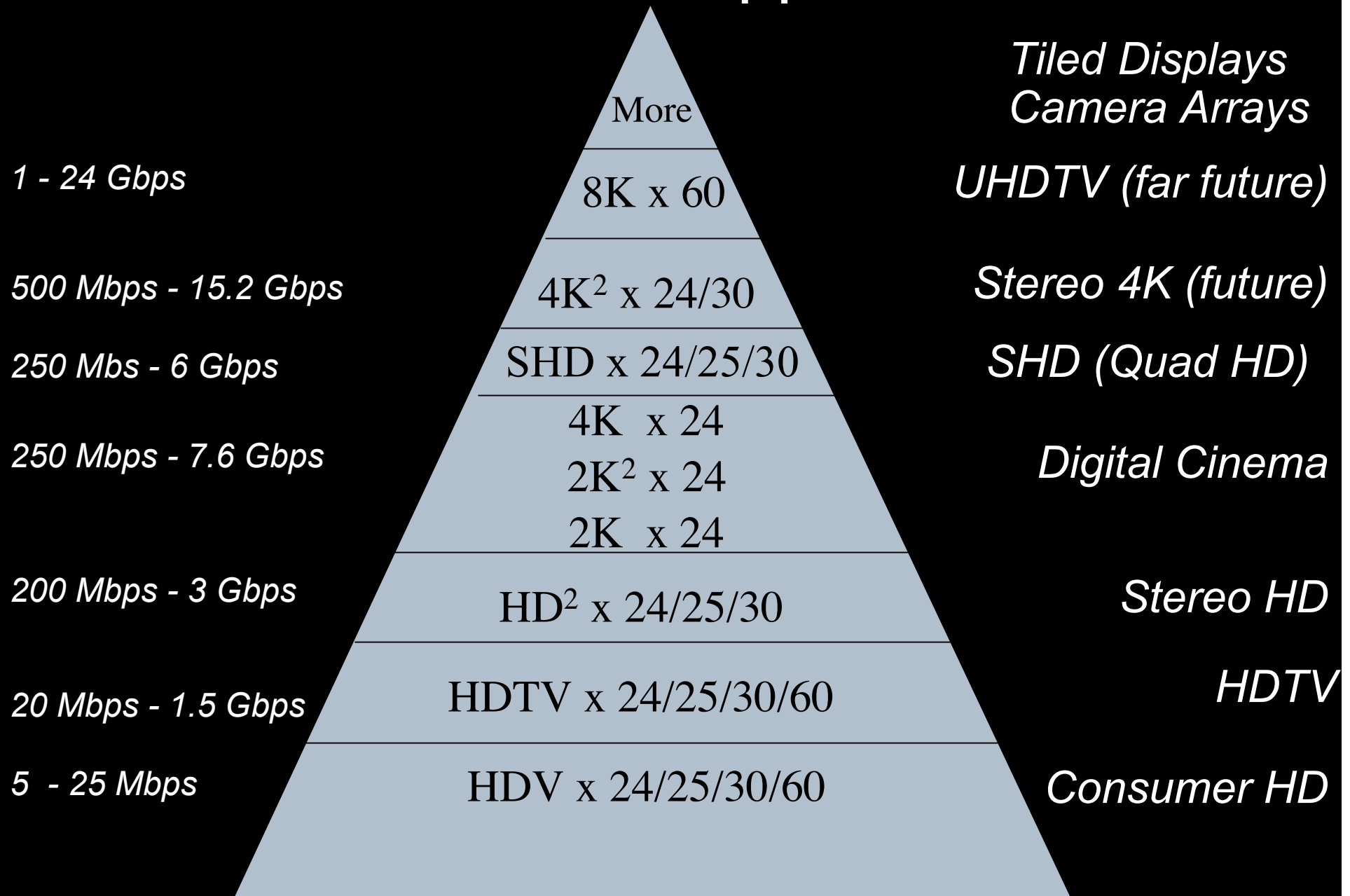
Swimming Fiber the Last 500m



CineGrid @ GLIF 2007 (Prague)



CineGrid: A Scalable Approach



Format - Numbers - Bits (examples!)

Format	X	Y	Rate	Color bits/pix	Frame #pix	Frame MByte	Flow MByte/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**
 - 1 TV Episode Dubbing Reference 1 GB
 - 1 Theatrical 5.1 Final Mix 8 GB
 - 1 Theatrical Feature Dubbing reference 30 GB**40 GB**
- **Digital Motion Picture Acquisition**
 - 6:1 up to 20:1 shooting ratios
 - 4k @ 24 FPS @ 10bit/color: ~48MB/Frame uncompressed
 - ~8TB for Finished 2 Hr Feature**8 TB**
- **Digital Dailies**
 - HD compressed MPEG-2 @ 25Mb/s
 - Data Size: ~22GB for 2 Hours**22 GB**
- **Digital Post-production and Visual Effects**
 - Terabytes, Gigabytes, Megabytes To Select Sites Depending on Project**~ TB**
- **Digital Motion Picture Distribution**
 - Film Printing in Regions
 - Features ~8TB
 - Trailers ~200GB
 - Digital Cinema to Theatres
 - Features ~200 - 300GB DCP
 - Trailers ~2 - 4GB DCP**8 TB**
200 GB
300 GB
- **Online Download**
 - Features ~1.3GB
 - TV Shows ~600MB**1 GB**





GLIF: Global Lambda Integrated Facility

© 2008, Global Lambda Integrated Facility. Visualization by Robert M. O'Neil, University of Illinois at Chicago. Data provided by Robert E. Braden, University of Illinois at Chicago. See: <http://www.globallambda.org>

Amsterdam CineGrid S/F node

“COCE”

DAS-3 @ UvA

DP AMD processor nodes

comp node

⋮ 77x

comp node

head node

bridge node

bridge node

bridge node

bridge node

bridge node

bridge node

bridge node

bridge node

bridge node

bridge node

storage node

2 * 48 TByte

M
Y
R
I
N
E
T

NetherLight, StarPlane
the cp testbeds
and beyond

Rembrandt Cluster
total 22 TByte diskpace
@ LightHouse

Opteron 64 bit nodes

head node

comp node

comp node

comp node

comp node

comp node

comp node

comp node

comp node

comp node

comp node

streaming node

8 TByte

**GlimmerGlass
photonic switch**

NORTEL
8600
L2/3 switch

F10
L2/3 switch

10 Gbit/s

suitcees &
briefcees

SURF
NET

Node 41

sara



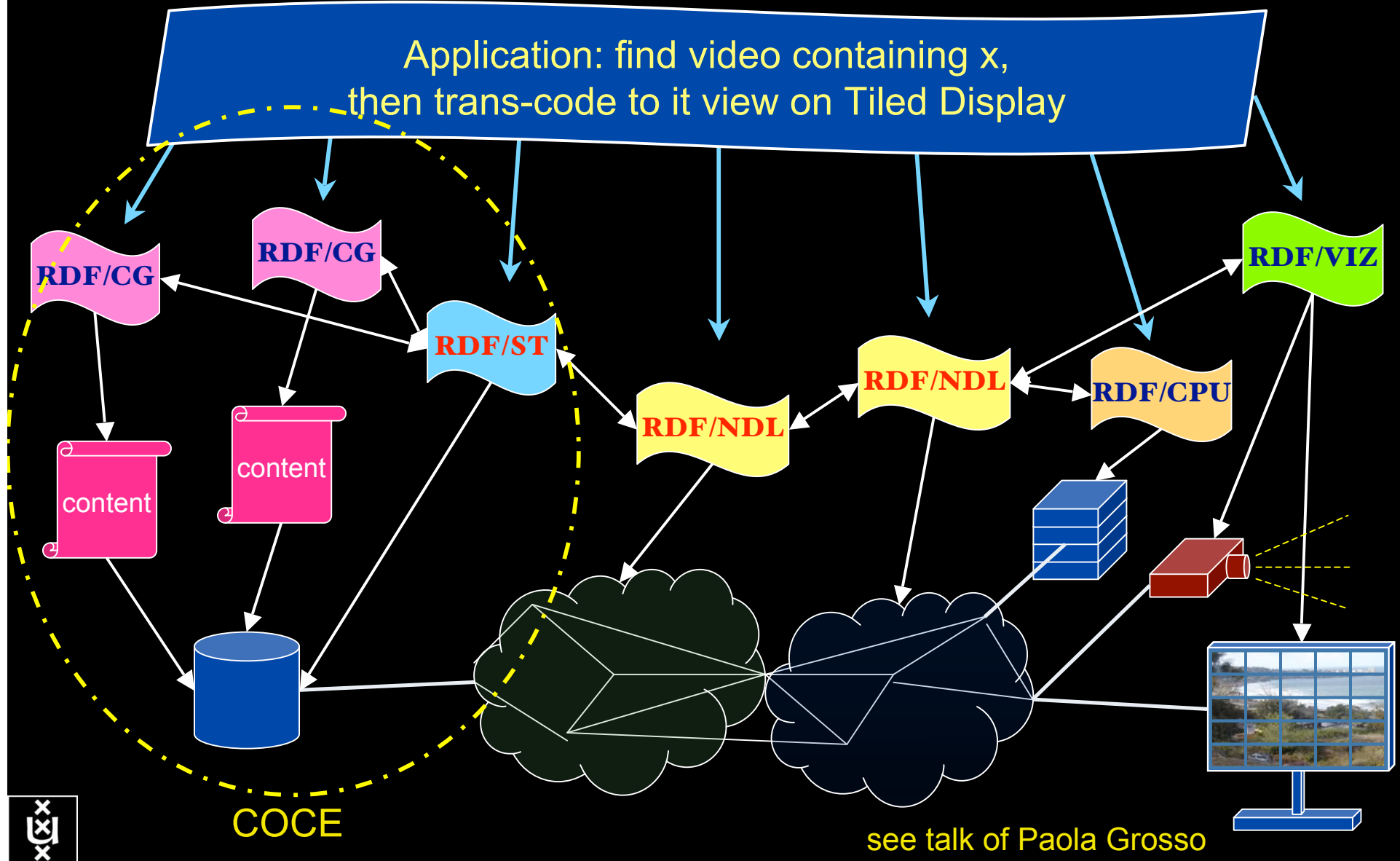
Role of UvA

- 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)



RDF describing Infrastructure

Application: find video containing x,
then trans-code to it view on Tiled Display





Questions ?

www.cinegrid.org

www.cinegrid.nl

www.supertube.org

www.science.uva.nl/~delaat

