Light Path To India

Jun Murai

KEIO University

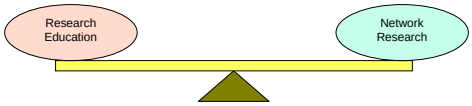
IIT Japan Conference
Nov. 15, 2007

Lambda Network for 2010 and beyond

Space Science, Astronomy
Environment, Energy
Medical Study・Health Management
ITER・High Energy Physics
Digital Cinema・New Digital Media
Sports (F1, Olympics)

Science Research and R&E Network

- Research and Educational Network
  - Infrastructure for Top-level Research and Education
  - 'Research Network' for Networking Research

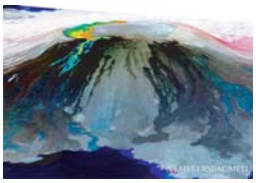


- Science Research requires the best network
  - EOS, ALOS, ITER, LHC, eVLBI, Education and Digital Cinema
- The best network has to be developed and operated
  - Light path based network

EOS（Earth Observation System）

- Earth Observation System
- Many observation satellite launches
- Received data would be shared
- Analyzed by researchers world-wide.

EOS TERRA



Laba of the ocean

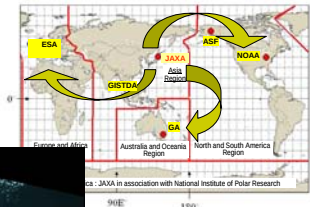
Shared Data from EOS

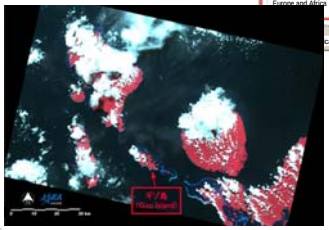
http://www.gsj.jp/
http://terra.nasa.gov/

ALOS（Advanced Land Observing Satellite）

- JAXA project
- Earth Observation
- Data analysis globally
- Shared by researchers around the world
- Requires huge amount of data

http://www.eorc.jaxa.jp/





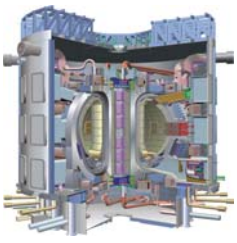
ソロモン諸島沖地震の解析

地球観測衛星 だいち

ITER

- Global project for the next generation of energy
- EU, China, Korea, Russia, US, India and Japan
- Core System would be in France
- JAEA

Research resource would be shared with network



ITER (image)

http://www.naka.jaea.go.jp/ITER/
http://www.iter.org/
http://www.itercad.org/

LHC（Large Hadron Collider）

- 大規模な陽子加速器の実験場
- 国際的な素粒子研究が行われる
- ジュネーブ郊外、CERN研究所の地下100Mに建設
- 日本担当機関：高エネルギー加速器研究機構（KEK）

Atlas実験装置の組み立て

LHCトンネル内

出典
http://www.kek.jp
http://ho.web.cern.ch/ho/

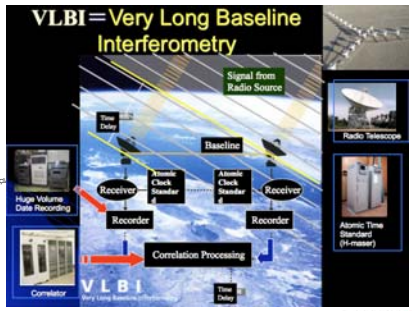
CERN研究所

参加各国の研究者が遠隔から測定データを解析するためにネットワークが必要

e-VLBI

- 衛星データを地上の離れた地点で計測する
- 複数の地上観測点のデータの差異から計測結果を得る
- 応用分野
  - 天体観測
  - 測地
  - 宇宙船のナビ

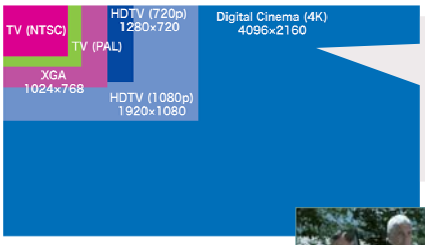
離れた観測点をネットワークで結ぶことによって多くの結果を得られる



出典
NICT 関戸衛 氏

Media for Collaboration

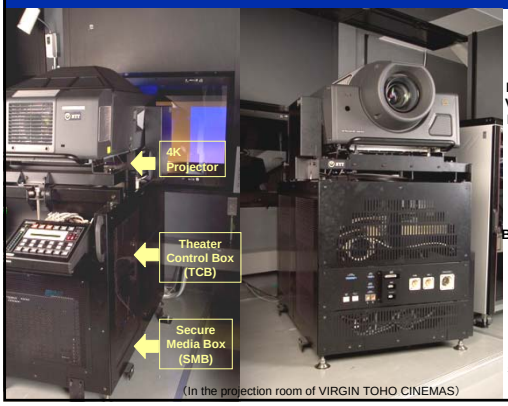
DVTS, HD-DVTS, and 4Kcinema



- ✓Comparison of screen resolutions for TV, computer display (XGA), HDTV and digital cinema
- ✓The higher the resolution, the clearer and more realistic the picture

- ✓The 4K Digital Cinema format has been developed by members of DCCJ (Digital Cinema Consortium Japan) with contributions from DMC researchers
- ✓The format has been approved as an international standard by DCI (Digital Cinema Initiative)

“4K Pure Cinema” Prototype In-Theater System



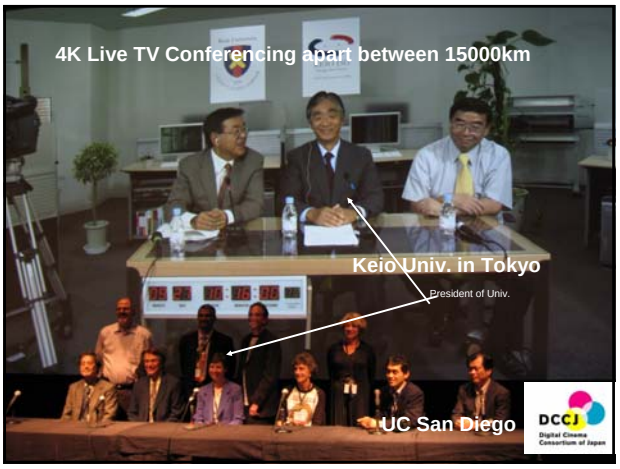
(In the projection room of VIRGIN TOHO CINEMAS)

Corpse Bride
Harry Potter 4
V for Vendetta
DaVinci Code
Poseiden
Mission Impossible 3
+
Tokyo Film Festival
Batman Begins
Stealth

Source: NTT

TV, Cinema and the new Media

- ✓DMC, in cooperation with NTT, UCSD and UIC, achieved the world's first successful transmission of a real-time 4K digital cinema stream across the Pacific Ocean in September 2005
- ✓This proved that global giga-bit networks can be formed to transmit ultra-high resolution moving images for academic, educational, medical and cultural applications



Distant lecture showing the Gutenberg Bible with the 4K digital camera iGrid2005 held on September 26, 2005

The New York Times

Like High-Def? Here Comes the Next Level

By JOHN MARKOFF
Published: September 26, 2005

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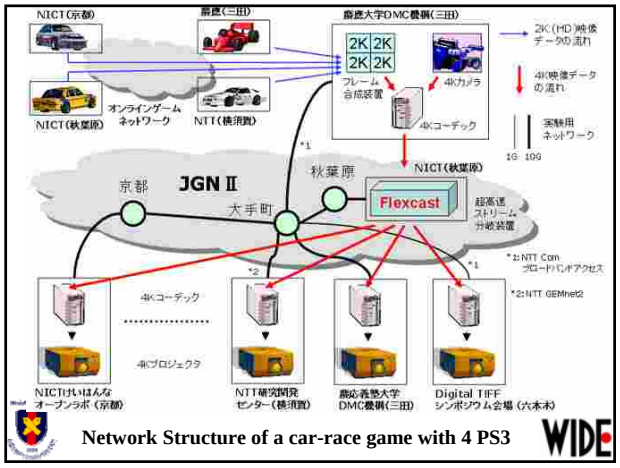
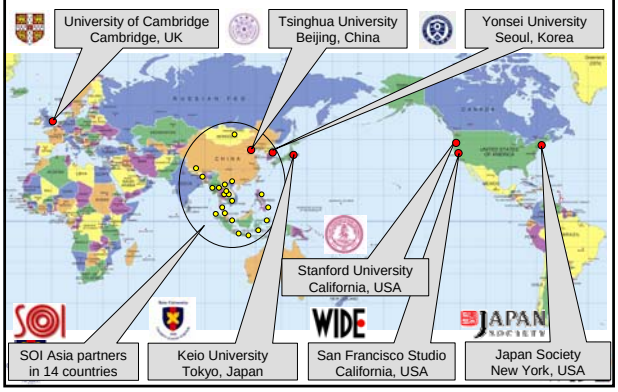
SAN DIEGO, Sept. 25 - Scientists and engineers in the United States and Japan plan to test the world's highest-resolution videoconferencing system on Monday evening over a 9,000-mile optical network linking the University of California, San Diego, with Keio University in Tokyo.



Network Structure of a car-race game with 4 PS3

Combined 4K image of a car-race game using 4 PS3 game machines

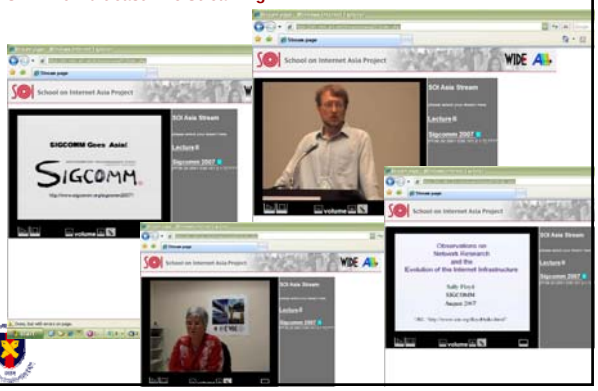
Global Digital Studios –Media and Tele-Presence with Sound-



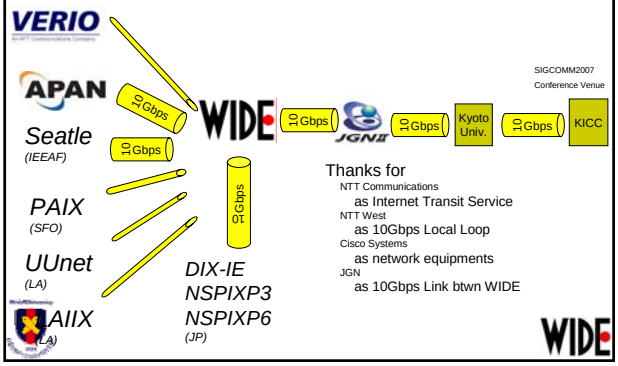
Studio at Keio University

Location: Tokyo, Japan
Operated by: Keio University DMC Institute
DVTS and Polycom / Multipoint capable
IPv4/IPv6
Re-constructed in February 2006

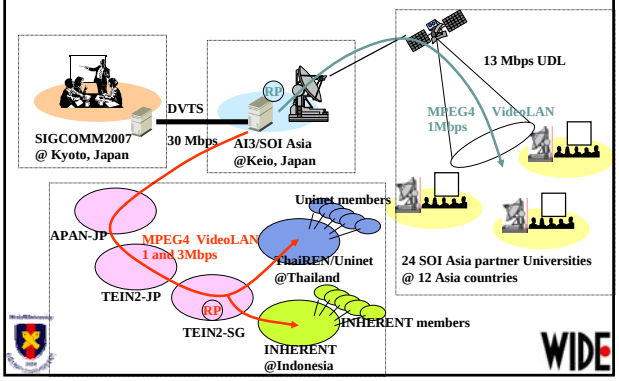
SIGCOMM2007
ASIA IPv6 Multicast Live Streaming



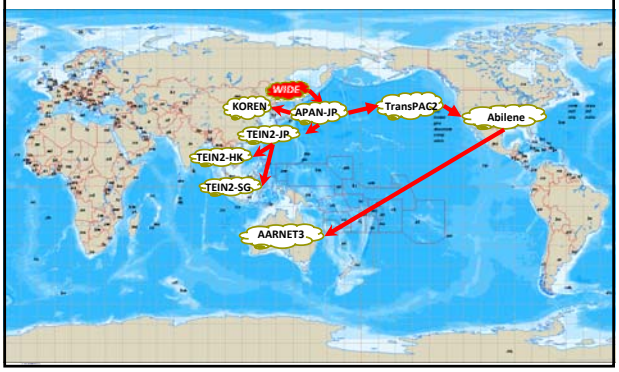
Topology



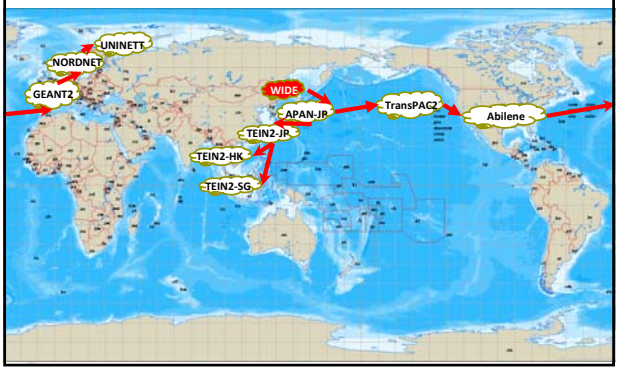
ACM SIGCOMM2007
ASIA IPv6 Multicast Live Streaming



IPv4 Listener AS (Confirmed)



IPv6 Listener AS(Confirmed)



Participated Asian Countries

Participants @ Kyoto
Multicast Streaming received

WIDE

AI3 and SOI-ASIA

IPv6 multicast in All Asia everyday

WIDE

What is SOI Asia ?

Multilateral partnership among Asian universities

to operate a platform for educational collaboration among universities in Asia

WIDE

Brawijaya University, Indonesia
Hasanuddin University, Indonesia
Sam Ratulangi University, Indonesia
Asian Institute of Technology, Thailand
National University of Laos, Laos
Advanced Science and Technology Institute, Philippines
University of Computer Studies, Yangon, Myanmar
Asian Youth Fellowship, Malaysia
Chulalonkorn University, Thailand
Institut Teknologi Bandung, Indonesia
Institute of Information Technology,, Vietnam
Universiti Sains Malaysia, Malaysia
Mongolian University of Science and Technology, Mongolia
Prince of Songklang University Thailand
Chulachomklao Royal Military Academy Thailand
Keio University Shonan Fujisawa Campus,Japan
Universitas Syiah Kuala, Indonesia
University San Carlos, Philippines
Bangladesh University of Engineering and Technology, Bangladesh
Institute of Technology of Cambodia, Cambodia
Tribhuvan University, Nepal

WIDE

27 universities/institutes in 13 countries

- Indonesia - 5
  - Brawijaya University
  - Sam Ratulangi University
  - Hsanuddin University
  - Institut Teknologi bandung
  - Univesitas Syiah Kuala
- Thailand - 4
  - Asia Institute of Technology
  - Chulalongkorn Univeristy
  - Chulachomklao Royal Military Academy
  - Pricen of Songkla University
- Laos - 1
  - National University of Laos
- Myanmar – 2
  - University of Computer Studies, Yangon
  - **University of Computer Studies, Mandaley**
- Malaysia - 2
  - University Science Malaysia
  - **Asian Institute of Medicine, Science & Technology**
- Singapore -1
  - Tamasek Polytechnic
- Vietnam - 3
  - Institute of Information Technology
  - **Vietnam National University**
  - **Hanoi University of Technology**
- Philippines -2
  - Advanced Science and Technology Institute
  - **University San Carlos**
- Mongolia -1
  - Mongolian University of Science and Technology
- Cambodia -2
  - Institute of Technology of Cambodia
  - **Asian Institute of Medicine, Science & Technology**
- Bangladesh - 1
  - Bangladesh University of Engineering
- Nepal -1
  - Tribhuvan University
- Japanese Partners - 2
  - Keio University
  - NAra Institute of Science and Technology

WIDE

platform?

- Sharing Knowledge
  - Sharing university lectures in real-time and archived.
  - Organizing seminars and symposiums
  - Helping remote participation to the international conference and seminars.
- Creating opportunity
  - for joint research
  - to study in Japan
- IT HRD
  - Workshops
  - Internships

Educational programs

- The project provided more than 20 graduate level courses consisting of more than 170 lecturers were provided by 9 universities in Japan, received by more than 1000 students in region wide. Some were accredited in universities.
- Lectures were delivered from 15 sites from Japan, Indonesia, Malaysia, Thailand, Bangladesh and USA.
- Topics were selected based on the partners' requirement and academic committee are formed for each area.
  - Marine Science and Technology, Bio Technology, IT …
- 65 real-time sessions (special seminars, tutorials, streaming from conferences were shared.

Collaboration with NREN

- Sharing contents with more universities through each country's NREN.
- Thailand
  - Uninet (150 universities)
  - Technical trial were successfully completed.
  - Joint workshop held in June 2007.
  - MoU between SOI Asia and Thailand government for Uninet collaboration is under preparation
- Indonesia
  - INHERENT (80 major universities, increasing)
  - Technical trial are undergoing.
  - A lot of demands from INHERENT universities
  - MoU between SOI Asia is under preparation
- Vietnam
  - VINAREN
  - Technical setup has been done
  - MOU signed up by 2 individual universities. More will come.
- Philippines
  - PREGINET
  - Technical setup has bee done and some of the contents are shared.
- Malaysia
  - MYREN
  - IPv6 collaboration

INDIA
- A LOT OF OPPORTUNITY !!!!

Various Types of Collaborations

- Contents partners
  - Providing more contents in wider area
  - JICA
  - UNESCO
    - 3 courses were delivered in 2007
    - ITB, AIT, BUET delivered lectures
    - Moure courses are planned in 2008
- Platform partners
  - Sharing each other's contents for both community
  - UNU/API through U of Hawaii
- Global Studio partners
  - Getting guest speakers around the world.

SOI Asia activities

- Sharing university lectures of global issues, global & local interests from Japan and other area, in real-time and archived.
- Helping remote participation to the international conference and seminar.
- Creating opportunity for joint research and studying in Japan.
- Training technical staffs at partner universities
- Developing the environment by ourselves

AI^3 & SOI-Asia: IPv6 Operation Started from Nov 16, 2005

- 2004 July—Equipments readiness
- 2005 August—IPv6 Training at the WS
- 2005 Nov 16—IPv6 Operation started
- 2007 January—Full SOI-ASIA applications are on IPv6
- 2007:
  IPv6 only network

Human resource development for network administrations

- 1st Workshop:
  First beginner's workshop for operators in 2002
- 2nd Workshop :
  First advanced operator's workshop in 2003
- 3rd Workshop :
  First workshop for training workshop lecturers in 2004
- 4th Workshop :
  First local workshop in 2005
- 5th Workshop :
  Combination of beginners/advanced contents workshop in 2005
- 6th Workshop :
  First Global-e-Workshop in 2006
- 7th Workshop:
  First Workshop focusing on IPv6 in 2007

AI3 & SOI Asia : Internship for Operators

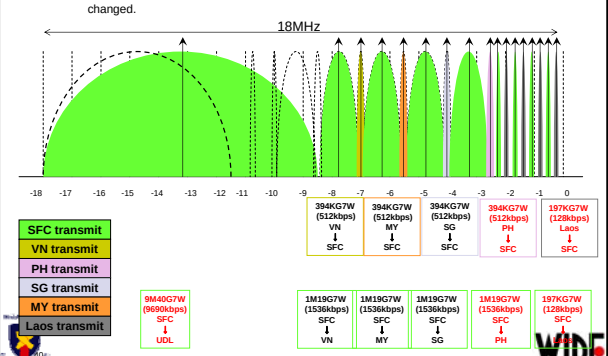
14 interns from 8 countries

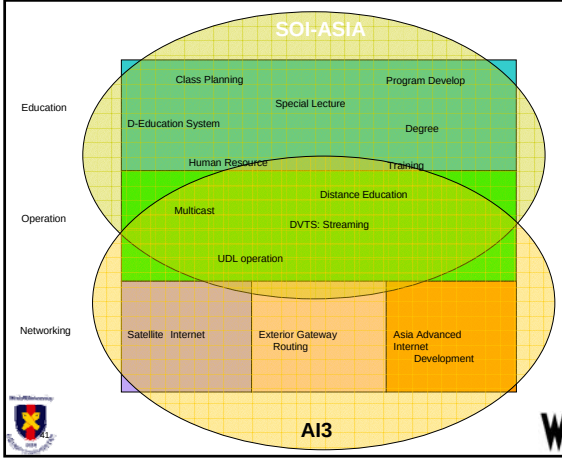
- 1st batch :Jan – Apr 2006
  - Myanmar (USCY)
  - Indonesia (UNSRAT)
- 2nd batch :March – June
  - Laos (NUOL)
  - Nepal (TU)
- 3rd batch :May - Aug
  - Indonesia (UNIBRAW)
  - Bangradesh (BUET)
- 4th batch :July - Oct
  - Indonesia (ITB)
  - Cambodia (ITC)
- 5th batch :Sept - Dec
  - Indonesia (UNHAS)
  - Mongolia (MUST)
- 6th batch :Jan – Apr 2007
  - Indonesia (UNSYIAH)
  - Malaysia (USM)
- 7th batch :Aug – Nov 2007
  - Indonesia (UNIBRAW)
  - Nepal (TU)

SOI Asia Operators Workshop

New AI3 C-Band Frequency Allocation

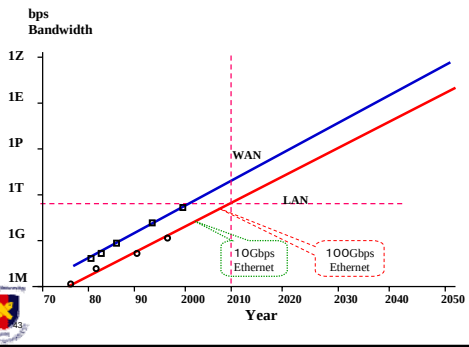
- When more than 3 197KG7W carriers are transmitted from SFC, the SFC license need to be changed.





Faster

Network Speed



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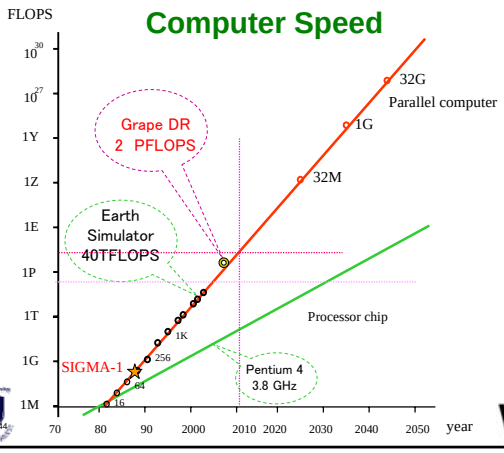
Computer Speed



WIDE

Global Distributed System

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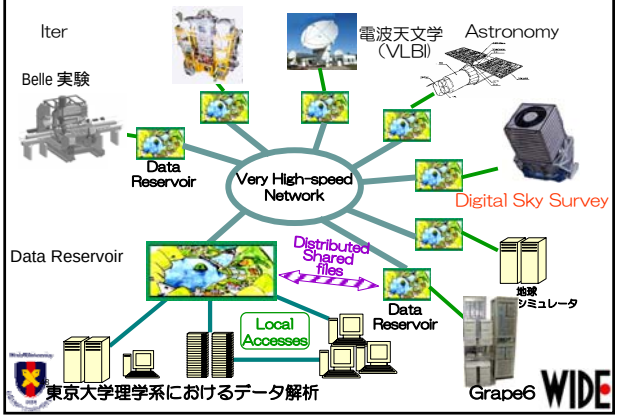
Data Reservoir LSRs

WIDE

LSR Trophies presented Apr 2006

WIDE

Data Reservoir Concept



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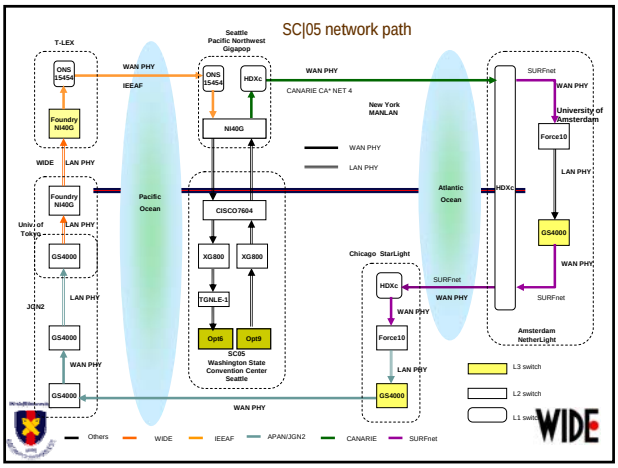
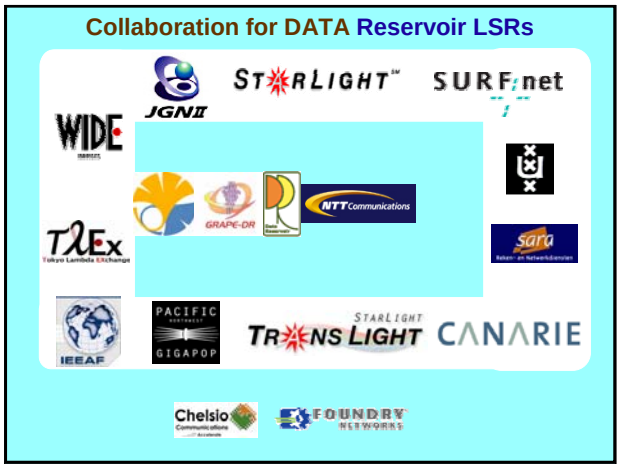
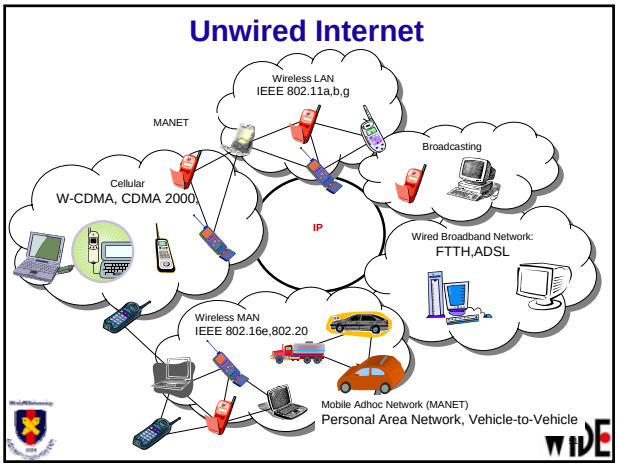
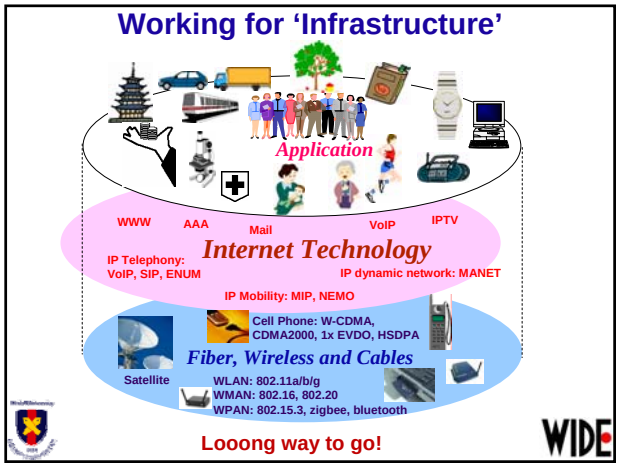








Latency Sensitivity

Has come!

133ms to reach

Lambda Internet

Global Lambda Integrated Facility

World Map – August 2005

International Research & Education Network bandwidth, to be made available for scheduled application and middleware research experiments by August 2005.

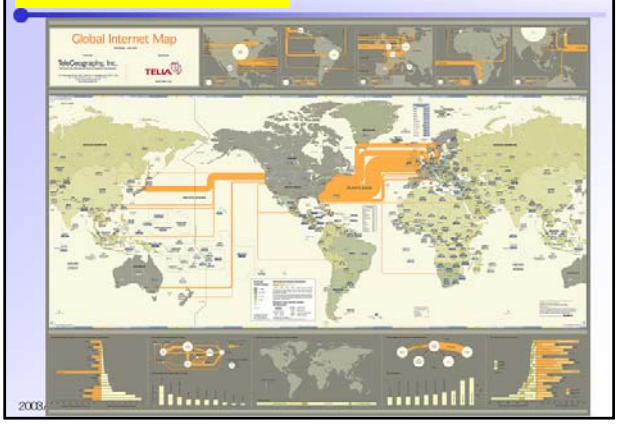
www.glif.is Visualization courtesy of Bob Patterson, NCSA/University of Illinois at Urbana-Champaign. Data compilation by Maxine Brown, University of Illinois at Chicago. Earth texture from NASA.

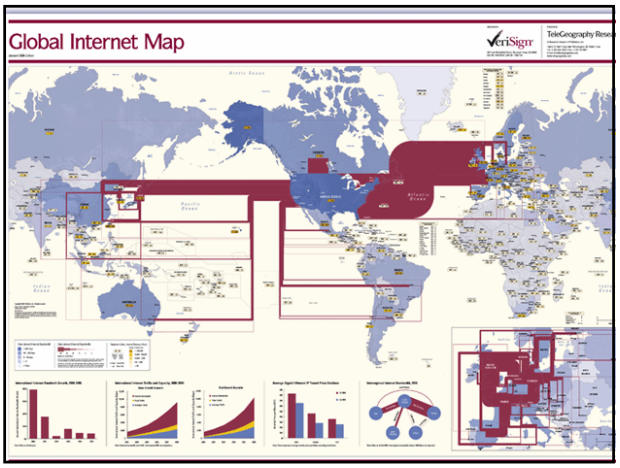
Lambda from Above

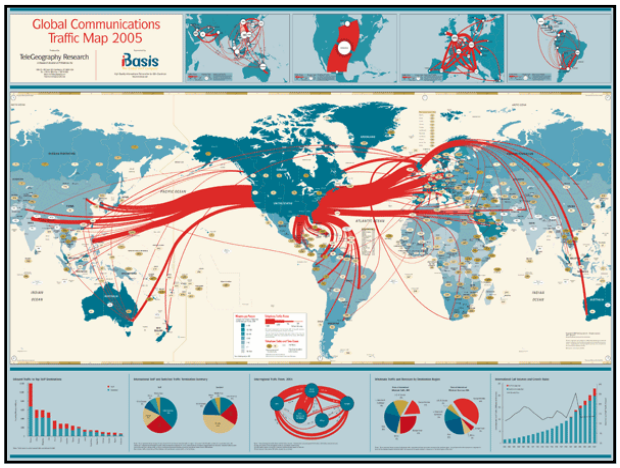
Light Path to India

1. India-JP: 10Gbps
2. India-EU: 10Gbps
3. Glif model lambda exchange in a city in India
4. Some major institute to connect to the exchange by 10Gbps
5. National High-speed Research and Education network development and operation

2001 InternetTraffic







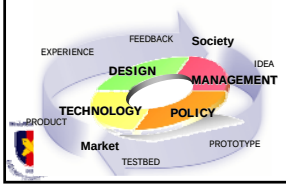
Lambda from Above

Graduate School of Media Design(to be established in 2008)

Key Features

- A well balanced program among **"Design", "Technology", "Management" and "Policy"** to foster "Media Innovators" capable of producing effort and value by combining and harmonizing four creative forces
- Two year consecutive curriculums
- Basics: Introductory and Intermediate course specialized to enhance knowledge required for Media designs
- Advanced courses for advancement in specialized and advanced knowledge
- "Real Projects", advanced research projects for practical society
- English language classes are available for internationalization

Four Creative Forces of the School



Future of Graduates:

Media Innovators, leaders with the global perspective that is required to lead the coming creative society

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Lightpath to India **Role of Universities.**

WIDE