

# Current Telescience in e-Heritage & Optical Network applications

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# Current Problem is Global

- Economy
- Environment/Climate Change
- Disease/Health
- Disaster
- Culture

APAN/TransPAC2(Affiliated)  
GEANT2/TEIN2(Affiliated)  
JGN2 SINET WIDE/IEEAF  
AARNet GLORIAD(Affiliated)  
Others

As of End of Oct. 2007

## How we can contribute to solve these problem ?





# Challenge

- Technical difficulty
- Diversity
- Time difference,
- Politics/Funding
- Indifference

# Live E! Sensor Deployment Status

In Dec. 2008

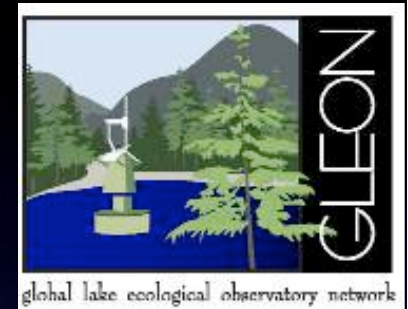
- Build sharable infrastructure
- Raise global awareness of what is going on
- Think global, act locally!



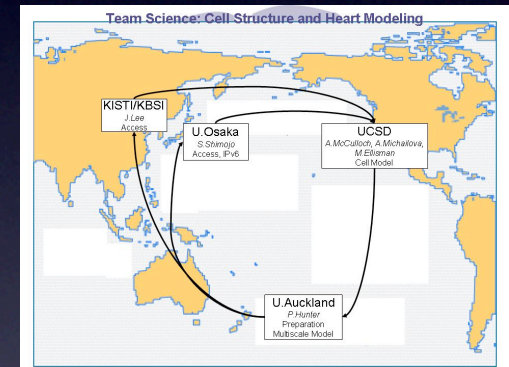
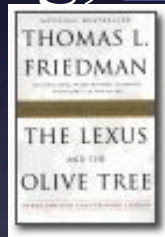


# PRAGMA's Founding Motivations

Science is an intrinsically global activity



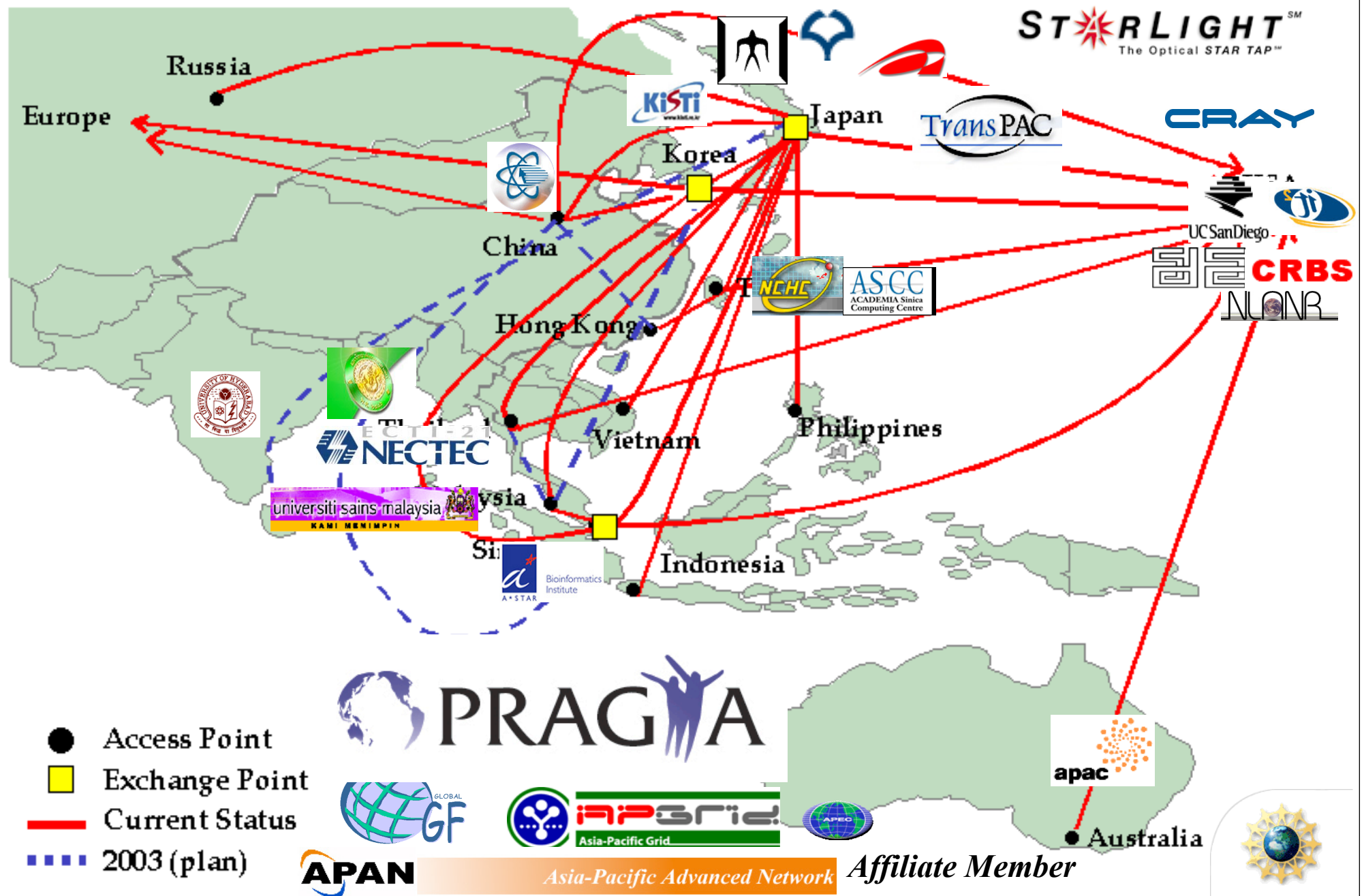
The grid is transforming e-science:  
computing, data \*, and collaboration



- The problem remains that the grid is too hard to use on a routine basis
- Middleware software and people need to



# PRAGMA PARTNERS





# Telescience working group on PRAGMA

Co-lead by me and Fang-Pang Lin

data acquisition, sharing, analysis and **visualizing** by (remote)  
observation using sensors and devices

## Common Architecture and Platform

### i. Middleware

Portals, Data Turbine, SAGE, COVISE

### ii. Platform

Viz Wall (TDW) , starCAVE, HOPE, ...

### iii sensors

## Applications:

- i. On demand real-time streaming.
- ii. Distributed measurement
- iii. Scalable, adaptive, reusable...



# Current telescienece activities

- remote instrumentation, eg. microscope
- remote monitoring of environment, eg. lake, coral leaf, urban area
- educational component
- sharing cultural heritage - e-heritage



# Presentations of PRAGMA17

- *SubAir/AirCleaner - Seoul Metro Integrated Management System for Intelligent & Energy-efficient Indoor Air Quality Monitoring & Control*, Karpjoo Jeong, Konkuk University, Korea
- *Remote Sensing and Stereography for Natural Disaster: Using Typhoon MORAKOT as an Example*, Chia-Shin Cheng, NCHC, Taiwan
- *A Distributed Architecture for Real-Time High Resolution Video Streaming*, Yi-Hsuan Chen, NCHC, Taiwan
- *Interactive Tiled Display Wall for Exploring Renaissance Paintings*, Kieko Kadobayashi, NICT, Japan
- *Virtual Site: Coral Reef Biomes*, Centre of Excellence for EcoInformatics, NECTEC-WU et al, Thailand, Taiwan



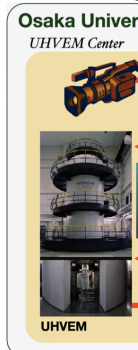
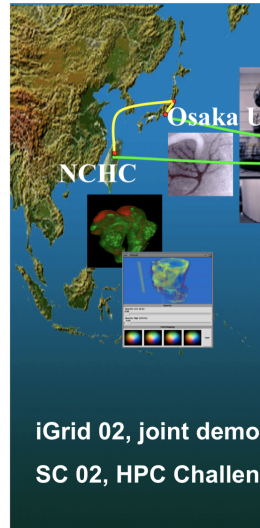
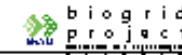
# Overview of Projects

- ◆ Tele-science on Tomography (Osaka U, NCHC, UCSDによる)

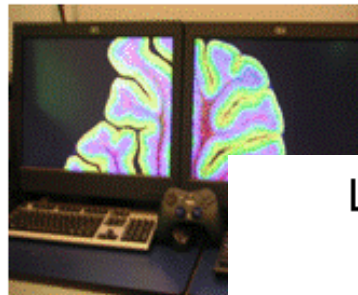


## ◆ Demonstration

- Telecontrol and image processing system
- ◆ SC2003
- HDTV
- Image processing



Supercomputing  
Best Application

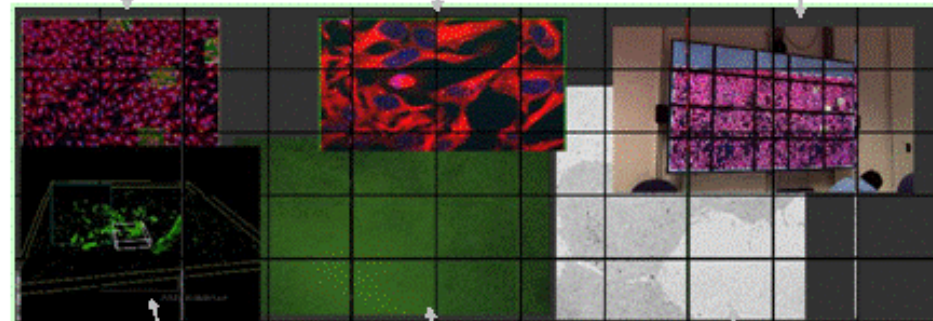


## LambdaCam Snapshot of Calit2 cluster during iGrid 2005

JuxtaView showing ~600 megapixel montage dataset from Amsterdam

HDTV stream from a light microscope at NCMIR

HDTV camera feed shows the conference room at NCMIR



Volume rendering with Vol-a-Tile in Chicago

HDTV video stream from UHVEM in Osaka, Japan.

4K x 4K Digital images from NCMIR UHVEM

Courtesy by Mark Ellisman



# Platform

# Enabling technology of telescience

- Live Streaming of observation
- Remote Instrumentation
- Observing Data acquisition
- Data Sharing and annotation
- Data analysis and synthesis
- Data Visualization
- Video transmission through High speed Internet
- TCP or Web services
- High quality CCD and sensor
- Grid Database
- Grid Resources
- Tiled Display wall

All elements are integrated into Optiportal



# OptIPuter Software Architecture--a Service-Oriented Architecture Integrating Lambdas Into the Grid

## Distributed Applications/ Web Services

Source: Andrew Chien, UCSD

Telescience

Data Services

LambdaRAM

Visualization

SAGE

JuxtaView

Vol-a-Tile

## Distributed Virtual Computer (DVC) API

DVC Configuration

DVC Runtime Library

## DVC Services

DVC Job  
Scheduling

DVC  
Communication

### DVC Core Services

Resource  
Identify/Acquire

Namespace  
Management

Security  
Management

High Speed  
Communication

Storage Services

PIN/PDC

Globus

GRAM

GSI

XIO

RobuStore

Discovery  
and Control

Lambdas

IP

GTP

XCP

UDT

CEP

LambdaStream

RBUDP

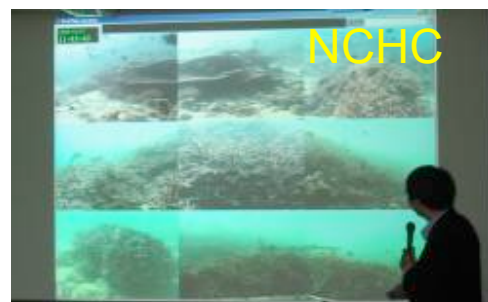
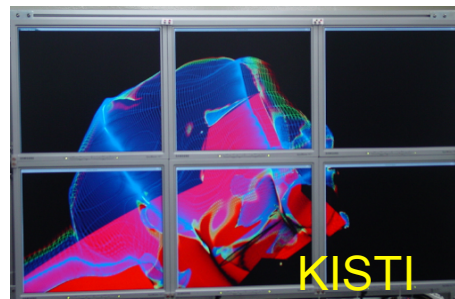


# Potentials of TDW

- easy to build
- variety of media
  - images, realtime streaming(HD, 4K)、 3D
- various middleware
  - SAGE, CGLX, COVICE, HyperWall
- Scalable、 High Performance
- Multiple Platform: TDW, CAVE, starCAVE
- Network enabled
- entry for cloud



# Step Two: Build a Rocks / SAGE OptIPortal





# TDW on NICT (32 displays)









# e-heritage

## Giotto+TeraHerz+TDW



Kadobayashi, Chikama, Fukunaga



# PRIME students from UCSD



□ Jade Kwan: Maya/3D max  
on COVICE



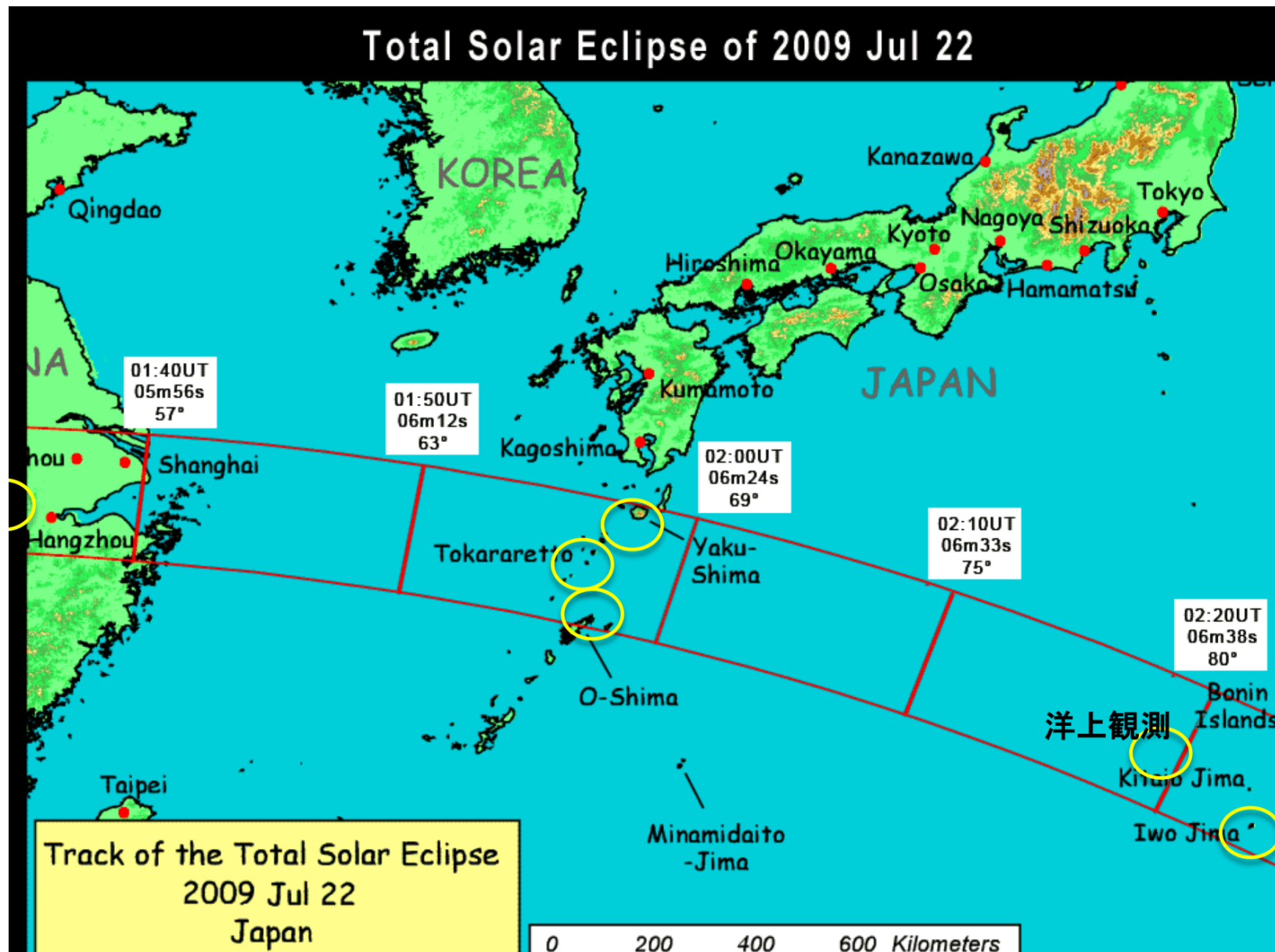
□ Isabelle Fanchu: Telaherz  
on TDW

# Streaming

- Digital Video ( 10xMbps)
- HD (40Mbps, 1.6Gbps uncompressed)
- HD stereo
- 4K (about 6G uncopressed)

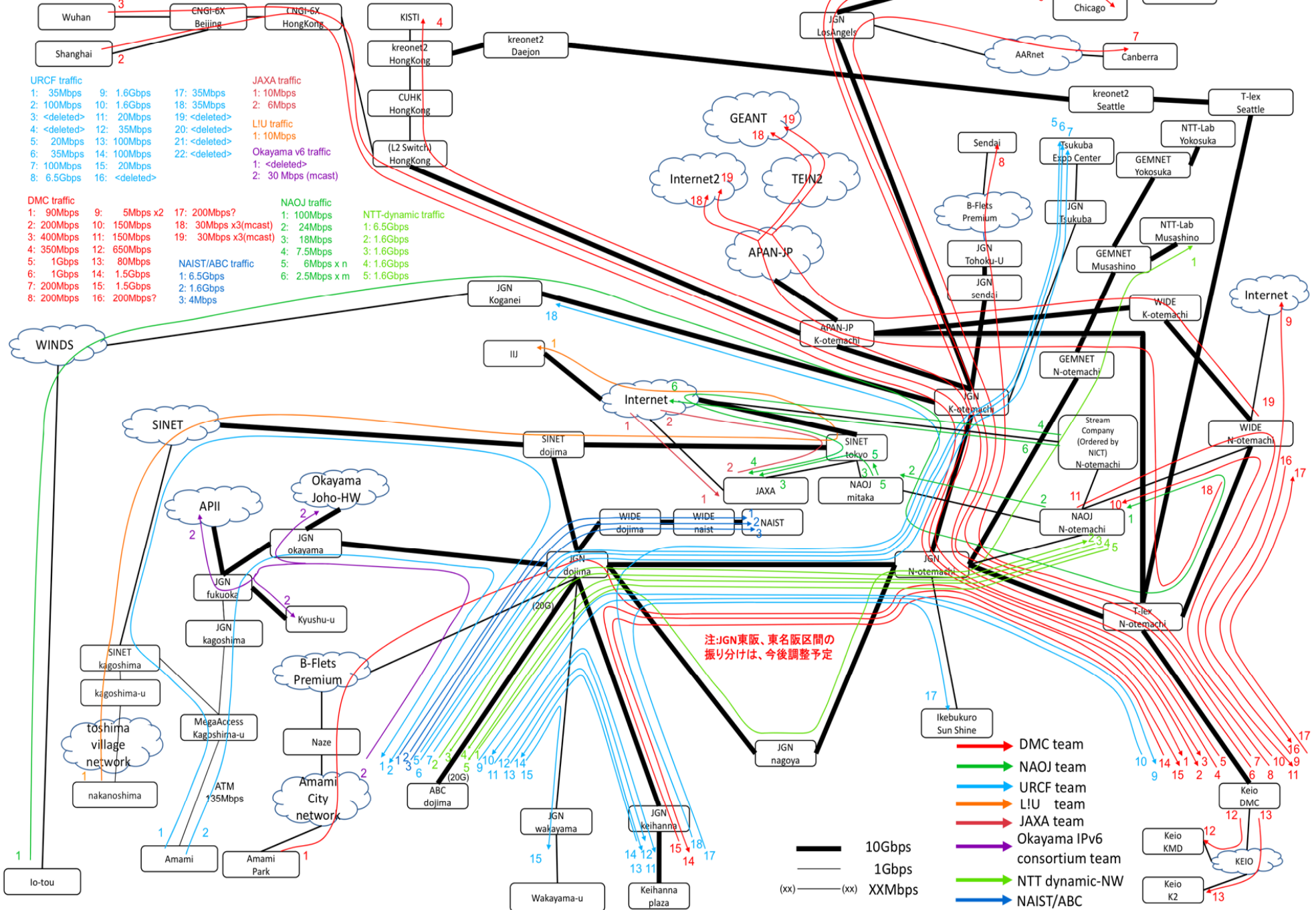


# Total Solar Eclipse Project



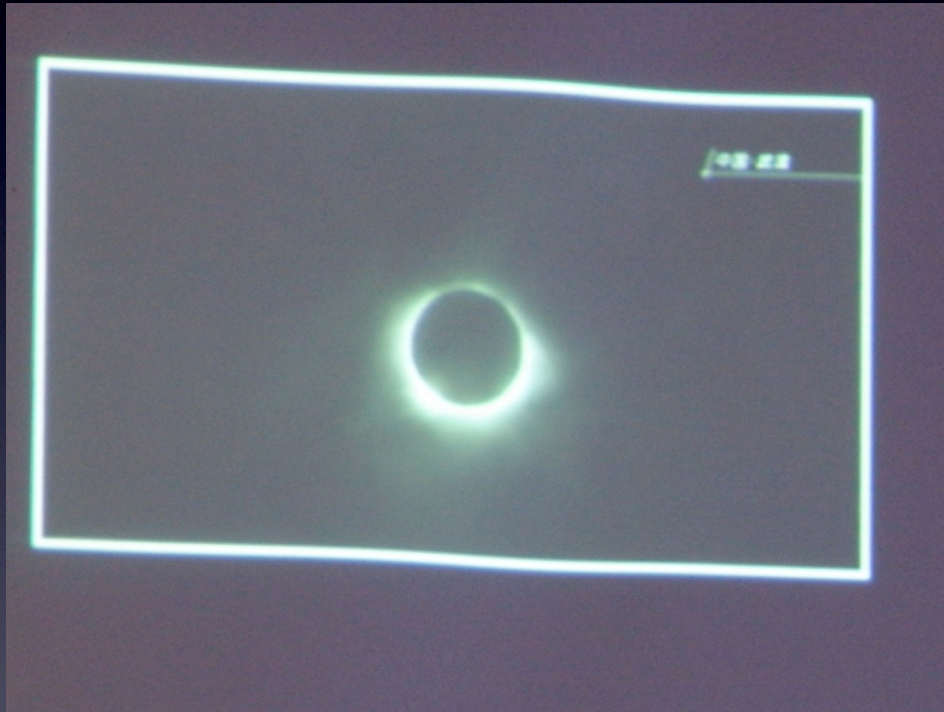
# Solar Eclipse 2009 Network Topology

Last modified  
at 2009. 7. 15 5:30  
by yama@wide.ad.jp

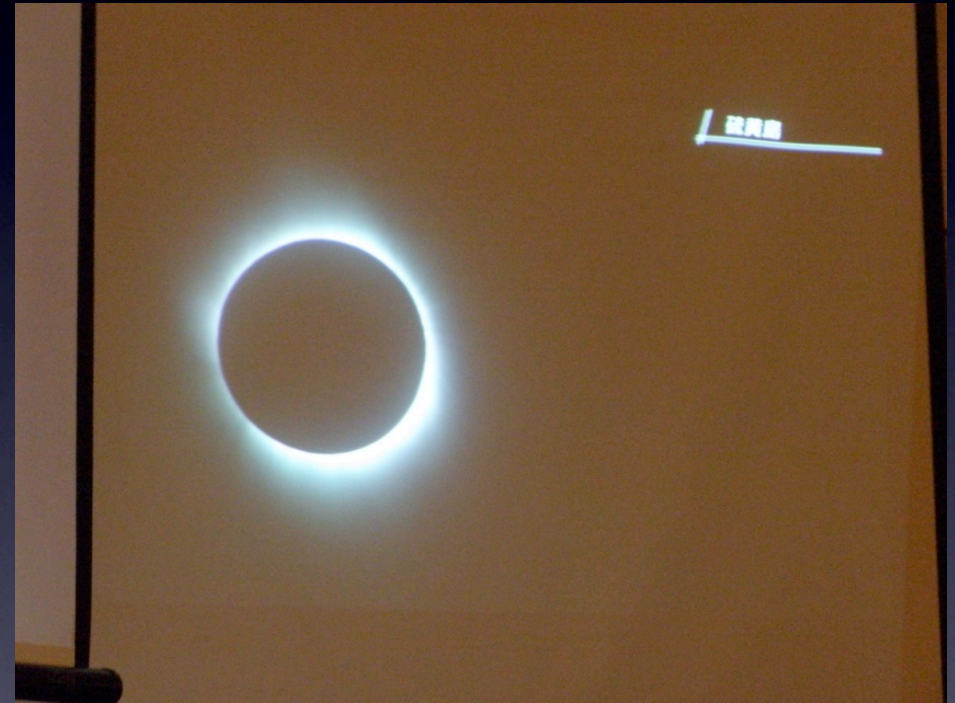




Live Broadcast of Total Solar Eclipse was shown at  
APAN 28<sup>th</sup>, Kuala Lumpur



From China



From Io-Tou



# 皆既日食ライブ中継

中国(武漢、上海)、奄美大島、硫黄島からの皆既日食ライブ映像を館内大型モニターで映写するとともに、大阪市立科学館の渡部学芸員、読売テレビのアナウンサー、植村なおみさん、横須賀ゆきのさん、五十嵐竜馬さんによる解説会を実施しました。







全天ドームシアター

写真3 ABCホール内のエアードーム

# Monitoring, sensors

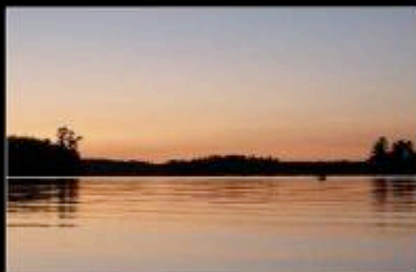




*Chalk Lake, Ontario, Canada*



*Lake Kinneret, Israel*



*Trout Lake, Wisconsin, USA*



*Yuan Yang Lake, Taiwan*

*Background Image: Fallison Lake,  
Wisconsin, USA*



global lake ecological observatory network

#### Further Information

*lakemetabolism.org • gleon.org*

#### Contact

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Tim Kratz *tkkratz@wisc.edu*

Fang-Pang Lin *fpilin@nchc.gov.tw*

#### Sponsors

*National Science Foundation (USA)*

*Gordon and Betty Moore Foundation*

*National Science Council Taiwan (KING Project)*

*Taiwan Forest Research Institute*

*Foundation for Research, Science and Technology (NZ)*

*The Israel Water Commissioner*

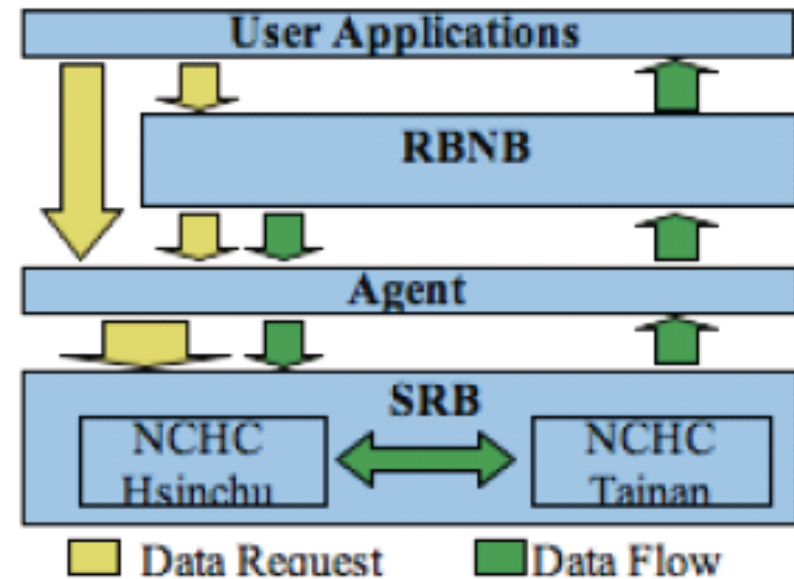
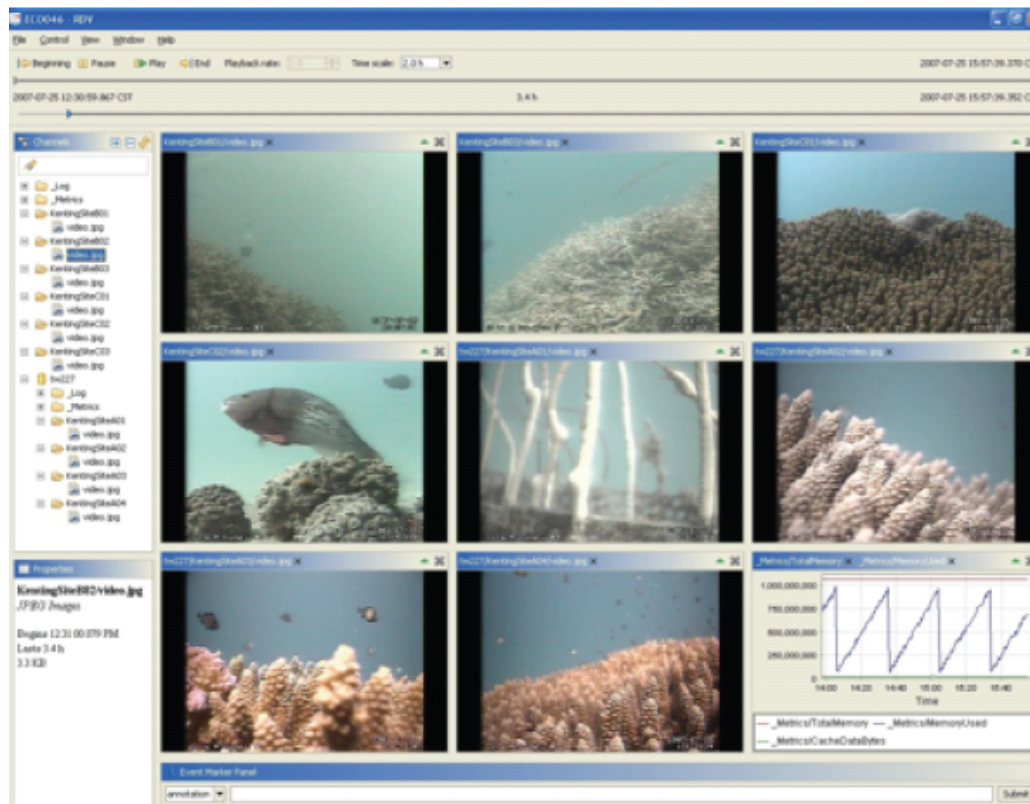
*Ontario Ministry of the Environment*

global  
lake  
ecological  
observatory  
network

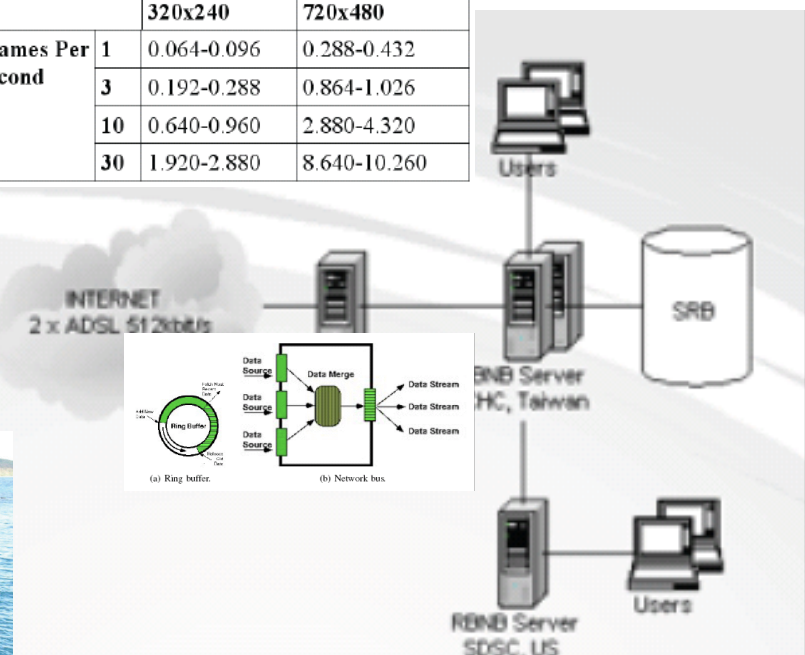
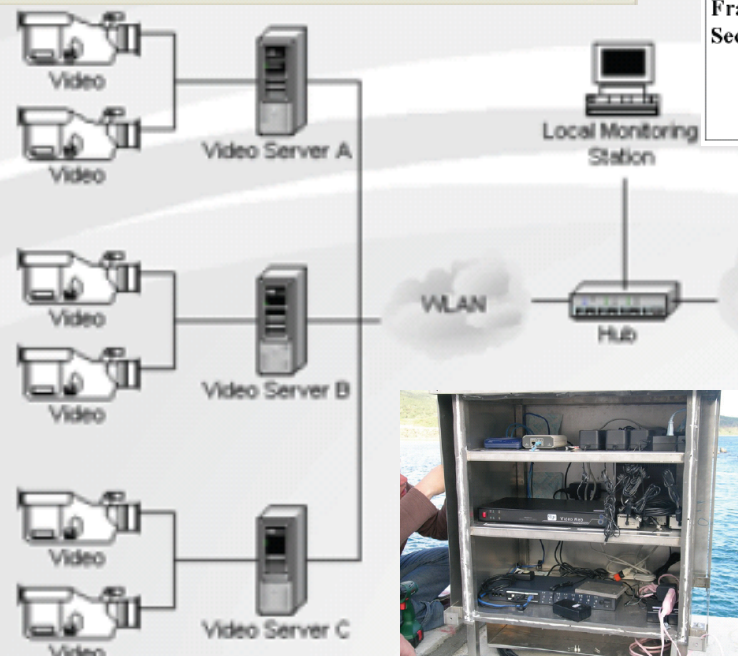
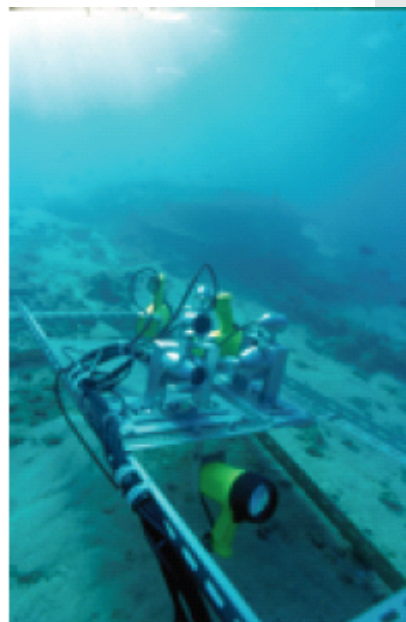


*gleon.org*





|                   |    | Resolution (pixels) |              |
|-------------------|----|---------------------|--------------|
|                   |    | 320x240             | 720x480      |
| Frames Per Second | 1  | 0.064-0.096         | 0.288-0.432  |
|                   | 3  | 0.192-0.288         | 0.864-1.026  |
|                   | 10 | 0.640-0.960         | 2.880-4.320  |
|                   | 30 | 1.920-2.880         | 8.640-10.260 |



Courtesy by Fang-Pang Lin



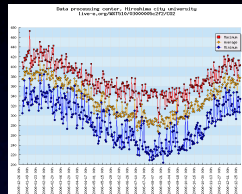
# Live E! System Architecture



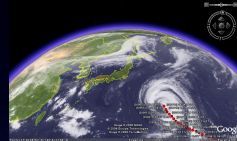
Disaster Management



Science  
Global Warming  
/ Heat island



Education



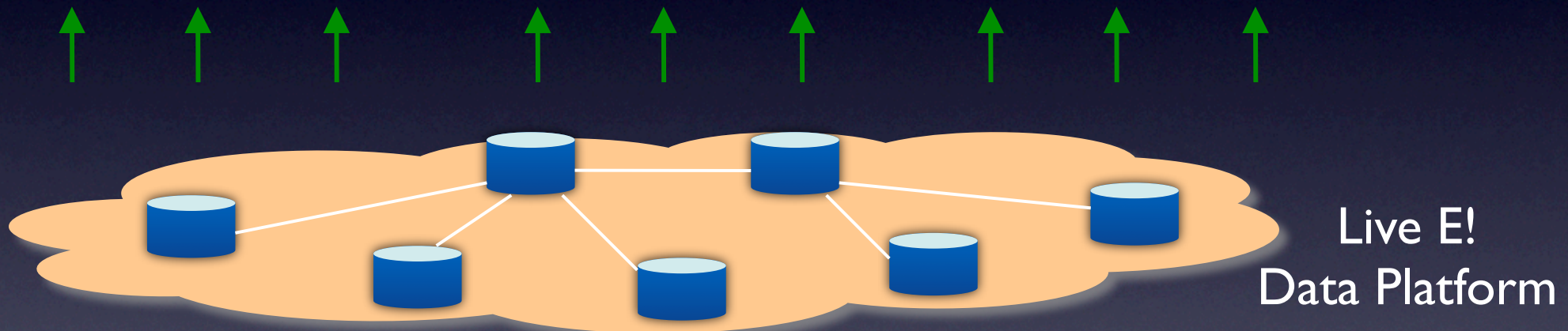
Agriculture



Facility Management



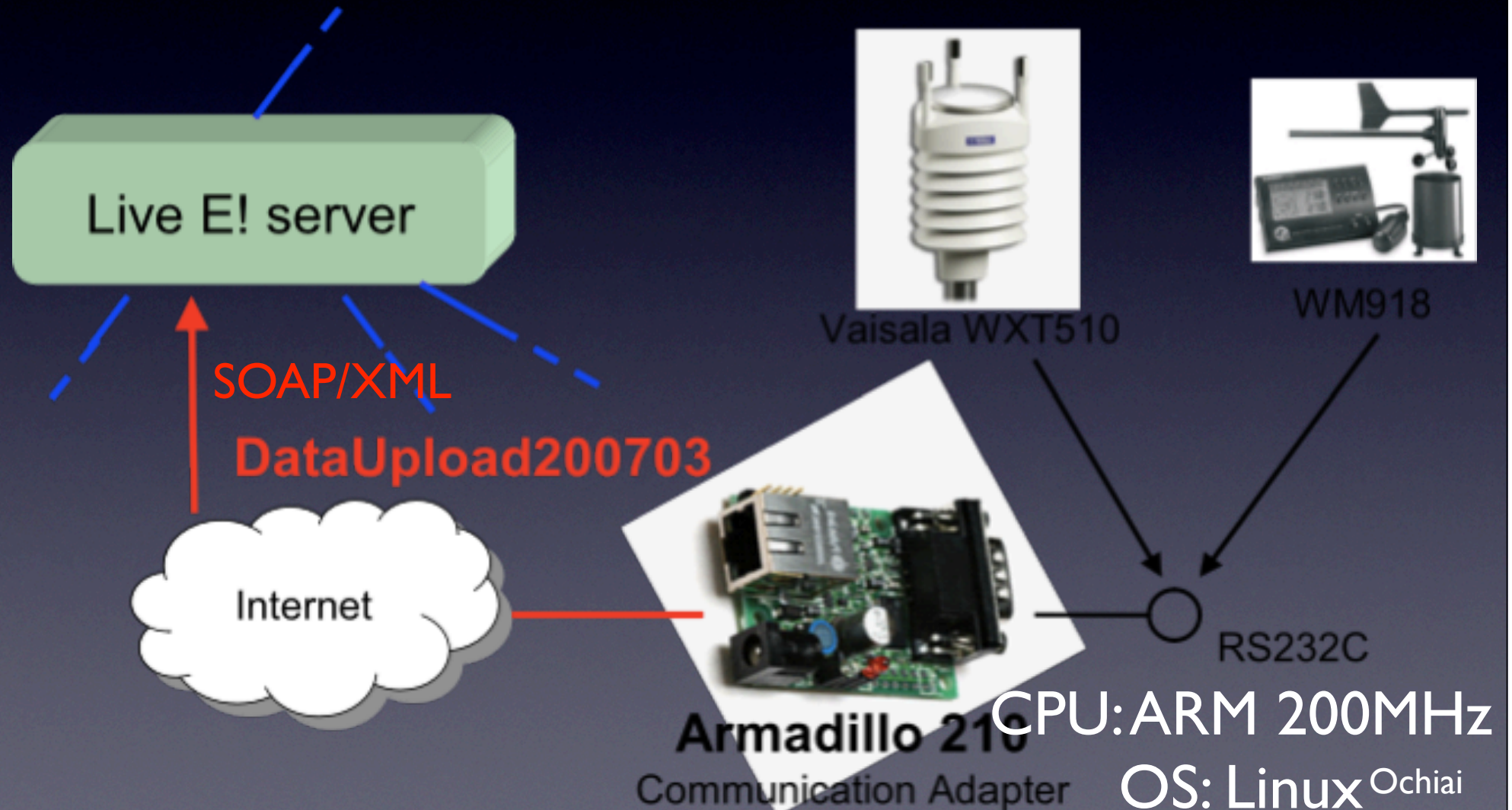
Live E!  
Application



Sensor

# Live E! Internet Weather Station

Temperature, Humidity, Air Pressure  
RainFall, Wind Speed/Direction





# APNG Camp

2009.7.22

Live E! workshop

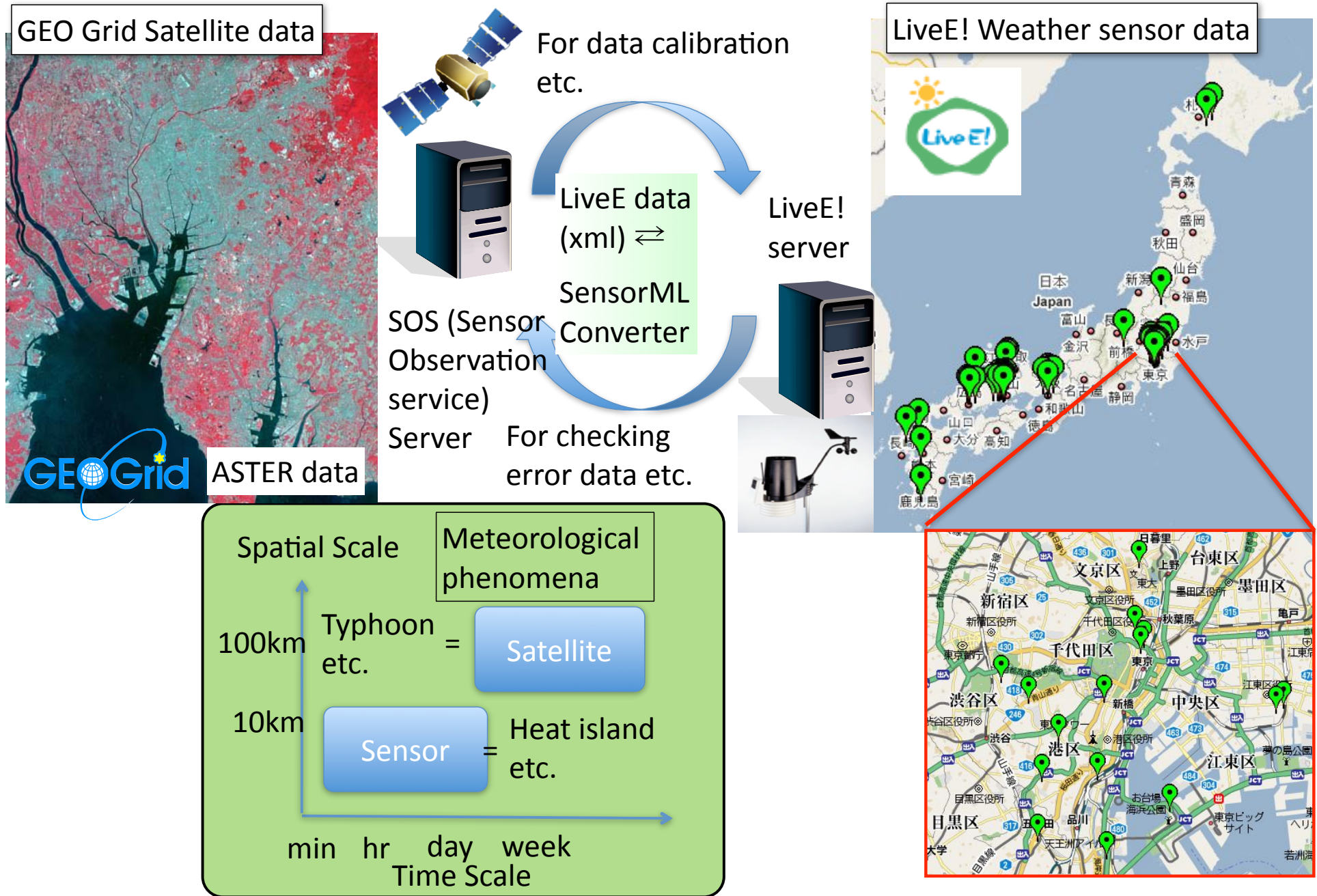
Hands on experience of sensor  
deployment

9 DTN sensor is used





# Fusion of Satellite and Weather Sensor Data





# Highlits on SC09, Portland

- e-heritage for National Palace Musium shown on TDW
- iPhone UI for SAGE
- e-Heritage expects to contribute to many country
- 3D Visual contents collaboration for COVICE with HLRS



## *Interactive TDW System for Exploring Renaissance Paintings*



Live HD Streaming (Tokyo  
<-> Portland) and  
TeraHerz analysis

Mobile Phone UI



## Live streaming on SC09



SC09 Exhibition floor (Portland, US)



NICT (Koganei, Japan)



## e-Heritage from National Place Musium is shown on TDW



著名な絵巻物の高精細画像（部分）



iPhoneでズームイン  
操作をしている様子





# Summery

- **Core Value**
  - **Sensor network technology**
  - **Visualization of Contents & Streaming Video**
  - **Diversity**
- **Opportunities for collaboration**
  - **Sensor Network in Urban Public Infrastructure**(Karpjoo, Kato)
  - **E-Heritage** (Kadobayashi, fang-pang, Kunwon)
  - **Extend to Global Coral Reef Ecological Observatory Network**(fang-pang, Sameer, , Joe)
  - **Education** (Shinji, David, Fang-pang, Russel)
  - **Microscope** (Shinji, David, Russel)
  - **Green ICT**



# Pragma telesience wiki

## <http://sites.google.com/site/extendedglobalcreon/>

### PRAGMA Telescience Group

#### ▼ Welcome

Member Contact  
List

#### ▼ Collaboration

Extend CREON  
GLEON ICT  
collaboration  
Virtualize TDW

#### ▼ Documentation

PRAGMA 17-  
Telescience  
Group Summary

#### Meeting

#### Publication

#### Resources

#### Software

#### Sitemap

## Welcome



(hand-in-hand in Vietnam- photo by Fang-Pang)

Dear teles,

Nice to see you all in PRAGMA 17. We had arrived a fruitful discussions and figured out practical actions for future in this meeting. This wiki will serve as our home for future collaborative efforts.

Shinji

Fang-Pang



Kazuhiko Naka

がオフラインになり

# 111

days until

PRAGMA 18 Demo

# 15

days since

SCo9

# 1

day since

SEAIP09 & 3rd

### PRAGMA Telescience Working Group

#### PRAGMA Telescience Working Group

Today ◀ ▶ December 2009 ▼

Print Week Month Agenda

| Mon                            | Tue   | Wed                                           | Thu | Fri | Sat | Sun |
|--------------------------------|-------|-----------------------------------------------|-----|-----|-----|-----|
| 30                             | Dec 1 | 2                                             | 3   | 4   | 5   | 6   |
| SEAIP09 & 3rd PRAGMA Institute |       |                                               |     |     |     |     |
|                                |       | JEO workshop (Jeju Environmental Observation) |     |     |     |     |
| 7                              | 8     | 9                                             | 10  | 11  | 12  | 13  |

# Thanks to

- NCHC
  - Fang-Pang Lin
- NCMIR
  - Masahiko Hoshijima
  - Steve Peltier
  - Tomas Molina
  - Mark Ellisman
- Pragma
  - Peter Arzburger
  - PRIME Students,
- CallT2
  - Larry Smarr
  - Tom defanti
- EVL@UIC
  - Maxine Brown
  - Jason Lee
- CMC
  - Kiyoshi Kiyokawa
  - Seiichi Kato
  - Susumu Date
- NAIST
  - Kazutoshi Fujikawa
- UHVEM
  - Hirotaro Mori
  - Kiyokazu Yoshida
- And many others who involved in the project.



