

# Global Advanced R&D Networks

- Enabler for “new generation” -



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# Agenda/Conclusion

Global R&D network will enable ;

1. New architectural paradigm
  - Toward global scale distributed computing
2. Education with applications on the “globe”
  - Live E! - sensor information for multiple use -
3. Business deployment
  - Establishment of technologies for global operation  
e.g., VoIP/SIP Interoperability



# IEEAF/GLIF in Asia

- Prof. Jun Murai of WIDE Project serves as Stewart of Asian area
- Integrating all the R&D and R&E Networks
- Key landing point candidates
  - China ; Beijing, Hong Kong, Shanghai
  - Korea ; Seoul, Pusang
  - Russia
  - Singapore
  - Thai ; Bangkok
  - India

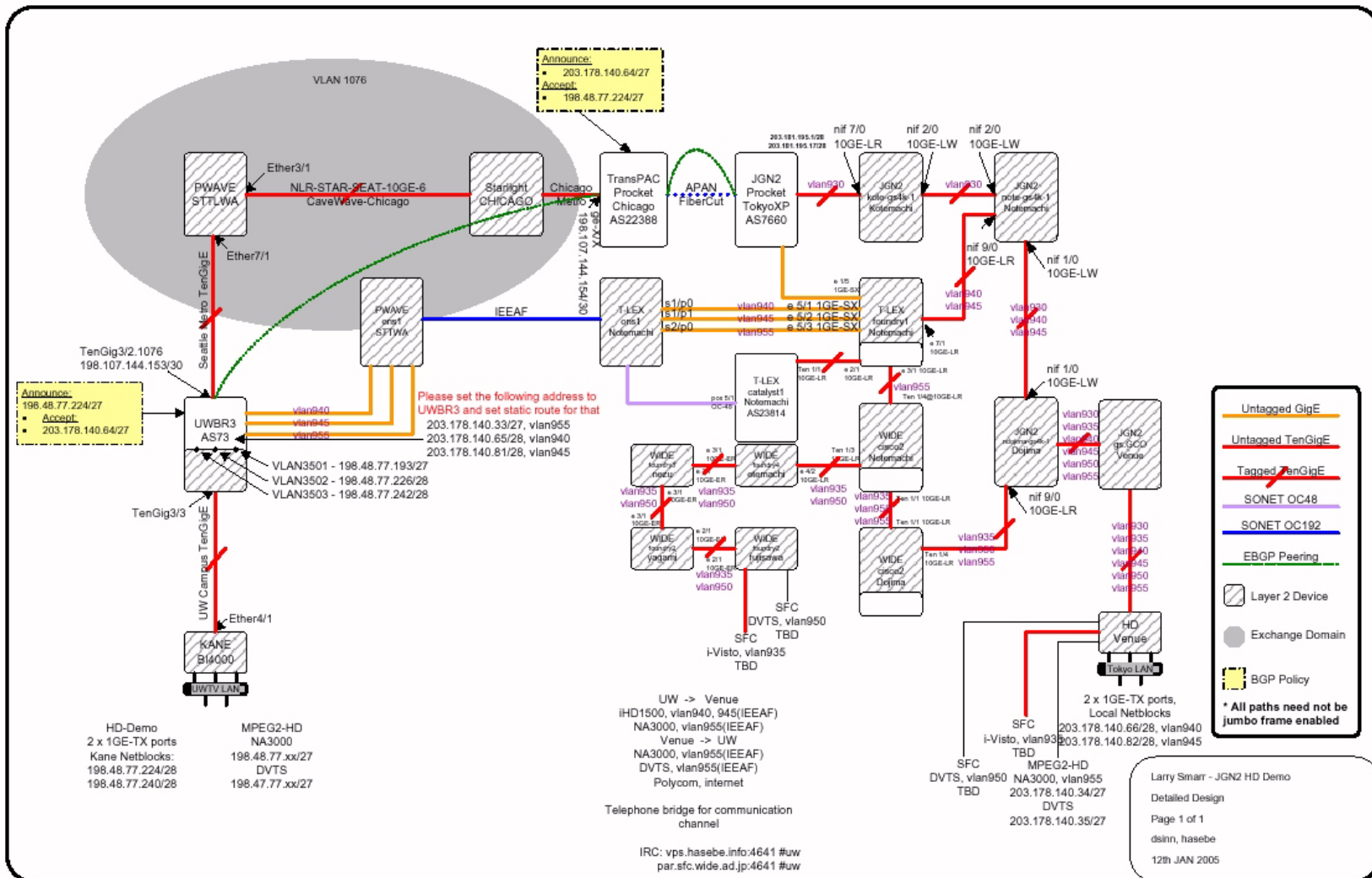
# Examples, in 2005

- Remote lectures with uncompressed HD (Jan.15, 2005)
  - Keio SFC(Tokyo) = JGN2 Symposium (Osaka)
  - Univ.of Washington(Seattle) = JGN2 Symposium (Osaka)
- TSUNAMI Symposium (Feb.23, 2005)
  - Prime Minister Office(首相官邸) = Keio Univ = Tohoku Univ. = Asian Univ.'s
  - DV Quality Video from Prime Minister Office
  - Asian universities via satellite system (AI3)
- “Deep Impact” real-time multicasting (September 5, 2005)
  - Subaru in Hawaii = Tokyo
  - Provide high-vision source of “Deep Impact” to NHK
- Remote lecture from SUBARU in Hawaii (Aug.04, '05)
  - Aichi Expo venue = Subaru@Hawaii
  - Bi-directional High-vision video

# JGN2 Symposium (Jan.17,18, '05)

- Two of uncompressed HDTV
  - University of Washington (Seattle) = Osaka
  - Keio University (Tokyo) = Osaka
- Small latency is essential for Interactive Session
- Global collaboration and cooperation
  - JGN2, WIDE, GLIF, STARLIGHT, PacificWave, IEEAF, NLR, etc





- 10 GbE VLAN across Pacific Ocean
- Two redundant paths
  - Seattle = Chicago = Tokyo = Osaka
  - Seattle = Tokyo = Osaka

# TSUNAMI Symposium

スマトラ沖地震によるインド洋大津波: アジアの大学から世界へ  
- 今大学に何が求められているか?

Date

Feb.24, 2005

Participants

慶應義塾大学

東北大学

アジア工科大学(タイ) チュラロンコン大学Dr.Anatによる主催

バンドン工科大学(インドネシア)

ブラビジャヤ大学(インドネシア)

Program

16:30 - 17:00 Keynote - Prof. Jun Murai

17:00 - 17:30 Report from Japan (1)

17:30 - 18:00 Reports from Thailand

18:10 - 18:40 Report from Japan (2)

18:40 - 19:10 Report from Indonesia (1)

19:10 - 19:20 Report from Indonesia (2)

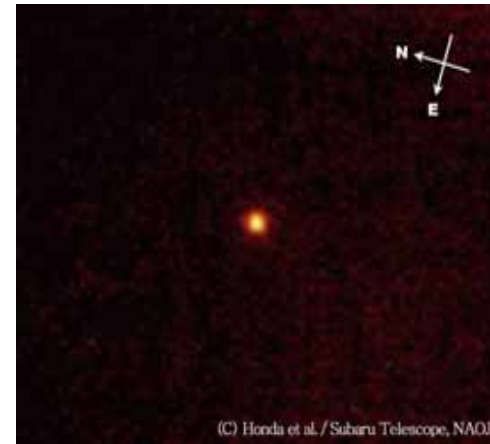
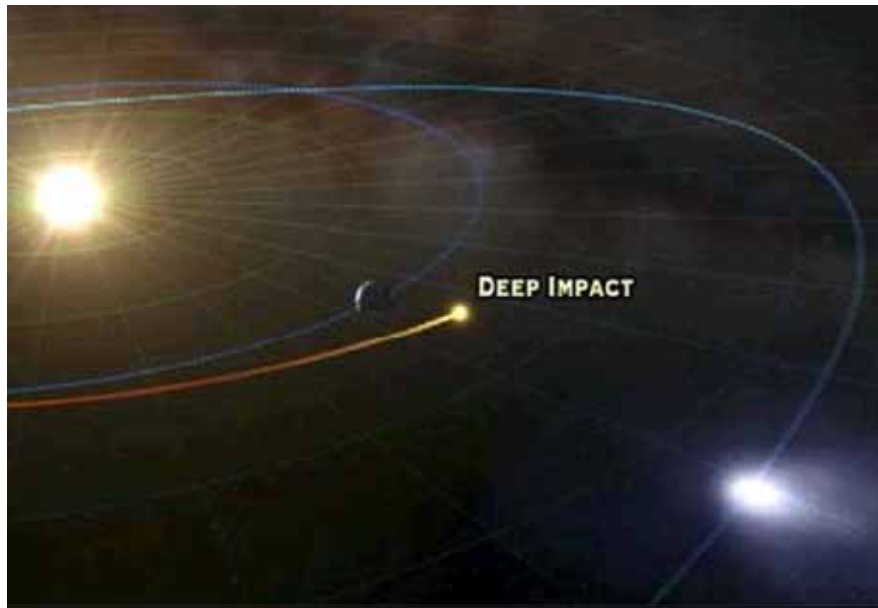
19:20 - 20:10 Panel Discussion

20:10 - 20:30 Closing





# Deep Impact Project by NASA



Live images from SUBARU  
in Hawaii

# Remote lecture from Subaru to Expo

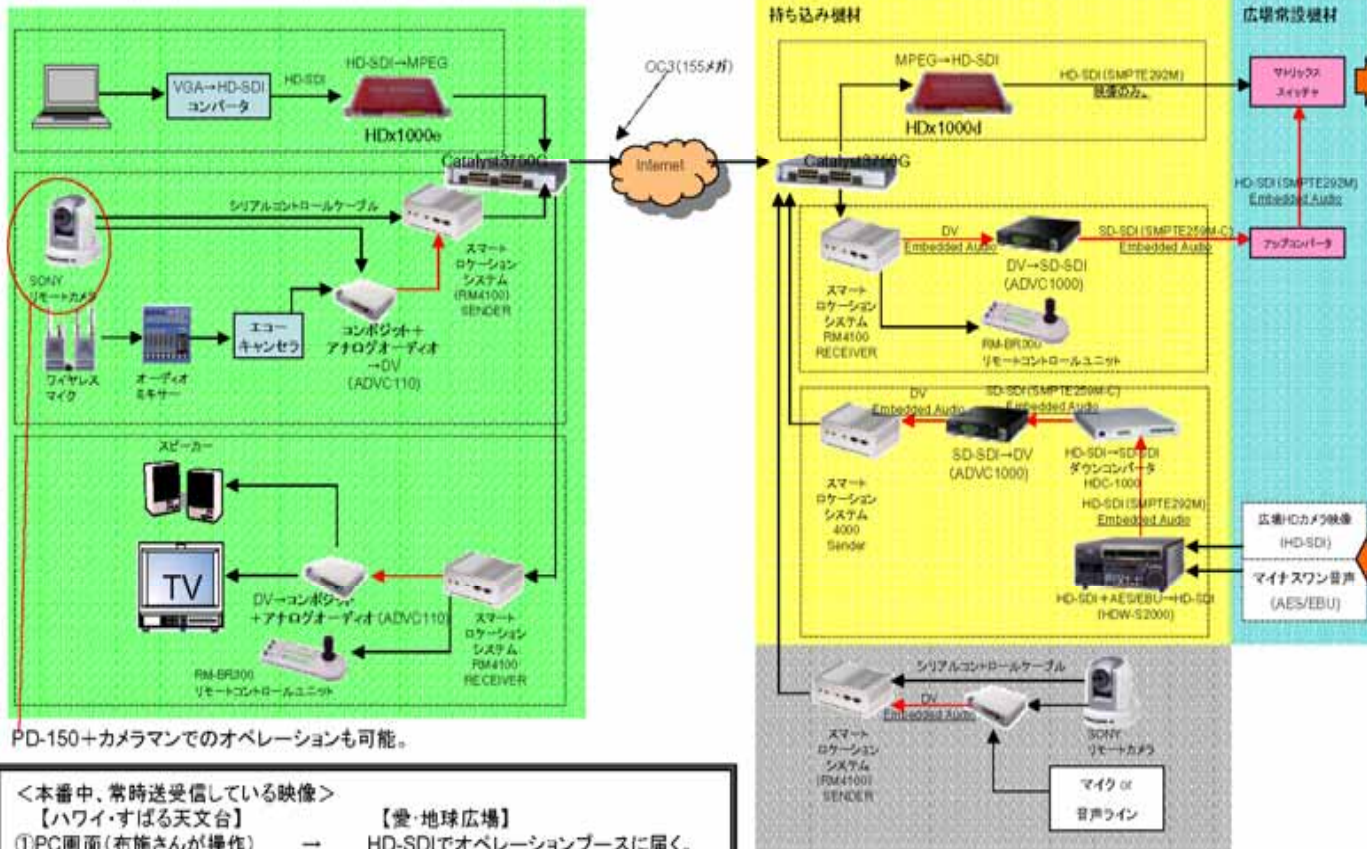


2005.7.14更新

## 8月2日、3日 愛・地球広場～ハワイ・すばる天文台 双方向中継系統図

HAWAII すばる天文台

日本(愛・地球広場オペレーションブース)



PD-150+カメラマンでのオペレーションも可能。

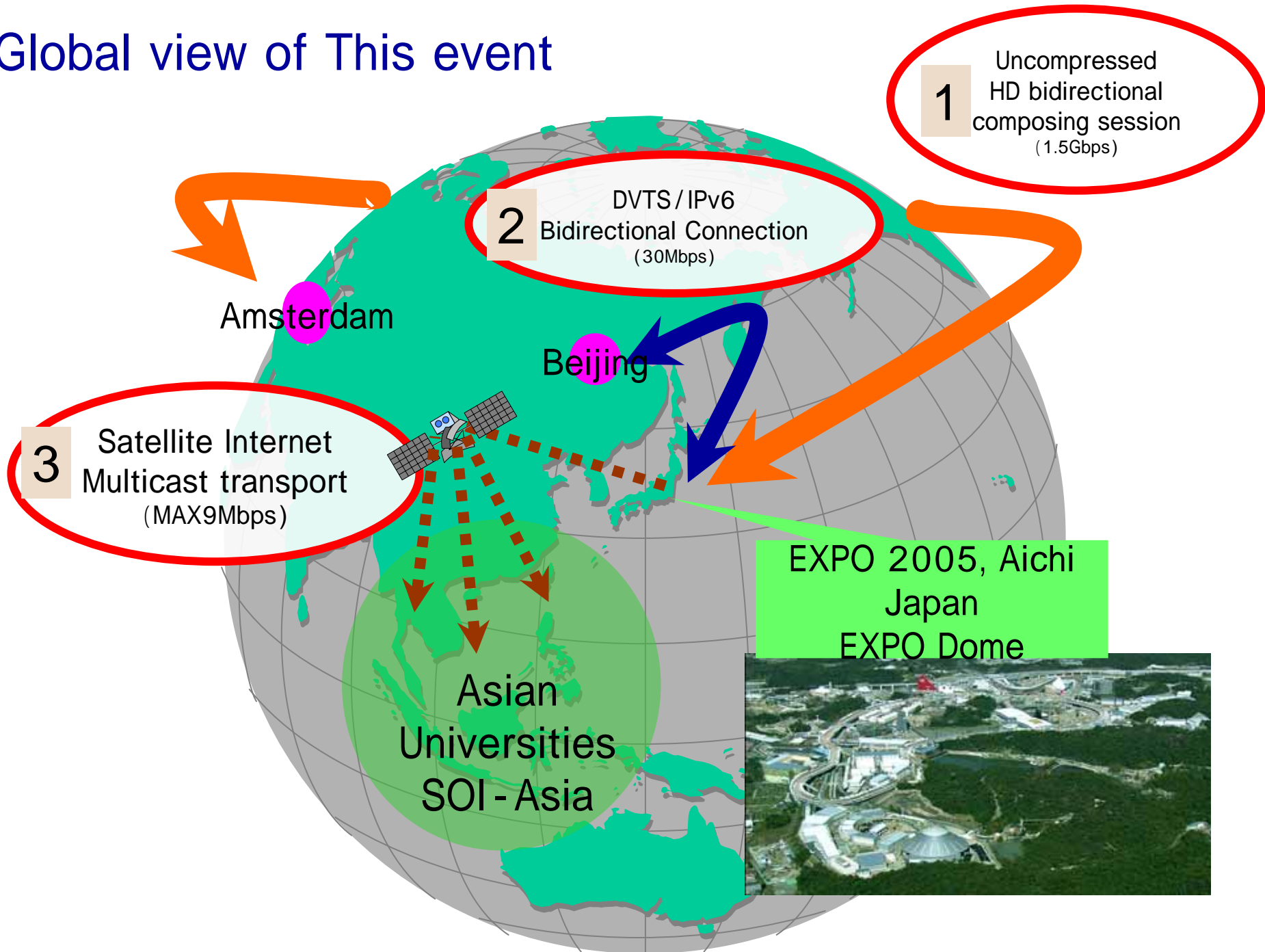
- <本番中、常時送受信している映像>
- | 【ハワイ・すばる天文台】   | 【愛・地球広場】                                   |
|----------------|--|
| ①PC画面(布施さんが操作) | → HD-SDIでオペレーションブースに届く。                    |
| ②布施さんの授業映像     | → SD-SDIでオペレーションブースに届く。                    |
| ③テレビ、スピーカーに出る  | → ステージ付近の有人カメラ映像(HD-SDI)+マイナスイオン音(AES/EBU) |

※灰色部分は本番演出には関係しません。

**EXPO 2005 Aichi, Japan Message Event,  
Closing Forum,  
"Towards the Creation of a Sustainable Society"**

**Event: Sept 21<sup>st</sup>, 2005**

# Global view of This event



# Uncompressed HD Bidirectional Communication

- HDTV over IP
  - i-Visto Gateway
    - Developed by NTT Communications



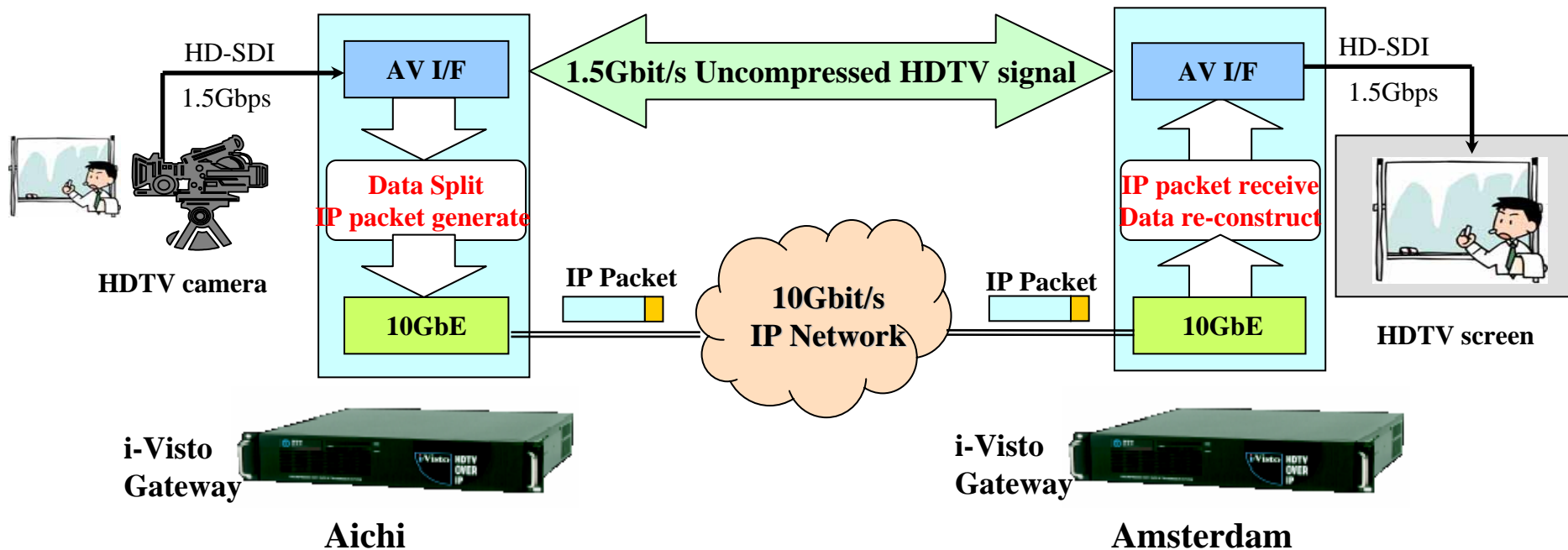
HDTV over IP : i-Visto Gateway

- Realizing a collaborative Jam session between Japan and Netherlands

# Real-time HD over IP with “i-Visto”

**i-Visto[’aibist]** : Internet video studio system for HDTV production

Real-time transport system for high quality video signal over IP network such as uncompressed HDTV (1.5Gbps), SDTV (270Mbps) between multiple points which is provided by NTT Communications





# AMSTERDAM INTERNET INFRASTRUCTURE WITH i-Visto

てらたもろ - 202.0.73.6 VT

File Edit Setup Control Window Help

Load Average				/0	/1	/2	/3	/4	/5	/6	/7	/8	/9	/10
Interface		Traffic	Peak	Total										
lo0	in	0.000 KB/s	0.000 KB/s	0.711 KB										
	out	0.000 KB/s	0.000 KB/s	0.711 KB										
em3	in	0.062 KB/s	3.954 KB/s	10.688 MB										
	out	0.192 KB/s	3.056 KB/s	10.037 MB										
em2	in	95.509 MB/s	95.594 MB/s	3.338 GB										
	out	95.486 MB/s	97.615 MB/s	1.658 GB										
em0	in	95.484 MB/s	86.365 MB/s	1.945 GB										
	out	95.501 MB/s	97.692 MB/s	3.173 GB										

てらたもろ - 202.0.73.6 VT

File Edit Setup Control Window Help

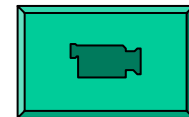
Load Average				/0	/1	/2	/3	/4	/5	/6	/7	/8	/9	/10
Interface		Traffic	Peak	Total										
lo0	in	0.000 KB/s	0.000 KB/s	0.711 KB										
	out	0.000 KB/s	0.000 KB/s	0.711 KB										
em3	in	0.138 KB/s	1.140 KB/s	11.019 MB										
	out	0.276 KB/s	1.188 KB/s	10.021 MB										
em2	in	95.481 MB/s	95.550 MB/s	3.407 GB										
	out	95.509 MB/s	96.547 MB/s	2.263 GB										
em0	in	95.486 MB/s	95.540 MB/s	3.772 GB										
	out	95.491 MB/s	97.354 MB/s	3.242 GB										





# Many Thanks!

- Japan Association for the 2005 World Exposition
- NTT Communications
- China Network Communications Corp. (China Netcom)
- Asia Netcom Japan
- Global Access Ltd.
- Marubeni Corporation (Beijing)
- Matsushita Electric Industrial Co., Ltd.
- Asahi Broadcasting Corporation Cisco Systems Inc.
- Powerplay Inc.
- Japan Science and Technology Agency
- Keio University
- WIDE Project
- APAN
- TransPAC
- Abilene
- GEANT
- SARA
- SURFNet



# We realize that;

- Computing resources on the “globe” will be available with large bandwidth
- We should/can (?) start the new architectural paradigm using global computing resources

# AGENDA



Global R&D network will enable ;

1. New architectural paradigm
  - Global scale distributed computing
- 2. Education with applications on the “globe”**
  - Live E! - sensor information for multiple use -**
3. Business deployment
  - Establishment of technologies for global operation  
e.g., VoIP/SIP Interoperability

# Discussion with Dr. Robert Kahn



- Internet is the logical architecture, rather than just a physical objects composed by routers or switches.

**Internet provides “commons”, that handles digital objects transparently.**

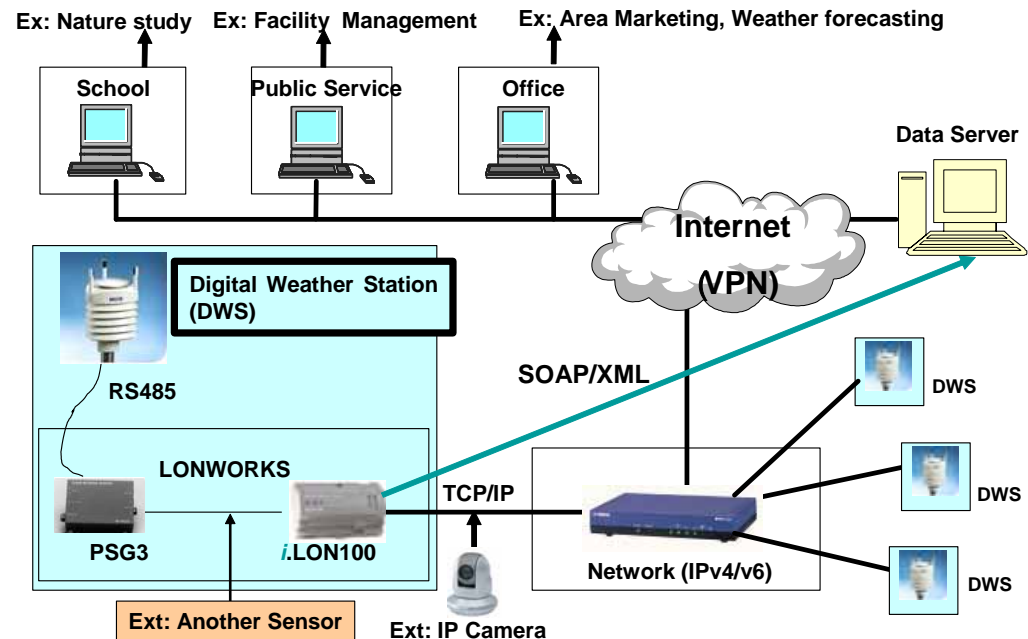
- “Key” of the Internet architecture is providing the “alternatives” and the “availability” of any multiple communication media.
- Just, the address length was extended, according to the number of nodes to be connected. **People need transparency for new usage/applications, i.e., “possibility”**



# Live E! Project

<http://www.live-e.org/>

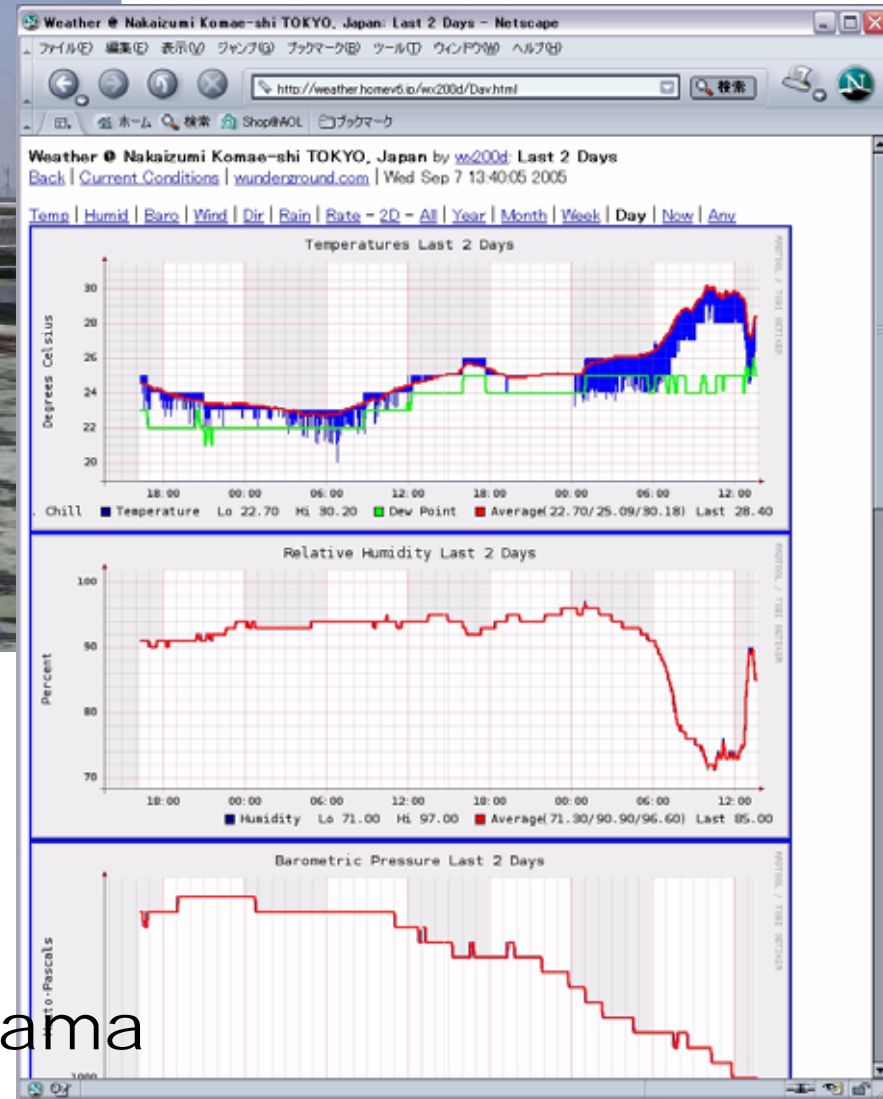
- Live E! is a approach that aims at the achievement of the infrastructure construction that can use, process, and share “Environmental Information”.
- “Environmental Information” is collected by "Digital Weather Station“, IP Camera, etc. that are set up by the individual and the organization voluntarily.
- “Digital Weather Station” acquire the weather information with low cost and send the information to the data server via the Internet and JGN2(Japan Gigabit Network).
- By the installation of a lot of “Digital Weather Station”, the environmental information can be utilized much more.
- The development of a new activity is assumed in an education, public service and the business cases.



## **Initiated “Live E!” project.**

- install weather sensor units**
- let information available for anyone**
- targeting mile-mesh network**
- three applications**
  - 1. Educational material**
  - 2. Public service**
  - 3. Business use**





Dense installation areas  
(in planning)

1. Minato-ku in Tokyo
2. Kurashiki-city in Okayama
3. Mitaka-city in Tokyo



# LIVE E! ; example of user application

The screenshot shows the Google Earth interface with a map of Japan. A temperature legend on the left indicates color-coded temperature ranges: 30°C以上 (red), 25~30°C (orange), 20~25°C (yellow), 15~20°C (light green), 10~15°C (cyan), 5~10°C (blue), 0~5°C (dark blue), and 0°C未満 (white). The map displays these temperature ranges over the Japanese archipelago. A list of locations is visible on the left, including 'Live\_E.kml' and various schools and companies. A yellow text box with a red border is overlaid on the map, containing the text: 'Philippine node has started the operation, as joint project of ASTI and NTT group'. The bottom of the interface shows a compass, a pointer with coordinates (35°26'49.65" N, 139°50'07.93" E), elevation (3 ft), and a control panel with various icons for navigation and map settings.

Google Earth

File Edit View Add Tools Help

Fly To Local Search Directions

What: e.g. Computer repair

http://www.map-asp.net/Spatial\_Gateway/plGate

Where: e.g. Clayville, NY

Current view

Places

- Live\_E.kml
  - 広島市立広島工業高校
  - 広島大学附属福山中・高校
  - 鳥栖工業高校
  - 塩田工業高校
  - インテック本社
  - 八戸工業専門学校
  - 岩崎農場
  - 阪神電鉄 石川川車庫
  - ダイダン技術研究所
  - S邸
  - 10373.com
  - 海士中学校屋上
  - 甲子園球場
  - 松下電工本社
  - 山武産業事業所
  - インテック東陽町ビル
  - 清水建設技術研究所
  - 三鷹天文台
  - エシエロンジャパン
  - A邸
  - K邸
  - 虎ノ門通信塔
  - 札幌通信塔
  - 沖縄通信塔
  - HICT
  - 三菱総研
- Sightseeing

Start your Google Earth world tour here! Click a placename for information, double-click to fly to

Layers

- Layers
  - International Geographic Magazine
  - Google Earth Community

30°C以上

25~30°C

20~25°C

15~20°C

10~15°C

5~10°C

0~5°C

0°C未満

Imperial Palace, Tokyo, Japan

Chiba-ken

Philippine node has started the operation, as joint project of ASTI and NTT group

Sagami-nada

Image © 2005 MDA EarthSat  
Image © 2005 DigitalGlobe

© 2005 Google

Pointer 35°26'49.65" N 139°50'07.93" E elev 3 ft Streaming 100% Eye alt 52.51 mi

Lodging Dining Roads Borders Terrain Buildings

# AGENDA

Global R&D network will enable ;

## 1. New architectural paradigm

- Global scale distributed computing

## 2. Education with applications on the “globe”

- Live E! - sensor information for multiple use -

## **3. Business deployment**

- Establishment of technologies for global operation  
e.g., VoIP/SIP Interoperability



# Why we started Task Force ?



- Huge number (10M+) of IP-Phone installation in Japan
  - Triggered by Yahoo BB, using the terrestrial phone numbers
  - NTT group, KDDI and Fusion Comm.
  - PBX migration in the corporate networks
- Going to develop/deploy in Asian countries
- **But,,,,,,**
  - **Insufficient interoperability among ISPes....**
  - **Insufficient consideration on Inter-Domain**
- Started VoIP/SIP Interoperability Task Force
  - Run by JPNIC
  - Technical supporting by JGN2
  - Global collab. With SIP Forum/SIPit, MSF, IPCC
  - Welcome participation from Asian countries



**JGN2**

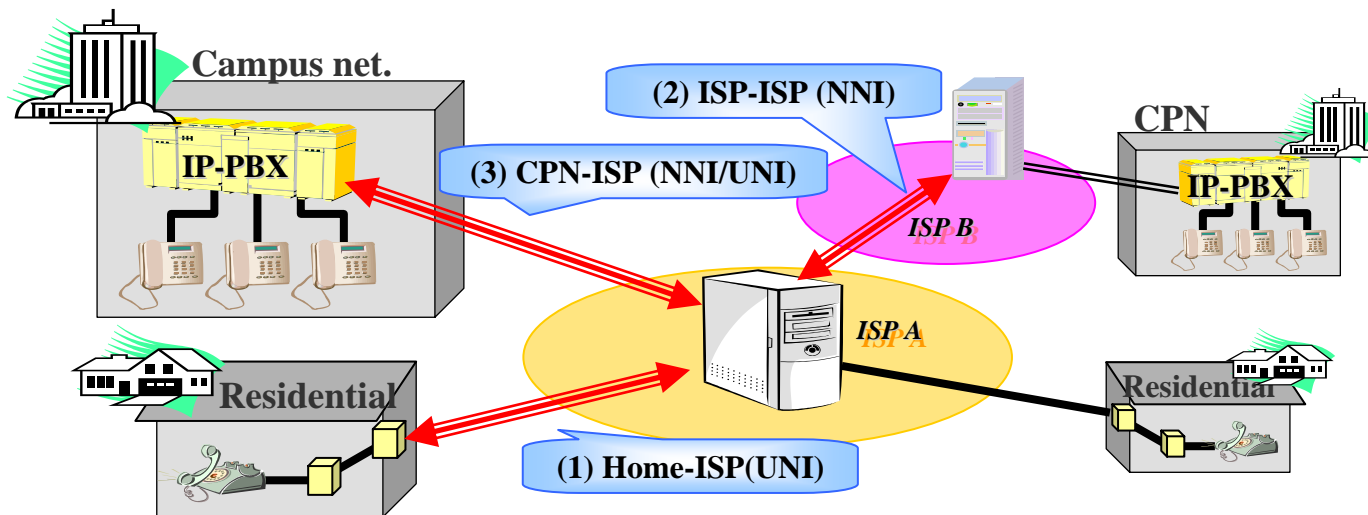


- IPv6普及・高度化推進協議会(v6PC)
- 株式会社アズジェント
- ENUMトライアルジャパン(ETJP)
- 岩崎通信機株式会社
- インテック・ウェブ・アンド・ゲノム・インフォマティクス株式会社
- エヌ・ティ・ティ・アドバンステクノロジー株式会社
- エヌ・ティ・ティ・コミュニケーションズ株式会社
- エヌ・ティ・ティ レゾナント株式会社
- 沖電気工業株式会社
- KDDI株式会社
- サンテレホン株式会社
- 伊藤忠テクノサイエンス株式会社
- シスコシステムズ株式会社
- 社団法人情報通信技術委員会(TTC)
- 情報通信ネットワーク産業協会(CIAJ)
- 高度通信システム相互接続推進会議(HATS推進会議)
- 砂原秀樹(奈良先端科学技術大学院大学)
- ソフトバンクBB株式会社
- 株式会社ソフトフロント
- 社団法人テレコムサービス協会  
VoIP推進協議会、
- 株式会社東芝
- 中村修(慶應義塾大学)
- 西日本電信電話株式会社
- 日本テレコム株式会社
- 日本電気株式会社
- 社団法人日本ネットワークインフォメーションセンター(JPNIC)
- NPO 日本VoIPフォーラム(VFJ)
- 株式会社日本レジストリサービス
- 株式会社ネットマークス
- 東日本電信電話株式会社
- 株式会社日立製作所
- 富士通株式会社
- フュージョン・コミュニケーションズ株式会社
- 株式会社三菱総合研究所
- 三菱電機情報ネットワーク株式会社
- ヤマハ株式会社
- WIDEプロジェクト (以上、36社/団体/個人)

# VoIP/SIP Interoperability Task Force

## Objectives and Targets

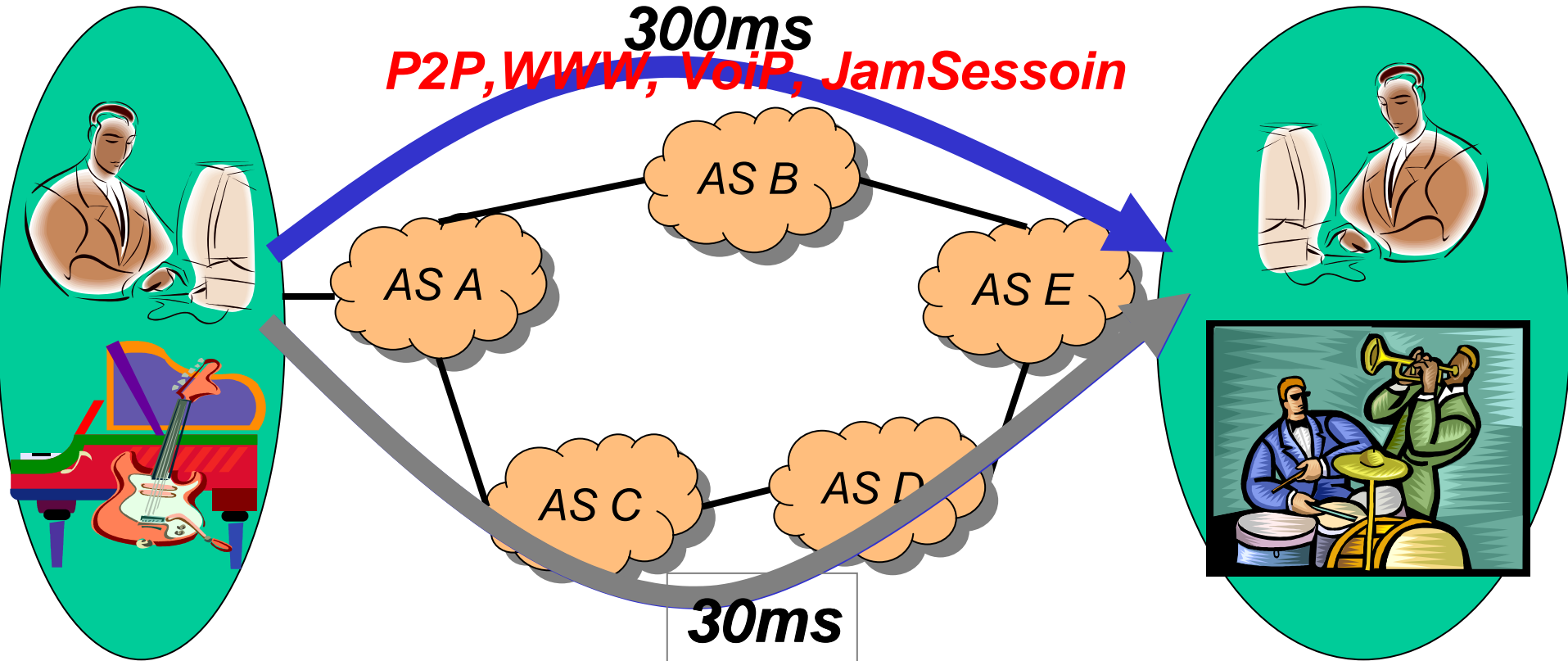
1. Establish interoperability among VoIP/SIP systemsSIP
  - i. Multi-vendor
  - ii. Multi-Provider
2. Establish environments for interoperability testing
  - i. Publish specification (conformance and interoperability)
  - ii. Provide self-testing software
  - iii. Operate testbed and test-event
3. Collaboration with related organizations



# Current Routing System

- **Not-aware of Latency**
  - $A \rightarrow B \rightarrow E = 3 < A \rightarrow C \rightarrow D \rightarrow E = 4$
- We need some tunneling technologies, e.g., MPLS, IP-in-IP, with policy routing....

→ We need new(?) routing architecture or operational configuration ?



# Lessons and challenges from VoIP/SIP activity

- Contribution and responsibility from R&D community to business deployment
  - Implementation
  - Operation
  - Governance (e.g., address)
- Essential technical challenge on Routing Architecture to come up with physical “globe”

# Summary

- *Responsibilities of “Global” R&D Network* -

“Enabler” for next generation;

1. New architectural paradigm (innovation)
  - e.g., R&D on Global scale distributed computing
2. Education with applications on the “globe”, to generate innovation gears
  - e.g., Live E! - sensor information for multiple use -
3. Business deployment
  - Establishment of technologies for global operation  
e.g., VoIP/SIP Interoperability