Seminar on ITU-T hot topics for Standardization
(Mar del Plata, Argentina, 2 September 2009)

Overview of HATS

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OKI Electric Industry Co., Ltd.
(Chairman: Steering Committee of HATS)
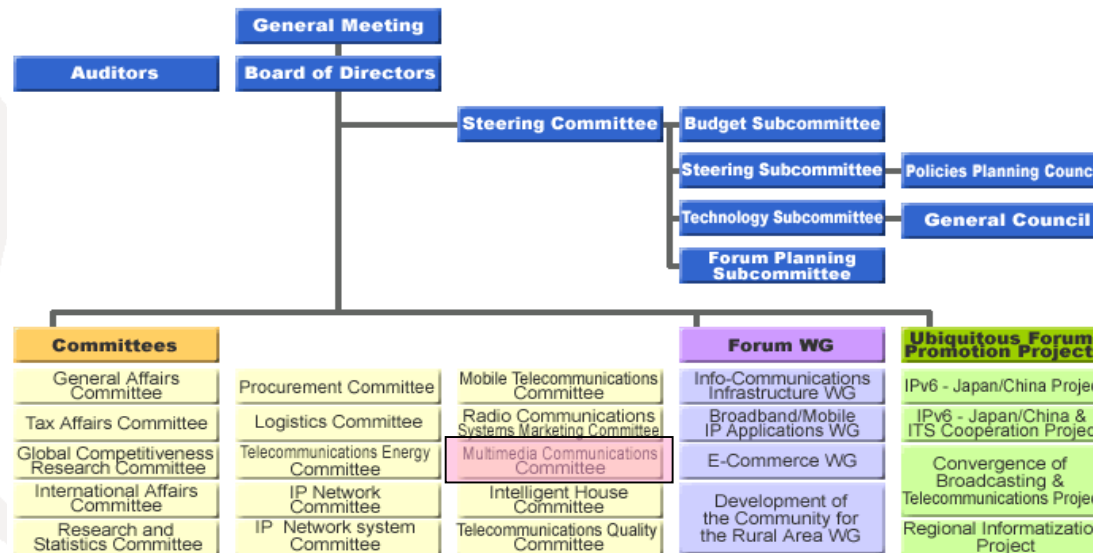
1. HATS General   -What is HATS ?-

- HATS Conference:
  Promotion Conference of
  Harmonization of Advanced Telecommunication Systems

- Activates to assure interconnectivity and interoperability test (IOT) between info-communication equipment of different manufacturers.

- HATS is the Non-Profit organization to ensure the Telecommunication Equipments Inter-operability in order to give a user convenience.

- HATS was established in Aug. 1988.
  - Members: info-communications manufacturers, vendors, carriers, TTC, MIC*1
  - Secretariat: Communications and Information network Association of Japan (CIAJ)

For the details, http://www.ciaj.or.jp/hats/e/what/about.html

Note*1:MIC(Ministry of Internal Affairs and Communication, At that time MPT Ministry of Posts and Telecommunications

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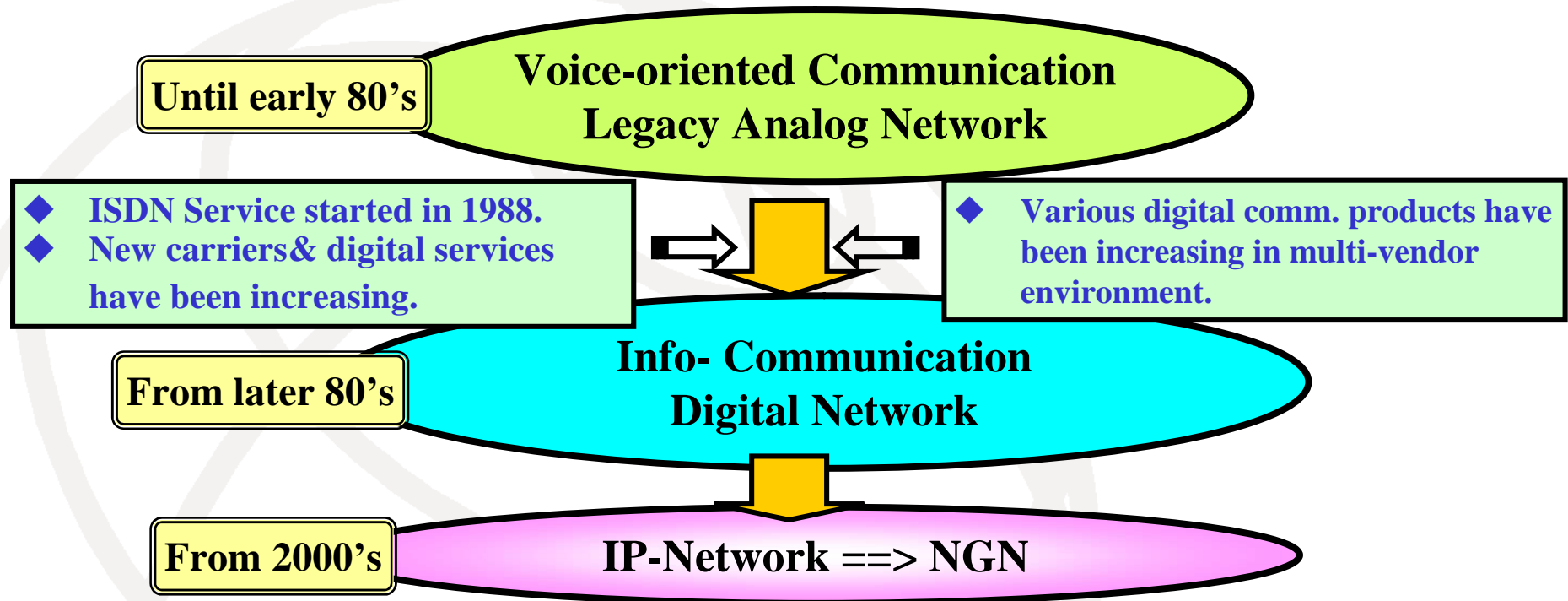
1. HATS General   -What is the CIAJ ?-

- CIAJ: Communications and information network association of Japan
- CIAJ is committed to the healthy development of info-communication network industries through the promotion of info-communication technologies (ICT) in Japan.
- The Multi Media Communication Committee discuss the technical issues about multimedia communication equipment, and act the IOT with HATS which is a
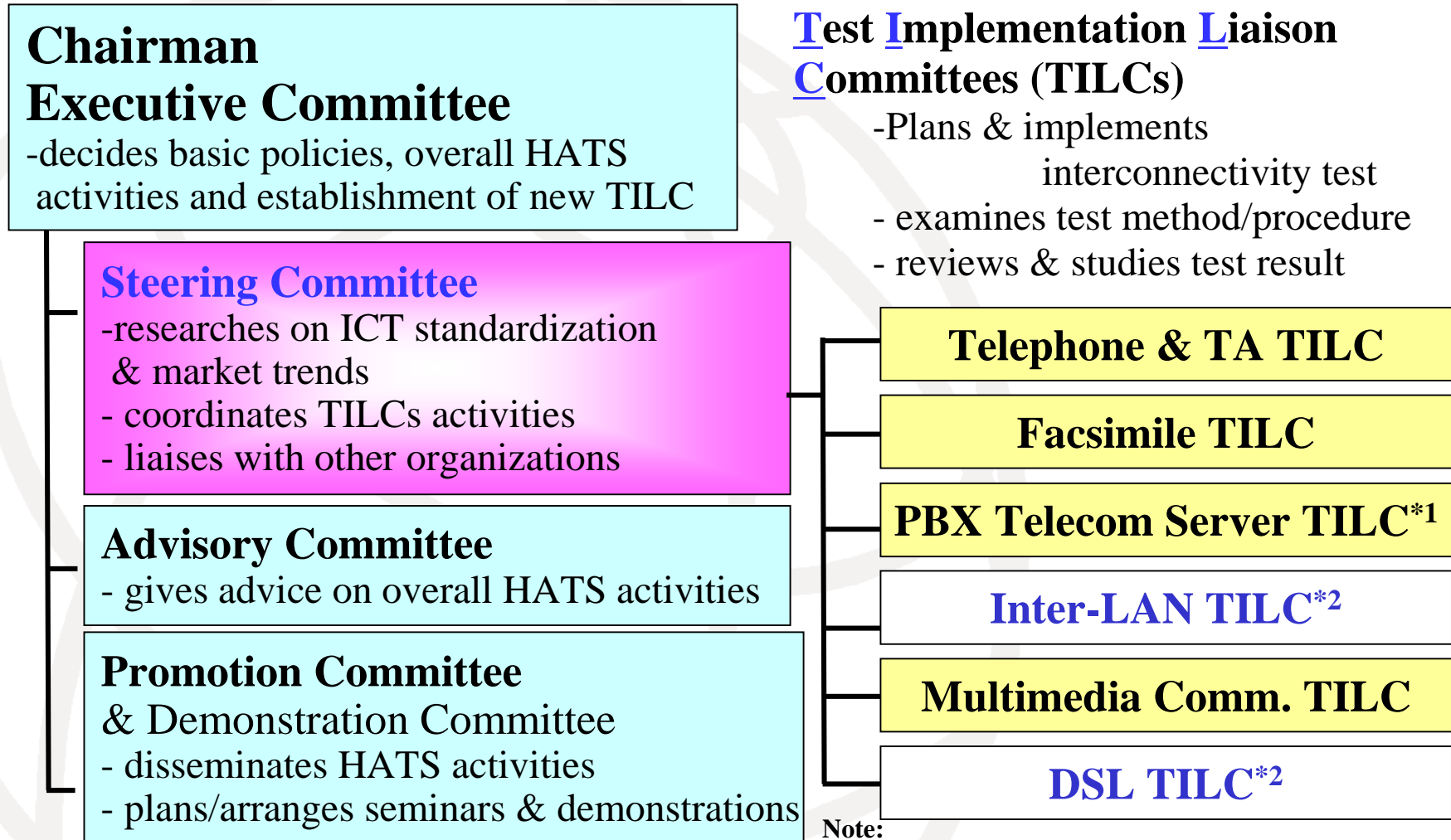
General Meeting

Auditors　**Board of Directors**

Steering Committee — **Budget Subcommittee**

Steering Subcommittee — **Policies Planning Council**

Technology Subcommittee — **General Council**

Forum Planning Subcommittee

Committees			**Forum WG**	**Ubiquitous Forum Promotion Projects**
General Affairs Committee	Procurement Committee	Mobile Telecommunications Committee	Info-Communications Infrastructure WG	IPv6 - Japan/China Project
Tax Affairs Committee	Logistics Committee	Radio Communications Systems Marketing Committee	Broadband/Mobile IP Applications WG	IPv6 - Japan/China & ITS Cooperation Project
Global Competitiveness Research Committee	Telecommunications Energy Committee	Multimedia Communications Committee	E-Commerce WG	Convergence of Broadcasting & Telecommunications Project
International Affairs Committee	IP Network Committee	Intelligent House Committee	Development of the Community for the Rural Area WG	Regional Informatization Project
Research and Statistics Committee	IP Network system Committee	Telecommunications Quality Committee		

And more…

http://www.ciaj.or.jp/e.htm

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2. Necessity of HATS -Background-

Until early 80's

Voice-oriented Communication Legacy Analog Network

◆ ISDN Service started in 1988.
◆ New carriers& digital services have been increasing.

◆ Various digital comm. products have been increasing in multi-vendor environment.

From later 80's

Info- Communication Digital Network

From 2000's

IP-Network ==> NGN

- IOT was required between several ICT equipments.
- In order to develop Info-communication market, a framework aiming to ensuring end-to-end IOT among various Info-communication equipments was needed in multi-carrier/multi-vendor environment.
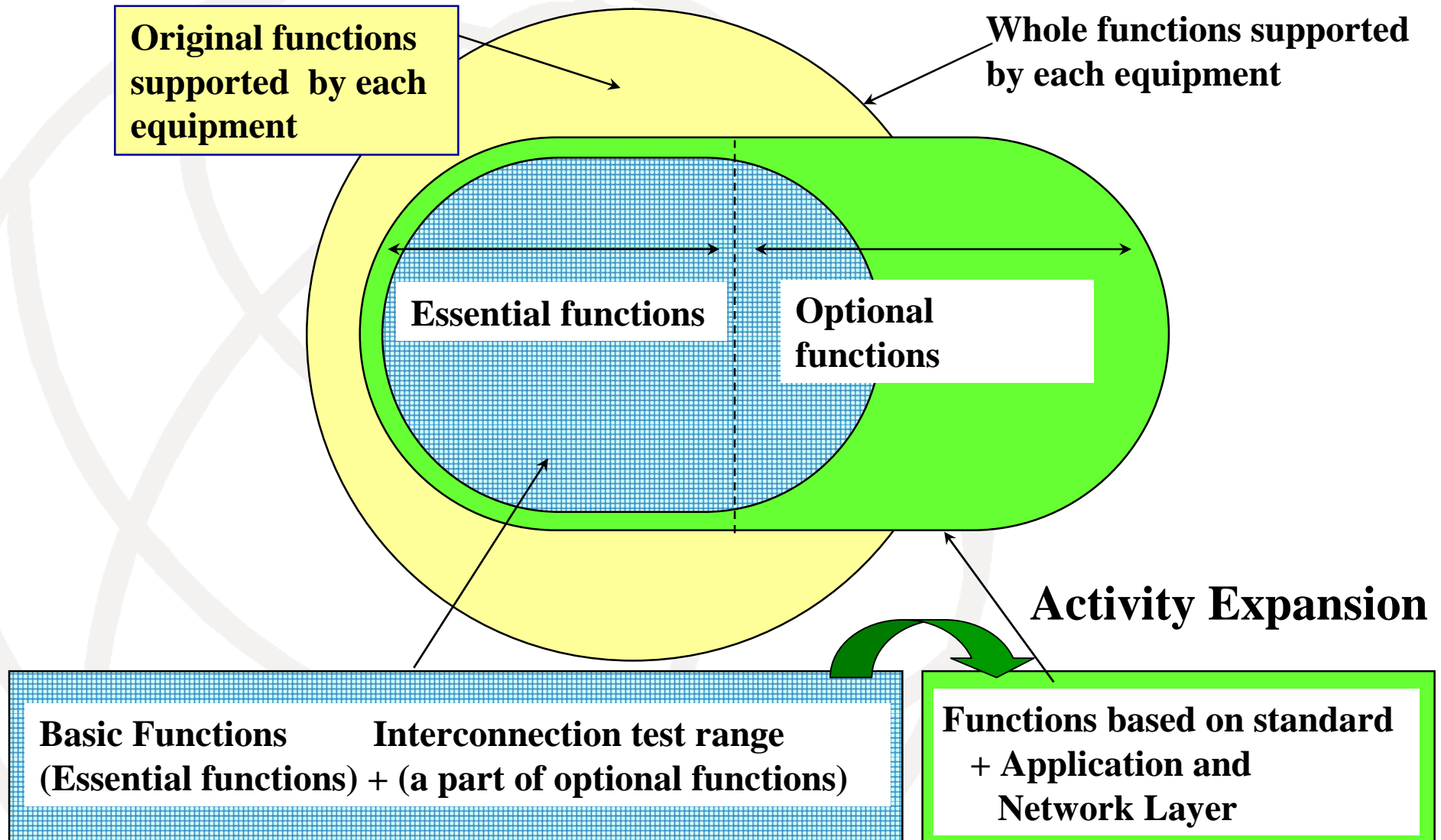
3. Structure of HATS Conference

Chairman
Executive Committee
-decides basic policies, overall HATS
 activities and establishment of new TILC

Steering Committee
-researches on ICT standardization
 & market trends
- coordinates TILCs activities
- liaises with other organizations

Advisory Committee
- gives advice on overall HATS activities

Promotion Committee
& Demonstration Committee
- disseminates HATS activities
- plans/arranges seminars & demonstrations

Test Implementation Liaison Committees (TILCs)
-Plans & implements
          interconnectivity test
- examines test method/procedure
- reviews & studies test result

Telephone & TA TILC

Facsimile TILC

PBX Telecom Server TILC*1

Inter-LAN TILC*2

Multimedia Comm. TILC

DSL TILC*2

Note:
*1: Name of TILC has changed because of their activities.
*2: Those TILC has terminated on 2005.

Secretariat: Communications and Information network Association of Japan (CIAJ)
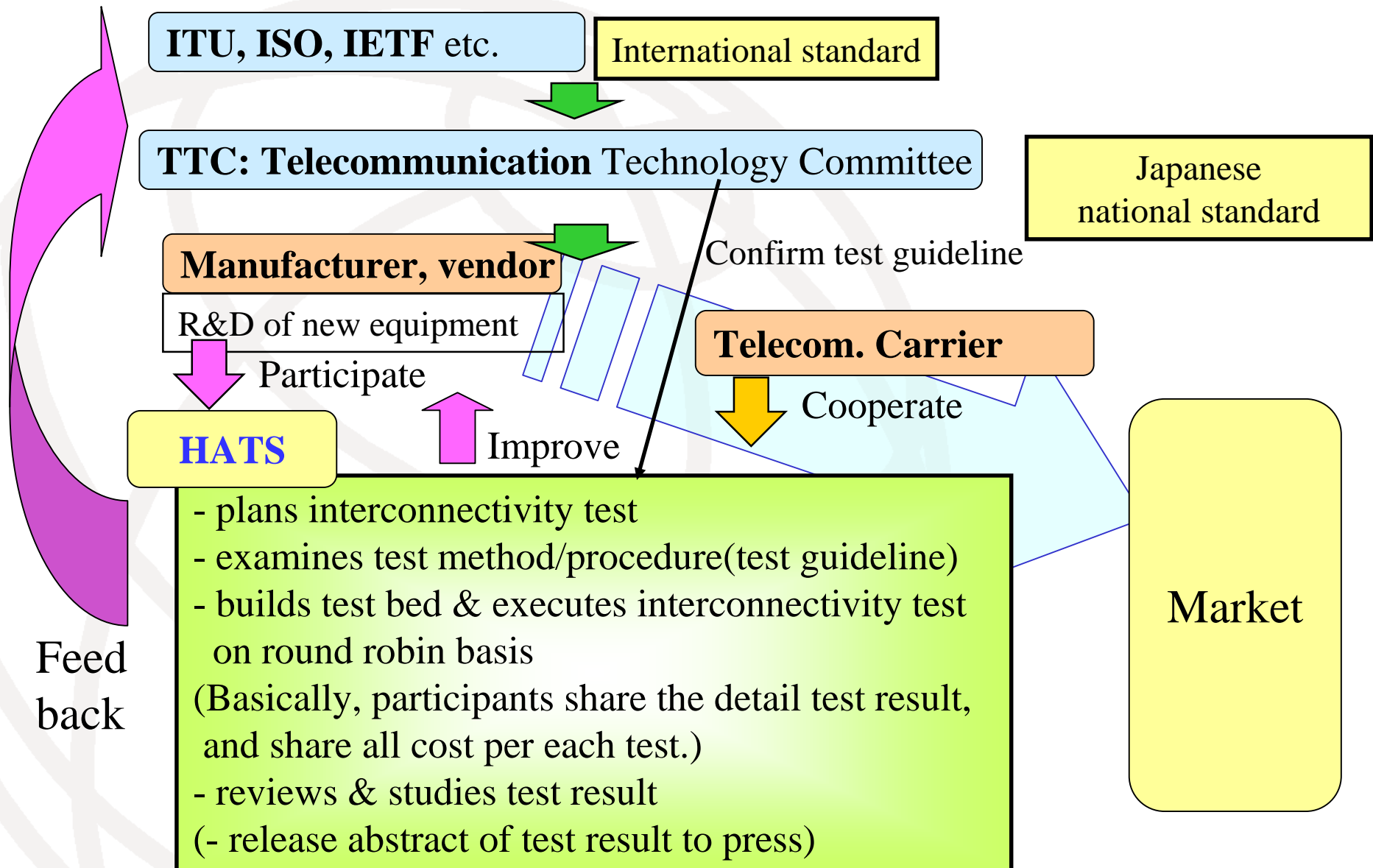
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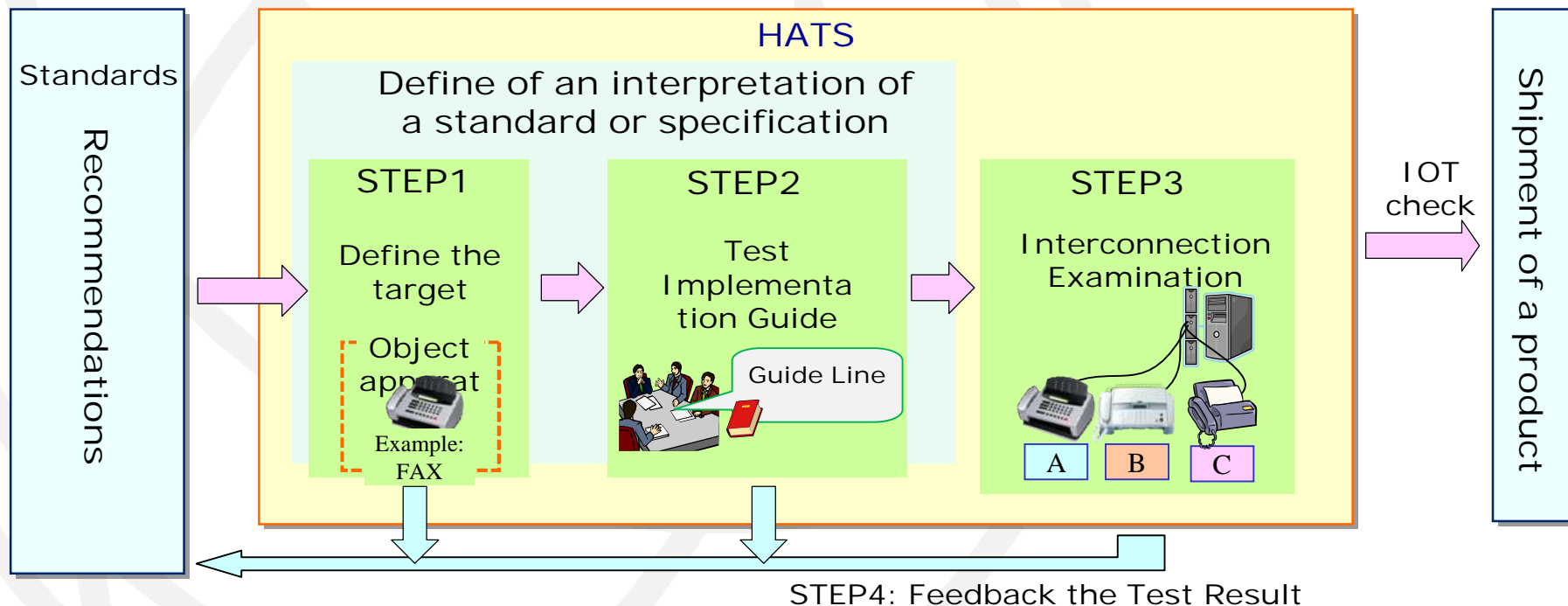# 4. The Interconnectivity Test Range Targeted by HATS

Original functions supported by each equipment

Whole functions supported by each equipment

Essential functions

Optional functions

Activity Expansion

Basic Functions   Interconnection test range (Essential functions) + (a part of optional functions)

Functions based on standard + Application and Network Layer

5. Standardization Flow in Japan

International standard

ITU, IETF…

| ITU-R | ITU-T |

ITU-T/ITU-R Recommendations

Downstream

JCTEA: Japan Cable Television Engineering Association
ARIB: Association of Radio Industries and Businesses

Upstream

Downstream

MIC*1

| ITU-R Committee | ITU-T Committee | Other Committees |

Standardization Body

| TTC | ARIB | JCTEA |

| TTC Standard | ARIB Standard | JCTEA Standard |

Japanese Standard (Mandatory)

Note*1: **MIC**
Ministry of **I**nternal Affairs and **C**ommunication

Certificate

JATE/TELEC

HATS

Japan Cable Laboratories

info-communications manufacturers, vendors, carriers, users

6. Role of HATS

ITU, ISO, IETF etc.

International standard

TTC: Telecommunication Technology Committee

Japanese
national standard

Manufacturer, vendor

R&D of new equipment

Confirm test guideline

Telecom. Carrier

Participate

HATS

Improve

Cooperate

Market

- plans interconnectivity test
- examines test method/procedure(test guideline)
- builds test bed & executes interconnectivity test
  on round robin basis
(Basically, participants share the detail test result,
  and share all cost per each test.)
- reviews & studies test result
(- release abstract of test result to press)

Feed
back

6. Role of HATS –Details-

- When a standardization has been recommended in ITU etc, the various systems and equipments are planned to develop by several companies. The interconnectivity test is the voluntary basis and the is following process.
  - STEP1: Identify the targets of ICT products and standards for interconnectivity test.
  - STEP2: Publish the guideline for the interconnectivity test; decide the method and procedures for the interconnectivity test.
  - STEP3: Carry out the interconnectivity test in accordance with the guideline mentioned in Step 2.
  - STEP4: Analyze the results of the interconnectivity test mentioned in Step 3, get feedback and improve the whole process of interconnectivity test (Feedback to Test Implementation Point, Rule, Standard, Etc.) .

Standards

Recommendations

HATS

Define of an interpretation of a standard or specification

STEP1
Define the target

Object apparat

Example: FAX

STEP2
Test Implementation Guide

Guide Line

STEP3
Interconnection Examination

A   B   C

IOT check

Shipment of a product

STEP4: Feedback the Test Result

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7. Variety of HATS Test

1989- ISDN Terminal Adapter/digital telephone, G4 facsimile, PBX, MHS

1990- Analog videophone

1991- Digital videophone/videoconference, LAN router

1996- Super G3 facsimile

1997- MPEG2(H.262)

1999- LAN router (ATM, IPsec), H.324 videophone, Internet facsimile

2000- H.323 videophone (over IP), Color facsimile

2001- ADSL, LAN router(IPv6 native/tunnel mode), PBX (VoIP:IP-QSIG), SIP (VoIP), Internet-FAX

2002- ADSL (CPE), LAN router (OSPF, PPoE), SIP (VoIP), H.323+, IP-PBX (VoIP:IP-QSIG+), Internet-FAX

2003- ADSL, LAN router (VRRP), sYCC color FAX, H.323, SIP PBX (IP-QSIG)

2004- LAN router (Internet VPN: IPsec-IKE), PBX-SIP , H.323, SIP

2005- PBX-SIP, IP-FAX, SIP, MPEG4

2006- PBX-SIP, IP-FAX, SIP, MPEG4, H.264

2007-2008 Expand the test function of the above-mentioned

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8. Major Activity of 2002-2009

(1) Facsimile TILC

For Digital Camera Spread Direct Data Transmission
 2002/10 Contribution from Japan (2003/7 Recommendation)
 2003/9 Color Picture Interconnection
 After 2004 Interoperability Test of Internet FAX ->Direct SMTP (T.37)

(2) PBX Telecom Server TILC

Interoperability Test using SIP (RFC3261)

(3) Inter-LAN TILC

Interoperability Test of several Internet Protocol VPN(IPsec)IPv6
PPPoE OSPF VRRP (Virtual Router Redundancy Protocol) IPsec IKE
Aggressive Mode etc
  Since the duty was finished, a liaison committee is freezing.

(4) Multimedia Comm. TILC

Expand to SIP Connection from H.323
 SIP/VoIP
 SIP/MPEG4 H.264 ➡ Shows the details after

(5) DSL TILC

Interoperability Test of ADSL ITU-T G.992.1 Annex C ITU-T G.992.2
Annex C and G.992.1 Annex I , VDSL G.993.1) on 2003
  Since the duty was finished, a liaison committee was terminated.

(6) Telephone & TA TILC

Examine the problems of VoIP communication on IP Network and NGN

Test Implementation Liaison Committees(TILCs)
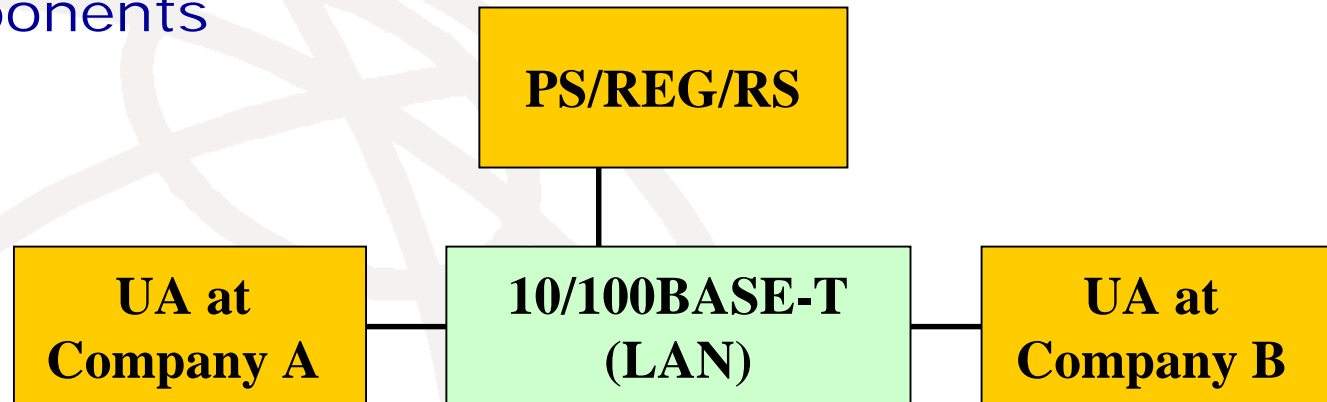
8.1 Details on Multimedia Comm. IOT

H.320 Video Conference and Videophone

ISDN:　　64kbps--1.5Mbps
1991-1994　　　　STEP1
1994-1996　　　　STEP2

Video Conference and Videophone WG

Total: 96 terminals

H.231 MCU

ISDN:　　64kbps--1.5Mbps
1994　　　　STEP1

Video Conference and Videophone WG

Total: 7 MCUs, 16terminals

H.320 Video Conference and Videophone

Open test site　1996

Video Conference and Videophone WG

MPEG2 (H.262)

ATM, Leased Line: 6.3Mbps
1997-1998　　　　STEP1

MPEG2 (H.262)　WG

Total: 16 terminals

H.324　　Video Phone　Interconnection　PSTN
H.323　　VoIP　=>Video Phone, Video Conference　　VoIP　SIP
Now　　SIP　MPEG4/ H.264 Interconnection
**　　+ HN (Home-Network), NW (Network)-Camera**

- SIP-SWG
- MPEG4-SWG
- HN-SWG
- NW-Camera SWG

8.2 VoIP IOT –General-

- **Problems for IP Telephony**

ISP-A

ISP-B

VoIP endpoint | Router
VoIP endpoint | Router

1. Inter-operability between End points

2. Inter-operability Between ISP

4. Common API

Application server

Call agent

Call agent

HATS IOT

3. Audio quality

Company user

Router
VoIP endpoint
PBX

5. Engineer Skill
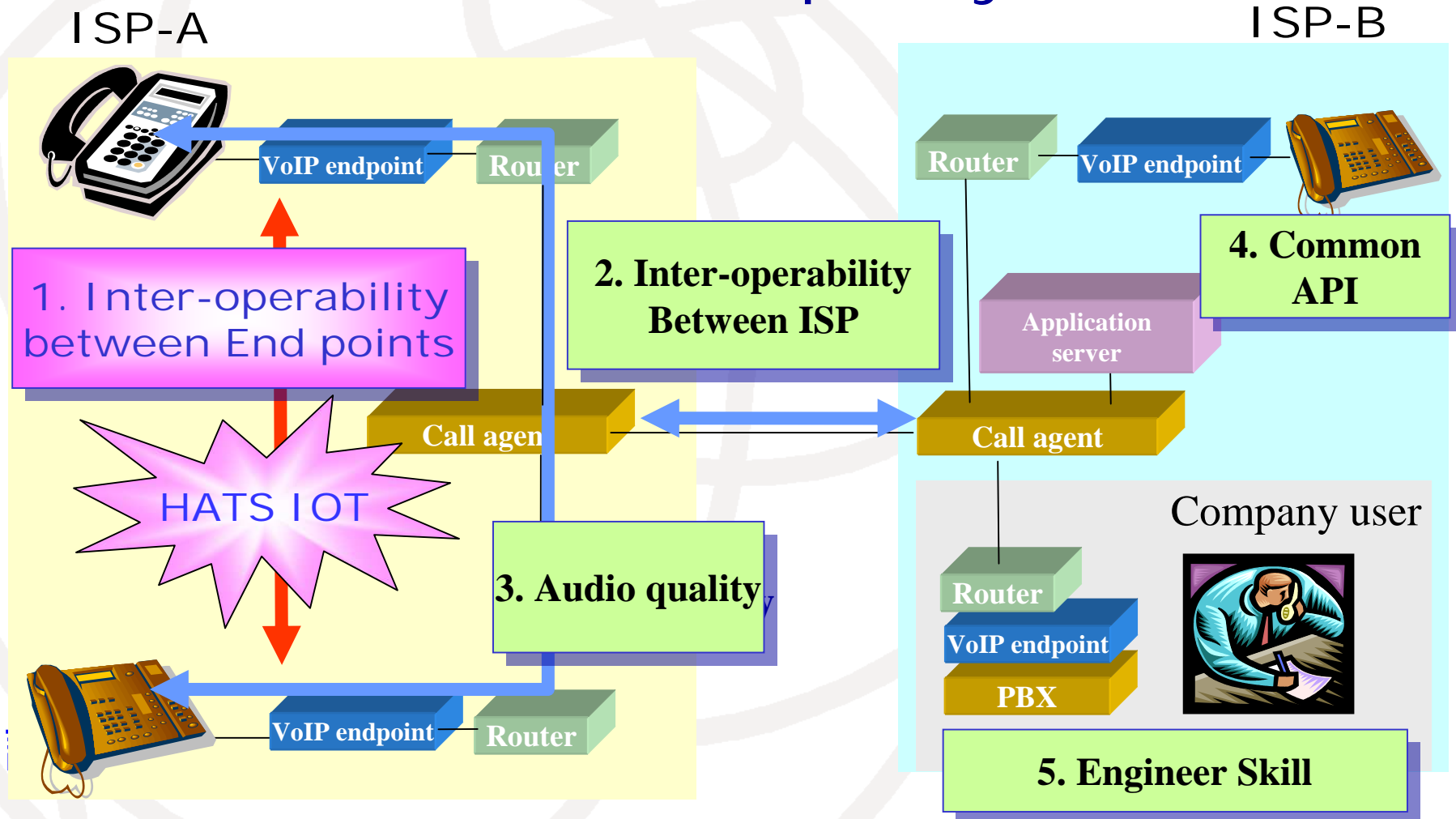
8.2 VoIP IOT –HATS IOT-

■ SIP IOT Components

PS/REG/RS

UA at Company A	10/100BASE-T (LAN)	UA at Company B

- **User Agent (UA) :**

  Includes elements such as terminals and gateways which are used to establish and terminate sessions

- **Network server :**

  Provides the following functionality:
  Proxy server (PS)—issues messages on behalf of other clients
  Registrar (REG)—accepts registration requests from the user agent
  Redirect server (RS)—changes the address when the user moves
  Location server—registers user position information (NB: beyond the scope of SIP)

Basic SIP Call Flow
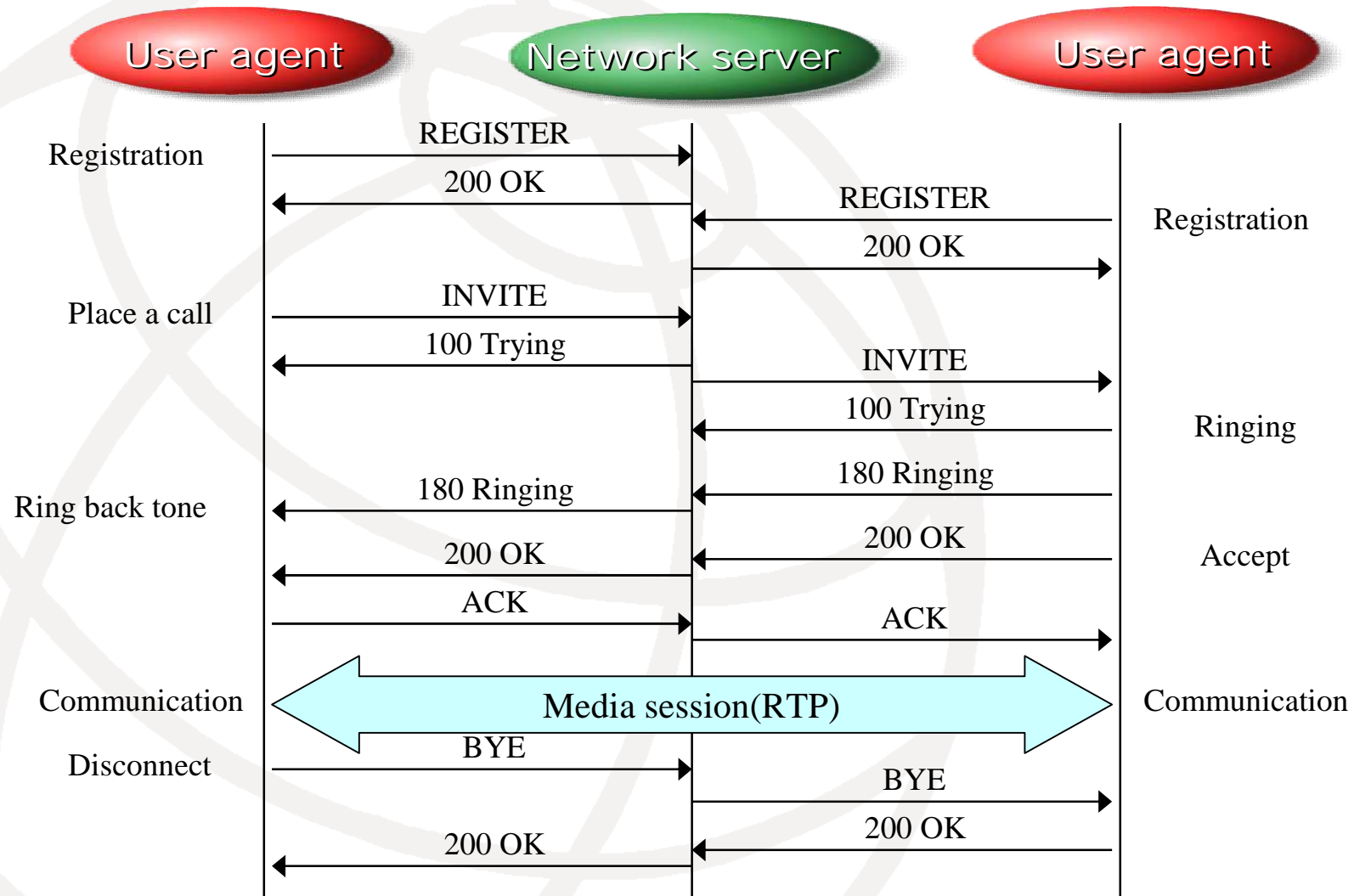
Test Procedure

- Scenario 1: UAs connected without server
- Scenario 2: UAs connected through server

■UA registered at server (Scenario 2 only)

■Transmission from UA at Company A to UA at Company B for three minutes; cut off by UA at Company A

■Transmission from UA at Company A to UA at Company B for three minutes; cut off by UA at Company B

■Transmission from UA at Company B to UA at Company A for three minutes; cut off by UA at Company B

■Transmission from UA at Company B to UA at Company A for three minutes; cut off by UA at Company A

From Guidelines for Interconnectivity Trials on Multimedia Communication Systems Using RFC3261 (SIP)—Step 1

For the details of Guide Line,
http://www.ciaj.or.jp/hats/e/activity/guideline.html

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Sample of IOT Sheets

Appendix 1 Check sheet					
		Test number/combination number	E	E1 non-P	
SIP Interconnectivity Trial—Check sheet					
Date/time					
Location					
	Company/organization:	Machine/model:	Supervisor:	]	
	Company/organization:	Machine/model:	Supervisor:		
Server C	Company/organization:	Machine/model:	Supervisor:	]	

Test items

No.	Item		Standard decision	Result (O = OK, X = NG)	Remarks (faults, problems, etc.)
1	Calling from terminal A	Audio transmission OK	Check for proper audio and video transmission in all modes. Record modes checked.		Transmission encoding mode / Reception encoding mode
2		Video transmission OK	Record highest transmission speed where capacity exchange is achieved.		Transmission encoding mode / Reception encoding mode
3		Video transmission speed	Should disconnect properly when disconnection is initiated by the remote side.	bps	
4		Other			
5		Remote disconnect	Should disconnect properly when disconnection is initiated by the local side.		
6		Local disconnect	Check for proper audio and video transmission in all modes. Record modes checked.		
7	Calling from terminal B	Audio transmission OK	Check for proper audio and video transmission in all modes. Record modes checked.		Transmission encoding mode / Reception encoding mode
8		Video transmission OK	Record highest transmission speed where capacity exchange is achieved.		Transmission encoding mode / Reception encoding mode
9		Video transmission speed	Record highest transmission speed where capacity exchange is achieved.	bps	
10		Other			
11		Remote disconnect	Should disconnect properly when disconnection is initiated by the remote side.		
12		Local disconnect	Should disconnect properly when disconnection is initiated by the local side.		

— M E M O —

Fault analysis (select one of the options below and enter in left-hand column)

1. Fault at Company A end 2. Fault at Company B end 3. Fault at both ends 4. Connection not possible due to discrepancy between specifications

Test results

	Result OK
×	Result NG (see description of problem in Remarks column)
	Not part of test item or connection not possible due to discrepancy between specifications (see

To record results from second and subsequent connection tests conducted in connection with prep time or follow up, copy this sheet using the Edit à Move or Copy Sheet function in Excel. After confirmation by both participants, the results of the interconnectivity test(s) should be forwarded to the Secretariat file server PC via an online file write procedure.

Test date/time and location
Company name, terminal, proxy information, etc.

Results for call originated at Terminal A

Results for call originated at Terminal B

Analysis of problems (if any)

Test results submitted after confirmation from both participants

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Previous SIP IOT Trials

- 1st trial: February 20 –22, 2002 and April 3, 2002
  - Trial involved 23 models from 14 manufacturers
- 2nd trial: July 23 – 25, 2002 and September 3, 2002
  - Trial involved 28 models from 19 manufacturers
- 3rd trial: July 28 – 31, 2003 and August 26, 2003
  - Trial involved 32 models from 15 manufacturers
- 4th trial: Jun 8 – 9, 2004 and July 21, 2004
  - Trial involved 22 models from 16 manufacturers
- 5th trial: July 12-13, 2005 and August 25, 2005
  - Trial involved 18 models from 12 manufacturers
- 6th trail :Jun 26-27, 2006 and September 3, 2006
  - Trial involved 19 models from 12 manufacturers
- 7th trail :July 26, 2007
  - Trial involved 10 models from 4 manufacturers
- 8th trail :July 1-2, 2008 (Basic TEST + Additional Services: Abnormal Operation, Call Transfer, instant message and presence...)

We have tested over 164 models.
From next year, overseas company also join !
 > We prepare English document for this trial.

Problems Samples on Identified During IOT

- Some connection failures are actually attributable to overly strict evaluation of the message body content (tag)

- The UA design verification via the server was not sufficient

- Some UA can only handle specific codec, and cannot accept plural description in media description header.

8.3 MPEG4 IOT

- Added H.264 spec. to the MPEG-4 guide line.
- Test Profiles

Item	MPEG-4	H.264
Session Control	SIP (RFC3261), SDP (RFC2327)	
Capability Exchange	(RFC3264)	(RFC3264,RFC3984)
Media Transfer	RTP (RFC3550, RFC3551) , RTCP (RFC3550 Option)	
	Packetization mode(RFC3016)	Packetization mode(RFC3984)
Video High Rate CIF, Low Rate QCIF	High MPEG-4 Visual SP@L3 Low MPEG-4 Visual SP@L0	High H.264 BP@L1.2 Low H.264 BP@L1
Audio	JT-G711 μ -Law	

Mandatory INVITE request items (request line, header item)

Mandatory SDP parameters (m line : media/port, a line : profile/level)

Make Offer/Answer model clear (using RFC3264 in SDP)

Testing Procedure

- **Preparation for IOT**
  - Confirm a specification of each vendor
  - Exchange a INVITE message via ftp server
- **Method of testing**
  - Round-robin Test
  - Face to Face Testing
- **Process**
  - 1) Call and Receive
  - 2) Keep 3 minutes then disconnect
  - 3) Put the result onto the test sheet
  - 4) Exchange caller and receiver, and test above 1-3

receiver

	A	B	C	D
A				
B				
C				
D				

caller

For the details of Guide Line,
http://www.ciaj.or.jp/hats/e/activity/guideline.html

Test Sheet Sample (H.264 IOT)

No	Item		Judging Standard	Result Yes / No	Remarks (problems etc...)
1	Sending side Terminal A	Confirmation of Audio communication	Confirm the communication Of audio and the video in each mode. Record the use mode.		Sending Side Encoding mode Receiving Side Encoding mode
2		Confirmation of Video communication			Sending side Encoding mode(Profile/Level) Receiving side Encoding mode(Profile/Level)
3		Transmission rate Of Video	Record the maximum transmission rate capability that was exchanged.	bps bps	Sending side Transmission Rate Receiving side Transmission Rate
4		RTP confirmation	Confirm the packetization mode of RFC3984.		When transmitted with Single NAL Unit, fill in Yes, otherwise, fill in No
			Confirm that the PPS/SPS is transmitted.		When transmitted, fill in Yes, When not transmitted, fill in No
5		Disconnection by A	Confirm that Terminal A disconnected properly when Terminal B disconnected.		
6		Disconnection by B	Confirm that Terminal B disconnected properly when Terminal A disconnected.		

The problem is filled in on Memo section or remarks to the extent possible.

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Result of MPEG-4 IOT

Held 4th IOT in June, 2008

First IOT was held in Tokyo in 2004.

By now, 20 models from 16 manufacturers participated.

Held 2nd H.264 IOT in June, 2007

First IOT was held in Tokyo in 2006

By now, 7 models from 6 manufacturers participated.
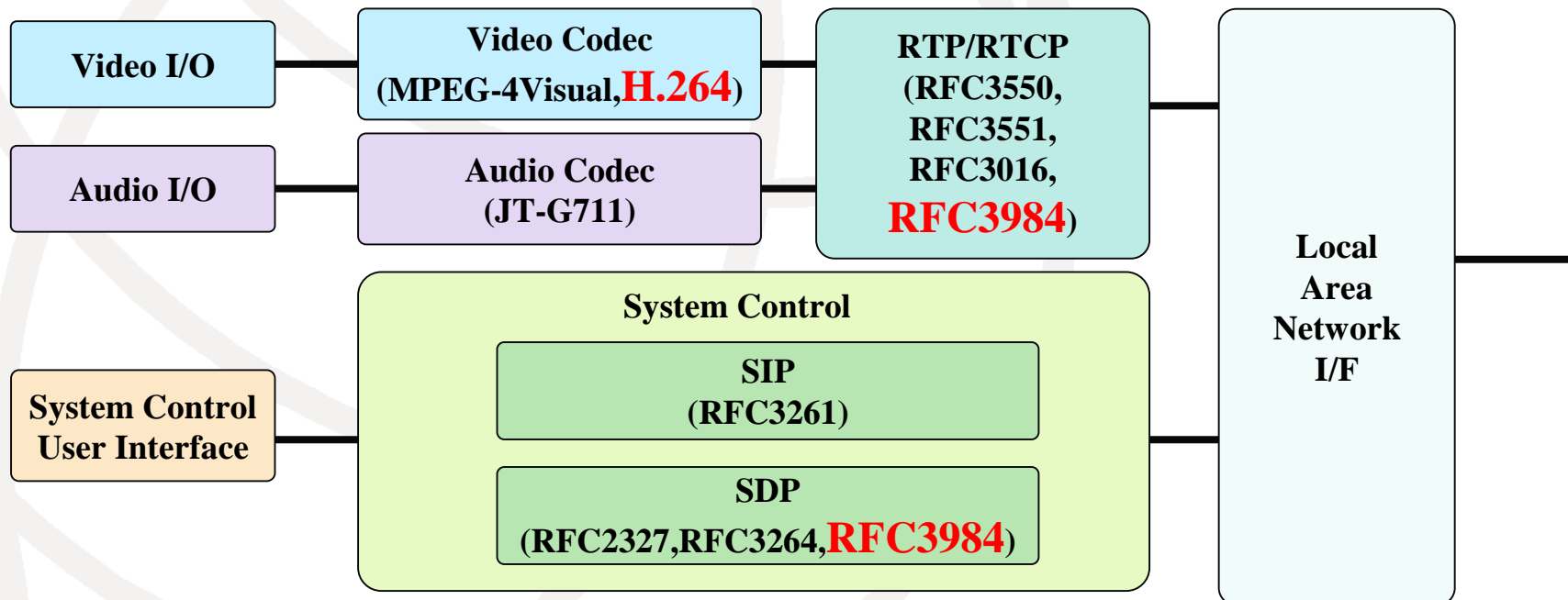
Test under a IOT guide line

MPEG-4 and H.264

9. Problems on IOT –On HATS-

- At the beginning of HATS, the interconnection tests were based on such as ISDN and ATM, so the examination tests ware based by a single recommendation.

- In current interconnection tests, network is based on IP network. So most of new ICT products consist of the combination of several standards, which includes not only ITU Recommendations but also technical standards/specifications by other standardization bodies/forums than ITU, it is required to identify what standards are included in the ICT products targeted by the test.

- Because of many recommendations, there are many profiles of the target equipments. So, we have to fix the target profiles to establish the interoperability.

- Technical specifications and User-Network Interfaces (UNIs) of actual networks (e.g. call control/management in SIP protocol) vary in countries and/or networks operators. It is not feasible to target and cover all varieties of technical specifications and UNIs of actual networks in the test.

9. Problems on IOT –Profiles-

- Two or more standards (not only ITU but various FORUM specifications are used) are required
  - For example, the example of TV Conference Terminal for multimedia services is considered.
  - By the term of H.323, Recommendation included not only the coding scheme but also communication protocol. But such as H.264, it had recommended only for the coding scheme.
  - For the development of the equipment, manufacturers have to determine the target specifications such as video profiles, voice coding scheme and the communication protocol. Following is the sample of the HATS choice.

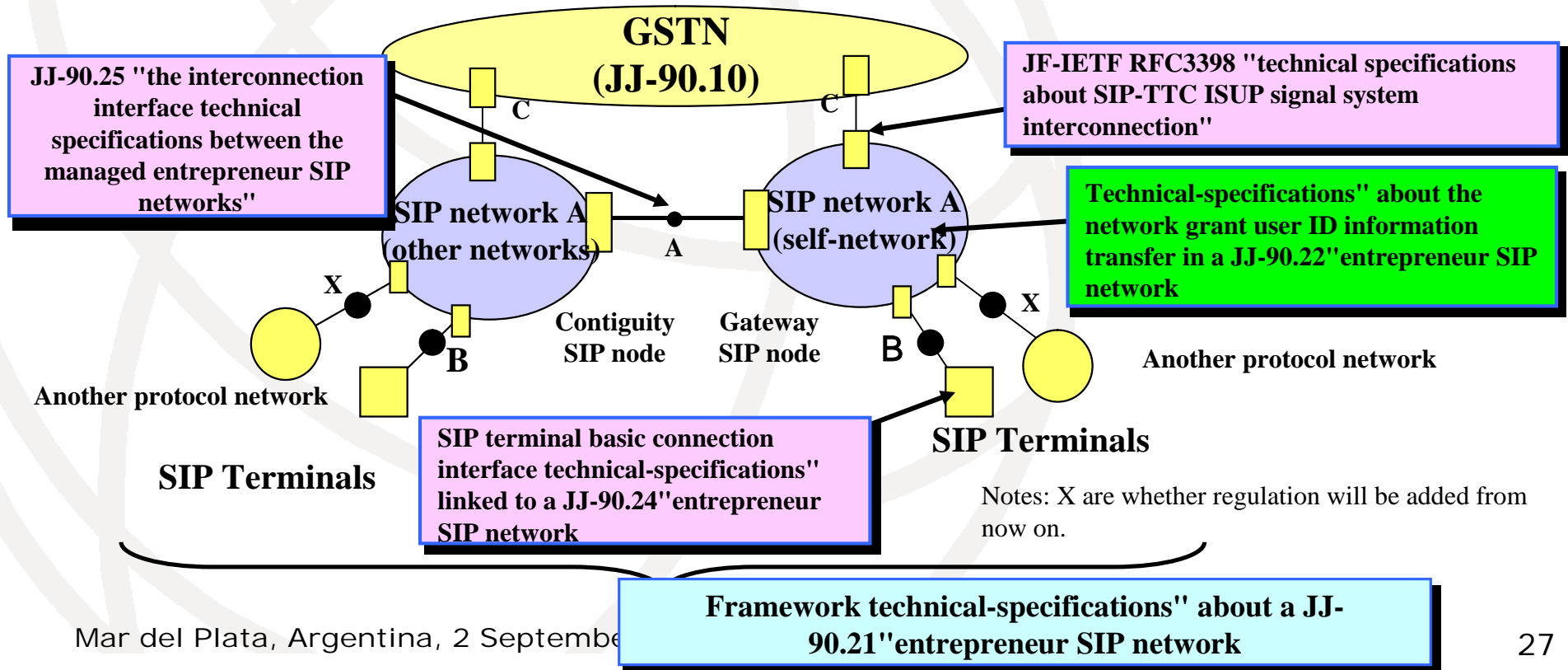|			
Video I/O	**Video Codec** (MPEG-4Visual,**H.264**)	**RTP/RTCP** (RFC3550, RFC3551, RFC3016, **RFC3984**)	**Local Area Network I/F**
Audio I/O	**Audio Codec** (JT-G711)		
System Control User Interface	**System Control** — **SIP** (RFC3261) / **SDP** (RFC2327,RFC3264,**RFC3984**)		

Testing Procedure

- Various development targets exist in a terminal specifications
  - Since MPEG4 and H.264 have various kinds of profiles, they need to determine a profile supposing the apparatus developed in fact. The following is the example.

Item	MPEG-4	H.264
Session Control	SIP (RFC3261), SDP (RFC2327)	
Capability Exchange	(RFC3264)	(RFC3264,RFC3984)
Media Transfer	RTP (RFC3550, RFC3551) , RTCP (RFC3550 Option)	
	Packetization mode(RFC3016)	Packetization mode(RFC3984)
Video High Rate CIF, Low Rate QCIF	High MPEG-4 Visual SP@L3 Low MPEG-4 Visual SP@L0	High H.264 BP@L1.2 Low H.264 BP@L1
Audio	JT-G711 μ -Law	

9. Problems on IOT –On UNIs-

- **The check of END-END interoperability is very difficult**
  - Since call control of an SIP server etc. intervenes, for example, the connectivity of UNI is required of NGN, but it is impossible in practice, and a virtual server must be placed and interconnection must be checked.
    Although interconnection nature of actual apparatus is performed through a network, since it changes with a country and carriers, the check of END-END is very difficult.

GSTN (JJ-90.10)

JF-IETF RFC3398 "technical specifications about SIP-TTC ISUP signal system interconnection"

JJ-90.25 "the interconnection interface technical specifications between the managed entrepreneur SIP networks"

C

C

SIP network A (other networks)

A

SIP network A (self-network)

Technical-specifications" about the network grant user ID information transfer in a JJ-90.22"entrepreneur SIP network

X

X

B

Contiguity SIP node

Gateway SIP node

B

Another protocol network

Another protocol network

SIP terminal basic connection interface technical-specifications" linked to a JJ-90.24"entrepreneur SIP network

SIP Terminals

SIP Terminals

Notes: X are whether regulation will be added from now on.

Framework technical-specifications" about a JJ-90.21"entrepreneur SIP network

10. Actual Results of HATS Test

ITEMS	2002	2003	2004	2005	2006	2007	2008
PBX	3	7	5	5	5	5	5
Facsimile	1	5	0	11	10	22	0
LAN	24	11	6			0	0
H.323	17	13	6			0	0
SIP	29	32	23	18	20	10	12
MPEG4			4	5	4	2	2
H.264					3	4	3
DSL	4						0
Total	78	68	44	39	42	43	22

Number of Info-communication Equipments Tested Under HATS Scheme
JFY2008, as of 2008/10)
=> 22
(TOTAL JFY1988-2008)
=>1,321

1989- ISDN Terminal Adapter/digital telephone, G4 facsimile, PBX, MHS
1990- Analog videophone
1991- Digital videophone/videoconference, LAN router
1996- Super G3 facsimile
1997- MPEG2(H.262)
1999- LAN router(ATM, IPsec), H.324 videophone, Internet facsimile
2000- H.323 videophone(over IP), Color facsimile
2001- ADSL, LAN router(IPv6 native/tunnel mode), PBX(VoIP:IP-QSIG), SIP(VoIP), Internet-FAX
2002- ADSL(CPE), LAN router(OSPF, PPoE), SIP(VoIP), H.323+, IP-PBX(VoIP:IP-QSIG+), Internet-FAX
2003- ADSL, LAN router(VRRP), sYCC colour FAX, H.323, SIP PBX(IP-QSIG)
2004- LAN router (Internet VPN: IPsec-IKE), PBX-SIP , H.323, SIP
2005- PBX-SIP, IP-FAX, SIP, MPEG4
2006- PBX-SIP, IP-FAX, SIP, MPEG4, H.264
2007-2008 Expand the test function of the above-mentioned

Number of tested equipment under HATS Scheme
Bar graph   Left   Cumulative Total
Line graph   Right   By Year

Cumulative Total values: 220, 310, 380, 430, 450, 540, 616, 686, 726, 774, 831, 985, 1,063, 1,131, 1,175, 1,214, 1,256, 1,299, 1,321

Fiscal Year: '90 '91 '92 '93 '94 '95 '96 '97 '98 '99 '00 '01 '02 '03 '04 '05 '06 '07 '08
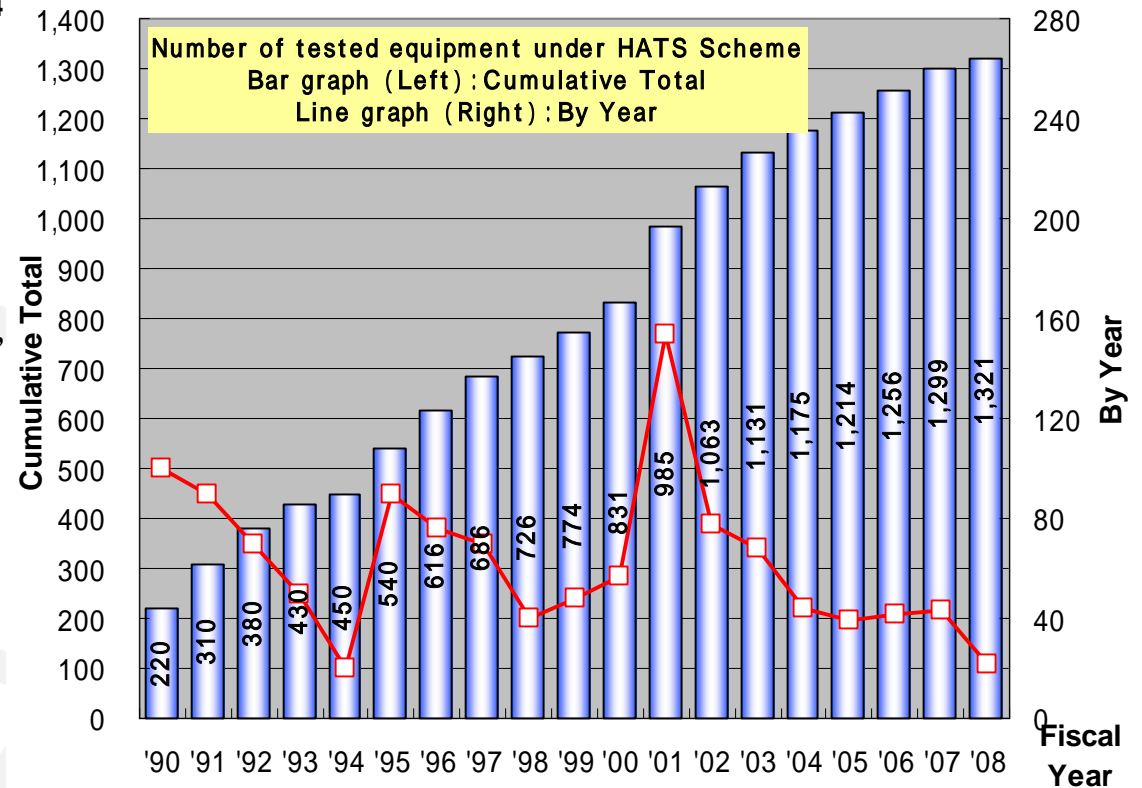
11. Future Activity on HATS - 1

Although HATS has performed the interconnection examination of apparatus based on the existing advice as mentioned above, only by apparatus, we will spread ranges, not only services but also network. For the future, Business solution of NGN or 0AB-J will consider and the problem in a relevant market should be prevented at the same time reservation of the interconnection nature of service etc.

<An example>
As the latest examination, there will the problem of a telephone etc. on ALL-IP network as following items.
   1) Quality and a function
   2) Safety and reliability
   3) Interconnection and network operation
   4) In addition to this (wireless, number portability, etc.)

  Our output
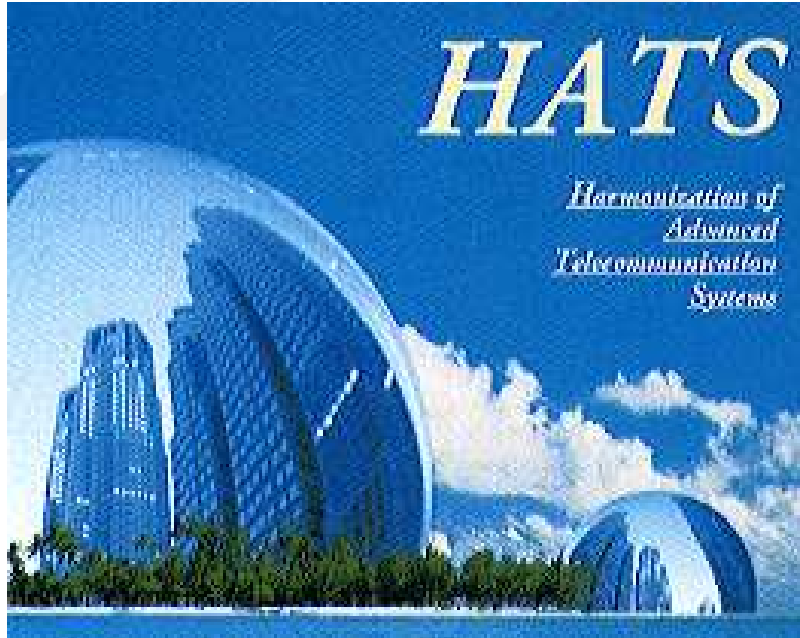We will propose an industry standard, required industry regulation, etc. relevant to the above.
   ➢ "Secured of facsimile communication in IP phone of 0AB-J" => guideline creation
      VoIP-TA /at the time of accommodating a facsimile terminal in IP-PBX via VoIP-TA Facsimile terminal guideline
         http://www.ciaj.or.jp/content/info/kikaku/CES-Q006-1.pdf
   ➢ 0AB-J IP phone terminal safety and reliability functional guideline
      http://www.ciaj.or.jp/content/info/kikaku/CES-I001-1.pdf

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Problems on IOT –Discussions-

- **Definition: What is IOT?**
  - IOT or CT (Conformance Test)?
  - IOT The examination of the interconnection of target apparatus
  - CT Certificate (for example, qualifying activity, a carrier, etc.) and standard compliance (for example, 3G-WiFi, etc.) by an organization
- **Required Documents?**
  - The document for deciding the candidate for an examination
  - Physical Architecture of testing
  - Implementation Agreement
  - Test Profile
  - Test Scenario Test Specification
  - Output of Test Recognition or Certificate?
- **Details?**
  - What is the Profiles?
  - Why the Test Scenario and Test Specification is required?

Background

- After graduating from Hiroshima University in Japan, Join to OKI

- Technical Experiment
  - Development of CATV Equipment
  - Development of TV Broadcasting Equipment
  - Development of Video CODEC and Teleconference Systems
  - Development of MODEM Systems
  - Development of Access Network Equipment
  - Development of Ad-hoc Network Systems

- Business Management
  - Video Communication
  - Access Network Systems
  - Home Network Systems

- Committee activity
  - Chair of HATS Steering Committee
  - Sub-Leader of Home Network (HN) Committee of TTC and HN Committee of NGN Forum in Japan