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Internet Policy Direction in the 21st Century

- Interim Report of the Telecommunications Council -

On March 28, 2001, MPHPT inquired of the Telecommunications Council (Chair: Mr. Yoshihisa Akiyama, Chairman, Kansai Electric Power Co., Inc.) on "Internet Policy Direction in the 21st Century." The council established two committees, the "Committee of Advanced Utilization of Internet" (Chair: Prof. Jun Murai, Keio University) and the "Key Infrastructure for the Internet" Committee (Chair: Prof. Nagaaki Ohyama, Tokyo Institute of Technology), under the Sectional Meeting of Info-communications Policy to deliberate the inquiry. The council compiled findings of the two committees as an interim report and on July 19, 2001, submitted the interim report to the Minister of Public Management, Home Affairs, Posts and Telecommunications.

[Outline of the interim report]

1. "Committee of Advanced Utilization of Internet"

This committee carried out studies from a viewpoint to identify issues for distributing multifaceted and advanced services and content over the Internet, which becomes faster and more inexpensive at an astonishing pace, and measures for realization thereof. Proposals made by the committee are as follows:

1) Applications to be expected

With regards IPv6 and mobile Internet, through assignment of IP addresses to equipment other than PCs, the report specifies what kind of applications will be available. As for "convergence," in addition to convergence applications at the well-known "terminal" level, it also refers to "storage" and "reuse," which are advantages of digital content.

2) Issues

Along with ongoing technological innovations, such as introduction of IPv6, digitalization of communications and broadcasting, etc., the following issues are arising:

- i) With IPv6, anyone will, at anytime, be able to technologically obtain digital information stored in all equipment connected to the Internet. Accordingly, it becomes increasingly necessary to establish a system that ensures consumer privacy and security.
- ii) Digital content is easily and "ille-

gally" copied without deterioration of quality. Accordingly, it becomes increasingly necessary to establish a system that ensures content creators to collect remuneration or benefits.

3) Measures to be implemented

- i) In order to accelerate and promote establishment of systems listed in 1) above, technologies in three fields, i.e., "IPv6," "security" and "copyright protection," shall be put into practical use and verification experiments for realization thereof. In parallel, regarding rules governing those technologies, there should be a broad consensus among users as well as content, equipment and solution providers.
- ii) For contributing to the global development of the Internet, efforts to promote widespread use of practical technologies and formulated rules on a global scale are of importance. To this end, the government shall comprehensively support private sector organizations, etc. who invest human and financial resources into those efforts.

2. "Key Infrastructure for the Internet" Committee

This committee, taking a drastic increase in communications traffic from now on into consideration, carried out studies from a viewpoint to identify i) basic structures of networks supporting

the Internet and ii) basic legal frameworks such as domain name systems, among others. Proposals made by the committee are as follows:

1) Internet infrastructures

For realizing broadband connectivity capable of coping with a drastic increase in communications traffic, entire infrastructures supporting the Internet are to

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be studied.

i) Decentralization of core functions of the Internet, such as IXs (Internet eXchanges) and data centers

IXs are concentrated in Tokyo. Taking into consideration crisis control and realization of a nationally balanced high-speed Internet access environment, decentralization of IXs is needed. For the time being, the government shall launch verification experiments of regional IX construction until the private sector initiates projects thereof.

ii) Costs for backbone circuits

Cost reductions of Internet backbone circuits are of importance for Internet service providers (ISPs). Charges for leased circuits shall be lowered further. Besides, regulatory frameworks for facilitating efficient use of dark fibers, etc. shall be established.

iii) Facilitation of interconnection among ISPs

Based on prerequisites that voluntary conclusions made by ISPs shall be respected, discussions shall be deepened on measures for facilitating interconnection among ISPs.

iv) Contribution to advancement of in-

ternational networks supporting the Internet

Verification experiments shall be carried out in order to i) change the current status that almost all Internet access traffic flows by routing the U.S. and ii) construct an international Internet hub in Japan.

v) Gathering of total Internet traffic data

Attempts for gathering the total Internet traffic data are not initiated. Thus, from now on, measures for gathering the total Internet traffic data shall be examined in a collaborative way among industry, academia and the government.

2) Preparation of legal frameworks such as DNS

Preparation of legal frameworks for domain name system (DNS) in a transitional period is examined. The topics examined include expansion of the number of registered domain names, the introduction of seven new domains and Japanese language domain names.

i) Improvement in technical and systematic reliability concerning use of domain names

Technologically, the key system

(DNS) for communications linking domain names and IP addresses shall positively cope with security technology and IPv6.

Legally, in order to cope with domain name disputes, ex post facto measures for preventing disputes and post facto measures for resolving disputes shall be promoted (e.g., proposal to the Internet Corporation for Assigned Names and Numbers (ICANN), etc.)

ii) Preparation of an environment for use of Japanese language over the Internet

Preparation of an environment for promoting use of Japanese language over the Internet is of importance, such measures as introduction of Japanese language domain names, establishment of entities for the domain names and supports thereof.

iii) Contribution to Internet governance

There is a need to contribute, with collaboration among industry, academia and the government, to Internet governance through preparation of an environment in which aggressive participation into ICANN, the Internet Engineering Task Force (IETF), etc. is made possible.

Second Report on “Interconnection Rules in the IT Age”

-- Review of the “Basic Rules for Interconnection” Based on Supplementary Provisions Article 15 of the Law to Amend the Telecommunications Business Law --

On July 19, 2001, MPHPT received the second report from the Telecommunications Council (Chair: Mr. Yoshihisa AKIYAMA, Chairman, Kansai Electric Power Co., Inc.) in response to an inquiry on the “Review of the Basic Rules for Interconnection Based on Supplementary Provisions Article 15 of the Law to Amend the Telecommunications

Business Law (Law No. 97 of 1997).”

The second report is compiled in response to the inquiry of October 11, 2000 of the Telecommunications Council.

MPHPT will take necessary measures, including amendments to relevant laws and regulations, paying due consideration to the second report.

succeeding to deliberations in January 2001 from the former Telecommunications Council, has compiled the second report on further measures for reviewing the interconnection frameworks, centering on issues left as those for future discussions in the first report.

Chapter I Development of interconnection system

1. Creation of interconnection system (1985)
2. Measures for ensuring fair and effective competitive conditions (1990-1996)
3. Making Basic Rules for Interconnection (1998-2000)
4. Prior revision of Basic Rules for Interconnection (2000-2001)
5. Progress of competition and current issues

Second Report on “Interconnection Rules in the IT Age” -- Based on Supplementary Provisions Article 15 of the Law to Amend the Telecommunications Business Law --

Outline

[Second report]

Preface

On October 11, 2000, MPT (currently MPHPT) inquired of the Telecommunications Council on the review of the Basic Rules for Interconnection in accordance with Article 15 of the Supple-

mentary Provisions of the Law to Amend the Telecommunications Business Law (Law No. 97 of 1997).

On this subject, the Telecommunications Council compiled the first report on December 21, 2000, entitled “Review of the Basic Rules for Interconnection.” The Telecommunications Council, by

Chapter II Current interconnection system

1. Ensuring interconnection
2. Designated telecommunications facilities
3. Interconnection charge
4. Technical conditions
5. Network function plan
6. Division of network elements and functions (unbundling)
7. Facilities installation in buildings, conduits, tunnels, utility poles, etc.
8. Dialing parity
9. Number portability
10. Measures concerning number information

Chapter III Introduction of new interconnection charges

Section 1 Setting forth regional interconnection charges concerning fiber-optic facilities

- 1) Setting different interconnection charges by carriers

The purpose of the NTT reorganization is that NTT East and NTT West develop its business operations in accordance with its business conditions as carriers. In consideration of the purpose, NTT East and NTT West should set forth different interconnection charges after FY2001, when the special cost sharing system expires.

- 2) Setting forth regional interconnection charges concerning fiber-optic facilities

Regarding the setting of regional interconnection charges concerning fiber-optic facilities within business areas of NTT East and West, the Council considers that thus far the environment is still immature for it, and that it is appropriate to continue the current system setting uniform interconnection charges within business areas:

- i) The current system for interconnection has just been commenced (December 2000) as a temporary one;
- ii) NTT East and NTT West, having last year demanded that regionally different charges be set forth, now insist that region-wise charges are a future issue;
- iii) It is appropriate to watch the implementation status of wholesale telecommunications services and the progress thereof, which are planned to be introduced henceforth; and,
- iv) It is necessary to study the effects on the regional difference in telephone user charges.

Section 2 Introduction of flat-rate interconnection charges

- 1) Significance of setting flat-rate interconnection charges and its problems

Flat-rate interconnection charges are effective in the smooth setting of flat-rate user charges for access to the Internet, and these charges must be realized.

The method to set forth flat-rate interconnection charges for carriers by deducting from flat-rate user charges at a proper ratio (carrier's rate) and thereby realizing flat-rate interconnection charges is considered appropriate because it does not impose a burden on switching systems nor require complicated segment cost calculation. (See Fig. 1.)

1.) If the flat-rate charges are realized by discounted charges for carriers (carrier's rate system),

- i) demands for Internet access at flat-rate charges including telephone PSTN are met;
- ii) by applying interconnection charges covering properly the cost rage for carriers to ISPs, fair competition requirements are ensured for ISPs, thereby promoting access to the Internet; and,
- iii) ISPs' investment will be independent from conditions set by NTT East and NTT West, such as flat-rate only at night.

- 2) Expected effects

By realizing flat-rate interconnection charges, diffusion of flat-rate charge for accessing the Internet, which can be used without caring about communications charges is billed by communications time, is expected.

Section 3 Introduction of discount carriers' rate to PSTN

- 1) Scope of services covered by discount carriers' rate

Even in trends toward IP networks, the current PSTN and ISDN systems will continue to remain important for the time being as access networks, such as DSL services or dial-up access networks to the Internet using

subscriber local loops, in addition to the conventional use of voice service. Accordingly, the introduction of discount carriers' rate tariffs is significant for promoting use of the Internet.

It is adequate that the discount carriers' rate tariffs shall be introduced basically into all public network services because there is no special reason for distinguish one service from another among telephony, ISDN, data transmission, etc.

In cases where total introduction of the tariffs into all services is difficult at an early stage, taking into account the importance of Internet use in the IT society, tariffs concerning flat-rate access to the Internet and ISPs shall be introduced with priority.

- 2) Anticipated effects

Through the realization of discount carriers' rate tariffs on public networks based on the above-mentioned measures, it is anticipated that ISPs will be able to provide Internet access services with lower rates than before.

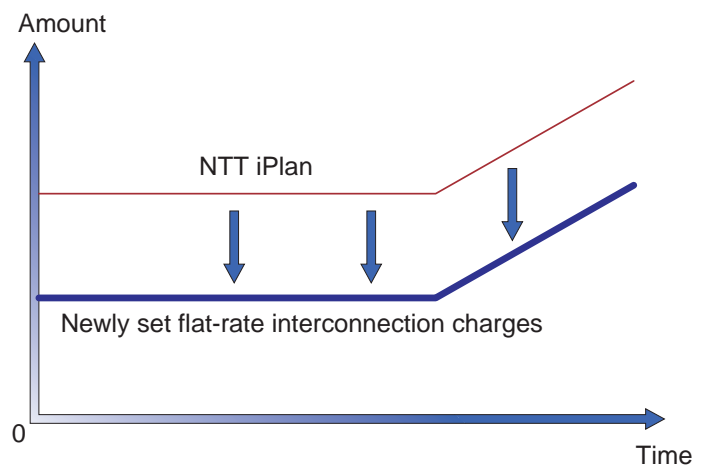
Chapter IV Improvement of network function plan system

- 1) Maintenance of principles of network function plan system

The network function plan system describing information on addition and change of network functions was established based upon the recognition that if networks are constructed ignoring other carriers' opinions or neglecting necessity of interconnection, smooth interconnection will be hindered.

This system still maintains important significance. It is necessary to maintain the principles stipulating the 200-day prior notification of network function plans before changing current networks and the publication thereof within 30

Fig.1. Newly set flat-rate interconnection charges



days counting from the day of the prior notification.

On the other hand, in consideration of early provision of new services, in order to simplify the operation of the system within the extent so as to prevent deterioration of the significance of this system, it is thought appropriate to take measures for i) reviewing applicable scope of the plan and ii) shortening the period for the publication in cases where specific requirements are met.

2) Applicable scope of the network function plan

As for routers, DSLAMs (G992.2 Annex compliance) and splitters, it is appropriate that the network function plan shall not apply to such equipment thought to be developed faster and frequently added/changed in terms of network functions; in addition, almost all such equipment is developed in its nature for interconnection, thus causing no problem in provision of network functions to date.

3) Time period to make the network function plan public

As for the time period to make the network function plan public, by setting a specific time period (for example, 30 days) to accept opinions from other carriers, etc. after the network function plan was appeared in the official gazette “Kampo,” in cases where there are no requests for explanation nor opinions from other carriers, or after necessary measures are implemented toward requests and opinions from other carriers, there are no additional requests nor opinions from other carriers, it is appropriate to introduce procedures so as to shorten the time period in making the

network function plan public to said specific time period in order to accept opinions from other carriers, etc.

However, to do so, there is a need i) to have the parties concerned become well informed about the content of the publicized network function plan and ii) to improve the manner of publication thereof.

As regards i), it is thought appropriate for applicants who submitted the 200-day prior notification of network function plan to add new items in helping to understand network functions such as “anticipated applicable fields and use.”

As for ii), further improvements are preferable, for example, after the plan has appeared in the “Kampo,” an explanatory meeting being held immediately (for example, within seven days) thereafter, with the notice thereof being delivered to carriers concerned before the day of the explanatory meeting at latest. (See Fig. 2.)

4) Anticipated effects

Through revisions of the network function plan above-mentioned, provision of new services suitable for the IT

society will be promoted at an early stage.

Chapter V Further unbundling of functions

1) Further unbundling of functions of transmission facilities

Regarding subdivision of classification dividing transmission facilities further, toward facilitation of high-speed Internet access service provision, rule-making shall be processed by paying necessary consideration to forecast actual demands for high-speed Internet access service. Accordingly, immediate tasks are to subdivide i) remote terminals (RTs) and poles in subloop distribution (between feeder points and end-user customer premises) and ii) other optional outside plant. (See Fig. 3.)

i) Subdivision in subloop distribution

As for subdivision in subloop distribution (between feeder points and end-user customer premises), in cases where fiber-optic cables are laid between feeder points and central offices, opinions are filed for requesting said subdivision so that DSL service can be realized through installation of DSL access

Fig. 2. Time schedule for the network function plan and procedural flow (example)

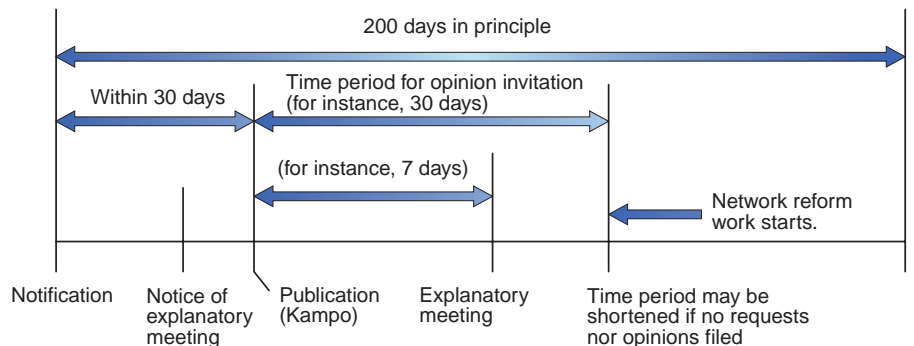
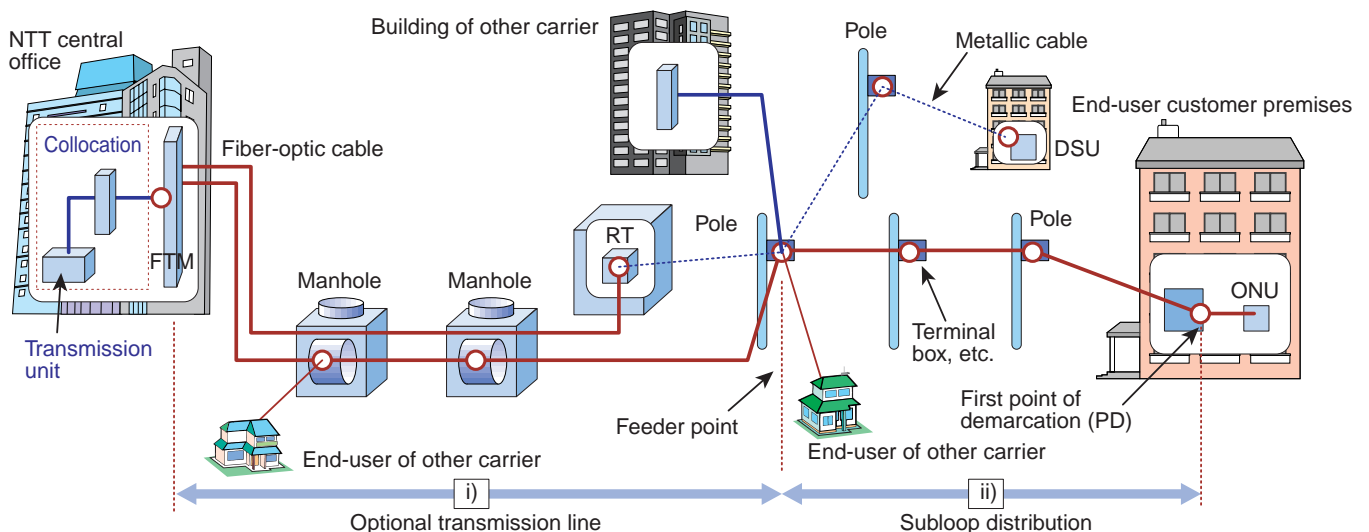


Fig. 3. Further unbundling of functions of transmission facilities



multiplexers (DSLAMs) at facilities installing RTs.

Regarding these requests, there have been the rules governing collocation in buildings stipulating the following procedures:

- Procedures and forms for application,
- Standard period for response to application,
- In case of rejection, response shall expressly state justifiable cause such as lack of space, etc. and
- In case of rejection with a reason for lack of space, designated carriers shall have requesting carriers investigate the fact.

Thus, by applying the rules to facilities installing RTs, said subdivision (unbundling) shall be implemented so that the problems can be solved in principle.

In conjunction with that, the real situation of facilities installing RTs (location and vacancy information), including whether collocation in facilities installing RTs is feasible or not and how to enable collocation, is unclear. Accordingly, NTT East and NTT West are expected to investigate said facilities.

ii) Subdivision in other optional outside plant

Among optional outside plants that are required for subdivision are transmission lines across rivers, bridges or roads, etc. Usually, manholes or ducts, which are places for collocation, are very narrow in general, and feasibility of ensuring space for collocation is still not clear. In addition, NTT East and NTT West raise a problem of the difficulty of demarcation point separating responsibilities on maintenance, etc.

It may be too early to make tariffs on the demarcation of responsibilities of collocation or maintenance of transmission lines on an optional basis. However, since there are demands for such tariffs, it is necessary to set up a forum for making the collocation tariffs. And, in cases where collocation is possible before collocation is tariffed, NTT East and NTT West are required to actively deal with collocation.

2) Subdivision of fiber-optic networks used for providing FTTH service

On fiber-optic networks used for NTT East's and NTT West's optical/IP communications network service (tentative name), demands for unbundling have become apparent. Therefore, interconnection charges of the fiber-optic net-

works should be set forth after network structures of NTT East and NTT West are fixed, and before or at the commencement of full-fledged service.

3) Expected effects

By the subdivision proceeded as the above, the expanded and high-speed DSL service is expected to be possible.

Chapter VI Sharing of interconnection-related costs

1) Criteria for "basic interconnection functions"

Access providers and NTT East and NTT West disagree on the scope of "basic interconnection functions" whose costs are shared by many parties. We think it necessary to clarify a criteria for specifying the scope, and thereby propose following standards:

- i) Interconnection functions required for many access providers based upon the assumption of a network allowing various access modes that are generally desired should be considered as the "basic interconnection functions;"
- ii) Whether a Type I telecommunications carrier installing designated telecommunications facilities currently uses for providing service or is planning to use thereof should not be regarded as the criteria for "basic interconnection functions;"
- iii) Functions for making efficient interconnection with exchange functions should, if they are shared by many access providers, be taken as the "basic interconnection function;"
- iv) The functions generally needed at provision of telecommunications service should, if they are shared by many access providers, be considered as the "basic interconnection function;" and
- v) Functions to ensure fair competitive conditions should, if they are shared by many access providers, be taken as the "basic interconnection functions."

2) Revision of calculation methods for individual interconnection charges

As regards functions for which individual calculation methods remain to be employed, the calculation methods for interconnection charges are necessarily to be reviewed focusing on the differences with the interconnection charges of the "basic interconnection functions."

Specifically, risks of such revision are

lower than those derived from charges of the "basic interconnection functions." Therefore, it is appropriate to set forth a method to calculate the expected profit ratio of net worth separately from charges for using networks.

Chapter VII Other items

- Research on the relations between interconnection charges and end user fees

On the relations between end user fees of NTT East and NTT West and interconnection charges (e.g., the desirable margin between the two), a study should be proceeded henceforth, referring to other countries' trends.

- Nondiscriminatory application of procedures, etc. concerning use of fiber-optic facilities regardless of affiliation

It is desirable that the procedures that access providers are imposed by NTT East and NTT West shall be applied to the relation between facilities sections and service sections inside NTT East and NTT West.

- Shortening development period of interconnection software

Currently, it takes 18 months for the development, but the period needs to be shortened for smooth provision of new services.

Chapter VIII Future measures and ongoing items to be deliberated

1. Measures to be taken after this proposal

Measures proposed in this report are to be proceeded as follows:

- 1) Asymmetric regulation
 - Preparation of relevant ministerial ordinances: By the end of CY2001
- 2) Introduction of new interconnection charges, etc.
 - Revision of relevant ministerial ordinances, etc.: By the end of CY2001 (Coming into force sequentially from late FY2001 to FY2002)
- 3) Improvement of the network function plan system, etc.: By the end of CY2001
- 4) Subdivision of functions
 - i) Document instruction to NTT East and NTT West: Around July 2001
 - ii) Revising relevant ministerial ordinances: By the end of CY2001
- 5) Revision of interconnection-related

- costs sharing
 - Revision of relevant ministerial ordinances: By the end of CY2001
 - 6) Shortening development period of interconnection software
 - Document instruction to NTT East and NTT West: Around July 2001
 - 7) Calculation method of costs sharing concerning power facilities
 - Document instruction to NTT East and NTT West: Around July 2001
- 2. Issues to be studied after this report**
This report identifies following issues

as those for further study. (Expected study period and its method are written in brackets.)

- 1) Study on interconnection charges
 - i) Grasping costs concerning designated telecommunications facilities by prefecture (Long-run incremental cost) (Around February 2002)
 - ii) Study on verifying relations between interconnection charges and end user fees (Study group will be held from late FY2001)
 - iii) Study on setting region-wise interconnection charges for fiber-optic

- facilities within business area (After FY2002)
- 2) Study on the network function plan
 - Verifying a new system for the network function plan (FY2002)
- 3) Study on subdivision of functions
 - Subdivision in optional outside plants (Study group will be held from late 2001)
- 4) Study on disclosing line information
 - Study on disclosure of Operations Support System (OSS) (Study group will be held from late 2001)

“Study Group on the Formation of Network Distribution Market of Digital Content” Compiles a Report

The progress of multimedia and multi-channel in digital broadcasting and the broadband Internet is bringing about increased demands for content. In order to solve the shortage of content, a network distribution market of digital content must be formed. However, thus far smooth content distribution has not been realized due to copyright (copyright and neighboring rights) holders’ fear concerning network use, lack of transaction rules governing creators’ or productions’ content management and other reasons.

Under these circumstances, the “Study Group on the Formation of Network Distribution Market of Digital Content” (Chair: Prof. Toshihiko Hayashi, Osaka School of International Public Policy, Osaka University) has been held since February 2001 for the purpose of studying legal/technological issues and practical measures for construction of a copyright management system required

upon forming a smooth content distribution market, etc. based upon the recognition of current trends and problems of content distribution. The group has compiled its findings as a report which advises the government to adopt the following practical action program:

1. Smooth management of copyrights

- 1) Verification of clearance system of copyrights

A market in which copyrights are dealt between right the holders and the users will vitalize content distribution over networks. This action program sets forth a goal of forming a suitable environment for copyright business.

- 2) Creation of transaction rules

Currently, acceptance by all copyright holders of usage conditions is necessary for the secondary use of content, which renders the content time-consuming and costly. In order to improve the conditions,

- i) transactions of copyrights of content should be grasped per transaction, and
- ii) consensus should be established among the parties involved concerning benefits and remuneration, to be calculated and divided on a pro rata basis under set rules.

2. Development and implementation of technologies for supporting broadband content distribution

A verification field shall be provided for research and development of relevant technologies supporting the distribution of broadband content.

3. Promotion of broadband content distribution in the educational field

Management of copyrights tailored to educational use shall be verified for promoting the distribution of broadband content in classrooms.

World’s Fastest Realtime VLBI Experiment Successful

Realtime VLBI Data Speed at 1 Gbps Achieved

The Communications Research Laboratory (CRL, President: Dr. Takashi IIDA), the National Astronomical Observatory of Japan (NAOJ, Director: Mr. Norio KAIFU), the Institute of Space and

Astronautical Science (ISAS, Director-General: Mr. Hiroki MATSUO) and Nippon Telegraph and Telephone Corp. (NTT, President: Mr. Junichiro MIYAZU) have successfully achieved

realtime Very Long Baseline Interferometry⁽¹⁾ (VLBI) observation experiment at the world’s fastest data rate of 1 gigabit⁽²⁾ (1,024 megabit) per second. The experiment was conducted on June 23,

2001, using the 34m radio antenna located at CRL Kashima Space Research Center and the 64m radio antenna located at ISAS Usuda Deep Space Center. Signals received at Usuda from a radio star⁽³⁾ was converted into high-speed digital signals, transmitted realtime to Kashima via ultrahigh-speed optical circuits connecting Usuda-NTT Musashino-Kashima, and cross-correlated realtime with signals received at the 34m antenna at Kashima at 1 Gbps. The realtime synthesis was achieved with the world's only high-speed processing technology developed by CRL. The success proves the effectiveness of the ultrahigh-speed networking technology enabling 1-Gbps stable data transfer developed by NTT, as well as being a research breakthrough for NAOJ and ISAS in the observation of very weak signals from radio sources in the space. The detection of very weak radio sources will accelerate the study on constructing a space-time standard infrastructure in space, now ongoing at CRL. This success will lead to the study on realtime and high time-resolution determination of the earth orientation parameters.⁽⁴⁾

[Background and identification]

CRL, collaborating with NTT Laboratories, developed the realtime VLBI system using the unique ultrahigh-speed network in order to conduct high-precision monitoring of crustal deformation in the Tokyo Metropolitan area. The system has been operational since 1997. At the same time, NAOJ and ISAS, collaborating with NTT Laboratories, have developed a system to integrate data

streams of the Usuda 64m antenna and the Nobeyama 45m antenna using the ultrahigh-speed network, and started radio source observations with the realtime VLBI.

By interconnecting the two networks, a huge synthesized virtual radio telescope⁽⁵⁾ (about 200km in diameter) using multiple large radio antennas in the Kanto-Shinetsu areas with the world's highest observation capacity can be constructed. An experiment group was thus formed by researchers of CRL, NAOJ, ISAS and NTT Laboratories. CRL identifies the experiment as the establishment of element technology necessary for the "study on constructing a space-time standard infrastructure in space" while NTT Laboratories sets the goal of the experiment as the verification of ultrahigh-speed networking technology effectiveness enabling Gbps-class stable data stream. In 1998, the group succeeded in a realtime VLBI experiment at data speed of 256 Mbps between the Usuda 64m antenna and the Kashima 34m antenna. The experiment this time was the same group's attempt at for high-speed data transmission and processing.

[Features of the experiment]

This experiment was conducted on June 23, 2001, using CRL Kashima's 34m antenna and ISAS Usuda's 64m antenna. The radio wave (8GHz band) from a quasar⁽⁶⁾ received at the Usuda antenna was converted into 1-Gbps high-speed VLBI data stream (digital signals). Then, the data stream was transmitted realtime to Kashima via 2.4-Gbps ultra-

high-speed optical network (asynchronous transfer mode⁽⁷⁾: ATM) connecting Usuda-NTT Musashino-Kashima. At Kashima, the VLBI data stream from Usuda and VLBI data obtained at Kashima through the same process as Usuda were cross-correlated, succeeding in obtaining the expected synthesized results. This proves that ultrahigh-speed networks are effective in the Gbps-class realtime VLBI observation.

The faster the data speed, the higher the sensitivity of virtual radio telescope (realized by synthesizing the signals of two or more antennas). This success enables observation with the double sensitivity of the current level, even with the same combinations of antennas. As the radio telescopes' sensitivities become higher, determination of the earth orientation parameters within a short time period becomes possible, leading to the improvement in location accuracy of space vehicles. In addition, a huge contribution is made to the development of radio astronomy by enabling observations of very weak radio sources (e.g., radio waves from corona of a fixed star, which is very weak and cannot yet be observed).

[Further development]

The team will conduct long-term experiments for evaluating stability of Gbps-class VLBI data realtime cross-correlation synthesis as well as actual earth orientation parameters determination observations for evaluating its accuracy. Furthermore, in order to observe weaker radio sources, development will be carried out on a 2-Gbps realtime VLBI observation system, distributed signal processing and addition of other antennas.

