

# JGN2 Utilization Guidance

(4th Edition)



September, 2007

National Institute of Information and  
Communications Technology  
(NICT)

If you have any inquiries regarding this utilization guidance or you want to apply for the JGN II network, please contact the following JGN II Center.

JGN II Center

National Institute of Information and Communications Technology

4-2-1, Nukui-Kitamachi, Koganei,

Tokyo 184-8795, Japan

TEL : +81-42-327-6024

E-Mail : [jgn2center@jgn2.jp](mailto:jgn2center@jgn2.jp)

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## Preface

An open testbed network for research and development allows you to perform pioneering works for research and development of various technologies. As a result, you can implement an IT society 5 or 10 years in advance, giving society and people an early glimpse of IT society. In addition, the feedback from society and people on your research and development can accelerate the progress of your research and development, leading to an early application of the results in society, which will significantly contribute to the early realization of an IT society. The testbed network is clearly an important part of the IT strategy in Japan as it is clear from “e-Japan IT strategy II (developed by the IT strategy headquarters in July 2004),” which states the importance of enhancing the testbed network for research and development.

The Telecommunications Advancement Organization of Japan (TAO) established the Japan Gigabit Network (JGN), a network for researching and developing advanced technologies, including super-high-speed networks and advanced application technologies, in order to implement a next generation super-high-speed network in the 21st century. The JGN was in service for five years from 1999 to 2003, and left significant results in the promotion of broadband utilization, the promotion of IPv6 shifted from IPv4 in the Internet, the regional activation and the cultivation of human resources.

Under this background, the National Institute of Information and Communications Technology (“NICT”), an incorporated administrative agency, has been managing a new R&D testbed network “JGN2” since 2004 as the successor of JGN. The JGN2 is a nationwide network and has access points in all the prefectures (47 in total). Besides, the Japan-U.S.A. circuit and the Japan-Asia circuits (Thailand and Singapore) have been operated since August, 2004 and November, 2005 respectively as the JGN2 network. As well as the JGN, the JGN2 network is not only to provide a means to implement high-speed communication but also to become a global core for technical research and development of advanced networks towards the next-generation. The JGN2 network which aims to further develop the JGN, will play an important role on social field experiments and international collaboration. Though the JGN2 network is mainly operated by researchers in the fields of networks and advanced applications, participation of ordinary people is taking place as well as collaboration and connection with overseas organizations. In anticipation of the network technology of the future, the JGN2 network aims to promote that the ubiquitous society will be realized.

With this goal in mind, the JGN2 network which is opened for everyone like the JGN will promote the establishment of a research system for utilizing advanced networks through cooperation among the industry, the academia, the government and regional organizations to be both domestic and overseas, as well as it will improve networks as a social infrastructure. This guidance explains procedures for the JGN2 network utilization.

## Chapter 1: Basic Operating Policy

Based on JGN2 Utilization Regulations, the basic operating policy is as follows:

### (1) Users

In principle, anyone can utilize the JGN2 network for research and development. However, the user must be the person who is specified in a joint research contract with the National Institute of Information and Communications Technology (hereinafter referred to as NICT) or the person who is appointed by NICT for the research and development performed by NICT itself.

### (2) Utilization Method

The JGN2 network can be utilized not only through connection to a JGN2 Access Point (hereinafter referred to as AP) established by NICT but also through connection to JGN2 Partnership Access Point (hereinafter referred to as PAP [\*1]) and should be utilized by the user who is specified in the Item (1) above. As for each AP or PAP, please refer to Appendix-4. The JGN2 network can only be utilized to the extent specified by the joint research contract.

#### \*1: PAP (Partnership Access Point)

PAP means some organizations not only connecting with JGN2 network but also providing in collaboration with NICT certain environment respectively to connect the other organizations with the JGN2 network as JGN2 users.

PAP can be connected with the JGN2 network as well as the existing AP, but as the operation policy of respective PAPs is to be established independently, their respective services and utilization procedures are different from each other among them as for the following items.

For further information, please refer to Appendix-9.

### (3) Costs

The JGN2 network can be utilized free of charge. However, the user's equipment must be connected to the equipment at AP or PAP. The cost of a line required for the connection (hereinafter referred to as the "access line") must be borne by the user.

## Chapter 2: Available Services

JGN2 provides not only Ethernet Connection Service (L2 Service) and IP Connection Service (L3 Service) that are available at all the access points but also OXC (Optical Cross Connect) Service, 10Gbps Connection Service and Optical Testbed Service which are available between specific access points [\*2].

The user can be connected to the JGN2 network physically through the line to a JGN2 access point, which is prepared by the user as an access line. Besides, a regional data highway provided by a municipality may be used as an access line.

Though 10/100/1000BASE-TX ports are provided at all the access points, the maximum transmission capacity available is specified for each access point as shown in Appendix-4. In addition, the JGN2 network does not guarantee the band, or the expected line speed may depend on the line configuration and the utilization status.

There may be cases where the JGN2 network collects communication data for research activities. In addition, there may be cases where the JGN2 network operation is suspended because of the influence of experimental traffic. In these cases, NICT will notify users of that effect via the NICT homepage, except for cases of emergency.

The configuration of the communication line is shown in Appendix-5 as “Outline of JGN2 Network”, while the interface conditions are shown in Appendix-6 as “Main Specifications of JGN2 Connecting Equipment” [\*2].

\*2: Available Services, etc. to Be Provided through PAP

In case of connecting with PAP, usable services, maximum transmitting capacity and interface conditions are different from each other among PAPs.

For further information, please refer to Appendix-9 or ask respective PAPs.

The services available in the JGN2 network are explained in the following.

### 2.1 Services Available in All the Access Points

In the JGN2 network, connection ports for 10/100/1000BASE-TX (RJ45) are provided at all the access points. In addition, an optical connection such as 1000BASE-SX/LX is also available though there are limits to the number of ports. In case the optical connection is utilized, it is required for users to contact the JGN2 contact point for each experiment.

### (1) Ethernet Connection Service (L2 Service)

#### a. Point to Point Connection Service

This service provides L2 point to point connection based on a VLAN.

#### b. Multi-points Connection Service

This service provides L2 multiple point connection based on the same VLAN.

If multiple paths are needed for the same access point in these services, VLAN-ID can be given for each path to use the same port.

(The VLAN-ID will be designated by NICT.)

### (2) IP Connection Service (L3 Service)

This service provides connections for JGN2 users with each other, or with other research networks and other users, at the IP level as a service with an IPv6/IPv4 dual stack. The information on available interconnected research networks will be released on the homepage as some new information is obtained. An IPv6 address can be assigned from this network, and an application can be submitted for the address to NICT as required. In this service, some networks cannot be utilized for communication and in addition, transit is not provided.

## 2.2 Services Available in Specific Access Points

For utilizing the following services, NICT can accept consultation on each experiment. As for the serviceable access points, see Appendix-4.

### (1) OXC (Optical Cross Connect) Connection Service

This service provides connections for places where the OXC system is installed at the optical wavelength level. 1Gbps and 10Gbps will be used as connection interface.

### (2) 10Gbps Connection Service

This service provides connections for certain access points by a 10Gbps-Ethernet. It is also possible to connect access points which do not provide this service.

### (3) Optical Testbed Service

This service provides optical transmission with dark fiber to conduct experiments between certain access points.

### 2.3 Other Research Support

To support research utilizing the JGN2 network, NICT is planning to provide the following information on its homepage and its mailing list.

- Maintenance and trouble information
- Traffic information
- Introduction of research in progress
- Information on symposiums, events, research result presentations
- Mailing list for promoting communications among participants
- Introduction of regional activities such as regional conferences



## Chapter 3: Procedures Required for Utilization of the JGN2 Network

### 3.1 Basic Concept on Utilization

The following procedures are required for utilizing the JGN2 network.

#### (1) Joint research contract

Before utilizing the JGN2 network, the user must conclude a joint research contract with NICT. A separate joint research contract is necessary for each research organization. In addition, overseas researchers can utilize the JGN2 network by concluding MOU (Memorandum of Understanding) based on the comprehensive joint research contract (See Appendix-8).

Once a joint research contract is concluded, each research organization does not have to conclude a new joint research contract each time when a new research project is organized. Otherwise, it is also possible for each new project to enter into a research contract. (In detail, see Section 3.4 “Concluding Joint Research Contracts”.)

#### (2) Submitting required documents

It is required to submit research plans to NICT, describing the contents of the research to be performed on the JGN2 network. Research plans must be submitted for each research project when a new research project is established or each time when the research project is modified.

A joint research contract must be concluded for each research organization, and required documents must be submitted for each research project. (In detail, see Section 3.3 “Documents (Research Plans) to Be Submitted When Using the JGN2 network”.)

When the user stipulated in Article 3 of JGN2 Utilization Regulations wants to utilize the JGN2 network for a short term (in principle, about one month at the longest) due to an event and the like, it is required to submit an event utilization application to NICT (In detail, see Section 3.6 “Temporary Utilization”).

#### (3) Submitting application

TO:

JGN2 Center

National Institute of Information and Communications Technology

4-2-1, Nukui-Kitamachi, Koganei,

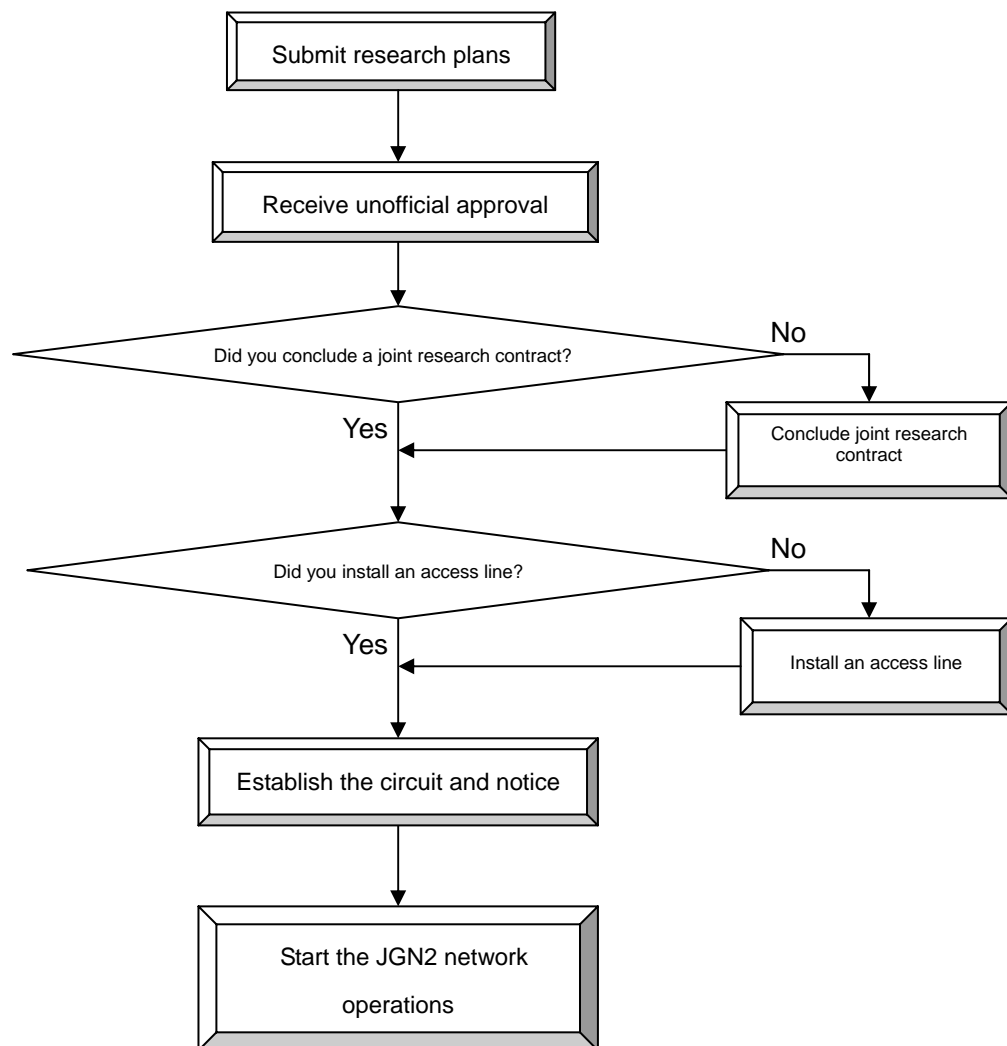
Tokyo 184-8795, Japan

TEL: 042-327-6024      FAX: 042-327-5689

E-Mail: [jgn2center@jgn2.jp](mailto:jgn2center@jgn2.jp)

### 3.2 Flowchart of Use

The basic procedures required to utilize the JGN2 network are shown below.



At first, it is required to submit research plans for the research to be implemented on the JGN2 network to NICT (See Section 3.3 “Documents (Research Plans) to Be Submitted When Using the JGN2 Network” and Appendix-2).

NICT examines the contents of the research plans. If NICT deems the plan appropriate, NICT will give unofficial approval to the applicant after confirming that there is no problem in the connection to the JGN2 network.

If the research organization has not concluded a joint research contract, NICT asks the organization to conclude a joint research contract in accordance with the research plans (In detail, see Section 3.4 “Concluding Joint Research Contracts”).

If the research organization does not have an access line, the organization should begin to prepare the access

line required to connect to the access point, as well as the equipment and facilities prepared at the user side. The user should prepare them in close coordination with the person in charge of the access point [\*3]. When the date is fixed for actually connecting the equipment to the access point, it is required for the user to notify NICT of its connection date.

After being notified of the connection date, NICT establishes the JGN2 circuit concerned. NICT will notify the user of the opening date when the circuit will come into service and the necessary information for its establishment.

The user can utilize the JGN2 network after all the procedures are completed.

**\*3: Procedures for Utilizing PAP**

In case of utilizing the JGN2 network through PAP, at first, the application for utilizing the JGN2 network through PAP should be submitted to NICT. After that, NICT is to confirm if it is acceptable or non-acceptable. In the meantime, the PAP contact person may occasionally get in touch with the user.

With regard to preparation of the access line necessary for connecting with PAP and the equipment at the user, please sufficiently consult with the PAP contact person.

### 3.3 Documents (Research Plans) to Be Submitted When Using the JGN2 Network

#### (1) Submitting research plans

It is required to appoint a project leader who controls the entire research project and a chief researcher for each research organization. In principle, the project leader is responsible to compile research plans, including [Research Project Overview] and [Research Organization Information], and submit them to NICT.

Table 3-1 Work Assignment as for the Preparation of Research Plans

	Preparation	Submission
Research Project Overview	Project leader	Project leader
Research Organization Information	Chief of each research organization	Project leader

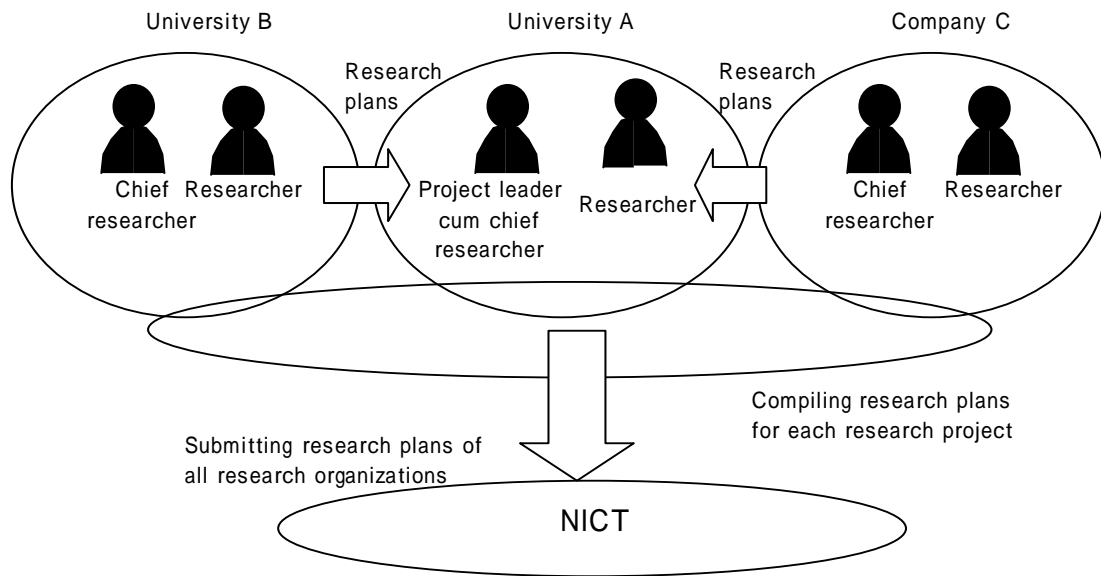


Figure 3-1 Image of Research Plan Submission

As for the research plan [Research Project Overview], the project leader should describe the entire research project information and submit it to NICT.

As for the research plan [Research Organization Information], the chief researcher in each joint research organization should describe each research organization information and submit the it to the project leader. The project leader should collect the information and submit it to NICT.

## (2) Configuration of research plans

The configuration of the research plans is summarized in Table 3-2. The details of these research plans are explained below the table. In addition, the submission of other documents may be required.

Table 3-2 Configuration of Research Plans

Name	Purpose
Research Project Overview	<p>Clarify the purpose of the research and the contents of the research.</p> <p>Clarify the network configuration of the entire research project.</p>
Research Organization Information	<p>Clarify the contents of each research organization.</p> <p>Set up and change the network and equipment in each research organization.</p> <p>Clarify the contact persons for each research organization.</p>

- Research Project Overview (Description related to the entire research project)

In the research project overview, it is required to describe the topics related to the entire research project as shown below.

1. Research Project Information (1) Research project theme (2) Project leader (3) Joint research organizations (4) Contact points for the research project (5) Research purpose (6) Contents of the research
2. Utilization Service Information (1) Topology (Network overview of the entire research project) (2) Information on connected sections (3) Schedule of the entire research project

- Research Organization Information (Information related to each research organization)

In the research organization information, it is required to describe the details of each research organization that participates in the research project as shown below. This information must be prepared for each research organization.

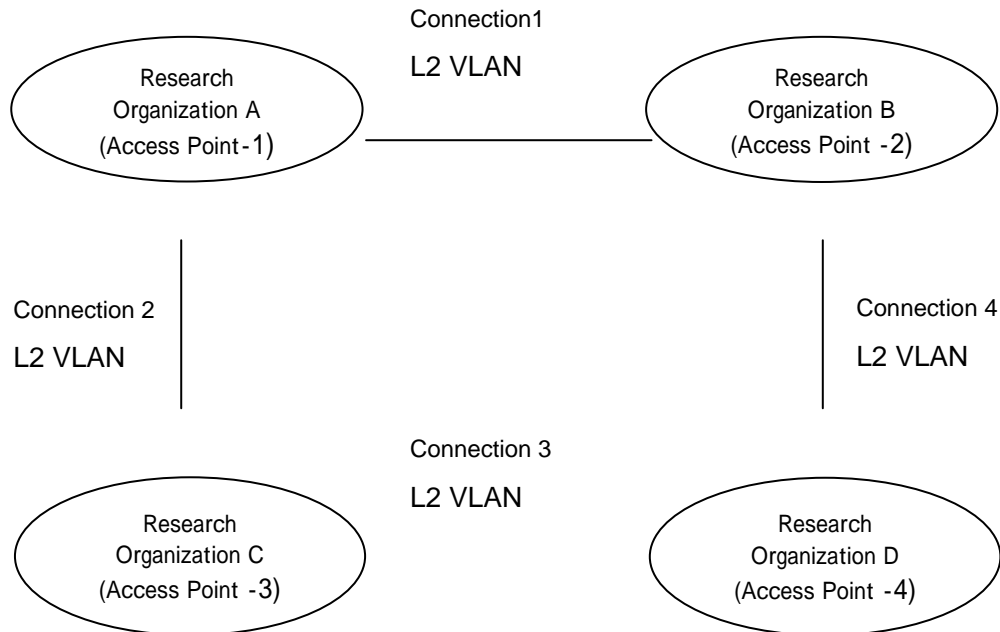
1. Researcher Information (1) Research project theme (2) Chief researcher (3) Researchers (4) Utilized Access point
2. Utilization Service Information (1) Topology (Details of network and equipment configuration in the research organization) (2) Connection information (3) Utilization schedule
3. Paperwork Procedure Information (1) Contact points for the research organization (2) Contact points of the person in charge of the contract paperwork (3) Information on the existing joint research contracts

Examples of topology diagram of the research project overview and the research organization information are shown below.

[Synopsis of Research Project]

2. Information of Service Utilization

(1) Topology (Synoptic Network of the Entire Research Project)



(It is required to write the configuration schematic diagram of the entire research project.)

(2) Detailed information on connected sections

Connection 1 (new/continue/abolish)

Date of Work (d/m/y)

	AP Name	Port Number	Physical IF	VLAN-ID	Nego	Service Type	Access Line
1A	AP-1		1000BASE-T			SA	LA
1B	AP-2		1000BASE-T			SA	LA

Connection 2 (new/continue/abolish)

Date of Work (d/m/y)

	AP Name	Port Number	Physical IF	VLAN-ID	Nego	Service type	Access line
2A	AP-1		1000BASE-T			SA	LA
2B	AP-3		1000BASE-T			SA	LA

Connection 3 (new/continue/abolish)

Date of Work (d/m/y)

	AP Name	Port Number	Physical IF	VLAN-ID	Nego	Service type	Access line
3A	AP-2		1000BASE-T			SA	LB
3B	AP-3		1000BASE-T			SA	LA

Connection 4 (new/continue/abolish)

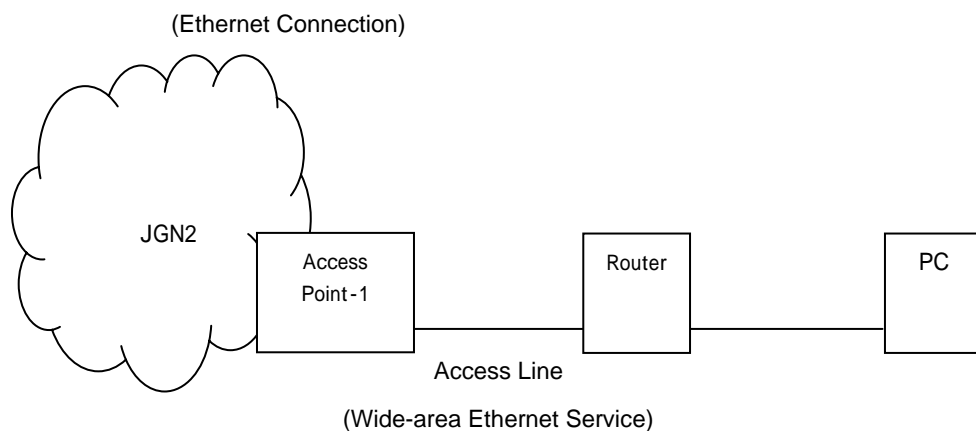
Date of Work (d/m/y)

	AP Name	Port Number	Physical IF	VLAN-ID	Nego	Service type	Access line
4A	AP-2		1000BASE-T			SA	LB
4B	AP-4		1000BASE-T			SA	LA

[Research Organization Information]

2. Information of Service Utilization

(1) Topology (Details of Network and Equipment Configuration in the Research Organization)



(It is required to write the equipment configuration diagram to each research organization from its access point connected.)

	AP Name	Port Number	Physical IF	VLAN-ID	Nego	Service Type	Access Line
1	AP-1		1000BASE-T			SA	LA

Figure 3-2 Image of Topology Diagram and an Example for Description

For the form required for applications, see “Appendix-2”. The form can also be downloaded from the following URL.

<http://www.jgn.nict.go.jp/>

### 3.4 Concluding Joint Research Contracts

To utilize the JGN2 network, a joint research contract must be concluded with NICT. The basic flow of procedures for concluding a joint research contract is shown below. (See Appendix-3 “Joint Research Contract (Example)”.)

- Submit research plans for each project.
- Conclude a joint research contract for each research organization.
- “The Research Plan [Research Organization Information] (1.Researcher Information)” should be a part of the joint research contract.
- “The Research Plan [Research Organization Information] (1. Researcher Information)” should be attached as numerously as belonging research projects to the joint research contract of each research organization.

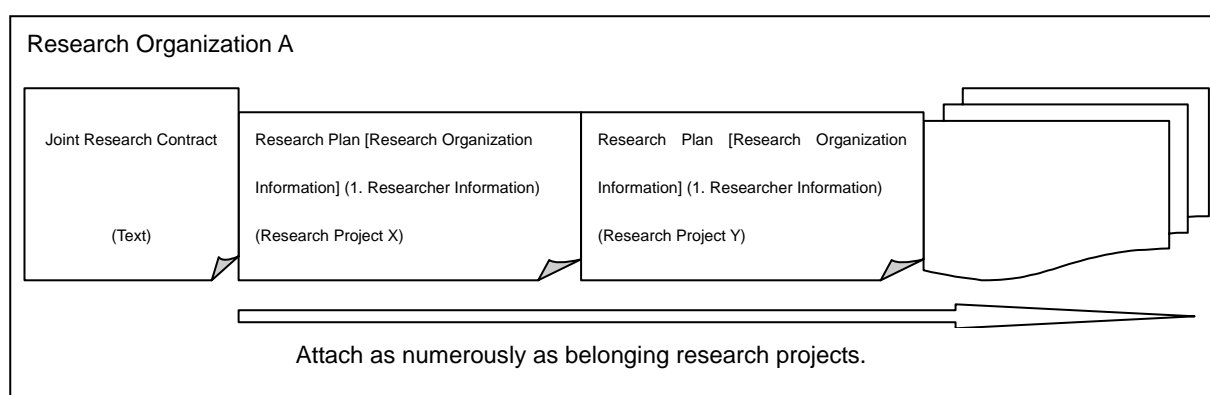


Figure 3-3 Formation of the Joint Research Contract

A research organization utilizing the JGN2 network for the first time should conclude a joint research contract. In principle, Joint research contracts terminate at the end of the fiscal year.

If a new research project is added or there is a modification to the contents of the research plan, the research organization ordinarily does not have to conclude a joint research contract again. After notifying NICT of the addition or modification, replace “the Research Plan [Research Organization Information] (1. Researcher Information)” in the joint research contract with a new one in accordance with the reply from NICT. (But it is also possible to conclude a contract again, if necessary.)

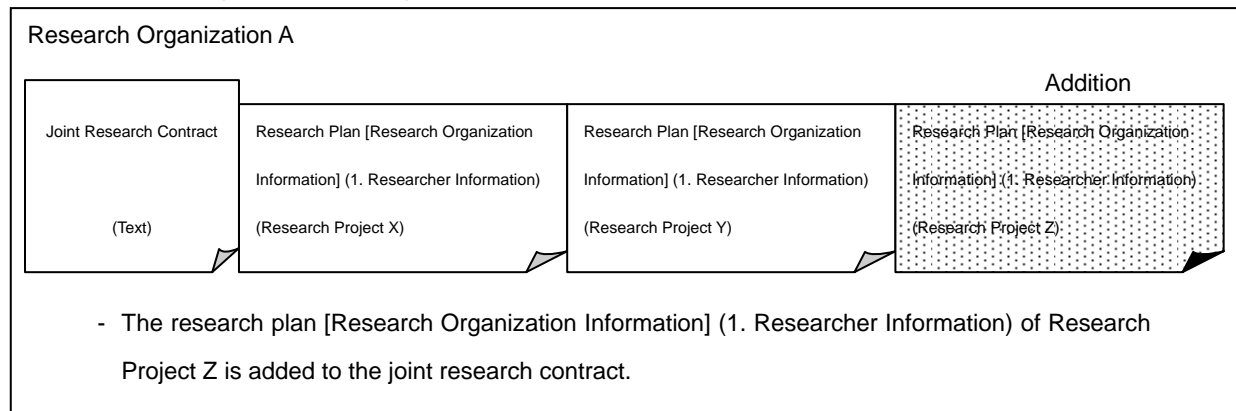
If a research organization that has already concluded a joint research contract wants to add a new research project, it is required to add the information on “the Research Plan [Research Organization Information] (1. Researcher Information)” to the contract.

If the research organization wants to modify the contents of the research project, it is required to replace the research plan with a new one (For details, see Section 3.5 “Specific Application Method”.

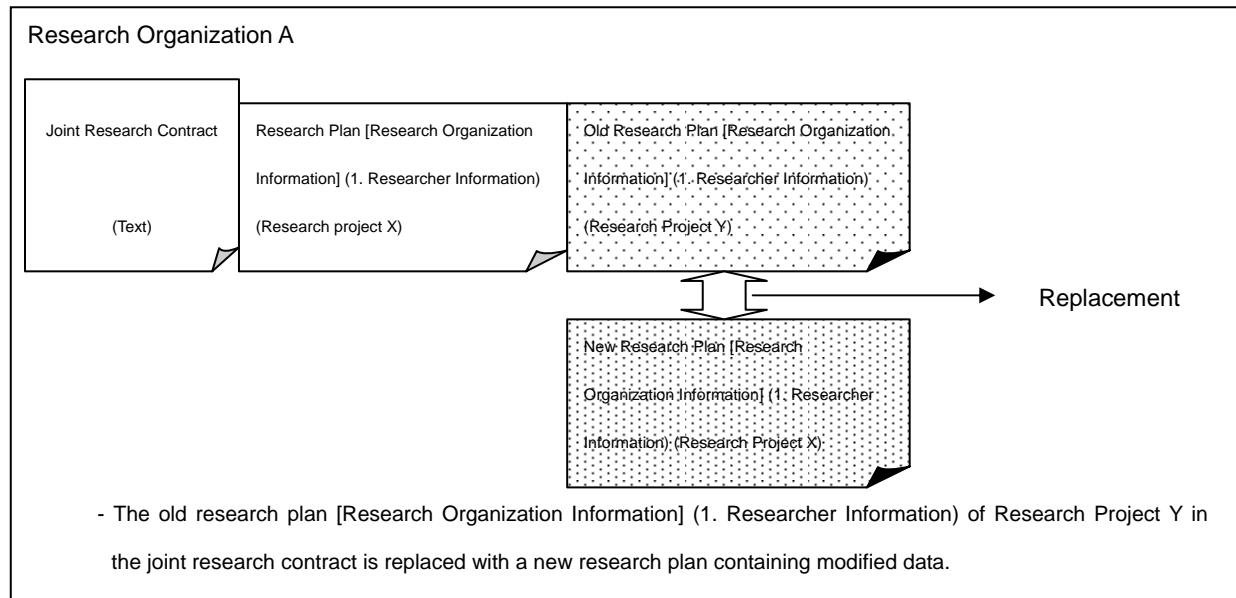


Diagrams on adding a research plan to the joint research contract, replacing the research plan and deleting the research plan are shown below.

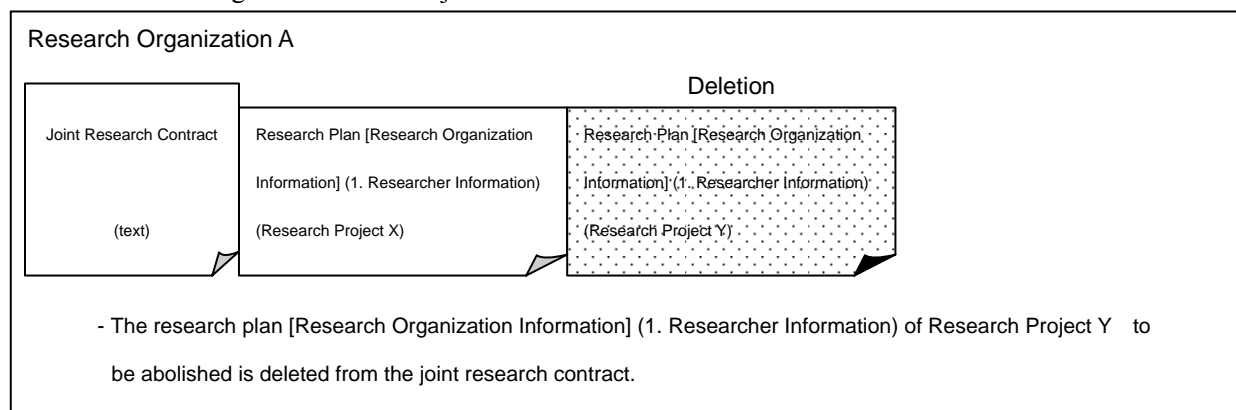
#### - In Case of Adding a Research Project



#### - In Case of Modifying the Contents of the Research Project



#### - In Case of Deleting the Research Project



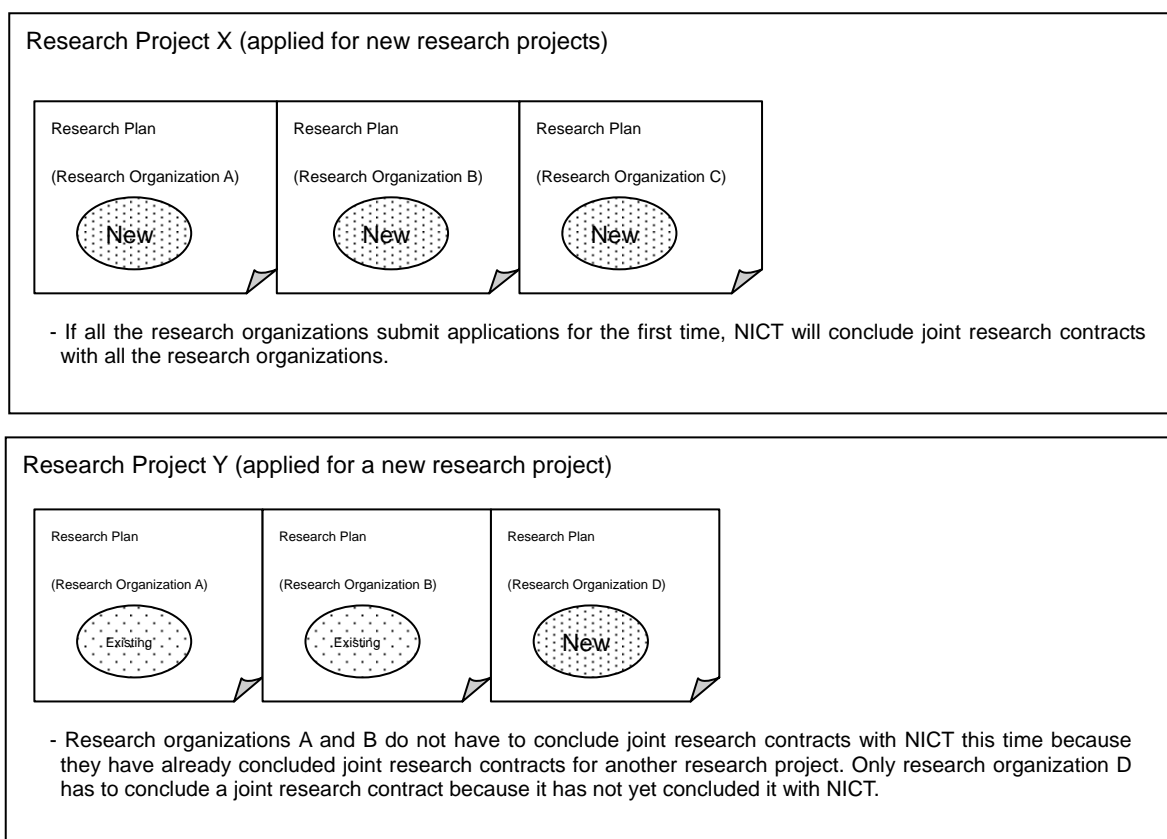
### 3.5 Specific Application Method

There are various cases in utilizing the JGN2 network: a case which new research projects may be launched, a case which a research organization may participate in the existing research project or leave the existing research project and a case which the contents of the utilization service may be changed. The specific application method is explained for each case in this section. (For cases which are not explained in this document, it is required to consult with NICT individually.)

#### (1) In Case of launching a new research project

In case of launching a new research project, it is required to compile research plans one by one for each research project and submit them to NICT.

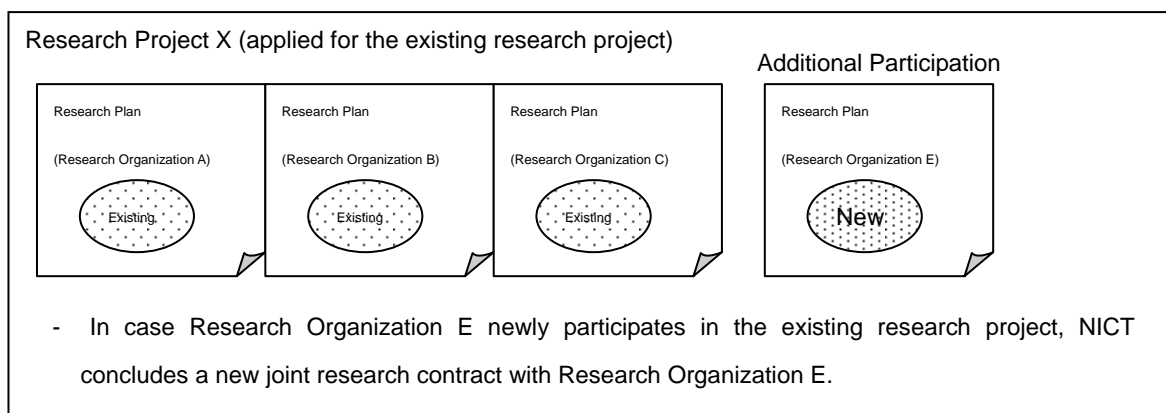
For utilizing the JGN2 network, a research organization which has not yet concluded a joint research contract with NICT should conclude a joint research contract with NICT.



#### (2) In Case of participating in the existing research project or leaving the existing research project

In case a research organization newly participates in the existing research project, it should submit a “Research Plan [Research Organization Information]” to NICT. If the research organization has not yet concluded a joint research contract with NICT, it should conclude a joint research contract with NICT. It

is also required to modify the “Research Plan [Research Project Overview]” and submit it to NICT. The project leader should compile research plans of the entire research project and submit them to NICT. The modification procedure is completed when a notice from NICT is received.



The leaving procedure is also in accordance with the additional participation procedure mentioned above. In case the research project is discontinued due to leaving research organizations, it is required to notify NICT of it in writing one month prior to its leaving in accordance with the joint research contract.

### (3) In Case of modifying (adding or deleting) the chief researcher or the researcher

In case of modifying (adding or deleting) the chief researcher or the researcher, it is required to submit a “Research Plan [Research Organization Information]” in which the information of the modified research organization is described. The information on research organizations for which no modification are made does not have to be submitted. A “Research Plan [Research Project Overview]” should be submitted only when there is a certain modification. The modification procedure is completed when a notice from NICT is received.

### (4) Other modifications

In case there is a certain modification to, for example, the utilization service, the research contents or others, it is required to submit the modified “Research Plan [Research Project Overview] and [Research Organization Information].” The modification procedure is completed when a notice from NICT is received.

## 3.6 Temporary Utilization

### (1) Temporary utilization

Temporary utilization, in principle, refers to the JGN2 network utilization in an event and the like by a

research organization which has already concluded a joint research contract. The event and the like refers to the JGN2 network utilization for a short period (in principle, no longer than one month) when the research organization meets the following conditions:

- Perform a demonstration by using the JGN2 network.
- Comply with the research contents described in the research plan.

In this case, the research organization is permitted to change the network setting defined in the research plan in order to perform the demonstration.

In case of performing a demonstration by using the JGN2 network, it is required to submit an event utilization application regardless of whether or not the network setting is changed.

See “Appendix-7” for the format required for submitting an application. The form can also be downloaded from the following URL:

<http://www.jgn.nict.go.jp/>

## (2) Utilization conditions

Before utilizing the JGN2 network, it is required to understand the following conditions:

- Take responsibility for any problems to the JGN2 network utilization through the person responsible for the event.
- Take care not to cause any physical damage to the JGN2 network during the event and before and after it.
- Accept no guaranteeing for the communication quality with the JGN2 network.
- Submit a research report related to the event (with any quantity and form) to NICT.
- Publicize the JGN2 network actively.
- Use the following logo during the event.



### (3) Caution

In case of submitting an application, it is required to take note of the following points:

- In principle, submitting an application one month or more in advance. (in case of establishing a line and the like, taking into account how many days required for its work.)
- There are cases where a request is not accepted because of the network setting.
- In principle, the period of the JGN2 network utilization is one month at the longest.

## Chapter 4: Before Utilizing the JGN2 Network

### 4.1 Conditions for Network Provision

- (1) NICT does not guarantee the quality of communication on the JGN2 network.
- (2) NICT is not liable for any damage resulting from users' utilization of the JGN2 network or inability to utilize the JGN2 network.
- (3) NICT may collect communication data for the purpose of research and management.

### 4.2 Rules to Be Observed

In utilizing the JGN2 network, the user should observe the following rules:

If the user violates any of the following rules, NICT may revoke permission to utilize the network.

- (1) In utilizing the JGN2 network, NICT prohibits the following acts:

The user should take appropriate measures to prevent the following acts.

- Utilize the JGN2 network without concluding a joint research contract.
- Utilize the JGN2 network for a purpose unrelated to the research performed by the user, which is specified in Article 3 of Utilization Regulations.
- Utilize the JGN2 network directly for profit
- Let a person other than the user specified in Article 3 of Utilization Regulations utilize the JGN2 network.
- Interfere with the network management.
- Violate the regulations or offend the public order and morals.
- Perform other acts which NICT (the JGN2 administrator) considers inappropriate.

- (2) In utilizing another network via the JGN2 network, it is also required to observe the utilization regulations of the network concerned.

### 4.3 Caution

In utilizing the JGN2 network, it is required to keep the following items in mind.

- (1) All matters regarding the user's facilities in the section to the user's site from the connection equipment installed by NICT and the access line are in the user's responsibility.
- (2) Depending on the access point, it may be required to have separate coordination with the organization which has installed the equipment before using the equipment.
- (3) The ownership of the intellectual property obtained by the user in the course of research utilizing the JGN2 network is stipulated in the joint research contract or other document.
- (4) NICT is not liable for any damage resulting from user's utilization of the JGN2 network.
- (5) If the user causes damage to NICT either intentionally or through gross negligence in utilizing the JGN2 network, the user is liable for NICT as for the damage.

### 4.4 Cooperation

- (1) To let people know about the usability of the JGN2 network and to urge onward a certain active research and development, it is required for users to cooperate with NICT by reporting the progress and results of the research through research presentation conferences and symposiums sponsored by NICT.
- (2) If users will contact the press or write a paper concerning the research utilizing the JGN2 network, it is required to state that the JGN2 network would have been utilized for the research and give the research project number that would have been assigned by NICT when the joint research contract is concluded. At the same time, it is required to submit a copy of the presented material or paper to NICT. When contacting the press, NICT will be informed in advance.

### 4.5 Others

- (1) Besides the JGN2 network, the user should establish an environment in which the Internet can be used because NICT notifies users of the JGN2 network troubles and the like.
- (2) Information on maintenance, troubles, traffic and events such as research presentation conferences and the like can be submitted on the JGN2 home page.

## Reference 1: Operation System

The JGN2 network is operated by NICT. To operate the JGN2 network smoothly, NICT has established the following organizations.

### (1) Next Generation Advanced Network Promotion Conference

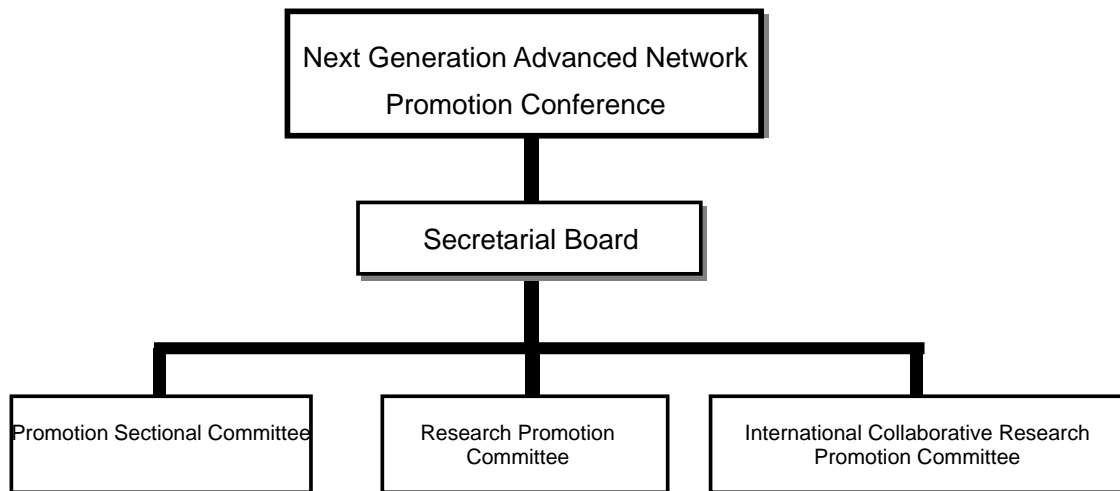


Figure Reference 1-1 JGN2 Operation System

The roles of the organization and each committee in Figure Reference 1-1 are as follows:

#### 1. Next Generation Advanced Network Promotion Conference

Examine methods to promote the research and development utilizing the JGN2 network and the direction of the JGN2 project management.

#### 2. Secretarial Board

Examine the issues regarding the smooth management for the next generation advanced network promotion conference and the management policy of the JGN2 project.

#### 3. Promotion Sectional Committee

Examine the utilization promotion of the JGN2 network, communicating with regional conferences, and carrying out public relations.

#### 4. Research Promotion Committee

Serve a forum to exchange opinions between researchers directly controlled by NICT and external researchers and examine the direction of research themes utilizing the JGN2 network.

#### 5. International Collaborative Research Committee

Examine the research and development utilizing the JGN2 international circuits.

## (2) JGN2 Center and JGN2 Network Operation Center (NOC)

To operate the JGN2 network smoothly, NICT has established the JGN2 center and the Network Operation Center (NOC).

### JGN2 Center

The JGN2 center plays a role to deal with users' applications for connecting to the JGN2 network, accept and examine research plans, conclude joint research contracts, determine network settings, respond to inquiries regarding network settings and provide research and development support information such as network reservation status, trouble information and the like.

### JGN2 Network Operation Center (NOC)

NOC implements network settings determined by the JGN2 center and operates and monitors networks.

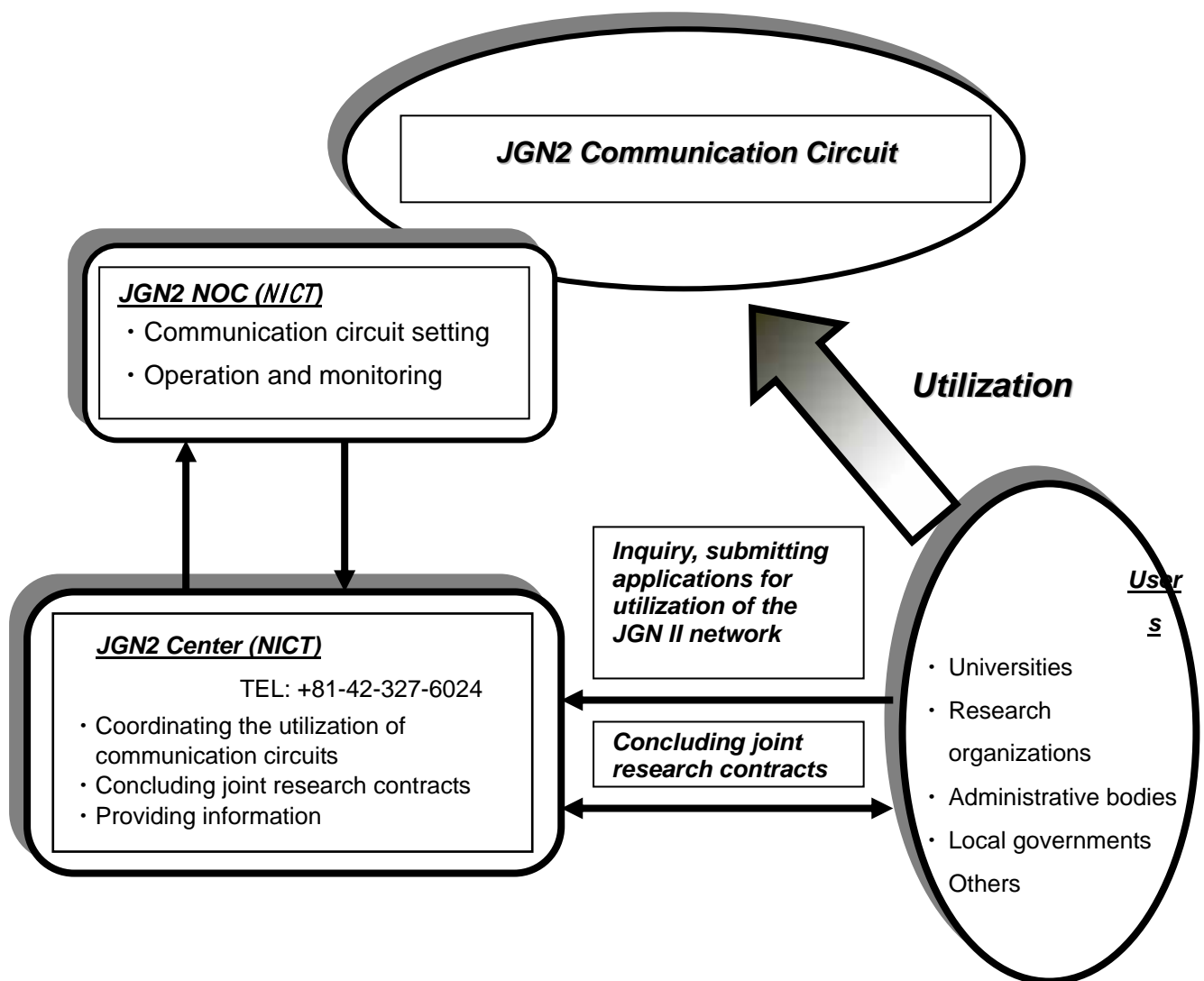


Figure Reference 1-2 Network Operation System



## Reference 2: Glossary

- [ Ubiquitous ]** The term ubiquitous means being everywhere in Latin.  
By way of example, Ubiquitous Network: A network that can be accessed from anywhere at any time not only by computers but also by various apparatuses including cellular phones.
- [ ADSL ]** Abbreviation of Asymmetrical Digital Subscriber Line. It is a type of high-speed communication technology using subscriber lines of telephones (metal cables). Transmission speeds are different between upstream and downstream directions.
- [ Ethernet ]** The most widely used LAN method. It has become a synonym for LAN. Transmission speeds of 10Mbps, 100Mbps, 1Gbps and 10Gbps are standard.
- [ FTTH ]** Abbreviation of Fiber To The Home. This is a plan to replace all cables such as telephone lines with optical fibers and to disseminate optical fibers into general households.
- [ IP ]** Abbreviation of Internet Protocol. A protocol which is widely used by LANs and the Internet.
- [ IPv4 ]** Abbreviation of Internet Protocol version 4. The most widely used version of the Internet Protocol at present. IPv4 addresses will be exhausted soon.
- [ IPv6 ]** Abbreviation of Internet Protocol version 6. An IP protocol for the next generation. To solve the IP address exhaustion problem, IP addresses have been extended to 128 bits, which are four times larger than IPv4 addresses.
- [ L2 ]** Abbreviation of Layer 2. In this method, packets are forwarded to the destination determined by MAC (Media Access Control) addresses.
- [ L3 ]** Abbreviation of Layer 3. In this method, packets are forwarded to the destination determined by IP addresses.
- [ OXC ]** Abbreviation of Optical Cross Connect. This is a device which relays signals without returning optical signals to electric signals. It assigns wavelength multiplexed optical signals based on the wavelength.
- [ QoS ]** Abbreviation of Quality of Service.
- [ VLAN ]** Abbreviation of Virtual LAN. This is a technique of constructing a logical LAN apart from a physical LAN by grouping computers connected to the LAN.
- [ VLAN-ID ]** Abbreviation of Virtual LAN-Identification. Additional information assigned to each group to distinguish groups when computers are grouped for a VLAN.