Executive Summary of the Report on

“Hokkaido and Cloud Network”

Cloud Network Infrastructure Workshop

February 15, 2012

Introduction

Cloud Network Infrastructure Workshop was established in December 2010, and eight meetings have been held so far. Participating companies have carried out vigorous discussions based on the latest information gathered from invited lecturers who shared their specialized knowledge on a wide range of topics. This report summarizes the discussions and proposals raised at these meetings. The Workshop defines “cloud computing” as the hub at which information processing takes place, and “cloud network” as an integrated service of information networking and computing. While a great amount of publications and information regarding cloud computing have become available in recent years, much of the concept of cloud network remains unclear. This report explains cloud network from the standpoint of the Workshop members’ specialized fields, with the goal of clarifying what kind of information infrastructure should be developed in Hokkaido.

1. Proposal by the Workshop

In order for Hokkaido to set up a base for cloud network, it must be able to provide, in a stable manner and at a low cost, a low-delay, high-volume communication line that directly connects Hokkaido with Internet Exchange Service (hereinafter referred to as IX) of Tokyo, Nagoya, and Osaka; IP Transit Service provided by Internet connection service companies; and existing data centers in Tokyo and Osaka.

Upon examining the optical submarine cables that are concentrated on the side of the Pacific Ocean and communication routes going through the Japan Sea, the Workshop has concluded that it is highly possible to construct a new optical submarine cable and to make it profitable, and proposes that this plan be moved forward by establishing an entity to take charge of execution of this plan.

2. Summary of the Workshop Report

Information network and computing have become one of the fundamental infrastructures that support a modern society. Improving its basic performance, providing stable operation, and enhancing energy efficiency are keys to promoting future industrial vitality. In order for domestic industries to continue its long-term growth, it is important to develop an information environment that is compliant with cloud services, which is the standard information service model for the future.

Cloud network is a service that combines information network and computing, not a simple data storage or calculation service. It is a service format that intimately interconnects the information of multiple cloud businesses and users who are scattered throughout a wide distribution area. It requires a higher level of capability and stability than that of the existing network and data centers.

Hokkaido offers favorable conditions such as supply of stable electric energy and frigid temperatures. These, in addition to the recent advancement of virtualization technology of information systems and technology for building large-scale data centers of PUE 1.05 class with energy saving capabilities, are bringing great expectations toward the construction of data centers which will be used mainly for cloud computing services in Hokkaido. At the same time, however, many issues exist. It is vital that Hokkaido makes clear, at an earliest date possible, what it will propose and what actions it will take to deal with these issues.

The issues that Hokkaido faces with regard to information infrastructure can be largely summarized into three points:

1. **The cost for a dedicated line to Tokyo and Osaka is high, and the route is unclear.**
2. **The delay time to Tokyo and Osaka is great.**
3. **There is no IX function for data center companies to mutually connect.**

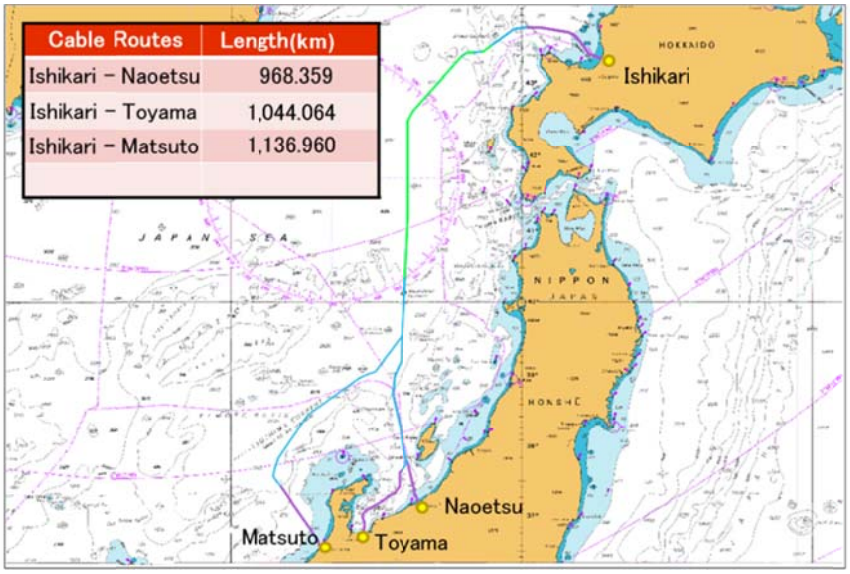
To resolve these issues, the Workshop recommends that a low-delay optical submarine cable be laid in the Japan Sea for the IX, data center, and Internet connection service businesses in Hokkaido, Tokyo and Osaka (Diagram 1). This cable line will be a private line for businesses who will be provided with an end-to-end network that spans between major cities of Hokkaido and Tokyo or Osaka. It is not a broadband environment designed for general users. The Workshop concluded through its deliberations that a cable route with an estimated 1.28 Tbps communication volume that runs from Ishikari to Toyama area or Naoetsu in Niigata could be built at around ¥4 billion (Table 1).

It was found that, even with the added operation cost, it would be fully competitive with large capacity dedicated lines offered by existing communication businesses. Because going through the Japan Sea would provide the shortest route to Tokyo and Osaka, and it would be a direct line with no extraneous transmission facilities or switching equipment in between, the new line can be expected to have less lag time compared to existing lines.

Building an optical submarine cable through the Japan Sea will help reduce operational costs of the cloud network base built in Hokkaido while making a positive impact on Hokkaido's information infrastructure development and industrial growth. Cloud network, as well as energy and transportation, is an essential industrial infrastructure that supports all industry sectors. For industries within Hokkaido to have the ability to access the cloud network under favorable conditions means that the prefecture will find itself at an advantageous position compared to other regions within the country. Effects that can be anticipated, even when looking at the information industry sector alone, are as follows:

1. **The establishment of multiple large-scale cloud businesses will lead to the setup of IX businesses in Hokkaido in order to support the exchange of traffic between the data centers, and this will improve the interconnection environment for the communication businesses within the prefecture.**
2. **Hokkaido could become an Internet connection base for regions in Northeast Asia, Russian Far East and North America (Diagram 2).**
3. **The possibility of communication shutdown in times of disaster such as a large-scale earthquake will decrease, while the competitive advantage for new businesses such as backup centers will increase.**
4. **Increased network redundancy will allow mission-critical information services (e.g., online marketplaces, content delivery centers) to be established in Hokkaido.**

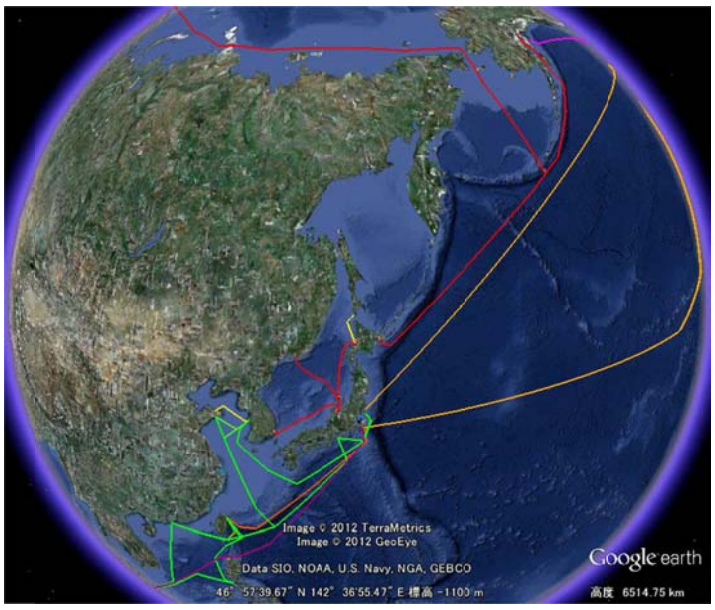
In order to make the building of the optical submarine cable in the Japan Sea possible, there are issues that must be resolved immediately, including the questions of business entity framework, funds procurement, and fishery rights. If, through cooperation between the industrial community and administrative agencies, these issues can be resolved and objectives be carried out expeditiously, the long-term economic effects of this project should greatly surpass the initial investment.



Courtesy of NEC Corporation

Diagram 1: Japan Sea optical submarine cable route

The landing points on the Hokuriku side are potential locations.



Courtesy of Fujitsu Limited

Diagram 2: Image of a global network structure built around Hokkaido

By building new optical submarine cables indicated in red, new routes to North America and Europe via Hokkaido will be opened. Detour routes for optical submarine cables that are concentrated in the Pacific Ocean side. Since Hokkaido is closest in distance to North America, this will allow for a low-latency network between Japan and the United States.

Table 1: Preliminary Cost Estimate for Ishikari-Toyama/Naoetsu Route

Item no.	Item	Estimated construction cost
1	Submarine cable, repeater	¥1.6 billion
2	Terminal equipment (incl. power feed equipment, monitor and control equipment)	¥0.5 billion
3	Equipment at the landing station, construction, testing	¥0.1 billion
4	Marine construction, testing	¥1.7 billion
5	Terminal construction, terminal testing, system testing	¥0.2 billion
6	Project management, training, documentation	¥0.2 billion
	Total	¥4.3 billion

Cloud Network Infrastructure Workshop

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