Construction of WebGIS system for lunar science data. J. Terazono[1], N. Asada[1], H. Demura[1], N. Hirata[1], K. Saiki[2], A. Iwasaki[3], R. Oka[1], T. Hayashi[1], T. Suzuki[1], H. Miyamoto[4], J. Haruyama[5], M. Ohtake[5], T. Matsunaga[6], S. Sobue[7], H. Okumura[7] and T. Fujita[8]. [1]The University of Aizu (Tsuruga, Ikki-Machi, Aizu-Wakamatsu, Fukushima 965-8580, Japan; terazono@u-aizu.ac.jp) , [2]Osaka University, [3] Faculty of Engineering, The University of Tokyo, [4]University Museum, The University of Tokyo, [5]The Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, [6]National Institute for Environmental Studies, [7]SELENE Project Team, Japan Aerospace Exploration Agency, [8]Remote Sensing Technology Center of Japan.

Introduction: Japanese lunar explorer "Kaguya" (SELENE) [1] was launched on 14 September, 2007. Currently (as of 28 December, 2007), Kaguya has completed main initial checkouts of each scientific instrument, and is starting the nominal observation.

One of the scientific goals of Kaguya exploration is a comprehensive understanding of lunar evolution and geology through the "integrated science", which uses all data acquired by 15 instruments of Kaguya. However, this integrated science has some challenging points. Among them, development of system to integrate various scientific data is a key to promote scientific progress. Additionally, some basic function for the research, such as telecommunication, data sharing and remote data handling, are also required. We are now starting the construction of lunar data analysis platform based on WebGIS concept.

System Requirements: To complete scientific goal using our system, we have the following requirements for this system.

o Network-based. As our members are distributed countrywide, it would be very difficult to hold meetings frequently. Instead, it will be convenient to concentrate all data and analytical functions onto the network. The function include network-based discussion, data sharing, and network-based data manipulation.

o Endurable for large amount of data. The total amount of scientific data obtained by kaguya is estimated as more than 10 terabytes. Additionally, some intermediate products should be kept in the storage. Therefore, the scientific data derived from the Kaguya raw data will run up to several terabytes.

Our system will focus on the handling of scientific data (secondary products) created by scientists participating in this project. The original data and basic products will be kept on the main server in ISAS/JAXA.

o Comprehensive usage. As all scientists are not experts of WebGIS system or database front-ends, we need some comprehensive interface through which non-experts can handle data smoothly.

o Security-aware. Network security is becoming major issue in these days. As our system make full use of the network facilities, proper network security system and countermeasures for intrusion or attacks are required. Additionally, as individual users will keep their priority data in shared storage, the system should have a function which clearly discerns one's data from other users. Some authentication mechanism and network protection system should be implemented.
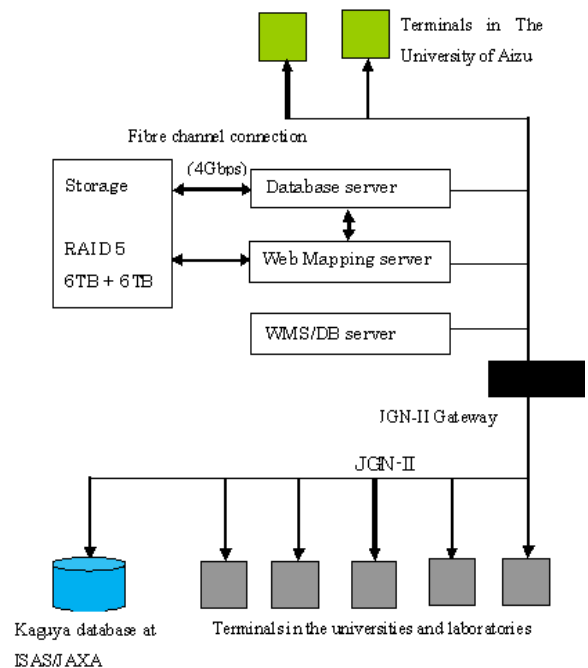

Fig. 1. Schematic diagram of the Kaguya science data WebGIS system.

The system will have a function of "virtual laboratory" specialized for data analysis of Kaguya.

Hardware: System hardware has been selected to put through the above-mentioned requirements.

The diagram of our system is shown in Figure 1. Main servers are comprised of two servers with a same specification. The server (Fujitsu Primagy RX200 S3) has a CPU of Intel Xeon 5110 dual core, 8 Gigabytes of memory and 73 Gigabytes of storage. These two servers control attached storage, Fujitsu ETERNUS 2000, which has 12 Terabytes storage in total. This external storage is separated in halves. Each separated storage is connected to server with the fibre channel (4Gbps).

Fig. 2. The photograph of the Kaguya science data WebGIS system. The lowermost machine is the storage, and middle two machines are web server and database server. Uppermost server is WMS/DB server.

This system has another WMS/DB server, HP Proliant DL380, with 146 Gigabytes of disk and 10 Gigabytes of memory. This server is mainly used to demonstrate interoperability of distributed WebGIS system between ISAS/JAXA and The University of Aizu.

The system is connected with the high-speed gigabit network (JGN-II, Japan Gigabit Network II) with 100Mbps throughput. This network bind two locations between The University of Aizu (Fukushima Prefecture), where the system is located, and the ISAS/JAXA(The Institute of Space and Astronautical Science, JAXA) in Sagamihara, Kanagwa Prefecture. The two facilities has more than 300 kilometers in distance. The network is also linked to The Internet and registered scientists can access our system via the net.

The photograph of the hardware are shown in Figure 2.

Software: Each servers are operated with Red Hat Enterprise Linux ES 4 with the most current patches applied. We are now installing some basic software including:

- Apache 2.2 (web server)
- PHP 5 (web server scripting)
- Postgres 8 (database server)
- MapServer 5 (database server)

Additionally, to enhance geographical data handling, PostgreSQL will be empowered with PostGIS.

Some authentication and security mechanism will be realized in the both servers.

Current implementation and future extension: We have just completed hardware settlement and now conducting initial testing of the system hardware and basic functions. After completing these tests, we will proceed into the installation of the software and implementation of basic functions such as authentication, displaying and mapping.

References: [1] Kaguya website in JAXA, http://www.kaguya.jaxa.jp/en/.