# Implementation of Broadband network using the VSAT system in rural areas (J3)

## Final REPORT (Activity and Accounting)

September 09, 2016

INFORMATION TECHNOLOGY, POST AND TELECOMMUNICATION AUTHORITY
MONGOLIA

KDDI foundation
JAPAN

INFORMATION TECHNOLOGY, POST AND TELECOMMUNICATION AUTHORITY, MONGOLIA

KDDI Foundation

# INDEX

# 1. Executive Summary

The Government of Mongolia has decided to implement Broadband network by decree No 145 of 2011. Based on this decree, the fiber optic cable network has been extended to over 33,000 km connecting all soums (smallest administrative unit) of Mongolia excepting 36. This project provides VSAT network to remote soums where the fiber optic cable has not been reached in order to implement the Broadband network.

The following actions has been done at 3 remote soums below:

- Exchange experts/engineers between Japanese and Mongolian research institutions;
- Installation VSAT system;
- Installation Wi-Fi equipment;
- Training how to use for subscribers.

**Tsagaannuur** (Mongolian: Цагааннуур = *white lake*) is a sum of Khövsgöl aimag. The area is 5,410 km². In 2000, Tsagaannuur had a population of 1,317 people, of which most identified themselves as Darkhad. 269 inhabitants identified themselves as Tsaatan. The sum center, officially named *Gurvansaikhan* (Mongolian: *Гурвансайхан*), is located at the shore of Dood Tsagaan nuur, 279 km north-northeast of Mörön and 1048 km from Ulaanbaatar.

**Khalkhgol** (Mongolian: Халхгол, meaning *Khalkha river*) is a sum (district) of Dornod Province in eastern Mongolia. There are 3,203 people in the sum, including 1,756 in the sum center. The area of the sum is 28,093 km², with a population density of 0.11 people/km². The sum center, officially named *Sumber* (Mongolian:*Сумбэр* ), is located at the shore of Khalkha river , 356 km from Choibalsan and 1012 km from Ulaanbaatar.

**Khatanbulag** (Mongolian: Хатанбулаг) is a sum (district) of Dornogovi Province in southeastern Mongolia. There are 2,972 people in the sum, including 603 in the sum center. The area of the sum is 18,670 km², with a population density of 0.16 people/km². the sum is located 231 km from Sainshand and 682 km from Ulaanbaatar.

This project gives us many benefits to rural area development and citizens in Mongol, especially following 4 points.

- encourage our governments and other public services to enhance their integration with the ICT broadband system in providing easy to use, transparent, and quality services to our citizens
- provide incentives to businesses, particularly SMEs (Small and Medium Enterprises) and individuals, to develop applications and to provide appropriate mechanisms for sharing revenue for the use of their application and content
- encourage regional use of content and applications for widening the scope and extent of the

regional market and to take the best advantages of regional needs and strengths

- encourage content and application sharing among member countries in a non commercial scheme for non commercial use.

Following section are the final report of our accomplishing activities and results at the end of this APT J3 project, herein.

## 2. Introduction

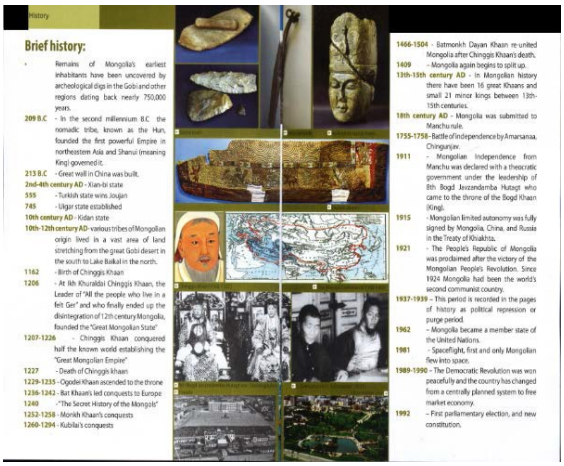
Implementation of Broadband network using the VSAT system in rural areas.

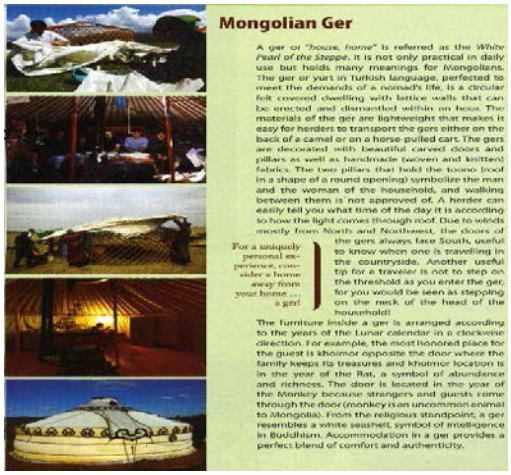
### 1) Objectives

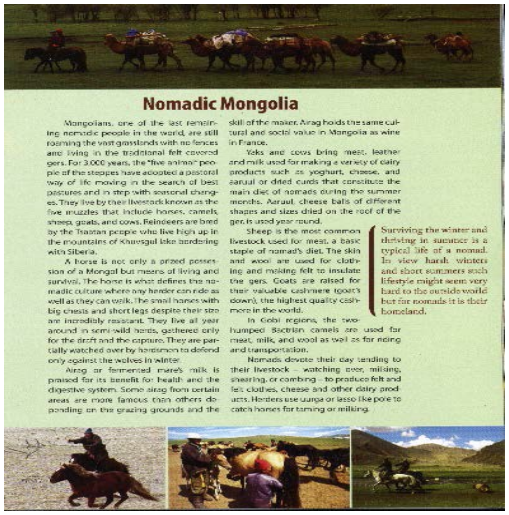
1) To promote access to ICT in rural areas
2) To install VSAT station in Remote side for broadband connectivity
3) To narrow the digital divide
4) To provide high speed internet service for rural government organizations and public

### 2) Current Status

The Government of Mongolia has decided to implement nationwide Broadband network by decree No 145 of 2011. In result of implementation of Program on high speed broadband network the fiber optic cable network has been extended to over 33,000 km connecting all soums of Mongolia excepting 36. These 36 soums have limited ICT service /only mobile phone/ by the private VSAT network.





Nomadic Mongolia

Mongolians, one of the last remaining nomadic people in the world, are still roaming the vast grasslands with no fences and living in the traditional felt covered gers. For 3,000 years, the "five animal" people of the steppes have adopted a pastoral way of life moving in the search of best pastures and in step with seasonal changes. They live by their livestock known as the five muzzles that include horses, camels, sheep, goats, and cows. Reindeers are bred by the Tsaatan people who live high up in the mountains of Khuvsgul lake bordering with Siberia.

A horse is not only a prized possession of a Mongol but means of living and survival. The horse is what defines the nomadic culture where any herder can ride as well as they can walk. The small horses with big chests and short legs despite their size are incredibly resistant. They live all year around in semi-wild herds, gathered only for the draft and the capture. They are partially watched over by herdsmen to defend only against the wolves in winter.

Airag or fermented mare's milk is praised for its benefit for health and the digestive system. Some airag from certain areas are more famous than others depending on the grazing grounds and the skill of the maker. Airag holds the same cultural and social value in Mongolia as wine in France.

Yaks and cows bring meat, leather and milk and for making a variety of dairy products such as yoghurt, cheese, and aaruul or dried curds that constitute the main diet of nomads during the summer months. Aaruul, cheese balls of different shapes and sizes dried on the roof of the ger, is used year round.

Sheep is the most common livestock used for meat, a basic staple of nomad's diet. The skin and wool are used for clothing and making felt to insulate the gers. Goats are raised for their valuable cashmere (goat's down), the highest quality cashmere in the world.

In Gobi regions, the two-humped Bactrian camels are used for meat, milk, and wool as well as for riding and transportation.

Nomads devote their day tending to their livestock – watching over, milking, shearing, or combing – to produce felt and felt clothes, cheese and other dairy products. Herders use *urga* or lasso like pole to catch horses for taming or milking.

Surviving the winter and thriving in summer is a typical life of a nomad. In view harsh, winters and short summers such lifestyle might seem very hard to the outside world but for nomads it is their homeland.







## 3) Purpose of this project

- To promote the use of broadband services and increase awareness and knowledge to use ICT for betterment of their lives
- To take better advantage of wireless technologies to speed up delivery of broadband services

## 4) Partners in this project

MONGOLIA:

Information Technology, Post and Telecommunication Authority (ITPTA) Communications Regulatory Commission (CRC)

Isatcom. LLC JAPAN:

KDDI foundation

Applicant & Chief researcher:

Head of Space and Radio communications Division, ITPTA

Mr. Batbayar Vandansambuu

Account Manager

KDDI-Foundation Mr. Yosuke Uchiyama

## 5) Milestone (Significant Phase)

1. Selection
2. Kickoff and site survey in near Ulaanbaatar (Phase 1)
3. Research, Study and discussion in Japan (Phase 2)
4. Pilot installation, practical operation and evaluation in Mongolia (Phase 3)
5. Final Evaluation and Discussion (Phase 4) Reporting

(Interim and Final report to APT with Activities and Accounting)

## 6) Expected Output and Contribution

The main social impact of the project is expected to be the greater availability of and access to telecommunications and information services for some of Mongolia's poorest and isolated rural citizens.

Ready access to quality telecommunications services in rural areas is one of the most important factors in overcoming isolation, enhancing economic activity and promoting social integration of these areas with the rest of the country.

The project will enable ICTs to become a driver for sustainable economic growth and potentially enable the government to use ICTs to provide services, including education and market information in rural Mongolia.

In result of this project 3 soums will be fully provided broadband network for Government organizations and public.

- An increasing number of soums to also have broadband wireless based Internet service, with the administration, hospital, kindergarden and school having Internet access; and
- An increasing number of e-Government services provided in partnership with the private sector and available to businesses and citizens.
- Internet access for public using Wi-Fi technology.

The project will also improve the ability of citizens, businesses and the public in general, to participate in the information society from a civic or professional perspective.

## 7) Approved Budget by APT

*According to Letter from APT on 27 January 2015*

| | | |
|---|---|---|
| Planning and Investigation | 4,500 | US$ |
| Equipment procurement | 38,850 | US$ |
| Shipping fee | 800 | US$ |
| Business Trips | 39,515 | US$ |
| Miscellaneous | 1,600 | US$ |
| ---------- | | TOTAL |
| Amount | 85,265 | US$ |

## 3. General Information of the country and those location

The Mongols gained fame in the 13th century when under Chinggis KHAAN they established a huge Eurasian empire through conquest. After his death the empire was divided into several powerful Mongol states, but these broke apart in the 14th century. The Mongols eventually retired to their original steppe homelands and in the late 17th century came under Chinese rule. Mongolia won its independence in 1921 with Soviet backing and a communist regime was installed in 1924. The modern country of Mongolia, however, represents only part of the Mongols' historical homeland; more ethnic Mongolians live in the Inner Mongolia Autonomous Region in the People's Republic of China than in Mongolia. Following a peaceful democratic revolution in 1990, the ex- communist Mongolian People's Revolutionary Party (MPRP) won most parliamentary elections and stayed in power either governing alone or in coalition. In 2009, current President ELBEGDORJ of the DP was elected to office and was re-elected for his second term in June 2013.

At 1,564,116 square kilometres (603,909 sq mi), Mongolia is the 19th largest and one of the most sparsely populated independent countries in the world, with a population of around 3 million people. It is also the world's second-largest landlocked country. The country contains very little arable land, as much of its area is covered by grassy steppe, with mountains to the north and west and the Gobi Desert to the south.

Mongolia is divided into 21 provinces (aimags), which are in turn divided into 329 districts (sums).[59] The capital Ulaanbaatar is administrated separately as a capital city (municipality) with provincial status.

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## 4. Status of Information and communication

Policy and Regulation

As part of its approach to economic development, the Government of Mongolia has identified three strategic sectors for investment: mining, banking and communications.
The Government of Mongolia has approved "National Program on High-Speed Broadband Network: 2011-2015 year" on 03 May 2011 by Government Resolution No.145.

In its ICT Development White Paper 2013, the Information Technology Posts and Telecommunications Authority (ITPTA) set out seven strategic objectives for the following three years. The seven objectives are:

1. The launch of two national satellites, including a communications satellite and an earth observation satellite;
2. The seamless delivery of government services through the development of enabling infrastructure such as national databases and public key infrastructure;
3. Increase the availability of free Wi-Fi hotspots in rural areas through reform of tariffs for backhaul communications and the deployment of mobile broadband technologies such as 3G and 4G;
4. Encourage audience-centric radio and television services through the introduction of digital broadcasting technologies in a way that supports diversity and a wide range of high quality content;
5. Expand the number of highly qualified and well paid occupations through the introduction of new occupation classifications and the application of appropriately scaled salary schemes;
6. Support the development of world class e-products by establishing a legal framework for intellectual property, an ICT Innovation Fund and an ICT Research and Development Centre;
7. Continued development of postal services by completing implementation of addressing reform, the promotion of public-private partnerships and the automation of postal services.

**ICT Sector infrastructure**

Generally, ICT and telecom infrastructure and particularly telecommunications, consists of three main layers:

- The access network
- The national backbone network
- International infrastructure

The access network is the key element in providing access for the end-user; such as individuals, private entities and organizations who use telecommunication services and applications. It includes the fixed-line infrastructure like conventional copper telephone lines and coaxial cable TV networks, as well as fibre optic connections connecting directly to premises and dwellings—so-called Fibre to the Home (FttH) or Fibre to the Premises (FttP)—and wireless/mobile connections which in many countries, including Mongolia, now increasingly use more than fixed lines. Also, mobile networks vastly cover hundreds of thousands of base stations throughout Mongolia, each of which serves a relatively small area of some square kilometres or less.

The national backbone network is the next main component to connect the numerous parts of the access network with each other; e.g. wireless base stations, switching centres, operation and maintenance (O&M) facilities, and international gateways. Main network lines are normally applied by fibre optic connections due to the high capacity demand on them. Also microwave radio links are often used because of their comparatively low operation costs, and are simple and speedy at the local level. But they are gradually being switched with fibre optic connections due to the growing demand for broadband data services on the access network, particularly in heavily populated areas. Moreover, satellite connections back-up national backbone connections, especially in remote areas.

The international infrastructure, the fundamental element to connect a country to the rest of the world, usually consists of fibre optic subsea cables with very high capacity that cover whole oceans and are also progressively replacing satellite technology. Landlocked countries connect with terrestrial transit connections through countries with coastal landing stations or by using satellites.

Principally, all three of the above mentioned layers are essential for complete operation along with effective communications, preferably with redundancy. In most markets around the world, all three layers are open to competition; i.e. there are several licensed service providers who have built their own network infrastructure and are offering services in competition with others. This in itself creates redundancy in network infrastructure covering the same geographical areas, but each operator will also strive to have redundancy within its own network in order to be able to provide uninterrupted service in case of temporary partial failures or outages.

**Fixed networks.** Historically, Mongolia had 200 telephone lines as of 1939, constructed open copper air lines in 1950, and the telecommunication service centre was established in 1960. In 1992, Mongolia introduced digital telephone switching. In 1994, the Earth Satellite station Naran was established. Today, Mongolia has only one national fixed-line network operator named Telecom Mongolia and it is also the biggest with 37.99% of total fixed telephone subscribers, and 7.2 telephones per 100 people at a total population 3,015,303 million.

After the introduction of mobile telephone technology, mobile telephone usage has increased dramatically around the world every year. In this regard, in Mongolia since 2006, the number of subscribers who subscribe to fixed telephone lines has decreased, but in the last few years the number has been increasing by over 70,000, resulting in a total number of fixed line subscribers of 228,327 in 2014.

The increase of fixed telephone subscribers is due to the penetration of triple play services (IPTV, Voice over Internet Protocol (VOIP) and Internet) offered by Univision (32.43%) and Skymedia (18.69%).

According to the project on "Broadband access network to the *soums*" (2012-2014), the objective was to establish network access infrastructure for Internet services to 250 *soums* which have no access to the Internet; 21 *aimag* centres and 90 *soums* had access to networks during 2012-2013. In 2010-2013, technical conditions improved and facilitated access to internet services in 118 *soums* by state investment and the Universal Service Obligation Fund (USOF).

According to the White Paper of ICT Mongolia-20141, Mongolia has 366 sets of medium and long wave radio listening zones and 349 sets of short wave radio listening zones today. In terms of capacity of the transmission stations in Ulaanbaatar and in some *aimags*, it was gradually upgraded

and the total capacity improved 7.9 times within last 70 years, and by 6.3 times in rural areas with reliable listening zones.

**Internet.** The first time Internet was introduced in Mongolia was in 1996. As of 2013, there are 55 ISPs delivering Internet services to users through Dial-Up, DSL, and FttH fibre optic cable, coaxial cable, and GPRS, 3G, EVDO, WiFi, WiMAX and VSAT technologies. According to the 2015 statistics of the Communication Regulatory Commission, Mongolia has 1,962 thousand Internet subscribers, that increased 2 times compared with the previous year. In Mongolia, GPRS, EDGE, 3G and EVDO technologies are utilised mostly to connect to the Internet.

The Government's policy objective towards development of the ICT sector is to promote universal access of the Internet in rural areas, and make Internet services affordable and cheaper. In this regard, ITPTA is aiming to develop and expand the access network, introduce next-generation network mobile bandwidth using 3G and 4G, formulate national programmes to increase affordability and usage of the Internet in remote areas, and introduce tariffs of geographic non-discrimination between urban areas and rural areas.

ICT infrastructure development of Mongolia is funded by foreign loans, public and private sector investments, and the public and private fibre optic network was totally built over 34,000 km covering 294 *soums* and settlements. There are a remaining 37 *soums* connected to the mobile communications network by a digital relay network and satellite network.

It is estimated that 16.8% of the world population are using Facebook, while 20.1% of the Mongolian population are Facebook users. The number of Facebook users has reached 640,000, which is 53% higher than the previous year, of which 580,000 users are from Ulaanbaatar.

**Mobile networks.** Mobile networks play a vital role in disaster management, because they reach a far greater percentage of the population than fixed networks. They offer mobility and they are more robust against damage because there are fewer potential points of failure per connection than fixed-line networks (although underground wires offer the best robustness). At least in densely populated areas, mobile networks also offer a certain degree of redundancy in case of local failure of individual base stations (BTS), since a neighbouring BTS will often be able to provide some degree of service in the affected area. Moreover, mobile networks can be scaled up relatively easily for temporary extraordinary traffic demand, for example in disaster areas, by bringing in mobile base stations or so-called 'cells on wheels' (COWs).

There are four mobile phone operators (Mobicom, Skytel, Unitel and G-mobile) in Mongolia. Their mobile networks cover almost 95% of the Mongolian territory, including the capital city, 21 *aimags* and 330 *soums*. According to CRC statistics, the number of registered mobile subscribers has reached 4.9 million in 2014.

With regard to network compatibility and redundancy, a key component of e-resilience, the market structure in Mongolia is in fact not ideal. In terms of second generation (2G) technology, four out of the country's mobile operators—Mobicom and Unitel—operate GSM networks. The other two, Skytel and G-Mobile, operate a CDMA-2000 network which is incompatible with GSM. Since there are very few GSM/CDMA dual-mode handsets, a Skytel and G-Mobile customer would need to buy a separate GSM handset if he wanted to use one of the other networks to take advantage of competition or in a disaster situation, should the CDMA network be down. GSM users, on the

other hand, only need a SIM card of the other GSM network to be able to use it with their existing handset.

3G mobile networks can deliver broadband data services at much higher speeds to more people than 2G networks, and in addition they offer significantly higher capacity for voice traffic and M2M (mobile-to-mobile) communication. So apart from the technology compatibility/redundancy advantage discussed above, they open up a whole new world of services and applications that are relevant to disaster risk management. However, while basic 2G and 3G (Skytel: CDMA-2000) services are available virtually nationwide as mentioned earlier, 4G coverage will take some time to become contiguous across all populated areas in Mongolia, and fewer people will be able to afford them initially due to the higher cost.

There are 3,027,243 active mobile subscribers in Mongolia as of 2014, out of which 25.03% were 3G, which means only 25% of consumers use smartphones. Mobicom had 1.3 million mobile subscribers in 2014, out of which 520,000 were 3G-enabled. Mobicom needs to improve its technology to introduce 4G. Only the company Skytel, with 17% of all mobile subscribers out of which 2,40,000 are 3G users, has connected all 21 *aimags* and Skytel 3G network covering around 90% of the territory.

G-Mobile introduced 3G (CDMA2000 1x/EV-DO technology) at its five-year anniversary in 2012, and it has been deployed in the capital city of Ulaanbaatar, Zuun Mod *soum* of Tuv *aimag* and Hovd City of Hovd *aimag* respectively as well as to numerous other major cities and rural areas.

Currently G-Mobile network covers 285 *soums* and settlements of 21 *aimags* and provides CDMA 2000 1x/EV-DO, DC-HSPA+ 3.99G technology to 500,000 subscribers nationwide. According to the officials of Information Technology and the Post and Telecommunications Authority of Mongolia, 4G will be introduced in 2016.

**Mobile broadband.** According to 2014 CRC statistics, there are 4.963 million mobile subscribers, out of which 1.7 million are smartphone users who can access the Internet through their mobile devices. This highlights the importance of mobile networks not only for basic voice services, but for data services as well. As the officials of CRC pointed out, there is a forecast that consumption of data services will be increased in the near future. A lack of mobile broadband network coverage or the higher cost of ownership is likely to be the key reason for this, or a combination of both.

**Terrestrial backbone fibre optic networks.** Mongolia has five major backbone networks. The resulting major commercial networks are:

- ☐ Netcom LLC
- ☐ Sky Networks LLC
- ☐ Mobinet LLC
- ☐ Gemnet LLC
- ☐ Railcom (Ulaanbaatar Railway)

Netcom is a state-owned information and communications network company, that owns around 17,000 km long fibre optic lines across country and has a commitment to ensure technical and technology background for delivering voice, Internet, radio and television broadcasting services to all people and communities throughout Mongolia by ensuring reliable operation and maintenance of the state-owned high speed networks at national, long distance and local levels.

Netcom's fibre optic network covers Ulaanbaatar, 21 *aimags* and 227 *soums*, and offers network wholesale services to service providers and operators that provide all kinds of information technology and telecommunications services.

The project on "Expansion and renovation of Information and communications backbone network" was carried out in 2013 and connected 140 *soums*.

Netcom is the country's largest Internet Protocol (IP) network providing access for all major Internet service providers (ISPs) nationwide, through a 50 Gbps Multi-Protocol Label Switching (MPLS)-enabled IP backbone using Synchronous Digital Hierarchy (SDH) and Dense Wavelength Division Multiplexing (DWDM) technologies. The vast majority of backbone fibre is installed underground, providing the best possible robustness against damage, e.g. due to natural disasters. Mobicom's MobiNet also covers all 21 *aimags* of the country, uses the same state-of- art technologies and offers many of the same features. The fibre optic backbone network has a total length of 7,342 km with a total trunk capacity of 7,664 Gbps. 190 Gbps are available for interconnection with other domestic operators.

**THE UNIVERSAL SERVICE OBLIGATION FUND.** According to the Communications Law and the Government Special Fund Law of Mongolia, the Universal Service Obligation Fund (USOF) was established in 2006.

The main objectives of this fund is to provide access and deliver information and communications services to Mongolian citizens regardless of their locations and living conditions, and to bring service delivery infrastructure to remote areas. The activities Building e-Resilience: Enhancing the Role of ICTs for DRM in Mongolia of the fund are maintained principles through non-discrimination of service providers, promotion of fair competition environment, and provisioning of transparency.

The Fund covers and implements projects and programmes in five fields covering mobile communications, Internet, radio, television, post, research and awareness.

During 2010-2013, through the projects and programmes implemented by the USOF, 42 *soums* and 35 remote settlements of 18 *aimags* have an access to mobile communications network. 25 *soums* of 14 *aimags* have connected to the information and communications infrastructures, with improved quality and coverage of existing mobile communications. Technical facilities of operators and power lines and fibre optic cables and antenna towers were established. Also, technical conditions of wireless Internet services for residents from three remotely located districts of Ulaanbaatar and 118 *soums* of 18 *aimags* are improved.

## 5. Activities Timelines of this project

**Updated chedule**

| | | 2015 | | | | | | | | | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| № | Activity | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb |
| 1 | Startup | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Kickoff meeting | | | | | | | | | | | | |
| 3 | Site survey | | | | | | | | | | | | |
| 4 | Study and design | | | | | | | | | | | | |
| 5 | Research in Japan | | | | | | | | | | | | |
| 6 | Preparation | | | | | | | | | | | | |
| 7 | Installation | | | | | | | | | | | | |
| 8 | Acceptance test | | | | | | | | | | | | |
| 9 | Final evaluation | | | | | | | | | | | | |
| 10 | Reporting | | | | | | | | | | | | |

## 6. Preparation

1) Re-Establish the project team in both side and communication by e-mail/voice. We should be replace two persons Ms.Oyuntsetseg /officer of ITPTA/ instead of Ms. Uranchimeg and Mr. Naranmandah /representative of CRC/ instead of Mr.Altankhuyag.

2) Agreement of objectives, milestone and role for this project
   - To get the permission of landowner or governor
   - To find the coordinate information such as longitude, latitude and altitude of Site antenna for satellite control
   - To do the environment test
   - To make the system design
   - To describe the equipment such as site server, access points, VSAT system facilities, and cables
   - To build the fence of the Dish antenna
   - To install the equipment to three site

## 7. Kickoff meeting and Site survey

### 1 ) Research and visit

We evaluated the population, infrastructure, and domestic market of 10 suitable sites and we selected only three sites. / Attached the selectable 10 sites/

If need, we are going to meet with governor of the soum / site/.

## 2 ) Discussion

- Had common understanding of importance and benefit of this project
- Had common understanding of APT project budget and schedule
- Selected 3 villages near Mongolia boundary, Khatanbulag, Khalkh and Tsagaannuur
- Agreed basic design of this system (Intelsat satellite and WiFi)
- Agreed to review WiFi technical specifications (KDDI Foundation)
- Agreed to get best price quote of satellite bandwidth (ITPTA)
- Agreed to get price quote of VSAT antenna and related equipment (ITPTA)
- Agreed to review transportation cost (ITPTA)
- Agreed to get consent from villages (Soums) on monthly cost of satellite bandwidth (ITPTA)
- Agreed Tokyo meeting scheduled for June 22-26
- Agreed KDDI Foundation to provide Invitation Letter for Tokyo meeting (KDDI Foundation)
- Agreed to update member list of this project (ITPTA and KDDI Foundation)

Courtesy Visit to Chairman of ITPTA

Project Memgers


Discussion in front of map of Mongolia


Visit to Artust Soum where VSAT has been installed and in use

# 8. Research, Study and Discussion in Japan

## 1) BSAT

June 23, 2015

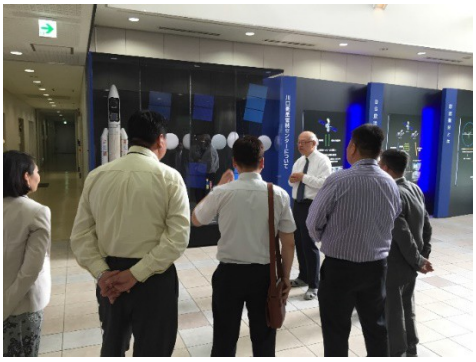
Studied and discussed about their Organization and Role of division. Visited their Satellite Control Center and Antenna facility.

Attendee:

Mr. Yoshinori Hattori, Director, Satellite Control Center Mr. Osamu Miyazaki, Senior Associate Director

Mr. Hiromasa Tanaka, Senior Associate Director Mr. Tomohiko Sugimoto, Associate Director Mr. Yoshiya Sasa, Associate Director

Mr. Tsuyoshi Tachino, Senior Engineer




Model Rocket used to launch satellite In front of Satellite Antenna

## 2) Ministry of Interior and Communications (MIC)

June 24, 2015

Studied and discussed about “Recent Space Communication Policy in Japan” , “Japan’s contribution to APT” and “APT project in Mongolia”.

Attendee:

Mr. Kimihiko Kimura, Director, International Cooperation Division

Mr. Kenji Kaneko, Deputy Director

Mr. Koichiro Oda

Ms. Kayo Hiraiwa, Space Communication Policy Division

Mr. Hiroyuki Sakurai, Senior Policy Advisor

Discussion at MIC office

### 3) Japan International Cooperation Agency (JICA)

June 25, 2015

Studied and discussed about "JICA's Cooperation Strategy and Trend in Mongolia" and future possible ICT related project.

Attendee: JICA
Mr. Yoshihisa Kasuya, Director, East Asia Division
Mr. Ryotaro Oda, Assistant Director Ms.
Risako Morikawa
Padeco Co.,Ltd.
Dr. Kenji Kimura, Principal Consultant
Mr. Akira Akasaka, Deputy General Manager

Discussion at JICA office

### 4) Discussion with KDDI Corporation

June 24, 2015

Discussed about Mobile service in Mongolia. Attendee:
Mr. Hiroshi Kamogawa, Head, Global Consumer Business Division
Mr. Koji Shikano, Director Mr.
Ko Mizutani, Manager
Ms. Yoko Hirano, Assistant Manager

### 5) Discussion with KDDI Foundation

June 22-26, 2015

Discussed about the project as shown below. Attendee:
Mr. Yutaka Yasuda, President of KDDI Foundation
Mr. Masazumi Inoue, Vice President Mr.
Yosuke Uchiyama, Deputy Director Mr.
Yoshihiro Nakayama, Manager

Discussion at KDDI Foundation office

## 6) Discussion and result

Agreed Equipment to be used in 3 soums as shown below

- Tsagaannuur soum of Khuvsgul province
- Khatanbulag soum of Dornogovi province
- Khalkhgol soum of Dornodprovince

The list of Satellite communication equipment:

| Type of equipment | Q | Specification |
|---|---|---|
| Antenna 1.8m | 1 | A set Satellite communication equipment |
| Satellite router | 1 | |
| LNB | 1 | |
| Transmitter (BUC) | 1 | |
| Antenna mount | 1 | |
| Feed horn, Cable connector and other accessories | 1 | |
| 2.4GHz Outdoor Access point UAP-Outdoor+AMO-2G with 10dBi | 1 | Omni directional antenna for connect to client antennas |
| 2.4GHz Flat antenna and router | 3 | install on the Government, Hospital and School |
| Other (switch, LAN cable…etc ) | 1 | For LAN network |
| Installation and transportation | 1 | Total installation and transportation to the Tsagaannuur |

Satellite internet service fee:

| Type of service | Month |
|---|---|
| Internet connection /1.5Mbps/ | 12 |

Agreed equipment price to be discounted to US$39,255.
Discussed installation schedule as shown below

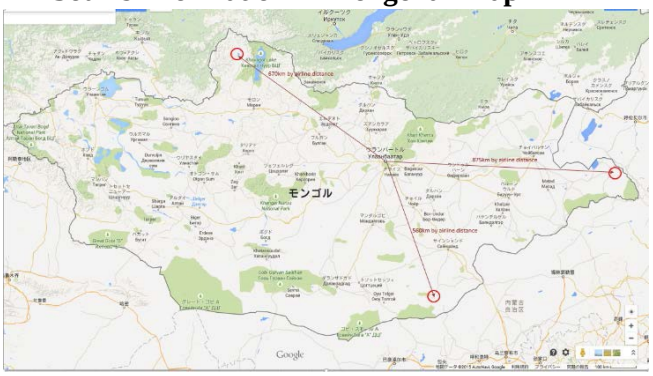
| | |
|---|---|
| 24 Aug | Preparation |
| 25 - 30 Aug | Installation in Tsagaannuur soum and other 2 soums |
| 31 - 4 Sep | Inspection in Khatanbulag soum and Khalkhgol soum |
| 5 Sep | Closing Meeting |
| 6 Sep | Spare |

Others
Equipment invoice will be from ISATCOM to ITPTA, ITPTA to KDDI Foundation in US$ amount.

# 9. Installation and experimentation

## 1) Design

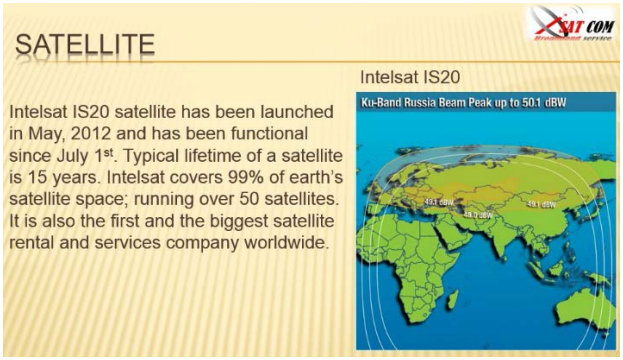
- **Soums information in Mongolian map**




**Tsagaannuur** is a sum of Khövsgöl aimag. In 2000, Tsagaannuur had a population of 1,317 people. The sum center is located at 1048 km from Ulaanbaatar.
**Khalkhgol** is a sum (district) of Dornod Province in eastern Mongolia. There are 3,203 people in the sum, including 1,756 in the sum center. The sum center is located at 1012 km from Ulaanbaatar.
**Khatanbulag** is a sum (district) of Dornogovi Province in southeastern Mongolia. There are 2,972 people in the sum, including 603 in the sum center. The sum is located 682 km from Ulaanbaatar.

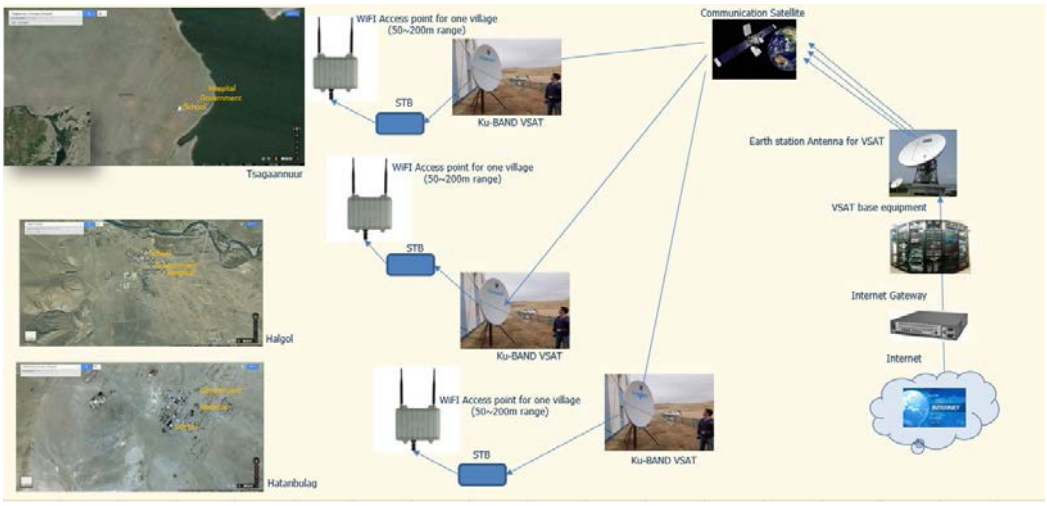
- **Satellite**

Intelsat IS20 Satellite, Ku-band, is to be used.




- **Diagram**

Regarding to the below scheme, each site is connecting to the satellite.




- **The list of Satellite communication equipment:**

| Type of equipment | Q | Specification |
|---|---|---|
| Antenna 1.8m | 1 | A set Satellite communication equipment |
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| Feed horn, Cable connector and other accessories | 1 | |
| 2.4GHz Outdoor Access point UAP-Outdoor+AMO-2G with 10dBi | 1 | Omni directional antenna for connect to client antennas |
| 2.4GHz Flat antenna and router | 3 | install on the Government, Hospital and School |
| Other (switch, LAN cable…etc ) | 1 | For LAN network |
| Installation and transportation | 1 | Total installation and transportation to the Tsagaannuur |

2) **Schedule**

Schedule in Tsagaannuur

| Organization & Members | DATE | DAY | TIME | ACTIVITY |
|---|---|---|---|---|
| 1. Mr.Batbayar Head of Space communications division of ITPTA Mongolia<br><br>2. Mr.Ochirkhuu Universal Service Obligation Fund Mongolia<br><br>3.Mr.Uchiyama KDDI Foundation Japan<br><br>4.Mr.Nakayama KDDI Foundation Japan<br><br>5.Mr.Bumchin CEO ISATCOM LLC. Mongolia<br>6. Installation engineers ISATCOM LLC Mongolia | Aug-25 | Tue | 8:00~09:00 | Breakfast at Bayangol Hotel |
| | | | 09:00~13:00 | Go to Ulaanbaatar → Erdenet City |
| | | | 13:00 ~14:00 | Lunch at Erdenet City |
| | | | 14:00~19:00 | Go to Erdenet City → Khuvsgul province centre |
| | | | 19:00 | Check in Hotel at Province centre |
| | | | 19:00~20:00 | Dinner at Hotel<br>Team members with Governor |
| | Aug-26 | Wed | 9:00~10:00 | Breakfast at Hotel & Check out |
| | | | 10:00~13:00 | Go to Khuvsgul province center → Tsagaannuur soum |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~18:00 | Go to Tsagaannuur soum |
| | | | 18:00 | Check in Hotel at Soum centre |
| | | | 19:00~20:30 | Dinner at Hotel<br>Team members with Governor |
| | Aug-27 | Thu | 9:00~20:00 | VSAT system Installation & in Service |
| | Aug-28 | Fri | 8:00~9:00 | Breakfast at Hotel |
| | | | 10:00~12:30 | Inspection & Project Ceremony<br>Team members with Government (School, Hospital) |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~17:30 | Inspection |
| | | | 18:00~20:00 | Dinner with Government Organization |
| | Aug-29 | Sat | 9:00~10:00 | Breakfast at Hotel & Check out |
| | | | 10:00~13:00 | Back to Khuvsgul province centre |
| | | | 13:00 ~14:00 | Lunch |
| | | | 14:00~18:00 | Back to Khuvsgul province centre |
| | | | 18:00 | Check in Hotel at Province centre |
| | | | 19:00~20:00 | Dinner at Hotel |
| | Aug-30 | Sun | 8:00~9:00 | Breakfast at Hotel & Check out |
| | | | 9:00~13:00 | Back to Ulaanbaatar |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~19:00 | Back to Ulaanbaatar |
| | | | 19:00 | Bayangol Hotel In UB |

Schedule in Khatanbulag

| Organization & Members | DATE | DAY | TIME | ACTIVITY |
|---|---|---|---|---|
| 1.Mr.Batbayar Head of Space communications division of ITPTA Mongolia<br><br>2.Mr.Uchiyama KDDI Foundation Japan<br>3. Mr.Baldansambuu Officer of Space communications division of ITPTA Mongolia<br><br>4.Mr. Munkhsukh ISATCOM LLC. Mongolia | Aug-31 | Mon | 8:00~09:00 | Breakfast at Bayangol Hotel |
| | | | 09:00~11:00 | Go to Ulaanbaatar → Gobi-Sumber province centre |
| | | | 11:00 ~12:00 | Lunch at Gobi-Sumber province centre |
| | | | 12:00~17:00 | Go to Gobi-Sumber province →Dornogobi province centre |
| | | | 17:00 | Check in Hotel at Province centre |
| | | | 18:00~20:00 | Dinner at Hotel<br>Team members with Governor |
| | Sep-1 | Tue | 9:00~10:00 | Breakfast at Hotel & Check out |
| | | | 10:00~12:00 | Dornogobi province center → Khatanbulag soum |
| | | | 12:00~13:00 | Lunch |
| | | | 13:00~17:00 | Go to Khatanbulag soum |
| | | | 17:00 | Check in Hotel at Soum centre |
| | | | 18:00~20:00 | Dinner at Hotel<br>Team members with Governor |
| | Sep-2 | Wed | 8:00~9:00 | Breakfast at Hotel |
| | | | 10:00~12:30 | Inspection & Project Ceremony<br>Team members with Government (School, Hospital) |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~17:30 | Inspection |
| | | | 18:00~20:00 | Dinner with Government Organization |
| | Sep-3 | Thu | 9:00~10:00 | Breakfast at Hotel & Check out |
| | | | 10:00~12:00 | Back to Dornogobi province centre |
| | | | 12:00 ~13:00 | Lunch |
| | | | 13:00~17:00 | Back to Dornogobi province centre |
| | | | 17:00 | Check in Hotel at Province centre |
| | | | 18:00~19:00 | Dinner at Hotel |
| | Sep-4 | Fri | 8:00~9:00 | Breakfast at Hotel & Check out |
| | | | 9:00~11:00 | Back to Ulaanbaatar |
| | | | 11:00~12:00 | Lunch |
| | | | 12:00~17:00 | Back to Ulaanbaatar |
| | | | 17:00 | Bayangol Hotel In UB |

Schedule in Khalkhgol

| Organization & Members | DATE | DAY | TIME | ACTIVITY |
|---|---|---|---|---|
| 1. Mr.Ochirkhuu Universal Service Obligation Fund Mongolia<br><br>2.Mr.Nakayama KDDI Foundation Japan<br>3.Mrs.Oyuntsetseg Senior officer of Space communications division of ITPTA Mongolia<br><br>4.Mr.Dulguuntengis ISATCOM LLC. Mongolia | Aug-31 | Mon | 8:00~09:00 | Breakfast at Bayangol Hotel |
| | | | 09:00~13:00 | Go to Ulaanbaatar → Khentii province centre |
| | | | 13:00 ~14:00 | Lunch at Khentii province centre |
| | | | 14:00~19:00 | Go to Khentii province cnetre →Dornod province centre |
| | | | 19:00 | Check in Hotel at Province centre |
| | | | 19:00~20:00 | Dinner at Hotel<br>Team members with Governor |
| | Sep-1 | Tue | 9:00~10:00 | Breakfast at Hotel & Check out |
| | | | 10:00~13:00 | Dornod province center → Khalkh gol soum |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~19:00 | Go to Khalkh gol soum |
| | | | 19:00 | Check in Hotel at Soum centre |
| | | | 19:30~20:30 | Dinner at Hotel<br>Team members with Governor |
| | Sep-2 | Wed | 8:00~9:00 | Breakfast at Hotel |
| | | | 10:00~12:30 | Inspection & Project Ceremony<br>Team members with Government (School, Hospital) |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~17:30 | Inspection |
| | | | 18:00~20:00 | Dinner with Government Organization |
| | Sep-3 | Thu | 9:00~10:00 | Breakfast at Hotel & Check out |
| | | | 10:00~13:00 | Back to Dornod province centre |
| | | | 13:00 ~14:00 | Lunch |
| | | | 14:00~19:00 | Back to Dornod province centre |
| | | | 19:00 | Check in Hotel at Province centre |
| | | | 19:00~20:00 | Dinner at Hotel |
| | Sep-4 | Fri | 8:00~9:00 | Breakfast at Hotel & Check out |
| | | | 9:00~13:00 | Back to Ulaanbaatar |
| | | | 13:00~14:00 | Lunch |
| | | | 14:00~19:00 | Back to Ulaanbaatar |
| | | | 19:00 | Bayangol Hotel In UB |

## 3) Installation

(1) Tsagaannuur

**Tsagaannuur** (Mongolian: Цагаannуур = *white lake*) is a sum of Khövsgöl aimag. The area is 5,410 km². In 2000, Tsagaannuur had a population of 1,317 people, of which most identified themselves as Darkhad. 269 inhabitants identified themselves as Tsaatan. The sum center, officially named *Gurvansaikhan* (Mongolian: *Гурвансайхан*), is located at the shore of Dood Tsagaan nuur, 279 km north-northeast of Mörön and 1048 km from Ulaanbaatar.

VSAT Antenna in front of Local Government Office

Opening Ceremony at School

WiFi Antenna at Hospital

(2) Khatanbulag

**Khatanbulag** is a soum of Dornogovi Province in southeastern Mongolia. There are 2,972 people in the sum, including 603 in the sum center. The area of the sum is 18,670 km², with a population density of 0.16 people/km². the sum is located 231 km from Sainshand and 682 km from Ulaanbaatar.

Local Government Office


VSAT Antenn

Opening Ceremony

**(3)** Khalkhgol

**Khalkhgol** is a soum of Dornod Province in eastern Mongolia. There are 3,203 people in the sum, including 1,756 in the soum center. The area of the sum is 28,093 km², with a population density of 0.11 people/km². The sum center is located at the shore of Khalkha river , 356 km from Choibalsan and 1012 km from Ulaanbaatar.

Head of Local Government Doctor's desk

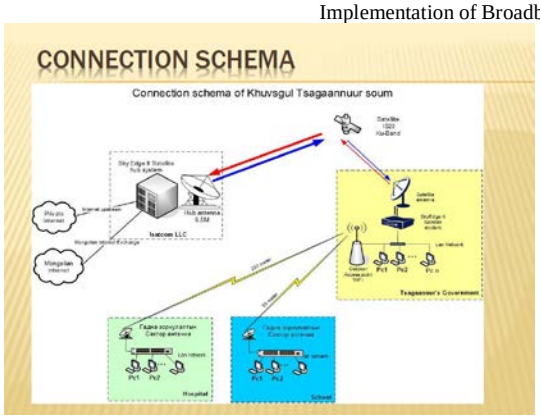
Opening Ceremony

## 10. Evaluation

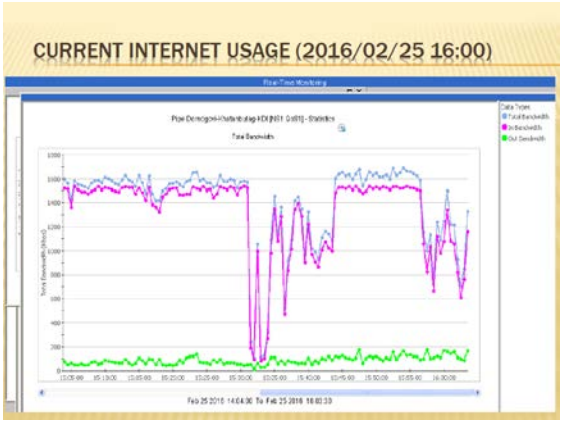
### 1) Operation (System, Service and Contents)

According to the site soum's governors and people really appreciate this project. Therefore, they are happy to use internet by satellite service without any fee a year. They can contact and share any information to their respective people and business partners. So the project was implemented fully operation in three soums and was creating good systems with good service and enough contents.

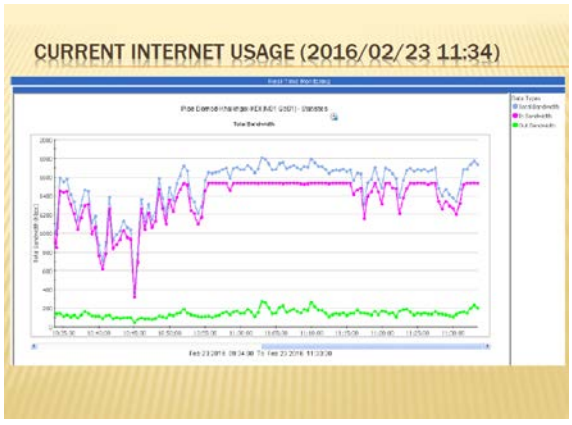
As shown in traffic graphs below, three soums uses at almost 1.5Mbps of maximum speed.




Khatanbulag soum

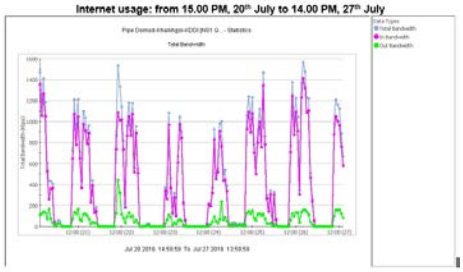




Khalkhgol soum

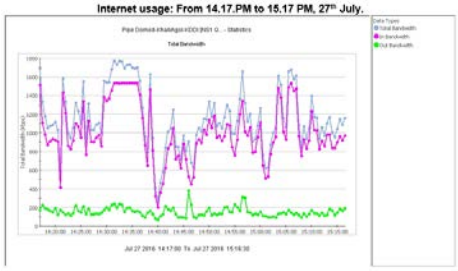



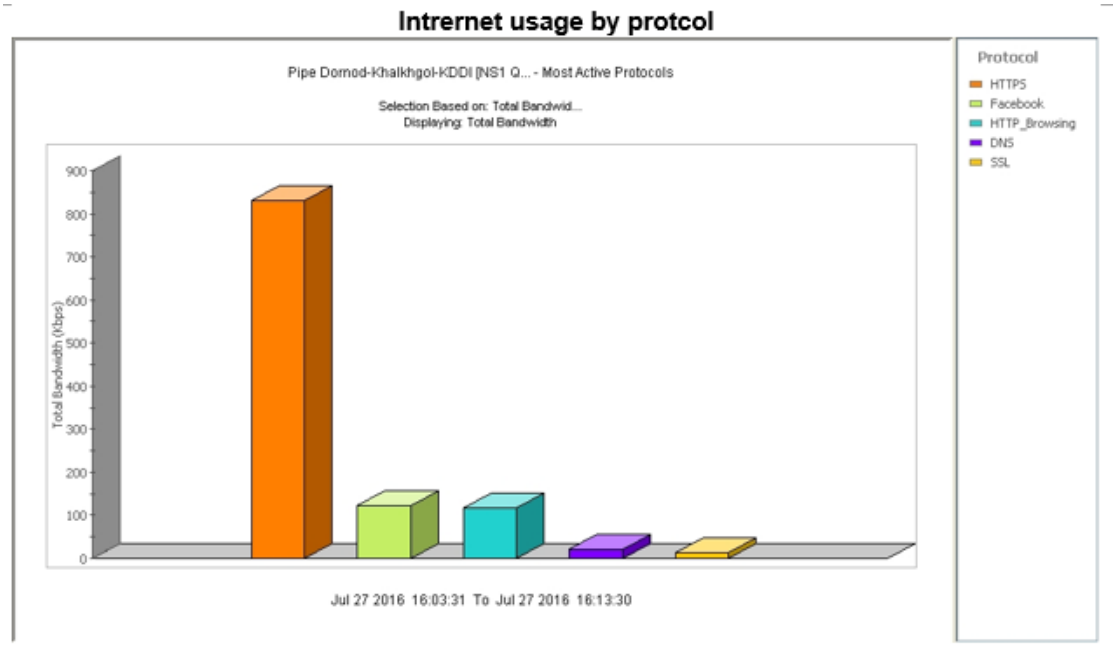
Khalkhgol soum

Internet usage: from 15.00 PM, 20th July to 14.00 PM, 27th July

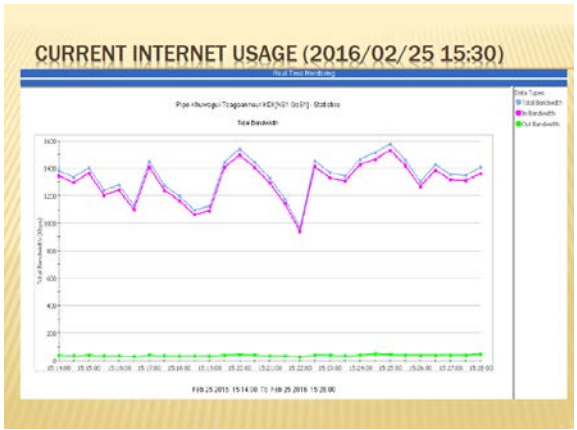


Internet usage: From 14.17.PM to 15.17 PM, 27th July.



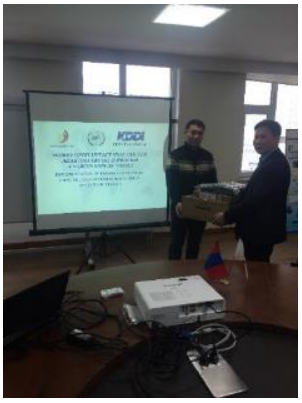


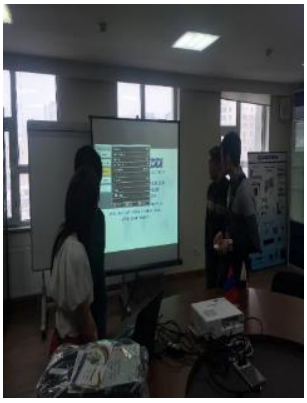

Tsagaannuur soum

## 2) Maintenance and Training (Skill-up)

Belongs to this project, the company has been provided the equipment's maintenance and training. The people can do use the computer, projector and other equipment s without any trouble.
In future, they will able to develop their knowledge by internet regarding to this project.







## 3) Quality of life in the location

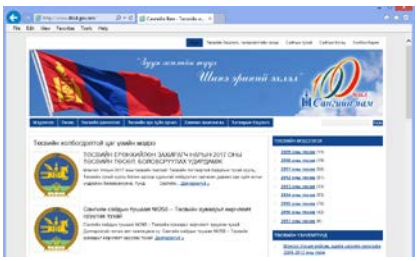
In the site soums , the people could be use the internet application and improved the daily life quality in regarding.

- Local Government

- The local government use the internet for daily service such as;
  - to exchange information to administrative organization
  - to share some issue to the ministry than receive their feedback
  - to transfer the photo and documents for government and other related organizations

For example,

- Tsangaanuur soum is easily connecting and sharing information with other local administrations and government organizations, and increased information (report, online meeting, e-mail et.c) exchange delivered on time. Before they only using the postal service or telephone, now they can report by e-mail or online meeting. It saves much time and budget (transport cost, gas cost...).
- Their intention is to use more applications such as Integrated Legal System, Local administration budget and procurement online system and Public service online system.

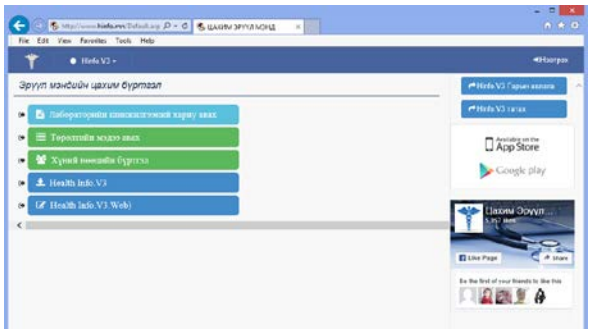
- Hospital

- The hospital use the internet for daily service such as;
- to exchange information to administrative organization
- to find some creative knowledge for local management
- to share the patient's information to university professors than received some advance
- to do some treatment by online

For example,

- The hospitals of all soums fully connected to Health info 3.0 online system.

This is portal site designed for all public hospitals. For registering all patients info and history, pregnant mothers registration and monitoring. And other statistical data including public health service. Diagnosis and Treatment info, Laboratory test, drug reference and order modules available


Health info 3.0 online system

➢ School

➢ The school use the internet for daily service such as;
- to exchange information to administrative organization
- to use the online education programs
- to create some programs for student knowledge
- students use internet there are free time and to study

**Some important results:**

1. Children's academic performance increased by 35% in Khalkhgol soum
2. Successful general admission test result increased by 20% from previous years in Tsagaannuur sum
3. Tsagaansum soums is ranked in Best 10 soums among the 24 soums of Khuvsul aimag

Letter from Governor

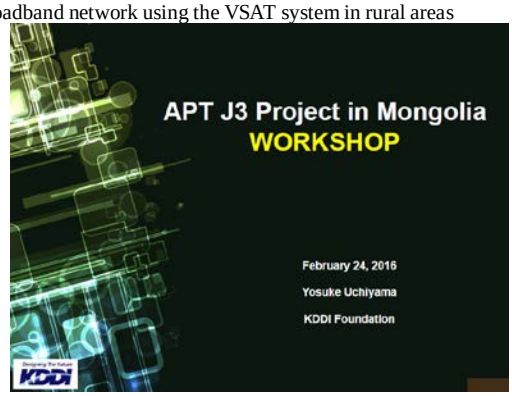
4) **Future Issues**

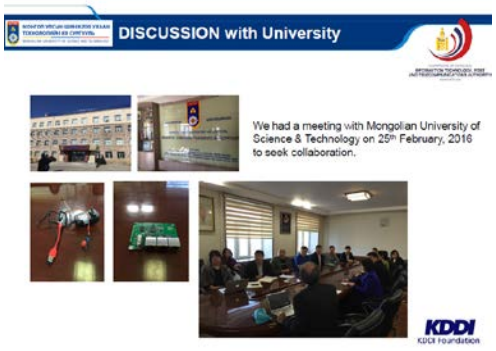
The soums governer office, school, hospital and other organizations will bear the cost to insert local expense for 2nd year. If they could not insert the budget to local governors expense.
In the future, the site is may be become difficulty to bear the satellite cost fee. There are some ideas shown below.

- Some direct and indirect costs decreased in 3 soums (postal service cost, working time, transport cost et.c)
- Asking reduce the Internet service price to Provider
- Working to find a budget with Government special fund "Soum Development Fund"
- Trying to find businesses and individuals to develop applications and to provide appropriate mechanisms for sharing revenue for the use of their application and content

## 11. Public Presentation

We reported all project results to the workshop participants in Ulaanbaatar in February 2016.





## 12. Summary of achievements and contributions

The achievement and results of our project will contribute below items;

- The main social impact of the project is expected to be the greater availability of and access to telecommunications and information services for some of Mongolia's poorest and isolated rural citizens.
- Ready access to quality telecommunications services in rural areas is one of the most important factors in overcoming isolation, enhancing economic activity and promoting social integration of these areas with the rest of the country.
- The project will enable ICTs to become a driver for sustainable economic growth and potentially enable the government to use ICTs to provide services, including education and market information in rural area of Mongolia.

Letter of Appreciation from Governor of Khatanbulag

Letter of Appreciation from Governor of Tsagaannuur

Letter of Appreciation from Governor of Khalkhgol

Appreciation from ITPTA Chairman

## 13. Accounting (Final) summary

Refer to "Accounting Report".

## 14. Conclusion (Final)

This pilot project gives us many benefits to rural area development and citizens in Mongol, especially following 4 points.

- encourage our governments and other public services to enhance their integration with the ICT broadband system in providing easy to use, transparent, and quality services to our citizens

- provide incentives to businesses, particularly SMEs(Small and Medium Enterprises) and individuals, to develop applications and to provide appropriate mechanisms for sharing revenue for the use of their application and content
- encourage regional use of content and applications for widening the scope and extent of the regional market and to take the best advantages of regional needs and strengths
- encourage content and application sharing among member countries in a non commercial scheme for non commercial use.

In the future, we would like to continue this project and to use satellite service to the remote soums. On the other hand, optic fiber backbone network expansion is ongoing. We'll continue to use of both medias depending on natural condition (weather and landscape). We are working on a guideline or recommendation paper on which media can be used.

The Apt J3 pilot project became good example for our future satellite communication service.

This year, we started to install VSAT system for Government organizations and public in 6 additional soums. The project is funded by Universal Service Obligation Fund.

- Arkhangai province, Chuluut soum
- Bayankhongor province, Bayanlig soum
- Dornogovi province, Khuvsgul soum
- Zavkhan province, Otgon soum
- Khovd province, Uench soum
- Khentii province, Dadal soum

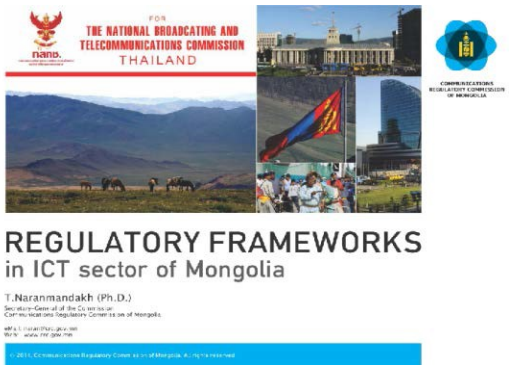
**ANNEX**

# Annex

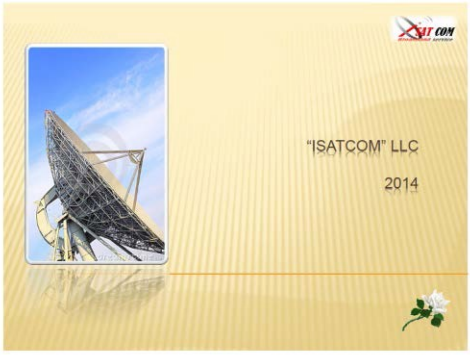
## 1) Material

Presentation Material of ITPTA


Presentation Material of CRC




Presentation Material of Isatcom




## 2) Acronym

| | |
|---|---|
| APT | Asia-Pacific Telecommunity |
| CRC | Communications Regulatory Commission in Mongolia |
| ICT | Information Communication Technology |
| ITPTA | Information Technology, Post and Telecommunication Authority in Mongolia |