# Key Note Speech

## The Impact of Satellite Communications on Information Infrastructure

Towards a Ubiquitous Network in the Broadband Age

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**I am Ichiro Taniguchi, of Mitsubishi Electric.**
**Today, with the given subject, I will take a look primarily at the role that satellite communications should fulfill in the info-communications infrastructure of the world of the 21st century, and hope to provide you with food for thought that will lead to earnest discussions here at ICSSC-21.**

**39 years have gone by since the first satellite communications using stationary satellites were made practicable by the Syncom 3 satellites in 1964. During this span of time, satellite communications have secured a uniquely important position in the world's communications**

**infrastructure.**

**In particular, important applications today are the following:**

**First, utilization of the roving capability, one of the advantages of satellite communications, has become essential for the simultaneous relay to the entire world of major international events such as the Olympics and the World Cup, and of incidents such as the 9-11 terrorist attacks, and the war in Iraq.**

2002 World Cup

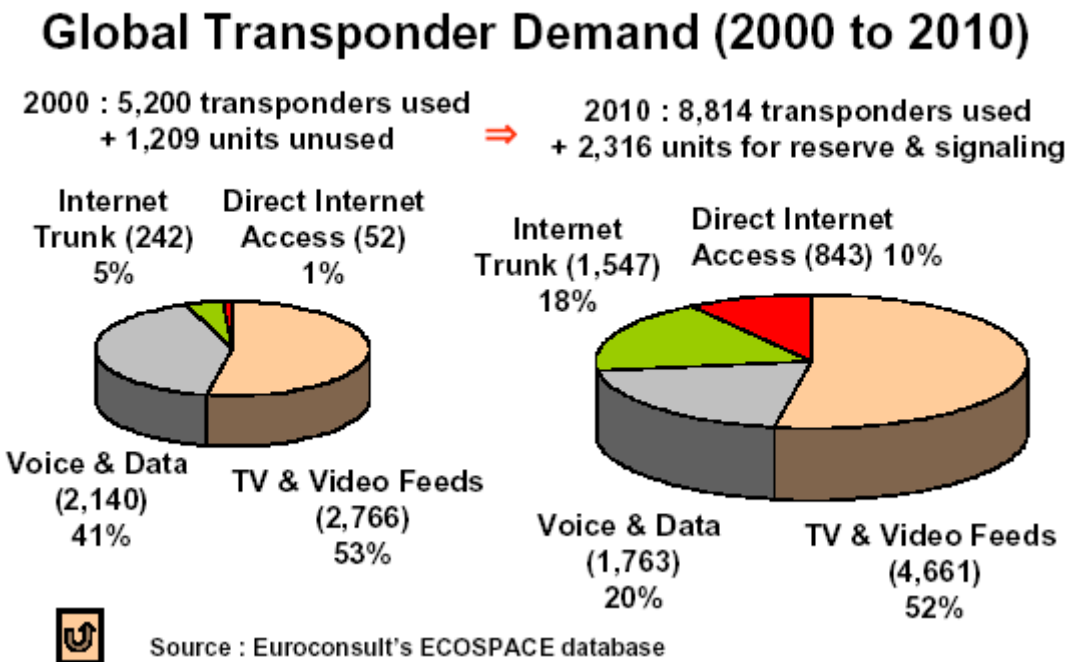
3 HD Panoramic Images transmitted by Satellite at 155 Mbps

Source: Communications Research Laboratory Symposium

**This shows a transmission experiment jointly conducted by the Japanese and Korean government organizations for last year's World Cup. With transmission speed of 155 Mbps and using 10m x 15m large-scale, high definition displays, public demonstrations were done at 4 locations in Japan and Korea in total.**

**Also, taking advantage of the ability to transmit the same information to multiple locations simultaneously, so-called multimedia multi-channel broadcasting of images, sound and data, forms the mainstay of satellite use.**

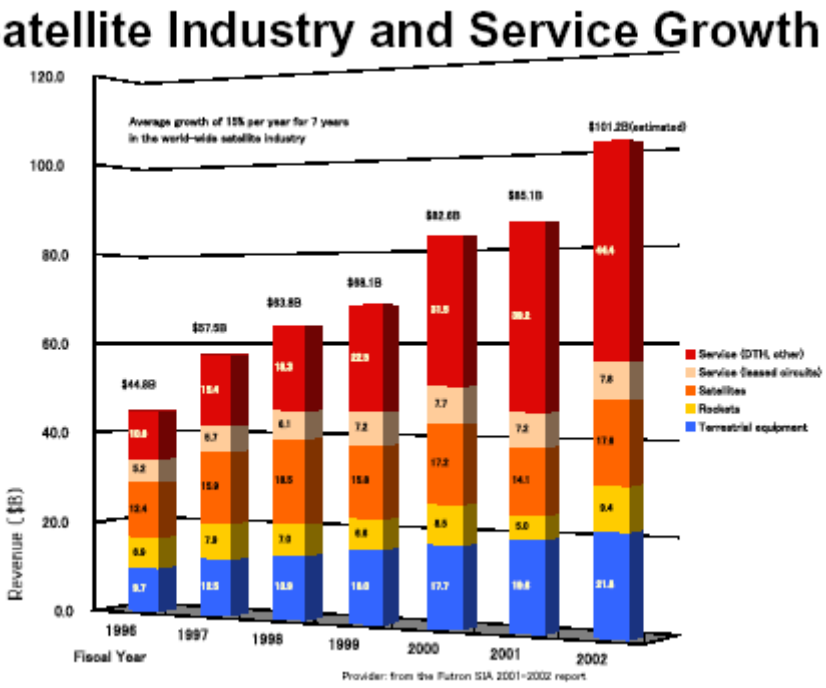
**The second example of applications is that because high-speed networks can be set up in a short period of time, the use of satellite communications, particularly in international circuits, is increasing sharply for the Internet backbones as the Internet is rapidly spreading.**




**This graph is based on a study conducted by Euroconsult. It reports that the number of transponders needed in the year 2010 will be approximately double the number in the year 2000.**

**You will notice that "Internet Trunk" portion in green and "Internet Access" portion in red increase rapidly and "Voice & Data" portion deceases instead.**

**Thirdly, as a means of communication in times of emergencies such as major disasters, the satellite communications are important. I think it is still fresh in everyone's memory that the satellite communications played the essential role as the sole backup to terrestrial systems at the time of the Hanshin [Kobe] Earthquake here in Japan 8 years ago.**




**This graph has been reprinted from Futron's study report. The space business, including service provisioning, has shown an average growth of 15% per year over the last 7 years.**

**Amidst that, the satellite communications has achieved high growth averaging 22% per year.**
**Particularly, in contrast to the slump in the terrestrial communications, the GEO business is stable with high earnings.**
**In addition, centered on the use of the Iridium System by the U.S. military, LEO business is also starting to pick up again.**

**Even in the communications industry that is said to be in a recession, the situation for the satellite communications field was slightly different. However, procurement of new satellites was small in quantity in 2002, and we see a slim chance to expect for a time in the future such a high growth as before.**

**I would now like to talk about the relationship between the satellite communications and the "ubiquitous network society" that is supposed to become a reality in the 21$^{st}$ century.**

**The realization of a ubiquitous network, in other words a network that "lets you use networks, terminals and content information freely, stress-free and worry-free, wherever you are without being consciously aware of it," is anticipated as a further evolved stage in the world of info-communications.**

**The realization of a ubiquitous network will bring about various ripple effects and changes to appear in our overall social lifestyle. Centering on services and commerce, the Japanese government's calculations predict an enormous economic ripple effect of 30.3 trillion yen in 2005 and 84.3 trillion yen in 2010.**

**In order to make this ubiquitous network a reality, it is necessary to do research and development of info-communications related technology in every possible field.**
**My view is that, among these technologies, it is the satellite communications that are essential and indispensable to the realization of such a ubiquitous network.**

**Looking towards realization of a ubiquitous network, the role of satellite communications will be to handle those areas that cannot be covered by the terrestrial networks. With this role, I think a true merger of terrestrial and satellite systems will be realized, and we can aim for "ubiquitous."**

**The following are the obstacles for realization of a ubiquitous network or what is expected most from the satellite communications:**

**① To instantly lay out a communications network to regions where people have not enjoyed the benefit of a well equipped communications infrastructure**

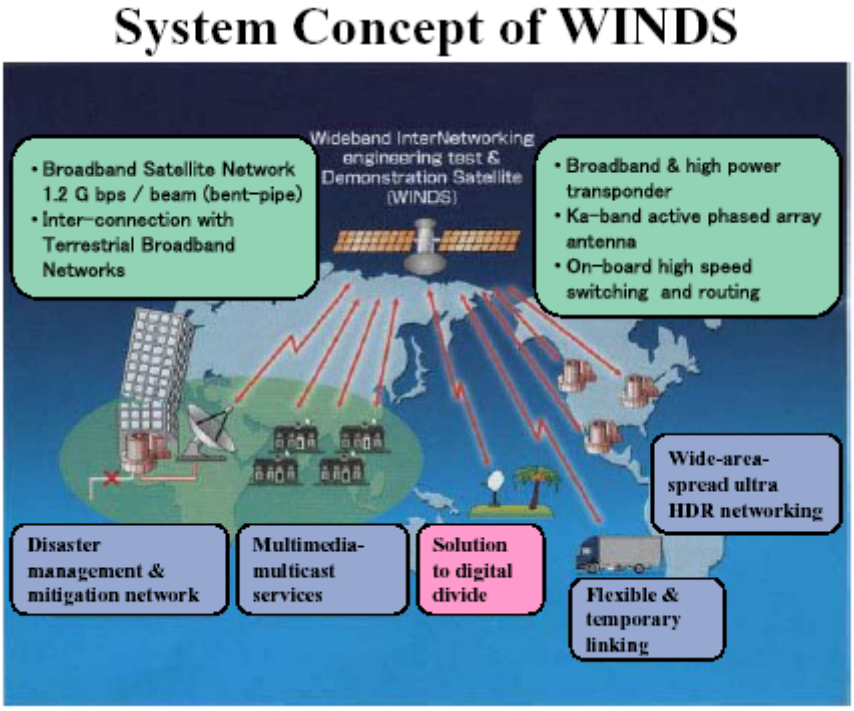
**② To provide appropriate means of communication even in an extensive nomadic or mobile environment. It is said that when people enter a nomadic environment, they immediately fall into a digital divide, thus this expectation.**

**③ To provide a necessary communications network even in a disaster or emergency situation.**

**Utilizing the satellite communications, it becomes possible to provide high-speed communications instantly to regions where no terrestrial network is absolutely feasible because of its construction costs.**

**In addition, you can provide high-speed communications to airline passengers. Further, in the case of automobiles, it becomes possible to provide new services in combination with positioning satellites like the GPS.**

**I would like to present you a few recent applications of satellite communications, directed at the realization of a ubiquitous network.**




**This is the first example. In Japan, there is an idea for a super high speed Internet satellite system. This satellite has 5 missions, one of which is the elimination of the digital divide.**

**Even in Japan, if you go a little away from the cities, the communications infrastructure, excluding fixed telephones, is not always very good. The cause lies in geographical conditions due to the large number of islands and mountainous regions, and, along with this, the enormously high cost of putting in an infrastructure in these places.**

**In Asia, as you know, the land area of these regions is vast and the population in these regions is extremely large compared to other regions. There are Korea, Taiwan, Hong Kong and Singapore, the so-called NIES, and Indonesia, Thailand, the Philippines and Malaysia, which are called the ASEAN 4, and then there are India and China. There are large regional differences among these areas in the ratio of having a communications infrastructure. The ratio for each of the NIES is about the same as that of Japan, but for the ASEAN 4, India and China, it is from 3 to 20%. This is 1/10 to 1/3 compared with that of Japan, still a low ratio.**

**In the future, communications will become more broadband, and the**

**hope for regions with topographical limitations lies with a satellite infrastructure that will be less expensive compared to building a terrestrial infrastructure for high-speed communications network.**


**The second example of the latest applications is shown in the video presentaton.**
**(Show the CBB commercial: not included)**

**The commercial images you just saw were of "ConneXion by Boeing", which Mitsubishi Electric have been jointly developing with Boeing. This service uses satellite communications to provide a high-speed communications infrastructure that is no different from a terrestrial system.**

**This will allow a person to use the Internet even on board an airplane. You will be able to view news and sports programs in real time, and, of course, to exchange business-related documents and data.**

**In addition, it will be possible to grasp a variety of real-time in-flight information, including crisis management inside the airplane.**


**The third example is now shown in another video presentation.**
**(Show the Quasi-Zenith Satellite video: not included)**

**The video you just saw contains some things that may be somewhat of a fantasy now, but it presents you an idea of services using the Quasi-Zenith Satellites.**

**The Quasi-Zenith Satellites are satellites that are in orbit at a certain angle of inclination with reference to a stationary satellite orbit. Selecting this angle of inclination to be approximately 45 degrees, the satellite's orbit is in a position near the zenith over Japan for about 8 hours.**

**Accordingly, with 3 of these satellites, 24-hour service is possible, and you can enjoy better communication with little blockage by buildings and such.**

**By giving these satellites positioning capabilities, the new services you just saw will become possible in the future.**

**What we should do is to make the satellite communications fully play the role as a "social infrastructure" in a ubiquitous network society. To that end, satellite's intrinsic characteristics of "being ubiquitous" should be utilized to the fullest extent in coordination with the terrestrial networks.**
**In order to do that, the following should be achieved:**

**(1) Multimedia-compatible system that can send anything**
**-- Individual formats for media such as TVs, telephones and data will have to be evolved to a format and interface that is common to all of these.**

**(2) Broadband system that allows high-speed communications**
**-- Turning the system to be broadband, the satellite communications will have to be mutually complementary with terrestrial networks that are evolving very rapidly.**

**(3) Seamless connections to terrestrial communications networks**
**-- In order that the user is not aware that communications are being made via satellite, the system will have to be IP-based to start with, and it is necessary to make protocols and formats in common with terrestrial systems.**

**(4) Low-priced circuits and user terminals**
**-- Low pricing that is competitive with terrestrial systems and that does not place an undue burden on users is necessary and essential.**

**(5) Network security**
**-- Much impregnable security will be required.**

**I would like to take the issues I have just raised and turn them into specific development items.**

**As I am not an expert in communications technology, I may be seeking solutions that would be extremely difficult for the experts to come up with, but my opinion is that, if the world is to truly have great expectations for satellite communications, then it is certain that technological breakthroughs that far exceed the current state of affairs are required.**

**First, in the field of communications systems, I think you could summarize it with the expression "realization of Quality of Service or QoS responsive to users' needs."**

**However, because high quality is something that all users want, without limitation, you have to realize customer satisfaction while making effective use of resources, specifically, limited frequency spectrum for wireless communications. To this end it is necessary to develop the following kinds of technology. Although 5 items are**

**shown here, they are further summarized into the following 3 items:**

**(1) Interference resistant and high efficiency communications technology:**

- **Reducing interference, among satellite systems and between satellite and terrestrial systems, will allow more efficient use of frequency spectrum, which is a major issue in wireless communications, thus satellite capabilities will improve exponentially.**

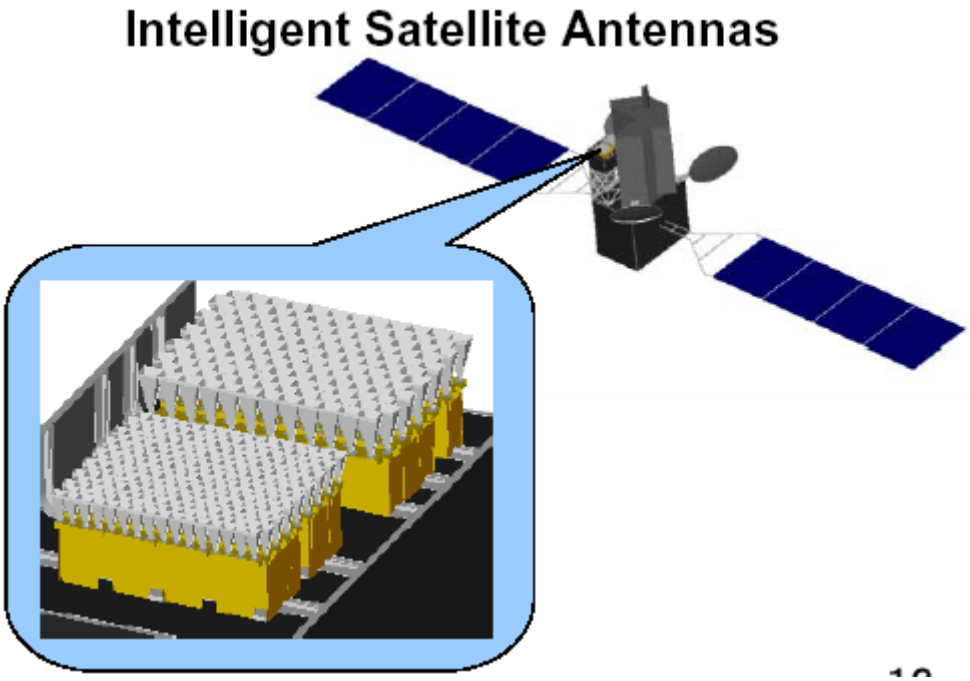
**(2) Communications security technology such as encryption**

- **Because satellite communications can be received by anyone, consideration to security and confidentiality of communications, and anti-jamming arrangement will give users ease of mind.**

**(3) Image compression technology of higher performance**

- **This is to allow effective use of limited frequency spectrum while maintaining quality, and this is directly tied to substantial reduction in unit cost of transponders and improvement of transmission efficiency.**

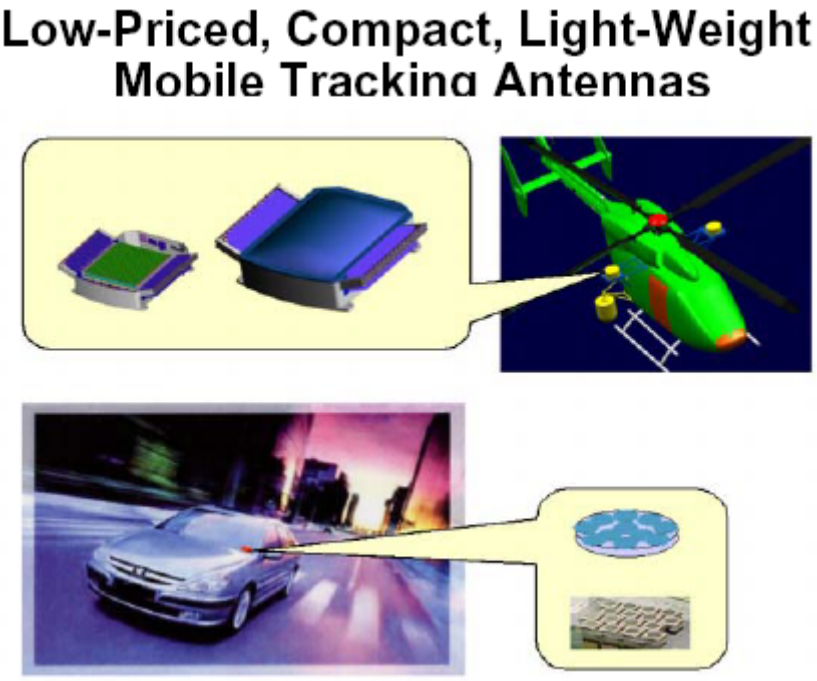
**With respect to hardware in both space and ground segments, technologies that need to be developed in the future are, in particular, related to flexibility and compatibility with terrestrial networks.**




**First is to make satellite antennas intelligent. It is necessary to**

**achieve flexibility in beam and transmission strength.**
**Second is the digitalization of transponders. Issues here are CPUs that are resistant to irradiation, high-speed A/D converters, re-configurable exchange functions and so on.**


**Thirdly, it is necessary to significantly lower the price by standardizing user terminals and making them more software-based, rather than hardware-based.**
**Until significant price reductions are achieved, satellite communications will never play the leading role in a ubiquitous network.**




**Fourth is the development of low-cost, compact, lightweight mobile tracking antennas. In particular, there is a demand for such antennas to be used on automobiles.**
**Last is high performance, low-cost home cache servers. This is definitely needed in order to allow a unicast method of usage while still taking advantage of satellites' strengths in multicasting.**

**As we move towards "a broadband age – a ubiquitous network society," satellite communications are essential to making it possible to experience an enriched IT society wherever you are in the world.**

**I believe it is the greatest expectation and also our mission that we realize a ubiquitous network society as early as possible utilizing satellite communications in particular.**
**In order to make this a reality, there should be an even greater joining of forces in technology development efforts by those involved in satellite communications.**

**(1) It is necessary to quickly and aggressively develop technology that can be comparable favorably to terrestrial communications technology, which is evolving at an astounding speed. Also, we must particularly focus our efforts on the development of low-cost, high performance user terminals, which are most important to the realization of a ubiquitous network society.**

**(2) We should also rectify the current overemphasis on investment of**

**resources in the development of infrastructure portions such as the satellites and gateways.**

**(3) In addition, working towards a substantial reduction in costs of the space segment by improving the reliability of satellites and rockets is extremely important.**

**(4), (5), (6) The satellite communications are intrinsically international in character. I would like to propose that everyone of us involved in the satellite communications of the world be closely united towards promoting deregulation, streamlining ITU procedures, securing new radio wave resources for broadband networks and towards joint development and common standardization of technologies, as well as letting satellite communications fulfill the role, aiming towards making a ubiquitous info-communications infrastructure a world-wide reality.**

**As the terrestrial broadband communications are at a standstill, now is the time for the satellite communications to boost up the power to accomplish its mission of making a ubiquitous network society a down-to earth reality.**

***Thank You For Your Kind Attention***

*As our knowledge of the universe increases, may God grant us the wisdom and guidance to use it wisely.*

*John H. Glenn in the U. S. Congress after his first flight in orbit.*

**This quote is from a speech given in the House of Representatives by the well-known U.S. Senator John Glenn immediately after his first orbital flight as an astronaut.**

**If you re-read this with "satellite communications" in place of "the universe", it turns into a suggestion that we have to have the wisdom**

**and guidance to wisely use the communications infrastructure of space, and makes us feel as if the words were showing us anew the direction of our technology development for the future satellite communications.**

**Today, as I speak about the realization of a ubiquitous network, I would like to close my talk by conveying to everyone once again these impressive words of Senator John Glenn.**

**Thank you very much for your kind attention.**