

## Research on IP communication performance of geostationary satellite line for transmission of space geodesy data.

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The IP communication in the satellite line is capable of transferring a large size of data and in high-speed long data transmission. Therefore, the application may be useful in the field of data communication on space geodesy, such as GPS and e-VLBI. Because the launch of *WINDS* - high speed Internet satellite - succeeds in this February, it will give a great attention to the field of this research from now. From these backgrounds, the fundamental position of this research is to establish the basis of satellite IP communication in the near future.

One of the major technical problems of satellite IP communications is the TCP - the major transport protocol of the Internet - which is not suitable under the environment with a large time-delay. This research focused on this aspect. The following is about the procedure of various measurements along with consideration.

At first, to understand and consider the characteristic of IP communication network usage on satellite line, I measured the propagation delay and the transmission rate of IP packets under a real environment. Since the reliable data was not able to gather from a slump of the equipment and from the time restriction, I supplementary measured under pseudo delayed virtual environment. Secondly, I examined the famous network simulator called *NS2*, if it's useful for research and development in the future, compared with measurement result in real satellite line environment.

The main result came out the following three points. First, the actual transmission time of ICMP packets was 640ms. On the other hand, the propagation delay of a wireless electric wave was about 500ms. It turned out that there was a large processing delay which cannot be ignored between each link of satellite earth stations on propagation delay. Since the cause is uncertain at this point, we need to verify it in the near future. Secondly, under high-delayed line, the transmission rate of TCP is not excelling. And also, the equipment called *SkyX* - that enables to improve the throughput of TCP - was able to overcome the TCP's disadvantage, which is the transmission rate in the satellite line. Thirdly, I confirmed that *NS2* is effective for satellite line as a network simulator and it's also useful for further research and development.

For future work, after the launch of *WINDS*, we need to research on TCP throughput which there is a new method to increase the throughput.