

SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems Concepts (1)

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THE ARCHITECTURE OF FUTURE SPACE INFORMATION NETWORK

Abstract

With the development of space communication and networking technology, more and more satellites will be launched in the future. The satellites would be more intelligent, and connected with each other by the inter-satellite cross-link, and provides global information service. The satellites can group in a network, called Space Information Network.

First, the architecture of future Space Information Network is discussed in the paper. It is defined to be an infrastructure that provides global space-based information achieving, process, storage and distribute, positioning navigation and timing (PNT), and communication services. It contains all kinds of satellites or constellations and the ground control facilities. The satellites include different orbits (GEO), different types (Remote Sensing) and with different capability. The satellites and ground facilities can connect with each other using the inter-satellite or ground satellite links. The network will connect to both the air and surface networks, making it an integral part of global information network.

Second, the main characteristics of network are discussed. For example, Interoperability, it can be the backbone, interoperate with other peer networks (e.g., air network, sea network, terrestrial networks). Flexibility, it can support the full range of operations and missions include the ground communications, the deep space explore. Extensibility, it can expand the number of users/satellites or increase the capabilities of the network without making major changes to the system. Evolutionary, it can take advantage of multiple generations of technologies. It can be compatible to different system, and evolution to next generation system. Efficient, all of the space and ground assets are optimized organized in the networking; it can provide the communication, navigation and remote sensing service efficiently. Intelligent, most of nodes in the network are intelligent agent. The external nodes only need to provide “what you want”, not need provide “How to do it”, it can operate autonomously.

Finally, one disaster and crisis support example is showed to exhibition the innovative application of network. When emergent situation (such as earthquake, flooded) occurs, we need satellites response as soon as possible. With the space information network, we can reduce the process of mission planning, scheduling, command up-link, imaging, dynamic adjustment, data receive, processing, integration, distribution, and application.

The Space Information Network would be one important develop direction for space satellites. Some of technical challenges are discussed in the paper, such as high-speed communication (laser optical), on-line data processing, on-line service, autonomous management, etc.