

Discussion Group #8

Ground Station Network (GSN) through
UNISEC-Global network

Background

- Problem

- Satellite owner/user

- Need longer data downlink time (= need many ground stations or ground station which is located on Arctic/Antarctic region (*for polar orbit satellite))
 - But difficult to have many ground stations because of the cost

- Ground station owner

- Ground station maintenance cost

- Solution

- Build ground station network with internationally distributed antenna

- Run the network continuously

- To be used whenever satellite owner/user needed the network

2 Dimension of GSN

- Human Network
 - for information exchange to develop, operate, or improve ground station.
 - to conduct first signal acquisition collaboration.
- Satellite Operation Network Software (Application)
 - for using ground stations to get longer communication time to satellite.

What We Have?

- Which ground station can join?
- What kind of software, tool, application can be used?
(Developed, Developing, Free, Commercial)
 - GMS?, GROWS?, GENSO?, Tight VNC?, Logmein?, Remote Desktop?, Dropbox?, PuTTY?, FileZilla?, ...
- Who is the stakeholder? What they do?
 - UNISEC Ground Station Network Working Group (UNISEC GSN-WG)
 - Cal Poly University
 - AMSAT?
 - Radio device Maker?

What Issues are?

- **General**
 - Frequency
 - HK UL and DL: UHF/VHF, S-band
 - Mission DL: S, X, Ku, (Ka) –band
 - License for radio ----- should be concerned
 - Security = Self-responsibility for user??? (User = satellite operator and ground station owner)
 - Internet + VPN connection, Data is encrypted if user needed and it is done by user(TBD)?
 - What is the concern for satellite protection and ground station protection?
- **Ground Station Control**
 - Autonomous tracking with using TLE
 - TLE is acquired via website (Nominal)
 - Calculated orbit information (TLE format) is set by satellite operator (Eg. Satellite operator may calculate the orbit by using GPS data downlinked as HK telemetry)
 - Correspondence for variety of demodulation
 - Typical modulation may be defined
 - Avoid relying on coding format (CCSDS standards or individual process)
 - Ability to switch operation target(=tracking satellite) manually and automatically
- **Mission Control (=Satellite Operation)**
 - Antenna allocation
 - Ground station booking and coordination by satellite user?
 - Autonomous downlink allocation?
 - Correspondence for decoding
 - Function for real time operation (send command and receive telemetry during a satellite pass)
 - Function for autonomous operation (set command on ground station before a pass, receive telemetry from ground station after a pass)
 - Constellation operation function
- **Network**
 - For Downlinked data transfer
 - For Sharing tracking information (orbit, downlink plan, etc.)
 - Internet, not a dedicated line
 - VPN ?
 - Encryption ?
 - Tolerate time delay

Today's Discussion

- Share the information about each ground station's (or group) specification, experience, current/future activity and problems.
- List up Issues which should be concerned
- (Brainstorming for possible actions)