Motivation

1. AX.25 link layer protocol is a successful standard but it was not designed for Space to Earth links (or vice-versa). Being widely used by radio amateurs, it was easily adopted by the small satellite community.

2. Challenges with AX.25:
   - Not designed for communication bandwidth constrained satellites. Long headers (>120 bits) make it sub-optimal for transmission of multiple short frames. Most telecoms designed for small satellite missions can fit within 80 bits (unless TC is used to send file/upload new code).
   - Most COTS radios designed for small satellite missions adhere to AX.25 format only. Implementation of AX.25 on these COTS radios imposes additional constraints on the user (such as frame size, type of CRC).

   There is a need for COTS radios that adhere to a basic packet protocol and gives users ability to customize on top of it.

Solution

1. A fresh approach was carried out to develop optimised TC TM structure.

2. Fields are customizable for mission specific designs. Easy to implement in HW using SDR (software defined radio).

3. In a session, a train of frames is sent. A preamble frame fist followed by information frames.

   Instead of address/control fields being present in each frame, the preamble frame contains these fields. This frame cannot be standardized as it may be required to add synchronization bytes for phase modulations schemes.

4. Information frames have custom fields. Data in these frames is bit stuffed and frames are separated by flag (0x7E).

5. A process is a sink for a TC and a source of TM.

   Application processes are divided into four application processes.

   Need to resend TC in case of incorrect TM. Paths of TM packets are tagged by TC PSC.

   Field list are received correctly by satellite.

The IITMSAT ConOps team has developed more than hundred detailed flowcharts and is being used effectively to support the mission success.