Nano-Satellite Protocol (NSP)

What is NSP

- A protocol designed to facilitate ground to satellite communication.

- CanX-2 nano-satellite mission.

- Created by U of T (Space Flight Laboratory).

- Based off the AX.25 link layer protocol (Amateur packet radio networks).

Destination Address	Source Address	PF	B	A	Command	Data[256]
1 Byte	1 Byte	1 bit	1bit	1 bit	5 bits	Variable: 0 to 256 Bytes

Fig 1. NSP Packet.

- Header (**Destination** & **Source** byte, five **Command** bits, **Acknowledge** bit, **Package Correlation** bit and a **Reply** bit).

- Total header size is 3 bytes.

- Followed by Data field (0 – 256 bytes).

Implementation

```
struct NSP_Header{
        unsigned int Command : 5;
        unsigned int Packet_Correlation : 1;
        unsigned int Reply : 1;
        unsigned int ACK : 1;
        unsigned _int8 Destination_Address, Source_Address;

};

typedef struct{
        struct NSP_Header Header;
        unsigned char _Data[256];
}NSP_Packet;
```

Fig 2. NSP Packet structure

- Data field is not always being sent.

- TCP connection is made between sever/client.

- Source and destination information is exchanged.

Server/Client

- Server/Client exchange IDs.
- NSP is sent.
- Server verifies source/destination.
- Server returns the header (reply $0 \rightarrow 1$).
- Client returns the header (ACK $0 - 1$).
- Process data.

Data File

1e 1 0 0

eg. 2. Header hexadecimal data

- Command (1e).
- Packet Correlation (1).
- Reply and ACK (0, 0).

48 65 6c 6c 6f 20 68 6f 77 20 69 73 20 74 68 65 20 77 65 61 74 68 65 72 20 64 6f 77 6e 20 74 68 65 72 65 21

eg.3. Data field hexadecimal data

- Read by program in pairs.
- Each pair represents a character.

Hello how is the weather down there!

- Result saved to file on server.

Conclusion

- Hex data is sent to server.
- Server/Client exchanges information to verify packets.
- Packet data is then saved as readable strings on file.