GOBIERNO DEL PARAGUAY | AGENCIA ESPACIAL DEL PARAGUAY

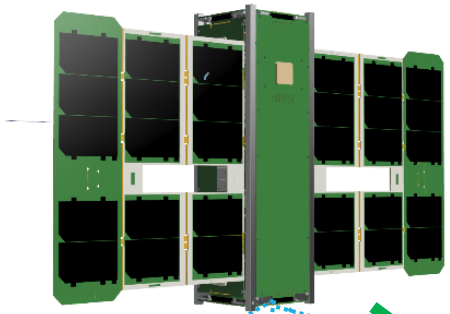
SPACE lab

Communication Plan
COM, APRS AND LORA

2025/07/17

UHF COM: Communication Plan

Guaranisat-2



Uplink 435.XXX MHz

Downlink 437.375 MHz

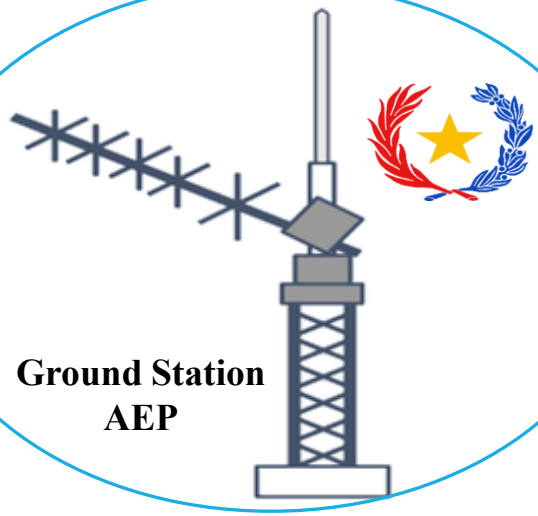
HKD: Housekeeping Data

* Telemetry (CW/20wpm)
* HKD and Payloads data (GMSK/4800bps)

*Commands
GMSK/4800bps

* Telemetry (CW/20wpm)
* HKD and Payloads data (GMSK/4800bps)

Ground Station from Amateur Radio Community



Ground Station AEP

UHF COM: CW format (downlink): Type 1&2

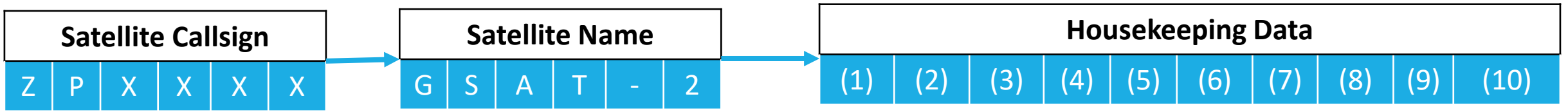
- **Satellite Callsign:** ZPXXXX
- **Satellite Name:** GSAT-2
- **Frequency:** 437.375 MHz
- **Housekeeping data (HKD):** Data for satellite health monitoring such as battery (temperature, voltage, current), solar cell status, etc), payload and subsystem situation data (ON/OFF).

There are two data format for HKD: **CW Type 1, CW Type 2.**

Total length: 22 characters

CW Type 1: 6 (Callsign) + **6** (SatName) + **10** (HKD)

CW Type 2: 6 (Callsign) + **6** (SatName) + **10** (HKD)

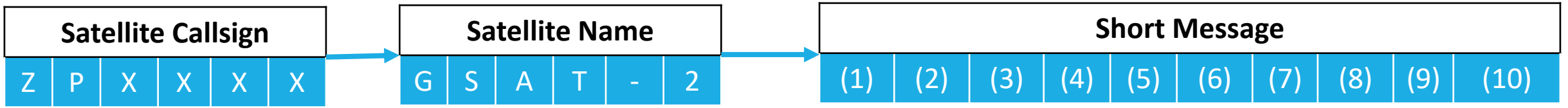


UHF COM: CW format (downlink): Type 3

- **Satellite Callsign:** ZPXXXX
- **Satellite Name:** GSAT-2
- **Frequency:** 437.375 MHz
- **Short message:** For some special events **CW type 3** would be activated only by command from ground station in order to promote amateur radio activities transmitting short message containing 10 numbers or letters, i.e. name of schools, universities, amateur radio operators, professors, stakeholders of the project, etc.

Total length: 22 characters

CW Type 3: 12 (Callsign + SatName) + 10 (Short Message):



UHF COM: GMSK Downlink frame

AX.25 Protocol length: 105 bytes

Frequency: 437.375 MHz

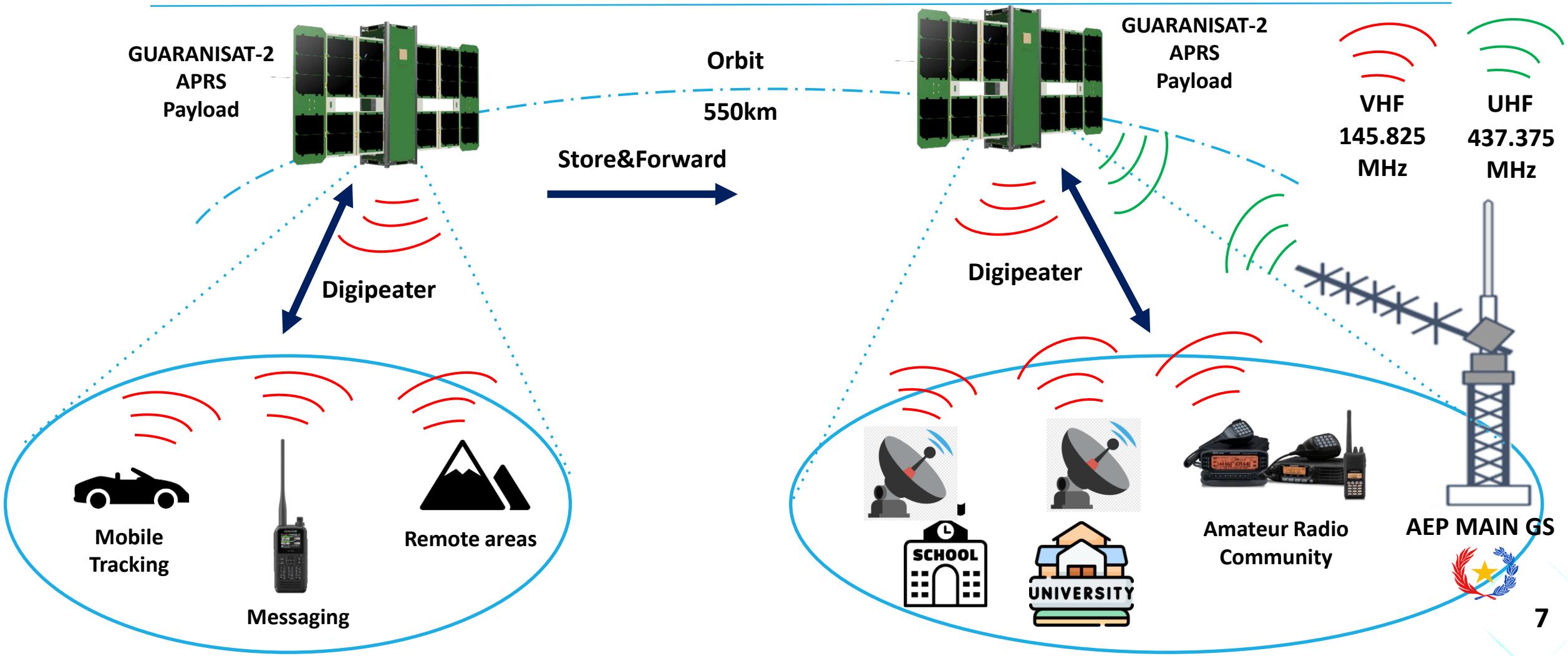
GS Call sign	GS SSID	Sat Call sign	Sat SSID	Control	PID	Header	Payload	Footer	FCS
XXXXXX	X	ZPXXXX	X	X	X	AA	85 bytes	AA	XX
6 bytes	1 byte	6 bytes	1 byte	1 byte	1 byte	1 byte	85 bytes	1 byte	2 bytes

UHF COM: GMSK Uplink frame

Frequency: 435.XXX MHz

- Mission Command
- Telemetry Command
- Reset Command
- The Command for turning off the radio
- Kill Command
- Etc.

VHF APRS Digipeater: Communication Plan



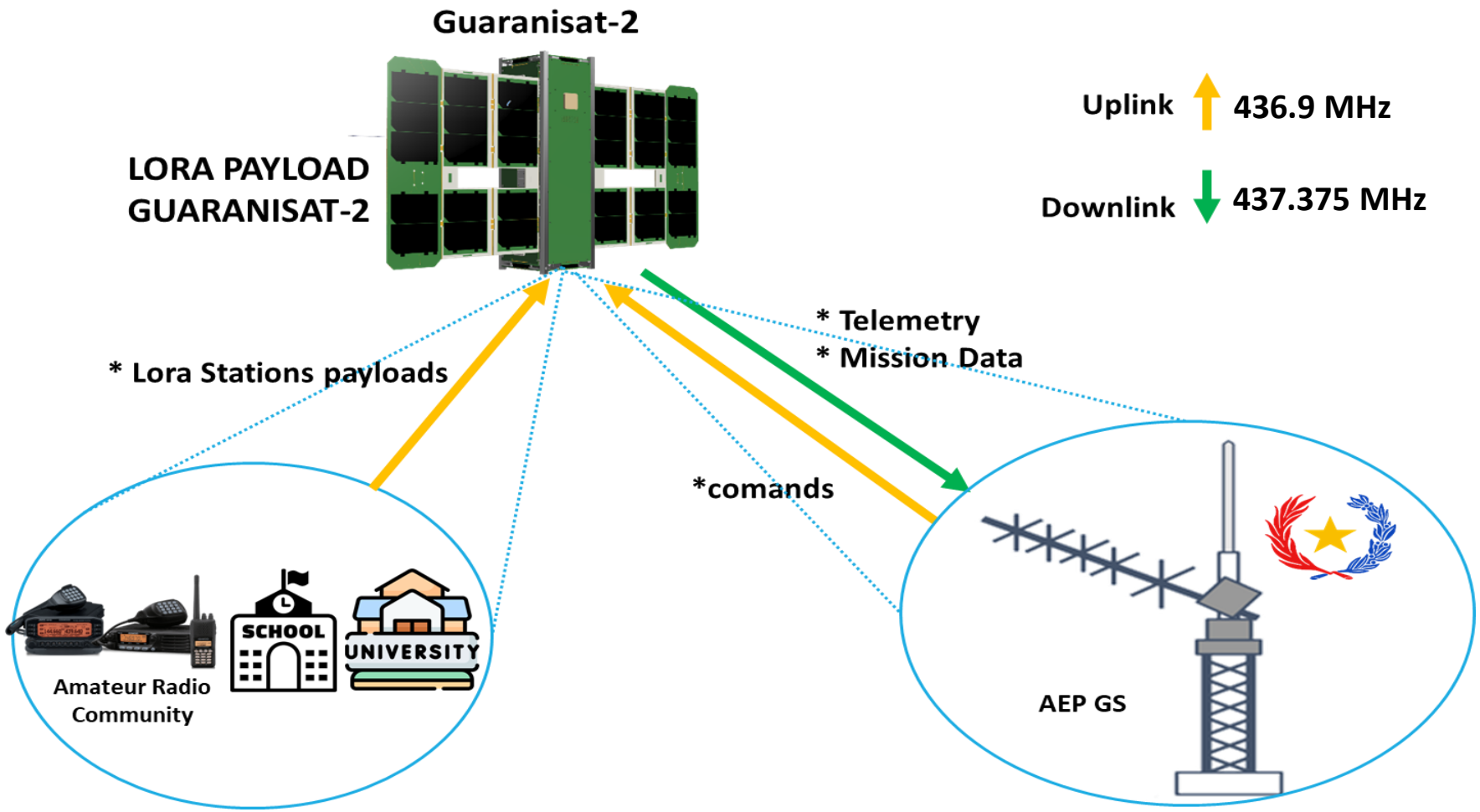
VHF APRS Digipeater: Uplink-Downlink frame

For APRS mission must follow AX.25 Protocol, as shown in figure below:

Ground Station 1 Call sign	Ground Station 2 Call sign	Digipeater addresses	Control	PID	Information field Message/GPS	FCS	Flag
XXXXXX	XXXXXX	WIDE1-1	X (*)	X (*)	85 char	XX(*)	X(*)
7 bytes	7 bytes	7 bytes	1 byte	1 byte	85 bytes	2 bytes	1 byte

(*) Those parameters are inserted automatically by your APRS transceiver, Terminal Node Controller (TNC) (Hardware, Direwolf, Soundmodem, etc) or APRS client software (UISS, PinPointAPRS, YAAC, etc)

UHF LORA: Communication Plan



UHF LORA: Uplink frame

Size	1 byte	1 byte	8 bytes	22 Bytes (max)
Definition	Header	Type of frame	Ground Station (Source) Callsign (*)	Payload
Type 3 (GST)	0x12	0x03	ZPXYZ-00	Timestamp (4 bytes) + temperature (2 bytes) + humidity (2 bytes)
Type 4	0x12	0x04	ZPXYZ-00	ASCII Text 23 byte

(*) Amateur radio stations, universities nodes, and schools nodes.

For packet reception operations, two types are established: one for remote sensor stations (GST), which report temperature and humidity values, and another for sending text in ASCII format.

UHF LORA: Downlink frame

Size	1 byte	1 byte	8 bytes	22 Bytes (max)
Definition	Header	Type of frame	Satellite Callsign	Payload
Type 1 (BEACON)	0x12	0x02	ZPXYZ-00	Satellite telemetry as Beacon (TBD)
Type 2 (ACK)	0x12	0xAA	ZPXYZ-00	Source identifier + link status level (RSSI 4 bytes, frequency deviation 4 bytes, SNR 4 bytes)

For LORA payload transmission operations, two frame styles are provided: one called beacon, intended for sending telemetry data, and another called ACK, to confirm packets that were correctly received.
TBD: to be defined