ESEIAAT

Cubesat Constellation
Astrea

Technical sheet

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Students:

Cebrián Galán, Joan
Foreman Campins, Lluís
Fuentes Muñoz, Óscar
Harrán Albelda, Fernando
Martínez Viol, Víctor
Pla Olea, Laura
Puig Ruiz, Josep
Tarroc Gil, Sergi
Urbano González, Eva María
Fontanes Molina, Pol
Fraixedas Lucea, Roger
González García, Sílvia
Kaloyanov Naydenov, Boyan
Morata Carranza, David
Pons Daza, Marina
Serra Moncunill, Josep Maria
Tió Malo, Xavier

Customer: Pérez Llera, Luís Manuel

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0.1 Communication Protocols

The communication protocols are a list of rules that allow different entities to communicate between them, enabling the transference of information.
In Astrea constellation, the communication protocols are very important because are the ones that allow the constellation to work together and accomplish de function it has been designed for. The protocols used in Astrea constellation have to be:

High-speed	Reliable	Secure	Compatible with external satellites

Table 0.1.1: Requirements of the communications protocol

In order to accomplish the requirements, the standards of the Consultative Committee for Space Data Systems (CCSDS) have been followed, toguether with the ISO model. Regarding the protocols of the Ground Segment, security has been the most important requirement to decide the protocol. The chosen protocols are exposed in the following table.

Space segment: CCSDS Standards		
Transport Layer	Space communication protocol specification transmission protocol: SCSP-TP	
Network layer	Main protocol	Internet Protocol version 6 (IPv6)
	Routing protocol	Open Shortest Path First (OSPF)
	Complementary protocols	IP over CCSDS
Data Link Layer	Data Link Protocol Sublayer	TC Space Data Link Protocol
	Sync and Channel Coding Sublayer	TC Sync and Channel Coding
Ground segment		
Presentation of the data to the client		Application
Protocol		Secure Shell (SSSH)

Table 0.1.2: Communications protocol overview

0.2 Ground segment

The ground segment is composed by the Ground Stations (GS) and the Mission Control Center (MCC), that allow the receiving of the information from the constellation to the Earth.
The placement of the different nodes of the Ground Segment is shown in the following map.

Figure 0.2.1: Location of the GS and MCC

Node	Color in the map	Country
GS1	Yellow	Canada
GS2	Orange	Falkland Islands
GS3	Blue	United Kingdom
MCC	Green	Spain

Table 0.2.1: Countries of location

The MCC is composed by a set of offices with good connection to the GS. The systems that compose the GS are exposed in the following table.

System	Features	Purpose	Elements included
S-band	Half-duplex system: downlink and uplink capability	Housekeepink data/TT& C Client data upload	Transciever LNA HPA RF Limiter RF Swith RF Fuse Rotors
X-band	X-band downlink capacity	Client data download	X-band receiver LNA RF Limiter RF Fuse Rotor

Table 0.2.2: GS's systems

Chapter 1

Bibliography