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COMMUNICATIONS DEPARTMENT: GROUND STATION

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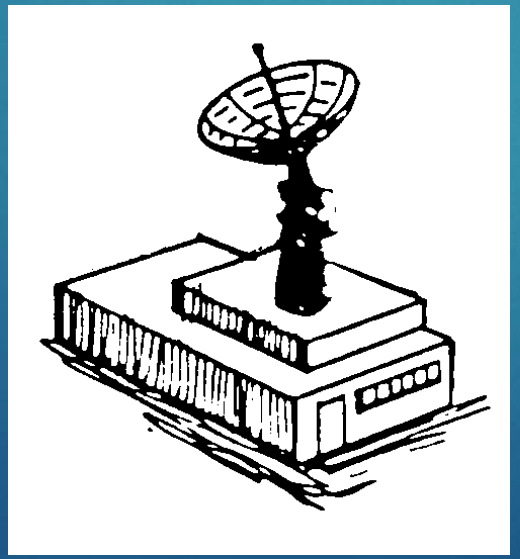
What are we going to talk about?

- Work done:
  - Critical failure
  - Ground station
    - Location
    - Cost



Critical failure

Project charter deffinition

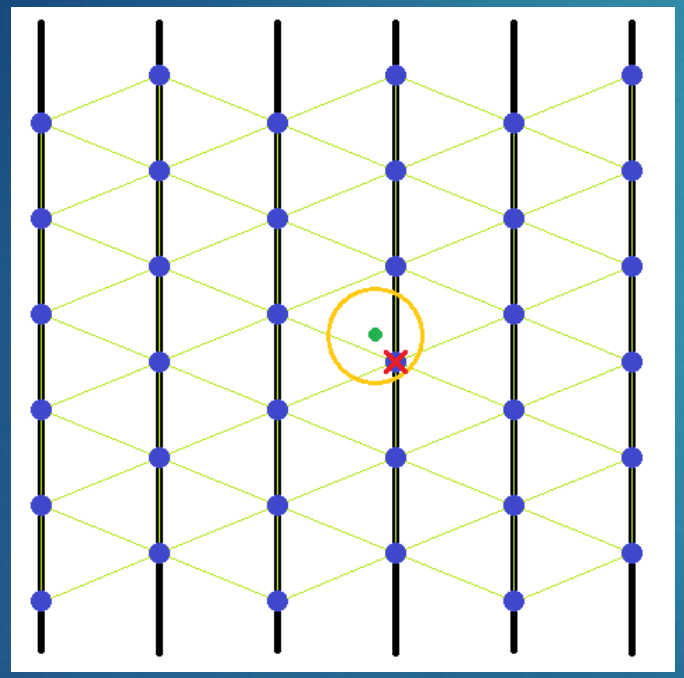
A major failure can be defined as the loss of a client's satellite coverage because of a failure in the network.

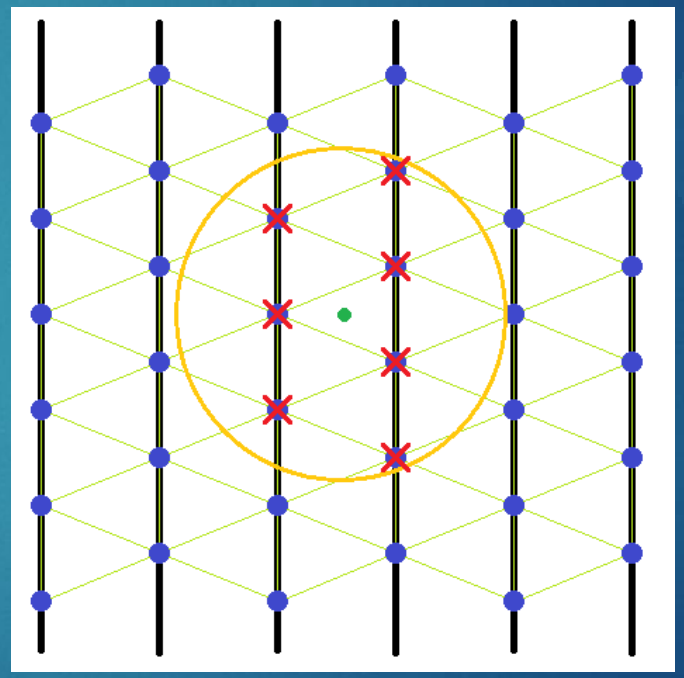
New deffinition

A failure in the network that causes a message to arrive from a client satellite to a ground station with more that 5 minutes of delay, or not arrive at all.

Critical failure: Coverage failure

- Satellites in range of the client's satellite: depends of the client's satellite





Critical failure: failure of all satellites in range of the client's satellite

Critical failure: Transmission time failure

- Transmission time ≈ 0,5 s
- Processing time ≈ 20 s
- Time to recognise a link as dead ≈ 45 s
- Time to reconfigure the network map ≈ 100 s
- Total time ≈ 165 s

- Time limit = 300 s
- Time to reconfigure 2 successive failures ≈ 310 s

Critical failure: failure of two satellites in the same communication route consecutively

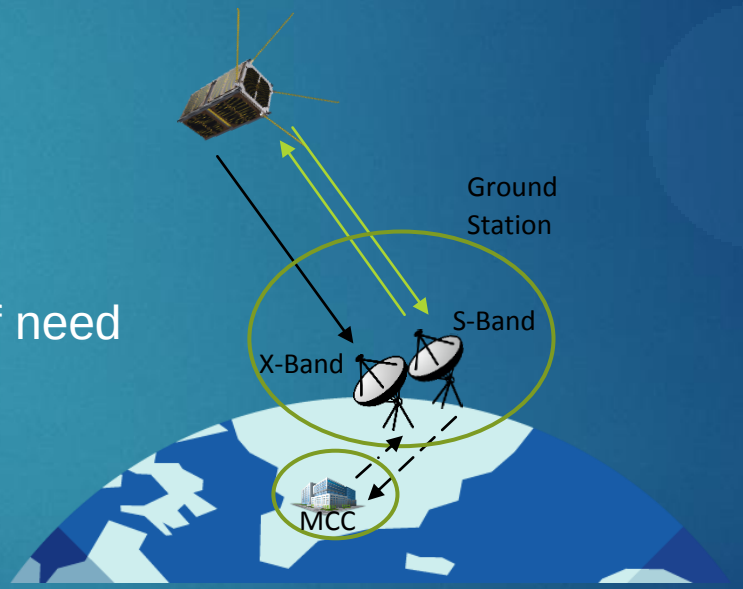
Critical failure: Ground station failure

- If all ground stations fail, the whole constellation fails.
- Each ground stations is considered critical

Critical faiure: loss of satellite visibility for any ground station

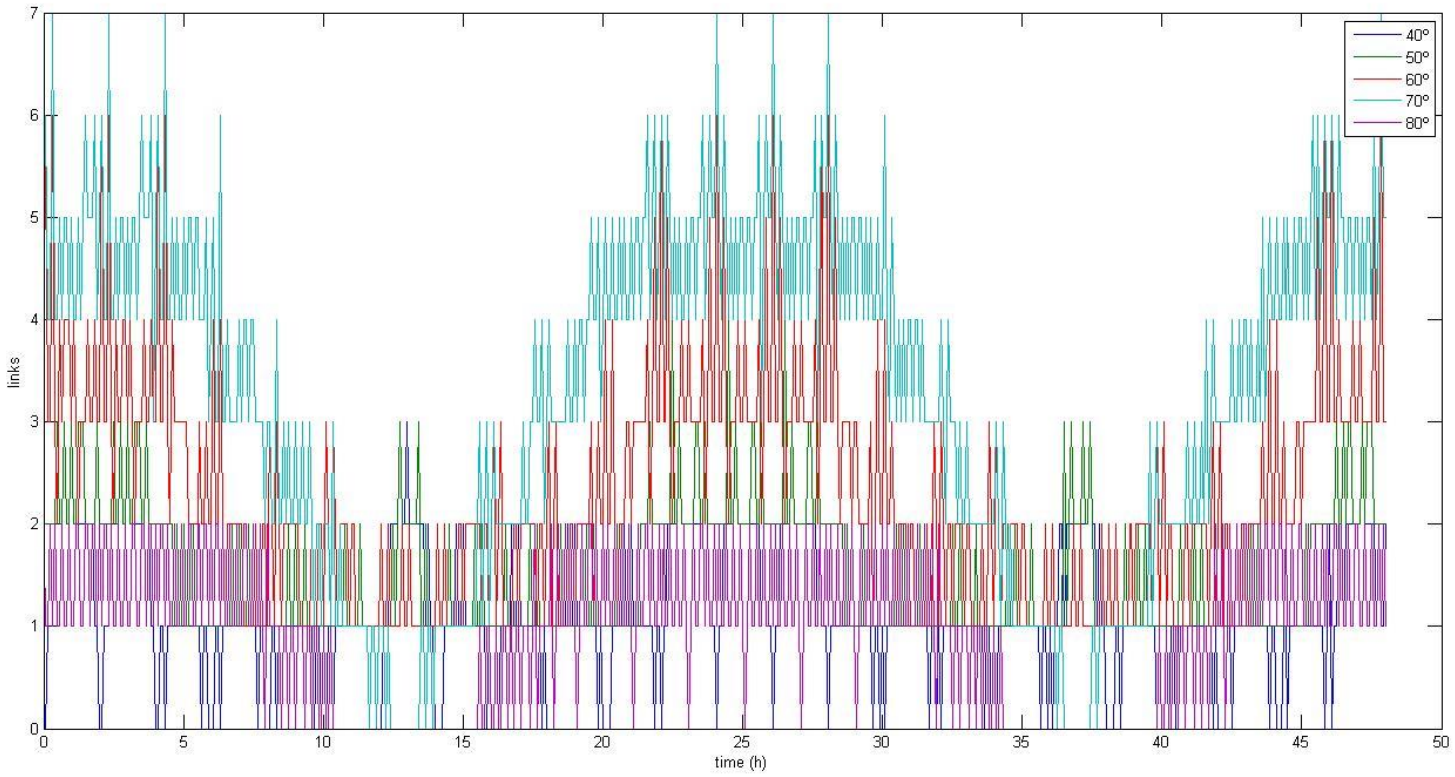
Ground segment structure

- Mission Control Centre
  - Only one
  - Located in Terrassa
  - Handles all the data
  - Checks the constellation status
  - Gives instructions to the satellites in case of need
- Ground Station
  - More than one
  - Located across the globe
  - Recieves TT&C and HK data and sends it to the Mission Control Centre
  - Recieves data from the client satellite and sends it to the client



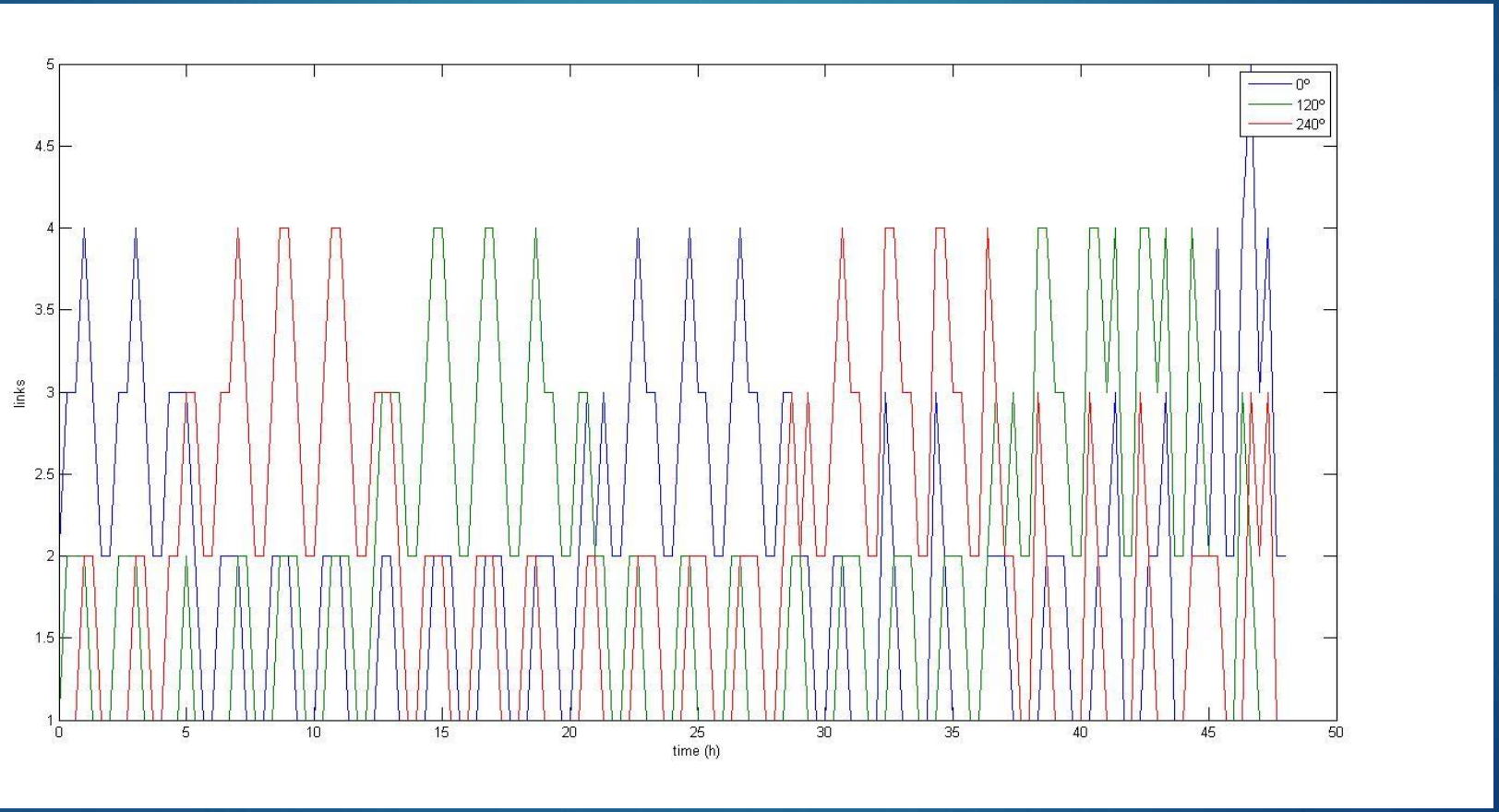
Ground Station: location

- Coverage in different latitudes over time



Ground Station: location

- Coverage in different longitudes over time



Ground Station: location

- Possible optimum Ground Station locations

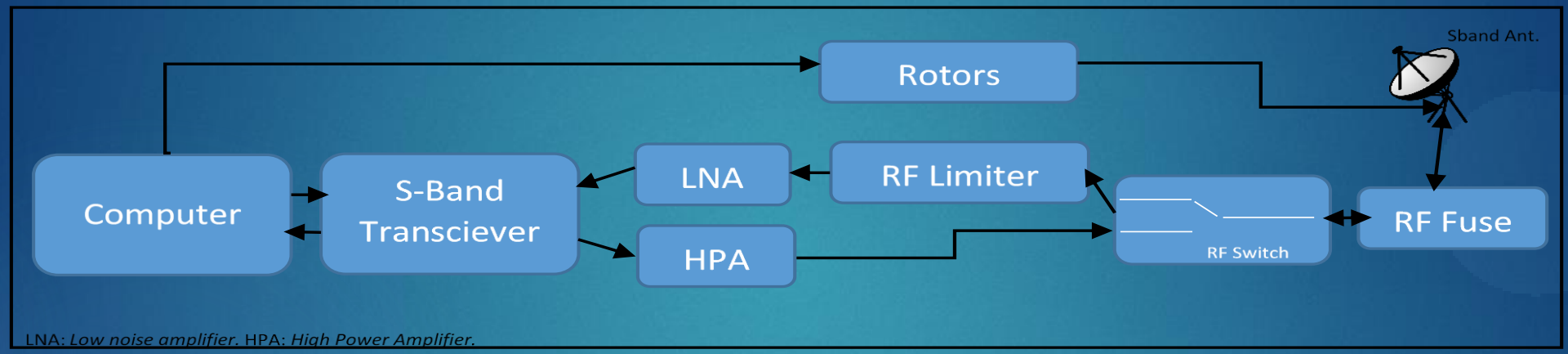
- Final location:
- Ground Station 1:
  - Canada
- Ground Station 2:
  - Scotland
- Ground Station 3:
  - Falkland Islands

Ground Station: costs

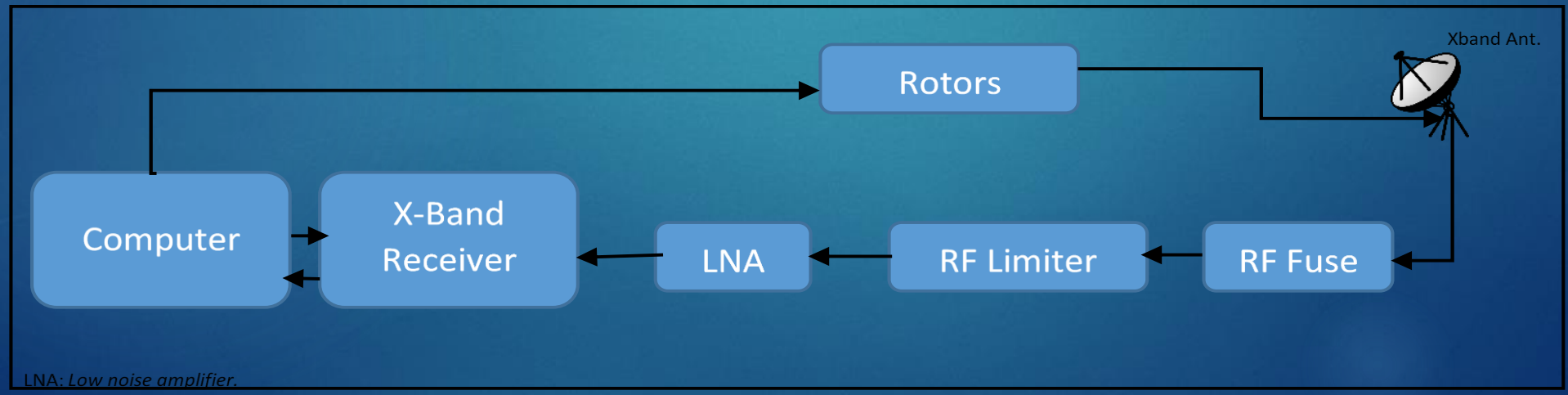
- Each Ground Station will consist of:
  - 100 m^2 building
  - Communication equipment
  - Office equipment
  - Electricity
  - Water
  - Internet connection
  - Ground Station license
  - Workers

Ground Station: costs

- Two systems: X-band and S-band



LNA: *Low noise amplifier.* HPA: *High Power Amplifier.*



LNA: *Low noise amplifier.*

Ground Station: costs

Costs	Canada	Scotland	Falkland Islands
Electricity	3,500 €	6,500 €	6,500 €
Maintenance	7,500 €	7,500 €	7,500 €
License fee	200 €	600 €	600 €
Salaries	380,000 €	295,000 €	125,000 €
Total	390,000 €	310,000 €	140,000 €

- Total annual cost of all Ground Stations: 840,000 €

Mission Control Centre: costs

- The Mission Control Centre will consist of:
  - 500 m^2 building
  - Office equipment
  - Electricity
  - Water
  - Internet connection
  - Workers

Mission Control Centre: costs

	Costs
Electricity	15,000 €
Maintenance	7,500 €
Salaries	375,000 €
Total	400,000 €

- Total annual cost of the Mission Control Centre: 400,000 €
- Total annual cost of all Ground Stations and the Mission Control Centre: 1,240,000 €

Summary

- Critical failure
  - Clear deffinition of a critical failure
- Ground segment
  - Ground Stations located in Canada, Scotland and Falkland Islands
  - Annual cost of all Ground Stations:840,000 €
  - Annual cost of the Mission Control Centre: 400,000 €