

Satellite Communications

**Satellite system to provide communication services  
to polar regions in Europe and Russia**

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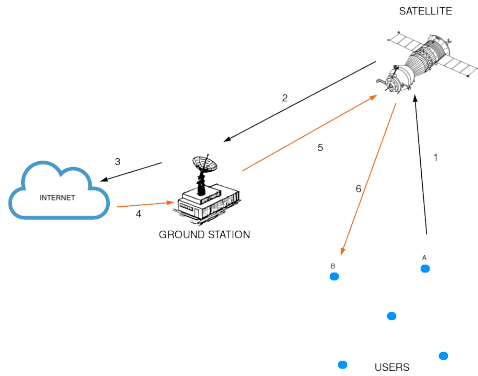


Figure 1: Scheme of the topology of the system.

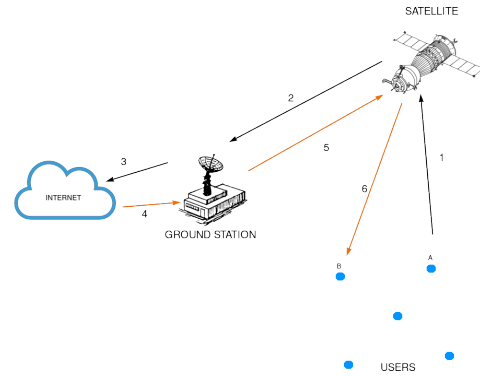


Figure 2: Typical communication path between an user A and an user B.

## 1. Problem Description

This project results from the necessity of having a good broadband coverage of polar areas and the land areas of Northern Europe and Russia: this means the coverage of latitudes over the 60 deg.

The subjects interested in this kind of communication are mostly industries involved in economic sector: they need a reliable communication system able to provide a service of 50 Mbps in download and 5 Mbps in upload.

The aim is to project a system able to provide a continuous, reliable and feasible communication service, maximizing the number of users allowed to access it over 60° latitudes and minimizing the costs. To do that, services in narrowband communication using LEO satellites are not useful, since the broadband communication required is not feasible with this technology.

A simple representation of the system to be built is shown in Figure 1 and a communication between two users is in Figure 2.

Typically, if a user A has to communicate with user B, it sends his packets to the satellite, with the recipient address in the header. The satellite receives the packets and forwards them to the Ground Station that sends them to the proper application (Skype, Hangout, ...). These packets are sent from the application to the Ground Station, that forwards them, through the satellite, to the recipient B.

## 2. Orbit Selection and constellation

To guarantee the service required in section 1., different orbits have been taken in account. The most used orbit to ensure a stable and reliable satellite communication is Geostationary. Figure 3 has been taken from the Inmarsat's Website, and shown as a GEO satellite can not reach the latitudes over 75°.

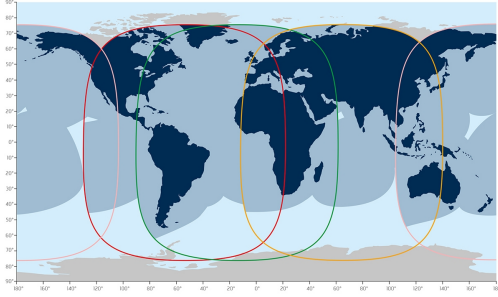


Figure 3: Approximate coverage of GEO Satellites.

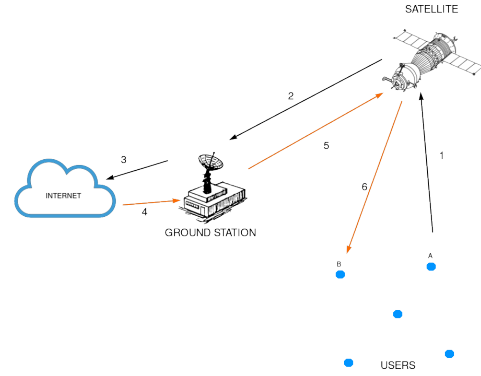


Figure 4: Typical communication path between an user A and an user B.

## 2.1 Simulation Architecture

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## 3. Payload and Space Segment

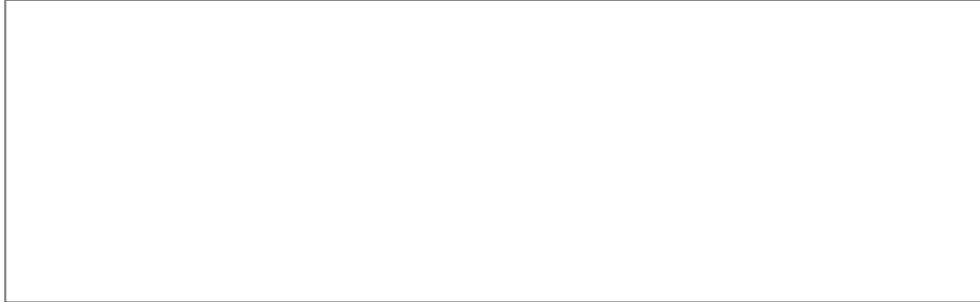
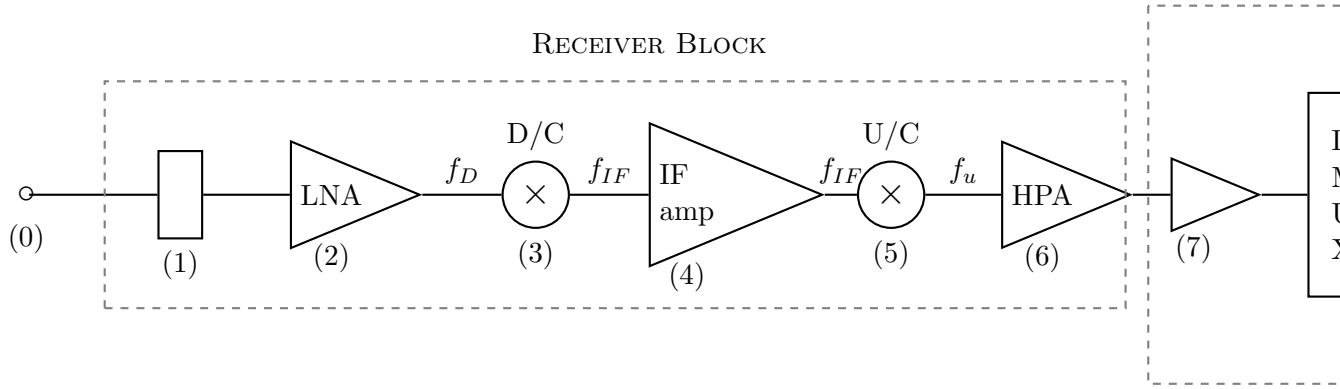
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### 3.1 Communication Module

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### 3.2 Payload



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### 3.3 Power Budget

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### 3.4 Weight Analysis

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## 4. Ground Segment

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## 4.1 Network Topology

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## 4.2 Ground Stations specifications

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## 6. Cost Analysis

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## 7. Final considerations and conclusion

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