

APPLICATIONS OF EMBEDDED COMPUTER SYSTEMS IN SPACE

THE COMMUNICATION SATELLITE

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ASEN 1969

Satellite communication plays a vital role in our daily lives. It works by transmitting encoded data through an electromagnetic medium between systems located on the ground and in space.

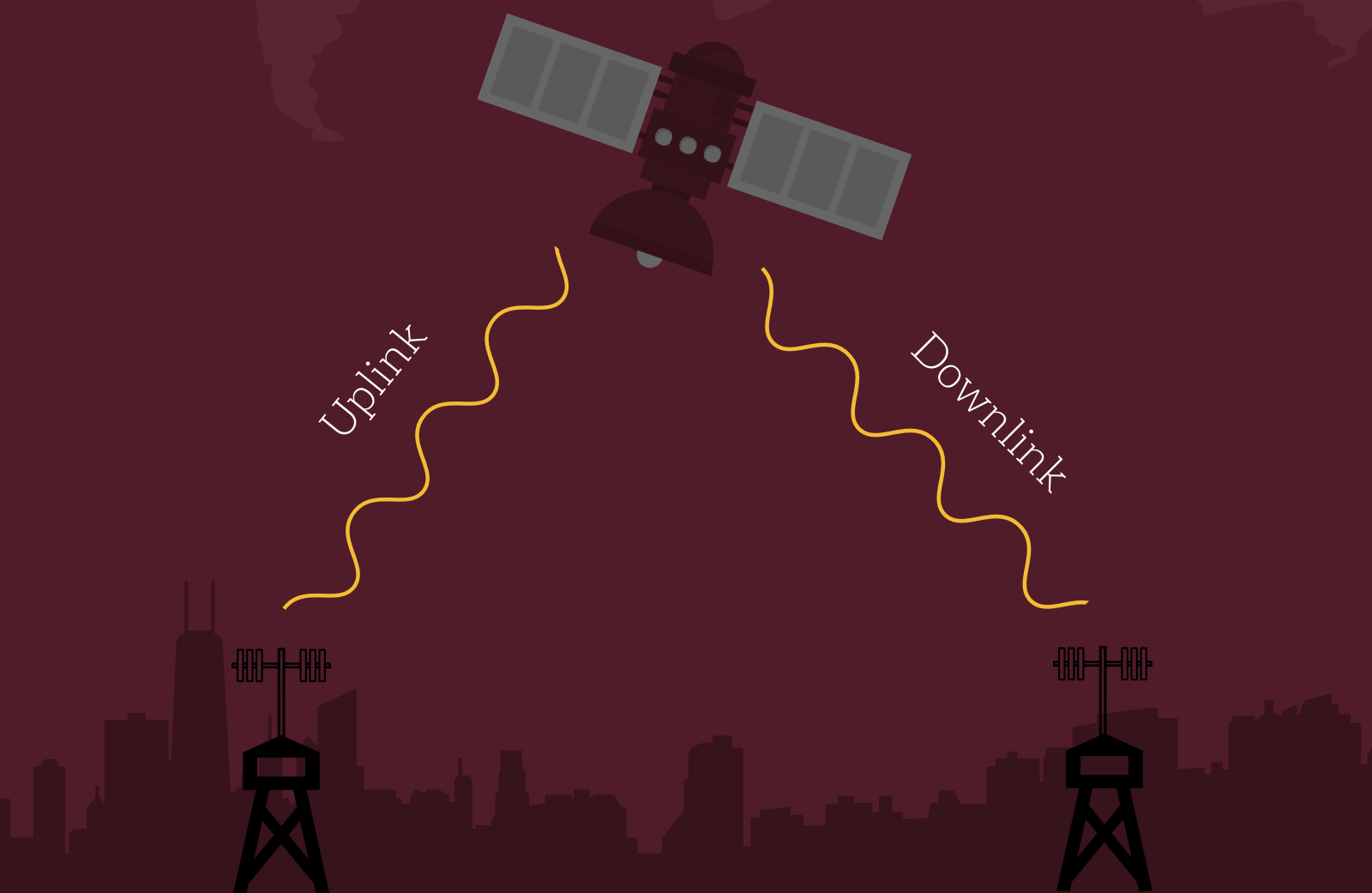
UTILIZATION

- GPS Location
- Remote Sensing
- Weather Monitoring
- Internet
- TV/Radio Broadcasting
- Military

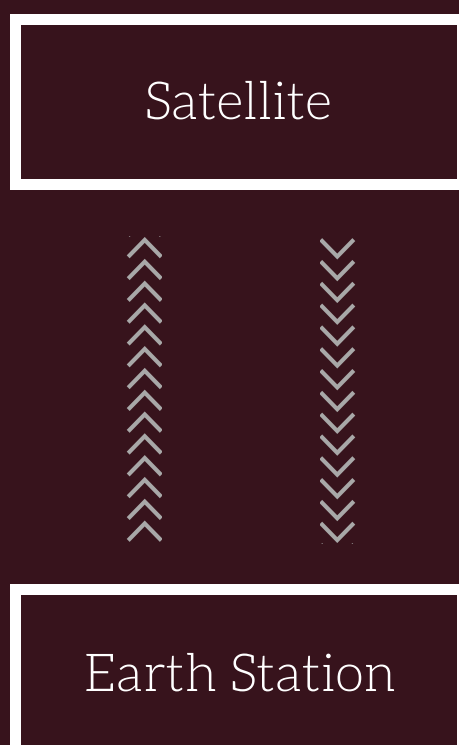


OPERATION

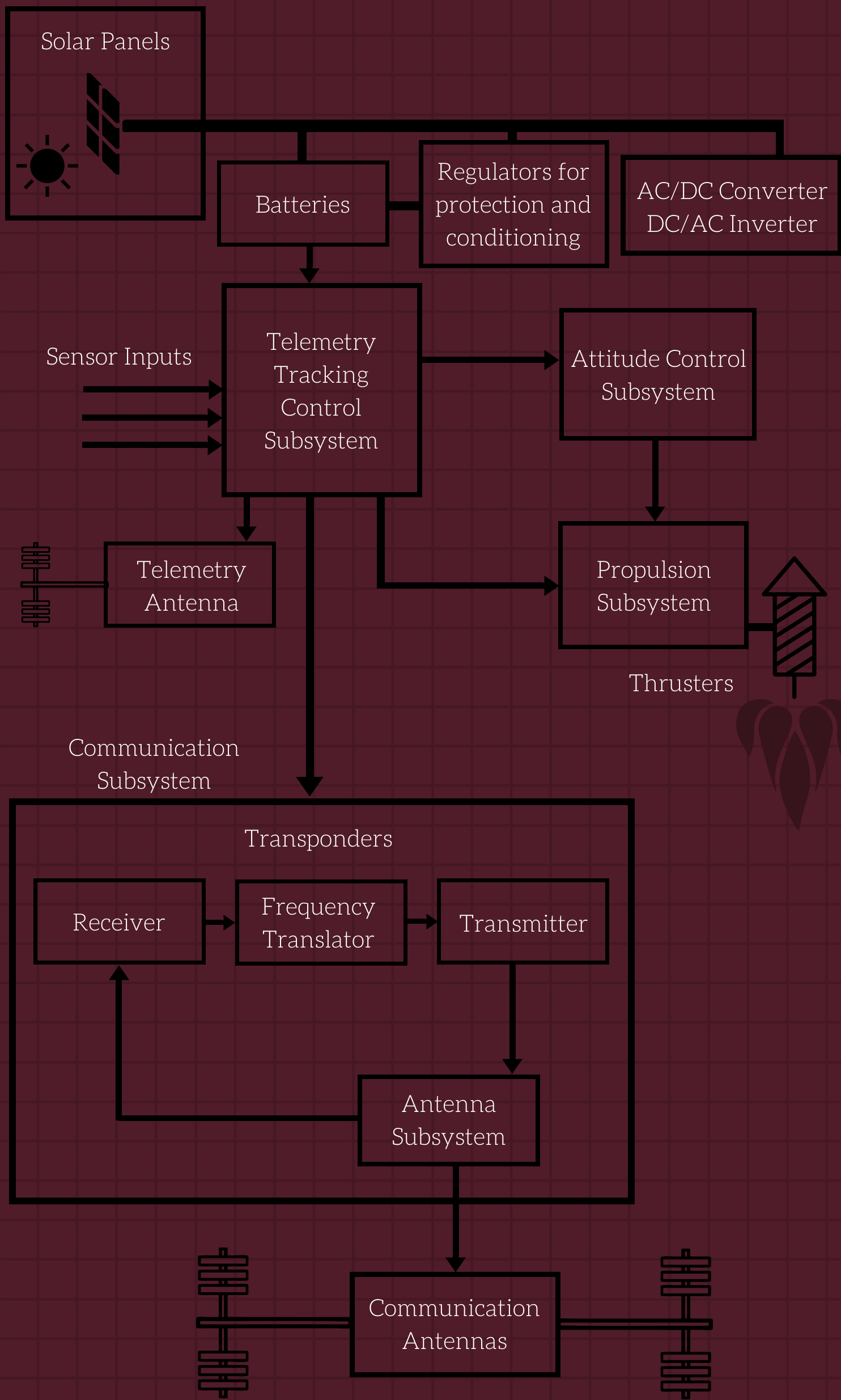
The satellite receives an electromagnetic signal from a station on the earth through a channel called the uplink. The satellite then changes the frequency of the uplink signal through the use of a transponder. This creates a downlink signal, which is sent back down to a second earth station.



Satellite communication consists of two subsystems:
The Satellite & The Earth Stations



SATELLITE BLOCK DIAGRAM



EMBEDDED SYSTEM PROPERTIES

COMPLEX ALGORITHMS

The processors that control the satellite must perform complex functions to operate the various subsystems within the satellite.



REAL TIME

The communication satellite's operations occur in real time. The communication subsystem must process the data signals as it receives them and send them back. The satellite's control system also receives input from various sensors in real time and performs the operations necessary to keep the satellite functioning correctly.



MULTIRATE

The processes that take place within the satellite run at different clock speeds. The communication subsystem must operate at different rates from other systems such as the attitude control system, propulsion system, etc.

MANUFACTURING COST

Satellites are designed to be cost efficient as well as lightweight to reduce the cost of launch. The engineers who design them ensure that money is spent on critical systems and that anything unnecessary for its operation is omitted from the satellite's design.



POWER & ENERGY

The satellite is powered by a rechargeable battery that gets its energy from solar panels. This design allows the satellite to maintain continuous operation because it has a constant supply of power that is replenished every time sunlight shines on the satellite.

SOURCES:

https://www.tutorialspoint.com/satellite_communication/index.htm

"Computers as Components: Principles of Embedded Computing System Design"
4th Edition, by Marilyn Wolf