

Network Layer Protocols

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0.1 Ground Stations

0.1.1 ESA Ground Stations

- **Kiruna Station**

- Coordinates: $67^{\circ} 51' 25.66''$ N, $20^{\circ} 57' 51.57''$ E.
- Number of antennas: 2.
- Size of the antennas: 15 meters. 13 meters.
- Frequencies: S band transmission and S and X band reception. S band transmission and S and X band reception.

- **Kourou Station**

- Coordinates: $5^{\circ} 15' 05.18''$ N, $52^{\circ} 48' 16.79''$ W.
- Number of antennas: 1.
- Size of the antennas: 15 meters.
- Frequencies: S and X band transmission and reception.

- **Maspalomas Station**

- Coordinates: $27^{\circ} 45' 46.40''$ N, $15^{\circ} 38' 01.68''$ W.
- Number of antennas: 1.
- Size of the antennas: 15 meters.
- Frequencies: S band transmission and S and X band reception.

- **Redu Station**

- Coordinates: $50^{\circ} 00' 01.64''$ N, $5^{\circ} 08' 43.24$ E.
- Number of antennas: 3.
- Size of the antennas: 15 meters. 13.5 meters. 2.4 meters.
- Frequencies: S band reception and transmission. Ka band reception and transmission. S band reception and transmission.

- **Santa Maria Station**

- Coordinates: $36^{\circ} 59' 50.10''$ N, $25^{\circ} 08' 08.60''$ W.
- Number of antennas: 1.
- Size of the antennas: 5.5 meters.

- Frequencies: S band reception.

- **Villafranca Station**

- Coordinates: 40° 26' 33.23" N, 03° 57' 05.70" W.
- Number of antennas: 2.
- Size of the antennas: 15 meters. 15 meters.
- Frequencies: S band transmission and reception. S band transmission and reception.

0.1.2 KSAT Ground Stations

- **Svabard Satellite Station**

- Coordinates: 78° N, 15° E.
- Number of antennas: 31+
- Size of the antennas: -
- Frequencies: C, L, S, X and Ka band.

- **Tromsø Satellite Station**

- Coordinates: 69° N, 18° E.
- Number of antennas: 30+
- Size of the antennas: -
- Frequencies: L, S and X band.

- **Troll Satellite Station**

- Coordinates: 72° S, 2° E.
- Number of antennas: 3?
- Size of the antennas: 7.3 meters.
- Frequencies: S and X band.

- **Grimstad**

- Coordinates: 58° N, 8° E.
- Number of antennas: 1.
- Size of the antennas: 3.2 meters.
- Frequencies: X band.

- **Hartebeesthoek**

- Coordinates: 25° S, 27° E.
- Number of antennas: 1?
- Size of the antennas: -
- Frequencies: S and X band.

- **Dubai**

- Coordinates: 25° N, 55° E.

- Number of antennas: 1?
- Size of the antennas: -
- Frequencies: S and X band.

- **Mauritius**

- Coordinates: 20° S, 57° E
- Number of antennas: 1?
- Size of the antennas: -
- Frequencies: S and X band.

- **Singapore**

- Coordinates: 1° N, 103° E.
- Number of antennas: 1?
- Size of the antennas: -
- Frequencies: S and X band.

0.1.3 NASA Ground Stations

- **Alaska Satellite Facility**

- Coordinates: 64° N, 147° W.
- Number of antennas: 3.
- Size of the antennas: 11 meters. 11 meters. 10 meters.
- Frequencies: S and X band. S and X band. S and X band.

- **McMurdo Ground Station**

- Coordinates: 77° 50' 20.87" S, 193° 19' 58.50" W.
- Number of antennas: 1.
- Size of the antennas: 10 metres.
- Frequencies: S band transmission and S and X band reception.

- **Wallops Ground Station**

- Coordinates: 35° N, 75° W.
- Number of antennas: 1.
- Size of the antennas: 18.3 meters.
- Frequencies: UHF.

- **White Sands Ground Station**

- Coordinates: 33° N, 107° W.
- Number of antennas: 2.
- Size of the antennas: 18.3 meters. 18.3 meters.
- Frequencies: VHF, S and Ka band. VHF, S and Ka band.

0.1.4 SSC Ground Stations

- **Clewiston Satellite Station**

- Coordinates: 26.7° N, 81.0° W.
- Number of antennas: 1.
- Size of the antennas: -
- Frequencies: S and X band.

- **Esrang Satellite Station**

- Coordinates: 67° 53" N, 21° 04" E.
- Number of antennas: 12.
- Size of the antennas: -
- Frequencies: 6x S band. 6x S and X band.

- **Inuvik Satellite Station**

- Coordinates: 68° 24" N, 133° 30" W.
- Number of antennas: 1.
- Size of the antennas: 13 meters.
- Frequencies: S and X band.

- **North Pole Satellite Station**

- Coordinates: 64° 48' N, 147° 30' W.
- Number of antennas: 2.
- Size of the antennas: -
- Frequencies: S band transmission and S and X band reception. S band transmission and S and X band reception.

- **Punta Arenas Satellite Station**

- Coordinates: 53° S, 71° W.
- Number of antennas: 1.
- Size of the antennas: 7.3 meters.
- Frequencies: S and X band.

- **Santiago Satellite Station**

- Coordinates: 33° 08" S, 70° 40" W.
- Number of antennas: 3.
- Size of the antennas: -
- Frequencies: S band transmitting and receiving.

- **South Point Satellite Station**

- Coordinates: 19° N, 156° W.
- Number of antennas: 2.

- Size of the antennas: -
- Frequencies: S, X and Ku band transmitting and receiving. S, X and Ku band transmitting and receiving.

- **Dongara Satellite Station**

- Coordinates: $29^{\circ} 03' S$, $115^{\circ} E$.
- Number of antennas: 3.
- Size of the antennas: -
- Frequencies: S, X, Ku and Ka band transmitting and receiving. S, X, Ku and Ka band transmitting and receiving. S, X, Ku and Ka band transmitting and receiving.

- **Yatharagga Satellite Station**

- Coordinates: $29^{\circ} S$, $115^{\circ} E$.
- Number of antennas: 1.
- Size of the antennas: 13.56 meters
- Frequencies: S band transmitting and S, X and Ka band reception.

0.1.5 Other Ground Stations

- **Goonhill Earth Station**

- Coordinates: $50^{\circ} N$, $5^{\circ} W$.
- Number of antennas: 28.
- Size of the antennas: 3.7 meters 32 meters.
- Frequencies: L, S, X, C, Ku and Ka band.