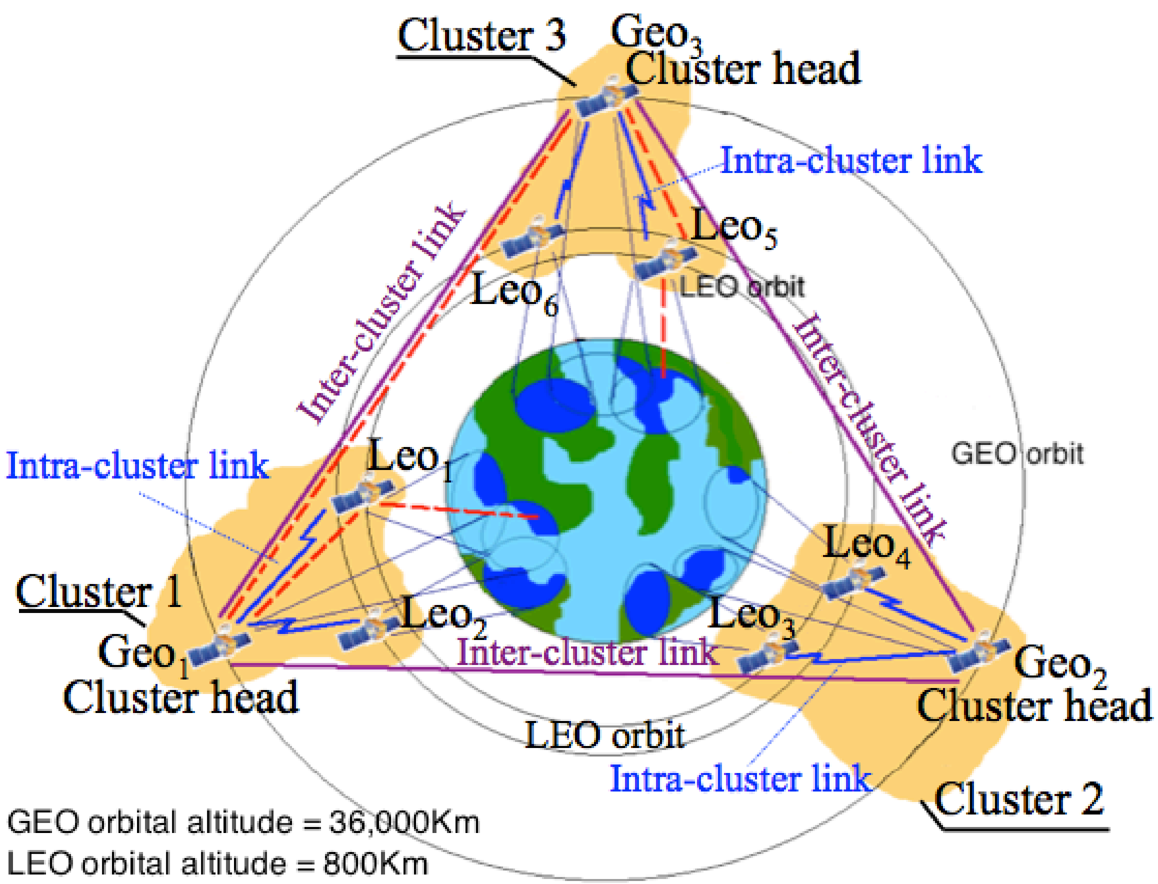
LEO satellite global network
低軌道衛星ネットワーク

AECS Satellite Cluster



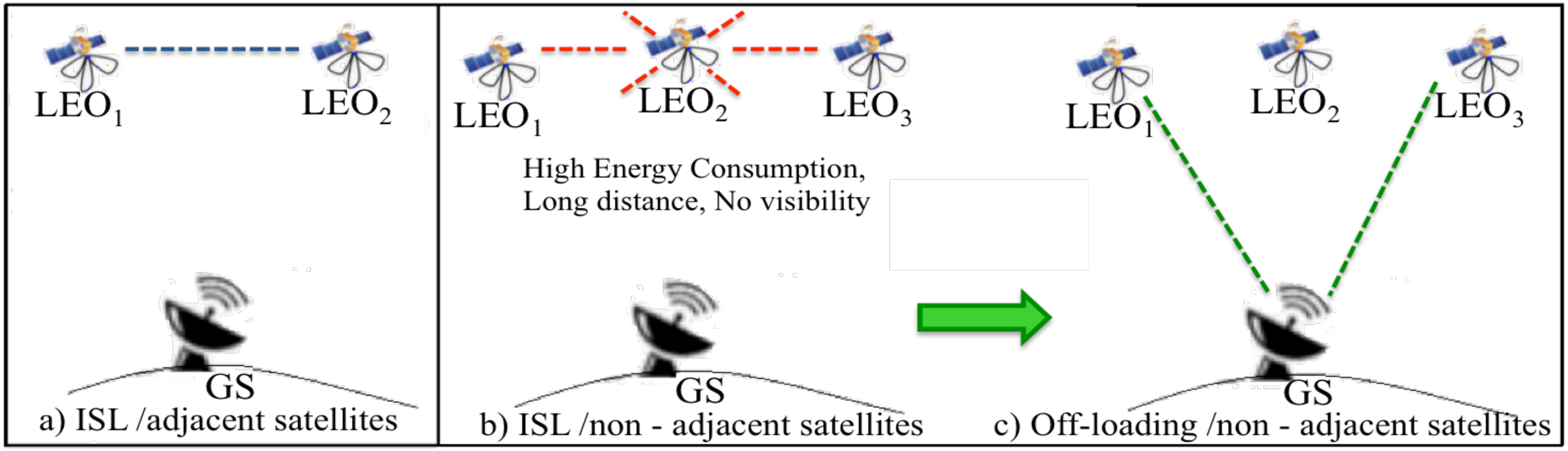
The proposed system consists of three satellite clusters sharing tasks by intra-cluster and inter-cluster links.

GEO satellites represent the cluster heads, whereas the LEO satellites are normal nodes.

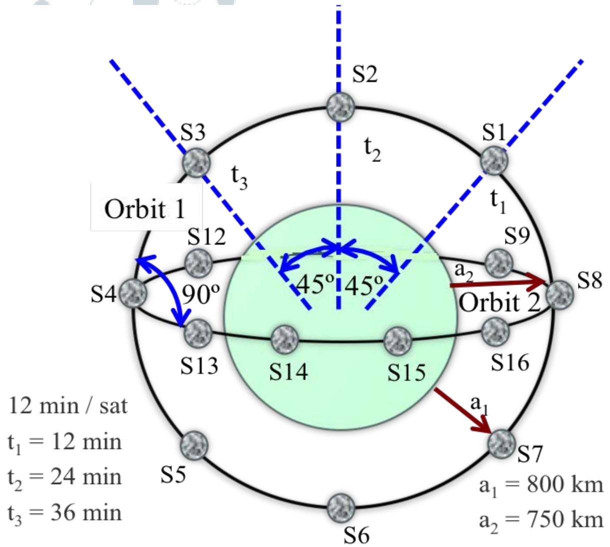
Three GEO satellites are the minimum number of satellites required to cover Earth. GEO satellites are chosen as cluster head because they seams to be static from Earth.

GEO and LEO satellites learn the location of other satellites by updating the database installed in their computers.

Off-loading Application

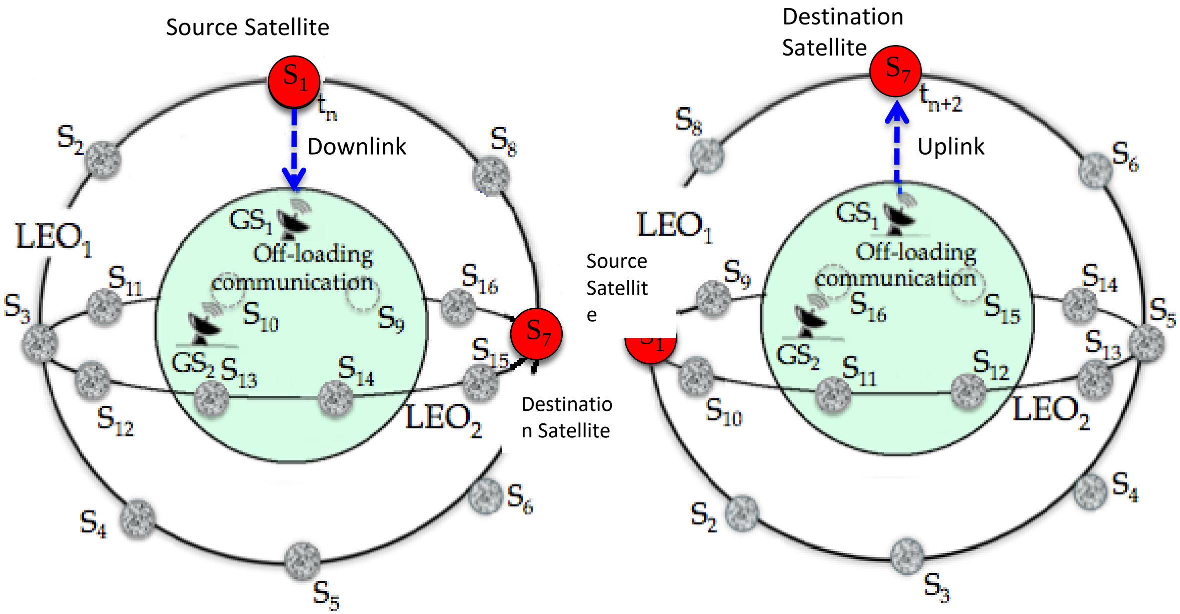


Off-loading Communication

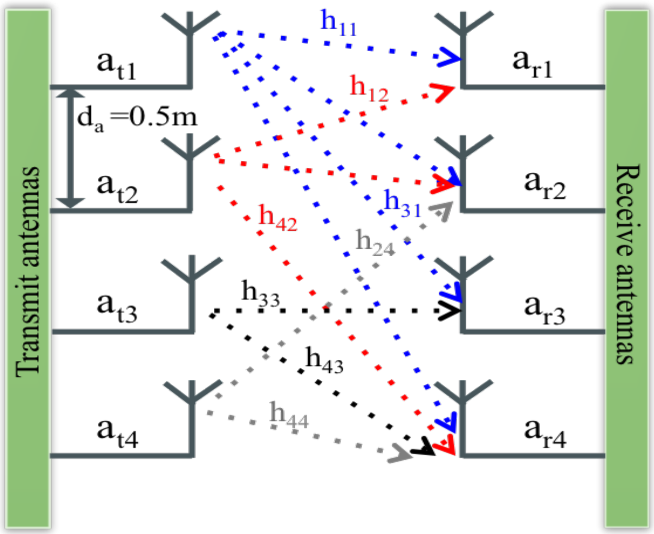


S2 and S3 connect each other by an inter-satellite link because the distance between them is short assuring low energy consumption.

The communication between faraway satellites, i.e. S1 and S7, must be performed through a ground station GS and it is formed by two secondary paths: the first one from the transmitter satellite to the GS , and the second one from the GS to the receiver satellite.

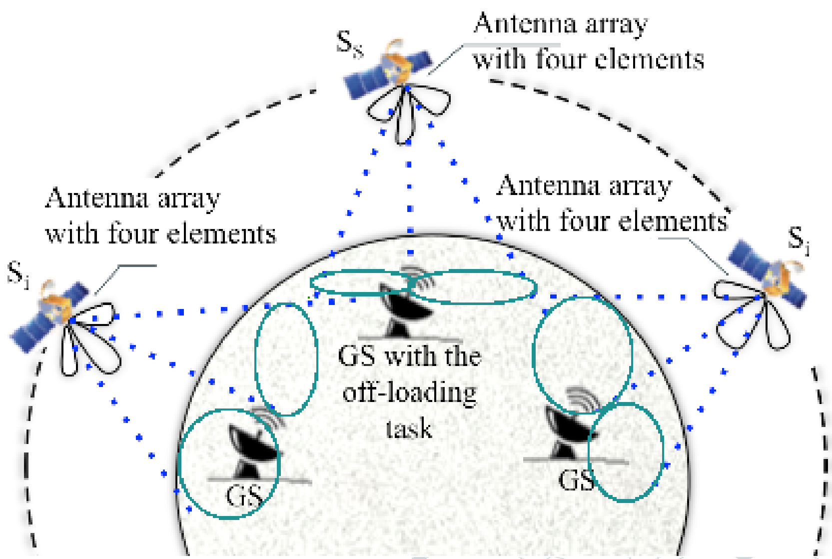


Adaptive Beam Forming Application



There are four primary beams with same source. Assuming there are only one primary lobe and several side lobes per each antenna, it is expected to get more interference.

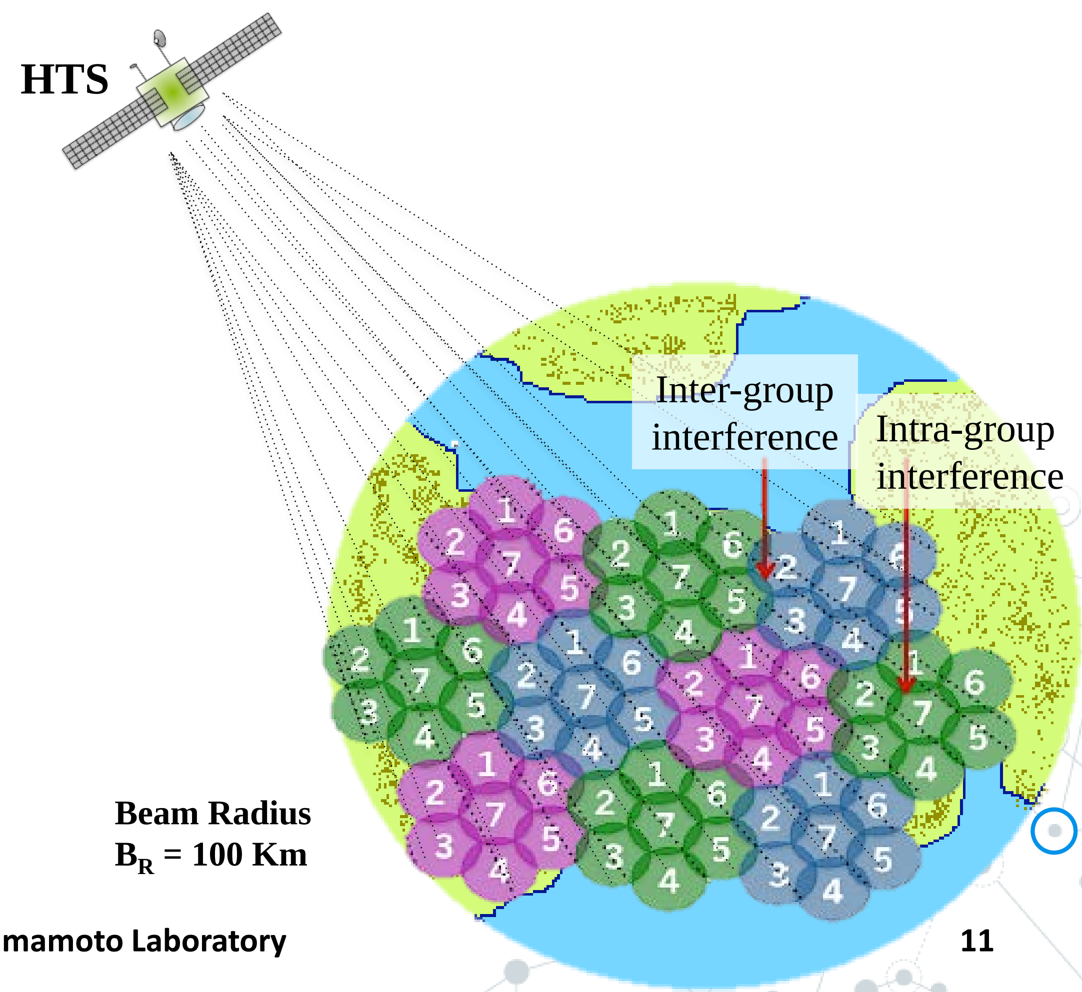
The interference is treat in two ways: constructive to get stronger signals into our satellite communication and destructive to get weaker interference signals.



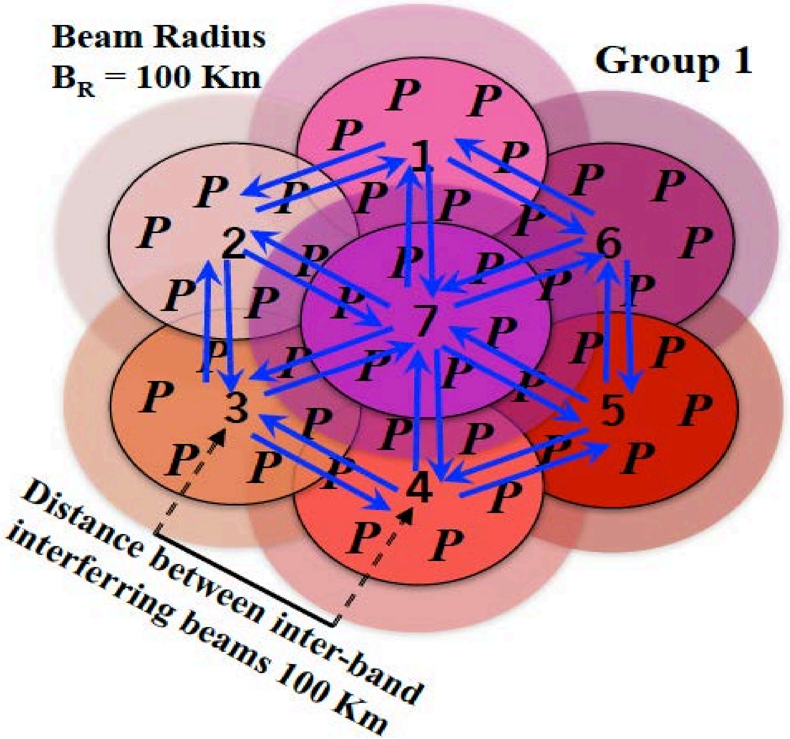
High Throughput Satellites (HTS)

High Throughput Satellites reach large number of users, providing high data rates at low cost.

Their implementation involves to deploy a large number of small sized beams.



Intra-Group Interference



Ψ = Inter-band interference that occurs inside each group.
BG = Number of Beam Groups.
EIRP = Equivalent Isotropically Related Power.
L = Free Space Loss.
G_r = Antenna Gain of the satellite.
G_{sh} = Shadowing Components of the satellite.
k = Number of beams inside each group.

$$I_{intra-group} = \sum_{BG=1}^{10} \Psi_{BG}$$

$$\Psi = \sum_{k=1}^{7} EIRP_k G_{rk} L_k G_{sh\ k}$$