Decentralised Communication in Small Satellite Constellations

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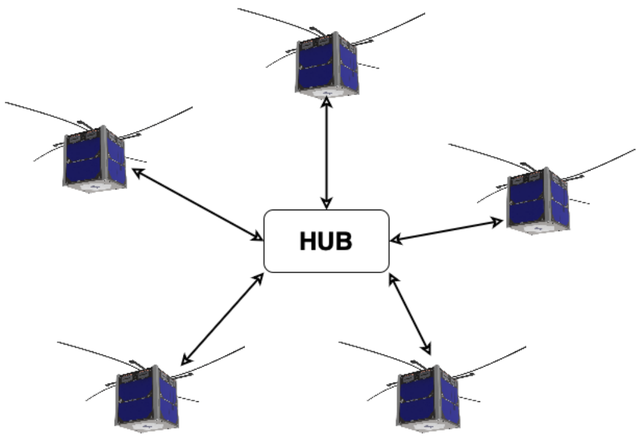
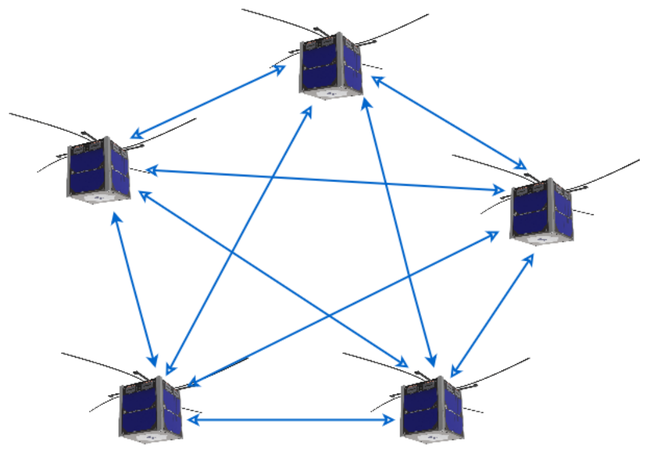
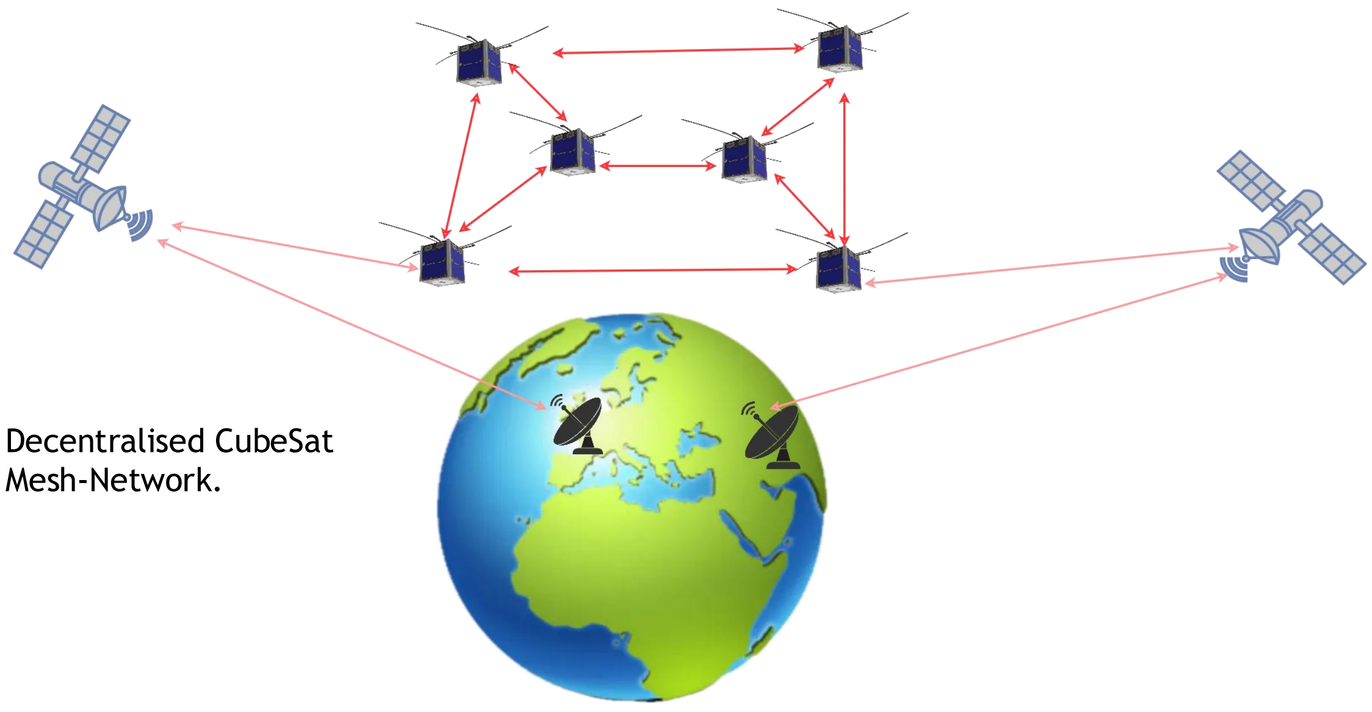
Decentralised communication networks between CubeSats offer significant advantages over traditional ground-based systems. This approach increases resilience, flexibility and scalability for applications such as earth observation and space exploration.



Centralised CubeSat communications architecture with centralised processing and verifying protocols.



Distributed CubeSat communications architecture with decentralized processing and verifying protocols.



Decentralised CubeSat Mesh-Network.

Decentralised networks reduce the risk of a single point of failure, a common problem with centralised networks. This makes the network more resilient, as the failure of one CubeSat does not bring down the entire constellation.
Implementing direct inter-satellite communication within a decentralised CubeSat network can significantly reduce latency, thereby improving real-time responsiveness. This capability is particularly beneficial for time-sensitive applications such as earth observation and space-based communication services, where timely data processing and transmission are critical.
As the load increases, additional CubeSats can be added to the constellation to meet the increased demand.

The space industry is experiencing significant growth. To move the sector forward, it is essential to develop a platform-based environment and establish common communication standards. One potential step is the creation of a distributed CubeSat infrastructure - a mesh network of CubeSats that can dynamically join or leave the constellation based on specific economic, technical and regulatory criteria. These constellations would use both RF and optical links for communication. They would also aim to achieve interoperability with geosynchronous satellites and deep space missions, thereby increasing the robustness and efficiency of the communications network.

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