Claims

1. A satellite payload, comprising:

a network node ~~configured for use in space, comprising~~, wherein the network node comprises:

a transmission interface for transmitting radio frequency signals;

a reception interface for receiving radio frequency signals;

wherein the transmission and reception interfaces are arranged to interface with a terrestrial network and a space-borne network;

a network management module ~~for determining communication session~~arranged to determine handover control and radio resource management information using the positions and availabilities of communications resources in the terrestrial and the space-borne network;

a controller arranged to control the transmission interface and the reception interface in accordance with ~~session~~ the handover control and radio resource management information ~~provided~~determined by the network management ~~interface;~~module to allow the satellite to operate as part of the terrestrial network.

~~wherein the transmission and reception interfaces are for receiving data from terrestrial nodes and space-borne nodes.~~

2. A satellite payload ~~network node~~ according to claim 1, wherein the ~~session~~radio resource management information includes resource allocation information.

3. A satellite payload ~~network node~~ according to claim 2, wherein resource allocation information includes information relating to communications traffic and the position and availability of network entities.

4. A satellite payload ~~network node~~ according to claim 2 or claim 3, wherein the resource allocation information comprises frequency use information~~.~~

~~5. A network node according to claim 4,~~ wherein the frequency use information enables signals transmitted and/or received by the respective transmission and/or reception interfaces to co-exist with signals associated with external space-based and/or terrestrial users without interference.

~~6. A network node according to any one of the preceding claims wherein the session information includes handover control information.~~

~~7~~5. A satellite payload ~~network node~~ according to any one of the preceding claims which provides the same network control functionality as the interface between a user equipment device and a packet core in a terrestrial network.

~~8~~6. A satellite payload~~network node~~ according to claim ~~7~~5, wherein the terrestrial network is an LTE network, and the network node provides the same network control functionality as an Evolved Node B.

~~9~~7. A satellite payload ~~network node~~ according to any one of the preceding claims comprising means for encrypting and decrypting data.

~~10~~8. A ~~network node~~satellite payload according to any one of the preceding claims in which the network management module is arranged to determine session information for:

a first communication mode for communication to an entity in the terrestrial network via a satellite gateway;

a second communication mode for direct communication to an entity in terrestrial network;

a third communication mode for direct communication to a ground-based gateway to the terrestrial network; and

a fourth communication mode for communication with another satellite.

~~11~~9. A network entity comprising a satellite payload ~~network node~~ according to any one of the preceding claims and further comprising a plurality of adaptive antennas connected to the transmission and reception interfaces, in which the plurality of adaptive antennas support multiple input multiple output, MIMO, air interfaces.

~~12~~10. A network entity according to claim ~~11~~9 in which the adaptive antennas are configured to allow adaptive beam coverage for in-orbit dynamic reconfiguration to optimise the beam set for traffic patterns and location, and interference mitigation.

~~13~~11. A network entity according to claim ~~10~~9 or claim ~~11~~10, comprising an inter-satellite link interface.

~~14~~12. A network entity according to claim ~~12~~10 or claim ~~13~~11 in which the controller is arranged to interface with the controller of a satellite.

~~15~~13. A satellite comprising the network entity of any one of claims ~~11~~9 to ~~14~~12 for use in any or a combination of a geostationary orbit, geosynchronous, Low Earth Orbit, and a Medium Earth Orbit.

~~16.~~ 14. A system comprising the satellite of claim 13 and a user equipment device configured for communication ~~with a space-borne network node according to any one of claims 1 to 10.~~
the satellite.