24th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Highly Integrated Distributed Systems (7)

Author: Mr. Peter Anderson
Clyde Space Ltd, United Kingdom

Mr. Greg Sandlier
London Economics, United Kingdom
Mr. Farooq Sabri
London Economics, United Kingdom
Mr. Robin Sampson
Clyde Space Ltd.,, United Kingdom
Mr. Craig Clark
Clyde Space Ltd, United Kingdom
Mr. Wen Cheng Chong
Kepler Communications, Canada
Mr. Mina Mitry
Kepler Communications, Canada
Mr. Jeffrey Osborne
Kepler Communications, Canada

# NANOSATELLITE PLATFORM CONSIDERATIONS FOR MACHINE-TO-MACHINE COMMUNICATIONS APPLICATIONS:

**Abstract**

The concept of 'machine to machine communications', which underwrites the global vision of the 'Internet of Things', i.e. a network of terrestrial sensors signalling near-real time data from a multitude of sources, is considered a key application of nanosatellites in low earth orbit. Whilst the concept IoT it-self may not be new and is as old as the internet, the emerging maturity of CubeSat bus systems holds clear promise that data-sensitive commercial opportunities can be accessed by aggregation, filtering, and processing of terrestrial sensor generated signals from nanosatellites.

Working together with leading nanosatellite telecommunications service providers, Spire Global, Kepler communications, and ExactEarth, Clyde Space has accumulated extensive experience in designing satellites within typical CubeSat system constrains which meet systematic requirements of a machine to machine communications platform. This includes design and development of low-EMI induction subsystems reducing on-board noise to a level where even low power machine signals on the ground can be heard in space.

Our control system methodology enables complete 3-axis control over a full orbit so that a distributed network of sensors around the globe can be heard and distributed ground station network can be contacted at any point on an orbit.

Clyde Space has improved our power subsystems generation capability and efficiency, to enable three ground-station down-link contacts, in high power (15W) transmissions per orbit, on a 3U platform.

System availability is key in determining the utility value of any telecommunication mission, and Clyde Space's onboard computer has been design to ensure no loss of critical 'up-time' should occur during a 4 year platform mission lifetime.

The above system level improvements demonstrate that key, commercial 'concept of operations' requirements for commercial M2M missions can be met with today's 'off the shelf' nanosatellite platform subsystems, and that 'lean constellations' which leverage more highly capable, and mission specific nanosatellite platforms, rather than unnecessarily large M2M constellation systems.