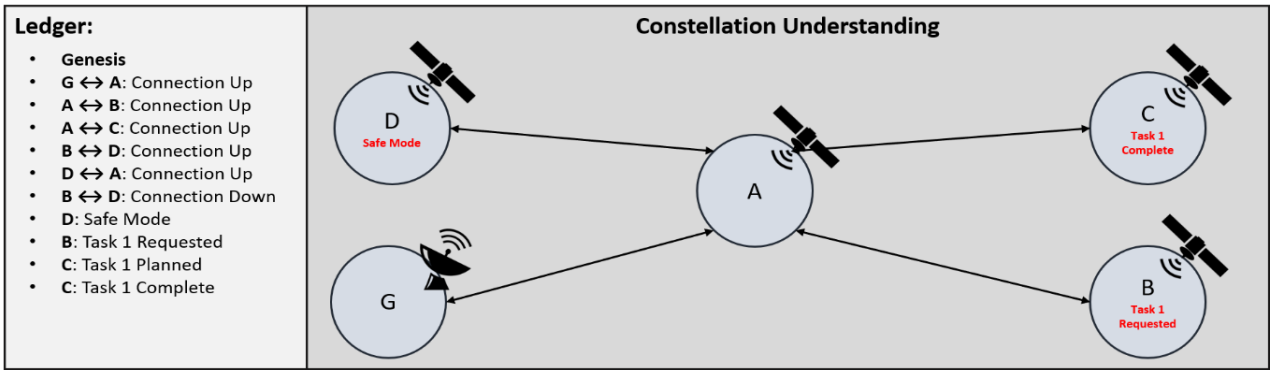
Press Release: Orbit Logic Leverages Blockchain for Constellation Communication over Dynamic Networks

GREENBELT, MD (January 7, 2021) – Orbit Logic has been awarded a Phase I Small Business Technology Transfer (STTR) contract sponsored by NASA to develop Space Communication Reconstruction and Mapping with Blockchain Ledgering (SCRAMBL) – a secure and distributed communication system that will facilitate cooperation among heterogeneous satellite assets to satisfy constellation-level mission requirements. The solution is being developed in partnership with Fraunhofer USA (FhUSA) and CyberPhysical Security, Inc.

By leveraging recent advances in blockchain technology, SCRAMBL will ensure secure and robust communication in satellite constellations where the network topologies and asset capabilities are uncertain and changing. SCRAMBL will enable each asset to securely and efficiently learn, update, and share the constellation's Common Relevant Operating Picture (CROP): a ledger of asset health, available communication links, and plan status that each asset accesses to determine its own actions. The figure below is an example illustrating how SCRAMBL will synchronize CROP ledger items. Orbit Logic's existing Autonomous Planning System (APS) will perform optimized spacecraft-level planning by interacting with CROP content via SCRAMBL for constellation-level coordination and task deconfliction.



Blockchain application involving spacecraft constellation state message broadcasting

FhUSA's blockchain algorithm is customized for SCRAMBL's concept of operations. It leverages blockchain technology elements that provide benefits to space systems, such as smart contracts to efficiently track changes in the CROP. At the same time, it omits features ill-suited for space operations, such as the expensive proof of work computations that make tasks like bitcoin mining necessary in blockchain applications where anonymous users communicate over unsecured networks. SCRAMBL will allow satellites to efficiently synchronize the CROP despite changing communication network topologies, changing asset availability, intentional data manipulation or cyberattacks, packet loss from communication corruption or radiation, and other adverse environmental conditions.

While the Phase I effort will focus on satellite constellations, SCRAMBL is relevant to any application requiring the coordination of autonomous heterogeneous assets. For example, Orbit Logic is applying APS for the robotic exploration of Mars[1] and of the Moon[2] using teams of mixed asset types (orbital and surface). In these missions, communication latency to Earth necessitates autonomous operation using the efficient communication and cooperation facilitated by SCRAMBL and APS. Missions with similar needs include wildfire sensing, prevention, and mitigation.

[1]Orbit Logic's NASA STTR, Mars/Interplanetary Swarm Design and Evaluation Framework (MISDEF) http://orbitlogic.com/uploads/5/7/8/8/57881343/20200416%20MISDEF%20Phase%20I%20Press%20Release.pdf
[2]Orbit Logic's NASA STTR, Intelligent Navigation, Planning, and Autonomy for Swarm Systems (IN-PASS)

About Orbit Logic

Orbit Logic (www.orbitlogic.com) specializes in mission planning and scheduling solutions for aerospace and geospatial intelligence. Orbit Logic's operationally proven COTS products create better plans faster with fewer resources for all mission phases. Orbit Logic services are available to configure, customize, and integrate Orbit Logic's mobile, web-based, desktop, and flight software applications to provide turn-key operational solutions that leverage the latest available technologies to meet customer goals and exceed their expectations.