mist® Wireless Sensor Mesh Network Protocol

RSAE Labs products and services capitalize on exclusive global rights to their advanced wireless sensor mesh network protocol, called mist® (mobile integrated sensing technology). The mist® protocol was developed from scratch (no reuse of cyber-vulnerable legacy protocols) with $50+M of public/private funding over the last twelve years to fulfill unmet market needs for cost-effective wireless sensor data and the Oracle-quality reliability required for true Blockchain implementation. mist® excels in data security (FIPS-140-2), scaling (10Ks nodes), ultra-low power (fraction of BLE), and dynamic ad hoc networking that existing wireless protocols do not and cannot address. mist® provides precision position beacons and a reliable, self-healing "last segment" communications using inexpensive, battery powered, wireless sensor mesh network nodes. mist® networks form using fully automatic mesh routing via hundreds of self-optimized hops with unmatched power efficiency. There is no need for expensive RF engineering surveys and deployment designs. Simply place the mist® sensor nodes, turn on a mist® data gateway and you're operational.

mist® is not only superior for fixed, stationary installations but can uniquely support precise tracking and continuous monitoring of mobile assets. When combined with RSAE's Global Sentinels (GS), mobile mist networks can seamlessly travel the globe. Now being produced in a sixth generation, the GS-6 series will track all forms of ISO and 53' containers, vehicles, vessels, locomotives and aircraft. With years of life on a single battery, costing less than $10 US, mist® sensor devices can monitor and precisely track items at the carton, pallet and container level, and immediately report actionable data between any points on earth.

To ensure backhaul reliability, Global Sentinels come standard with options for up to four different types of communications. As an example, most devices ship with global cellular (2G, 3G, 4G/LTE Cat-M1/NB-IoT), Iridium satellite (options for INMARSAT and Globalstar) and two forms of local wireless communications, like mist® and WiFi. With the recent porting of mist® to the latest multi-protocol System on a Chip (SOC) by Nordic (nRF52840), RSAE can now support legacy protocols
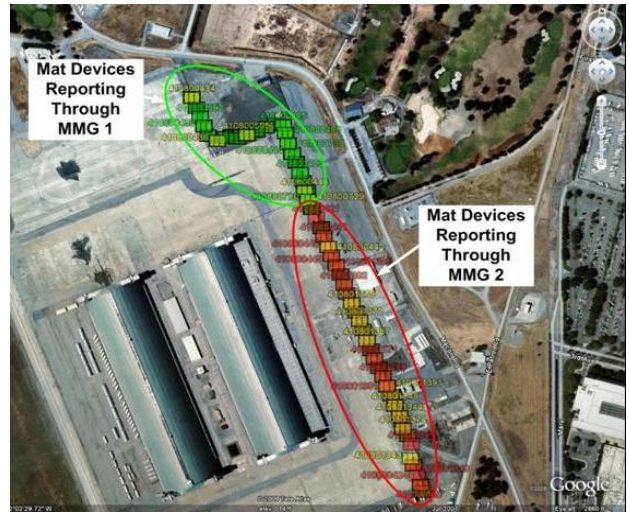

mist®-enabled modules

like Bluetooth and ZigBee variations on the same SOC. Changes between protocols can be supported from local memory or via an over the air firmware upgrade. This allows mist® devices to be data bridges between consumer-grade legacy protocols on smart phones and the DoD-grade mist® network devices. The nRF52840 also supports Near-Field Communications (NFC) allowing point of sale, access key and user ID applications. As an example of over-the-air encrypted firmware update in support of the US Army, 6,500 mesh sensor node mist® tags were all automatically networked with a single mist® gateway and securely upgraded with an over-the-air encrypted firmware update prior to shipping to Afghanistan in 2012.

With mist® providing "last segment" two-way communications and Global Sentinels providing global backhaul, the third component of RSAE's Global Logistics Management Services (GLMS) is the suite of cloud-hosted applications to authenticate, decrypt, process, archive and distribute actionable data in near-real time to end-user operators. In total, these applications are known as a Device Management Center (DMC) because its other primary functions allow remote configuration management and tailored edge-processing on the "smart" mist® devices, data gateways, rule-driven networks, and edge-managed Global Sentinels.
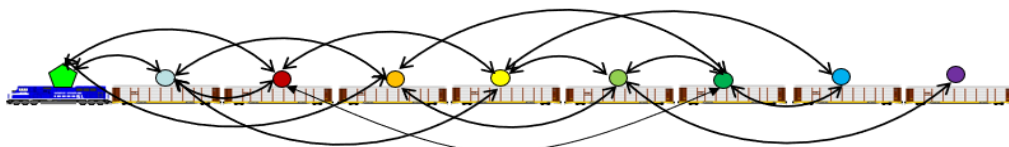
Developed for US Army *Sense and Respond Logistics*, the security features "baked into" the protocol and mist's robustness in dynamic, mobile environments are also important for rail operations and all commercial logistics processes. Non-logistics related sensor and information data collection can include plant operations, personnel safety, facility security, infrastructure monitoring, livestock management, irrigation and more.

The unique emissions control features of mist® included to satisfy US Army requirements is not to "talk" until the "interrogator" is authenticated. As a result, unauthorized "listeners" are unable to identify and track specific tagged items. mist® was developed to maintain reliable connections even in a significant and contentious RF environment by continuously frequency hopping across 16 channels that make up the 2.4 GHz IEEE 802.15.4 spectrum. As a result, mist® data collection networks can operate within the "white noise" of other IEEE 802.15.4 networks (e.g. ZigBee) and other 2.4 GHz ISM waveforms.

One-mile Linear mist® Topology - Feb 2009
Moffit Field-Silicon Valley, CA

mist® has earned fifteen (15) US patents. Technical innovations covered by the patents include a peer-to-peer method of TDMA, continuous channel hopping, alternative methods for medium access control to mitigate RF contention and scaling challenges, a number of bi-directional routing features, quality of service, accelerated rejoining features, loop avoidance detection, and link layer encryption using different encryption keys for every node pairing which makes brute force decryption attacks ineffective. These patents and the myriad of Trade Secrets and US Copyrighted firmware, drawing and documentation form the core of RSAE Labs' intellectual property and expertise.

mist® Creates a Dynamic, Ad Hoc Mesh Network for Secure, Reliable Two-Way Data Communications
Validated on 110-car test train by TTCI in 2016

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