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The Internet of Things (IoT) and associated MachineTo-Machine (M2M) connectivity has been named the next Industrial Revolution, as it will bring major changes in the way all businesses, governments, and people will interact with each other, as well as with the entire world. In this article, we will explore if IoT/M2M will also bring about the next Industrial Satellite Communications (SATCOM) Revolution. Forecasts for growth and expected number of IoT/M2M devices are staggering. Just to take one example, Ericsson Mobility Report(*1) beginning of 2016 predicts IoT will overtake mobile phones by 2018, and predicts that between 2015 and 2021 the number of IoT/M2M connected devices will grow 23 percent annually. Furthermore, Ericsson predicts the number of IoT connected devices is

expected to grow 23 percent annually, and of the 28 billion total devices that will be connected by 2021, close to 16 billion will be IoT devices.

Other notable forecasts summed up by Forbes(*2) on November 2016 are McKinsey's estimates that the total IoT market size in 2015 was up to \$900M, growing to \$3.7B in 2020 attaining a 32.6% CAGR, the General Electric prediction that the Industrial Internet of Things (IoT) investment is expected to top \$60 trillion during the next 15 years, and the IHS forecast predicting that the IoT market will grow from an installed base of 15.4 billion devices in 2015 to 30.7 billion devices in 2020 and 75.4 billion in 2025.

Predictions are predictions, but one thing is for certain, IoT is going to be big. So what about IoT and SATCOM?

The World Bank Group considers financial inclusion a key enabler to reduce extreme poverty and boost shared prosperity, and has put forward an ambitious global goal to reach Universal Financial Access (UFA) by 2020. More than 55 countries have made commitments to financial inclusion while more than 60 have either launched or are developing a national strategy.

Financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their

needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way.

Being able to have access to a transaction account is a first step toward broader financial inclusion since a transaction account allows people to store money, and send and receive payments. A transaction account serves as a gateway to other financial services, which is why ensuring that people worldwide can have access to a transaction account is the focus of the World Bank Group's Universal Financial Access 2020 initiative.

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Some interesting facts about IoT/M2M solutions over Satellite

Before we dig into SpaceBridge Inc' IoT/M2M solutions, let's first look at some interesting facts.

SATCOM was always utilized for industrial M2M. In fact some industries like the Utilities, Oil & Gas, Lottery, Banking, Government, Sensor Networks, Security and Industry depend on SATCOM for their deployments.

The first IoT/M2M objects are considered by some to be ATM machines going online as far back as 1974. Since then SATCOM was always involved in M2M, Industrial SCADA network deployments, telemetry and others. For many years this market segment was named in the satellite communication circles as "transactional low data rate SATCOM applications", this in contrast to Enterprise and Consumer Broadband applications over satellite.

During the last 10 years, a new and growing SATCOM market has emerged-- cellular backhaul over satellite. As cellular connectivity is also often utilized for IoT and M2M, SATCOM has been also utilized to backhaul larger number of IoT/M2M devices connected via cellular, Wi-Fi or other wireless communication means.

The IoT/M2M market is currently experiencing the advent of ultra-low cost radio transmission standards for IoT such as LoRa™, Sigfox™, LTE-M, Weightless and NB-IoT targeting less than \$5 per radio transmitter, as well as low cost localized gateways to concentrate larger numbers of IoT/M2M devices in their vicinity, even thousands. At SpaceBridge Inc we see this trend leading to a new SATCOM application segment IoT/M2M Gateway Backhaul over satellite.

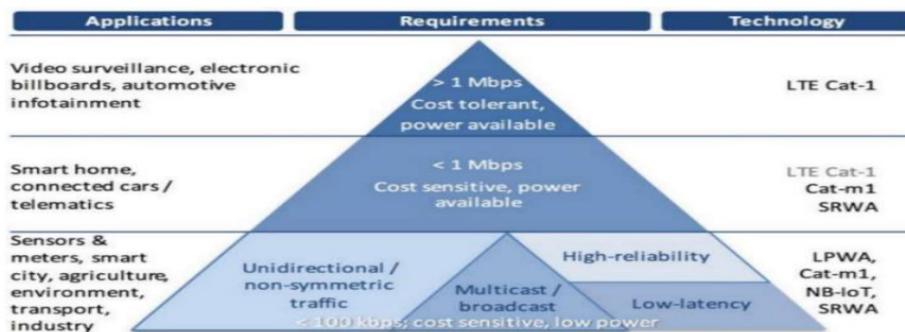
Due to the above and other market factors, SpaceBridge Inc expects that if the general IoT/M2M market grows dramatically, this growth will spill over also to satellite communications.

Not only SpaceBridge Inc thinks so, but for example the October announcement of the IoT partnering between Inmarsat and Vodafone(*3) to enhance IoT reach shows the importance of Satellite in this sector—"Thanks to its ubiquitous coverage and high network availability, even in extreme environmental conditions, satellite powered IoT allows organizations to extend their services beyond terrestrial networks, where they have remote connectivity requirements, for example in the agri-tech, utilities, oil and gas and transportation sectors."

New IoT/M2M over Satellite Requirements

So as stated above, IoT/M2M/SCADA/Telemetry over satellite were traditionally considered low data rate (not broadband), and hence L-Band Pay-Per-Use (every data BYTE charged) such as Inmarsat

BGAN became popular along with low data rate and more expensive traditional C/Ku-band VSAT systems supporting low data rate random access SCADA devices deployment over satellite.



IoT connectivity market structure

Source: LoRa™ Alliance

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SpaceBridge Inc has recognized that with the new IoT/M2M applications and massive deployments, also come new IOT/M2M application requirements. The IoT/M2M data rate requirements have grown over the years, with new IoT/M2M applications requiring much higher data rates as can be seen in the diagram on the previous page (Source:LoRa™ Alliance)

In addition, with such massive number of IoT/M2M units being deployed, as well as the advent of new IoT/M2M communication standards with low cost transmitters and gateways, it is hard to envision SATCOM or even LTE to be utilized solely for each individual IoT/M2M device, but in addition also for IoT/M2M Gateways backhaul over satellite. SpaceBridge Inc foresees that IoT/M2M Gateway Satellite Backhaul may become as popular as Satellite Cellular Backhaul, further increasing the market potential for IoT/M2M over Satellite

SpaceBridge Vision for IoT/M2M Over Satellite

In order to further tailor the ASAT™ SATCOM System to IoT/M2M requirements, SpaceBridge Inc recently introduced a new SATCOM Terminal, the ASAT™ C7720-ODU.

The ASAT™ C7720-ODU, SpaceBridge Inc' newest interactive VSAT Transceiver-Router is an integrated VSAT transceiver router featuring technological advancements such as Software Defined Radio and Direct Modulation, fully integrated with Ka transceiver-router in an UltraCompact All-Outdoor configuration. This new ASAT™ SATCOM Terminal delivers the versatility and ease of deployment required in Machine-ToMachine (M2M), Internet-of-Things(IoT) and SCADA/Telemetry applications over Ka HTS satellites.

SpaceBridge Inc' new Ultra-Compact All-Outdoor ASAT™ C7720-ODU VSAT transceiver-router was specifically designed for M2M, SCADA and IoT over satellite. The ability to combine the ASAT™ C7720-ODU with SpaceBridge Inc' complete line of ASAT™ VSAT Broadband terminals further enhances deployment flexibility, as such VSAT terminals could be utilized for satellite backhaul of a concentration of SCADA, M2M, IoT devices connected via other wireless mediums such as LTE or WiFi, where the C7720-ODU can be utilized for those locations only reachable via satellite, and where data rate requirements exceed 1Mbps. The C7720-ODU was designed for a wide variety of IoT/M2M/SCADA and Telemetry satellite applications such as:

- Transaction Oriented Applications: Gas Stations, ATM Machines, Lottery, Self-Service Voting/Info Kiosks,
- Interactive-TV: VoD, Program Rating, Shopping, Social TV
- Sensor Networks such as Oil and Water pipe lines, Smart Fences and Perimeter Control
- SmartGrid, M2M, SCADA and Telemetry
- Smart Home and Internet-of-Things (IoT)
- Large-scale Random Access Messaging Networks



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Another ASAT™ IoT/M2M addition to the custom designed ASAT™ **C7720-ODU** IoT/M2M SATCOM terminal, was to enhance traditional VSAT Bandwidth-On-Demand (BOD), transforming it into a dynamically configurable SATCOM access method that enables dynamic configuration to the exact IoT/M2M polling requirements, guaranteeing bandwidth when and where it is needed, as well as preventing IoT/M2M data to be lost. The result is SpaceBridge Inc' ASAT™ versatile SATCOM multi-service access method dynamically supporting multiple modes of operation such as:

- Dedicated and variable rate channel per site (SCPC and Dynamic-SCPC)
- Highly over-subscribed bandwidth-on-demand (BOD) broadband Internet
- Service-Level-Agreement (SLA) defined enterprise broadband
- Guaranteed IoT/M2M polled access
- High priority unsolicited IoT/M2M access
- WaveSwitch™ technology enabling configurable triggered switching (application, traffic, time, external, alarms...) between the above modes of operation, dynamically adapting to the changing application requirements from each site.

Other important IoT/M2M features introduced into ASAT™ SATCOM systems are:

- Both Indoor and All-Outdoor Satellite Terminals covering varied deployment requirements and budget limitations
- Flexible and dynamic data rate support of a few bps to 14Mbps per terminal Configurable SATCOM access method allowing to define exact IoT/M2M polling requirements guaranteeing bandwidth when and where needed and that no data will be lost
- Dynamic SATCOM access method supporting both Solicited (Polled) and Unsolicited IoT/M2M data transfer modes
- Open platform and extensive NBI for seamless integration with IoT/M2M applications and management systems
- Efficient Ka HTS waveforms for lowest CAPEX
- Extensive Multi-Service NMS for straight forward service operation, with special IoT/M2M support
- Integrated ASAT™ Billing System facilitating both monthly, pre-paid and pay-per-use service models
- Scalable ASAT™ Hubs accommodating SATCOM deployments from 50 to over 500,000 sites per high density chassis and beyond
- ASAT™ Dynamic WaveSwitch™ Multi-Service SATCOM System allowing both Bandwidth and Waveform on-the-fly adaptation, efficiently delivering IoT/M2M as well as high quality broadband services over a common SATCOM system

SpaceBridge Believes IoT Will be The Next Industrial Satellite Communications Revolution!

With the massive tripling or quadrupling of a new age of IoT/M2M devices and new applications it is clear that IoT/M2M will bring a massive change over the coming years.

Ubiquitous broadband internet and mobile cellular brought along the “Connected Society”, and our new generations and new businesses interact differently as they did before. SATCOM playing an important part in the “Connected Society” especially in developing countries, but also in large developed countries like the United States and Europe where cellular coverage was not able to reach everywhere.

Now with the shift from Internet-of-People to Internet-of-Things, at SpaceBridge Inc we believe that in a few years this transformation will lead to the equivalent of a new industrial revolution, and hopefully a new Satellite Communications revolution, with satellite communications and the new HTS and LEO satellite constellations playing an even greater role than before.