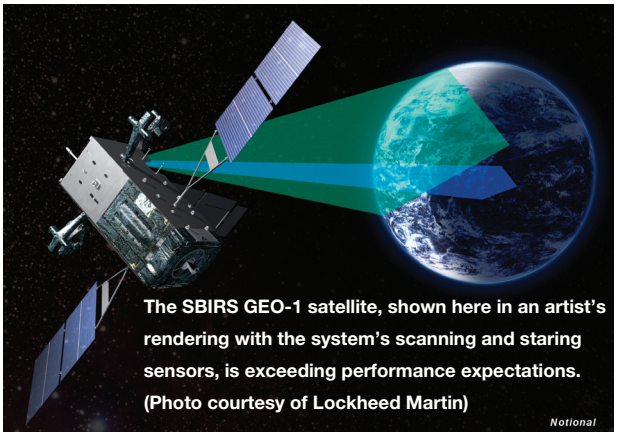
SBIRS GEO SATELLITES
Track Missiles Using Infrared Data

Infrared satellites have proven viable as part of the ongoing mission to enhance tactical intelligence capability. To buoy this effort, the second Space-Based Infrared System (SBIRS) Geosynchronous Earth Orbit (GEO) satellite was recently declared operational. The SBIRS GEO-1 and -2 satellites aim to deliver continuous and accurate missile warnings and infrared surveillance information to combat commanders, the intelligence community, and other key decision makers.

To improve the quality of infrared data collection, SBIRS performs a series of steps. When a missile is launched, the SBIRS sensors detect and track the infrared radiation from its hot exhaust. The satellites then process and transmit that data to the ground terminals. From there, it is forwarded to the Mission Control System (MCS). The MCS receives all data from the sensors, combining data from the multiple satellites and payloads to increase accuracy and aiding in processing and management of the constellation. Next, launch reports are generated with information including the type of missile, its launch point, time, azimuth, and the predicted impact point. Launch reports are reviewed by Air Force Space Command operators and released to assorted intelligence users.

The SBIRS architecture includes a mix of satellites in GEO, hosted payloads in highly elliptical orbit (HEO), and ground hardware and software *(see photo)*. The ground system performs five functions: mission planning/payload tasking, constellation management, mission processing, event reporting and data distribution, and ground control. It is operable in three modes: normal, survivable, and endurable. In conjunction with the satellites and payloads, the ground system provides enhanced global, persistent coverage and missile-launch detection. These aspects help to support ballistic-missile defense systems and subsequently bolster situational awareness for warfighters in the field.



The SBIRS GEO-1 satellite, shown here in an artist's rendering with the system's scanning and staring sensors, is exceeding performance expectations. (Photo courtesy of Lockheed Martin)

The SBIRS GEO satellites utilize a global positioning system (GPS) receiver with a Selected Availability Secure Anti-Spoof Module (SAASM) for secure communication of coordinates. The ~1000-lb. infrared payload of scanning and staring sensors includes short-wave, mid-wave, and see-to-ground sensor-chip assemblies. In addition, Short Schmidt telescopes provide dual-optical pointing, agile precision pointing and control, and passive thermal cooling.

The satellites rely on a mix of Earth antennas, omnidirectional antennas, and dual-band gimbaled spot beams. They operate on three frequency bands at Ka-band, three at S-band, and one at Q-band. The Ka-band is used for survivable mission, normal mission, and wideband sensor data. The S-band is utilized for theater mission downlink, backup space-ground-link-system (SGLS) telemetry downlink, and backup SGLS commanding. The Q-band is used for anti-jam commanding.

The HEO payloads perform similar functions to the GEO satellites for vital polar coverage. The ~600-lb. infrared payload includes a scanning sensor, as well as the Short Schmidt tele-

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PEOPLE

NORTHROP GRUMMAN—Catherine Gridley was named sector vice president of business development for the company's Technical Services sector. Also, appointed is His Excellency Walid Abukhaled as chief executive Saudi Arabia, effective Jan. 1, 2014. Charles W. "Charlie" Lyon has also been appointed corporate lead executive for company business in Hampton, Va., and will report to Timothy C. Jones, vice president, aviation and intelligence, surveillance and reconnaissance. Lyon will replace the retiring Timothy A. Peppe.


GRIDLEY

LOCKHEED MARTIN—The board of directors has elected Marillyn A. Hewson chairman of the board, effective Jan. 1, 2014. She will continue her responsibilities as President and CEO. Robert J. Stevens has stepped down from the position of Executive Chairman and will retire from the company in early 2014.

BOEING—Named Dennis A. Muilenburg vice chairman, president, and chief operating officer. The firm also promoted Raymond L. Conner to vice chairman, president, and CEO, Boeing Commercial Airplanes. Christopher M. Chadwick replaces Muilenburg as executive vice president, president and CEO, Boeing Defense, Space & Security. Shelley K. Lavender will replace Chadwick as the leader of Boeing Military Aircraft.

scopes, agile precision gimbal pointing and control, and passive thermal cooling. The payloads boast a data rate of 100 Mb/s to the ground.

All SBIRS satellites and payloads are currently under contract by Lockheed Martin. Three more satellites (and subsequent HEO payloads) are set for eventual launch. GEO-3 recently passed functional integration testing while GEO-4 is scheduled for delivery in 2015. GEO-5 and -6 are under long-lead parts procurement. The SBIRS team is led by the Infrared Space Systems Directorate at the U.S. Air Force Space and Missile Systems Center with operation led by the Air Force Space Command. ■

M2M DEVELOPER KIT Aims To Spur Marketplace Innovation

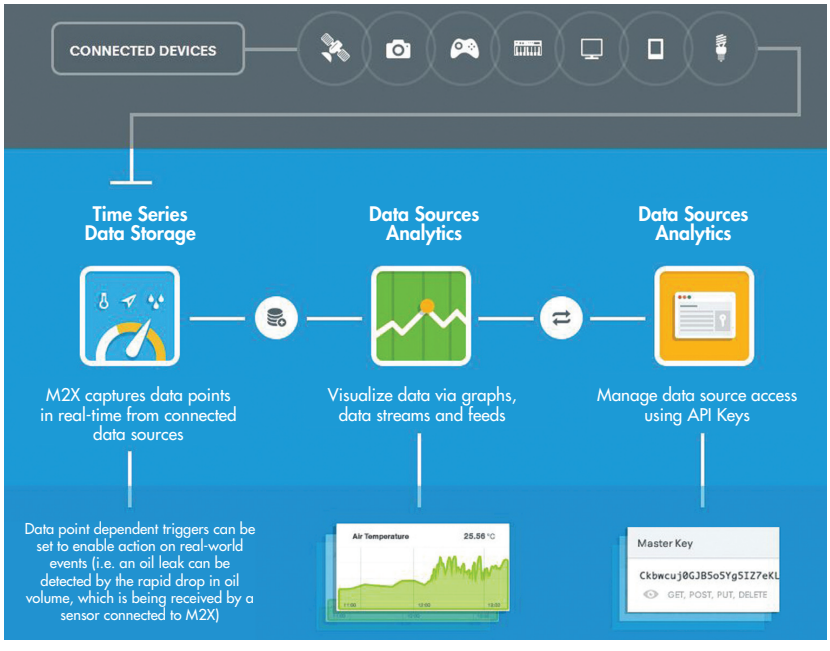
WITH A NEW cloud-based developer kit, machine-to-machine (M2M) communications users are promised an easy way to manage connected devices and data from prototype to launch. The AT&T M2X Developer Kit helps in the creation of M2M devices—from choosing the right hardware to coding devices. It also provides the necessary services for aggregating data and making necessary business decisions from it.

Microwaves & RF discussed the M2X Developer Kit with Mobeen Khan, AT&T's Executive Director of Product Marketing, Advanced Mobility Solutions, and AT&T Business Solutions. According to Khan, AT&T has been involved in the M2M industry for about a decade, connecting machines, monitors, cars, and mobile devices. Now that more devices are becoming connected via the so-called "Internet of Everything," mainstream developers need a next-generation solution. M2X addresses those needs by combining a variety of AT&T assets. Bundled together, they provide a single place where one can register, verify his or her connection, and start to code.

The kit combines two main services: M2X and a control center *(Figs. 1 and 2)*. M2X is the cloud-based data-storage service that allows highly secure data transmission, data sharing, and near-real-time event management. The control center, powered by Jasper Wireless, allows developers to activate subscriber identity modules (SIMs) and transmit the data collected on them to any connected machine. This capability enables everything from network provisioning to device activation, customer support, billing options, and performance audits. Such added connectivity also extends upgrade, diagnostic, and repair options for devices. M2X supports a variety of libraries and device platforms including mbed, Arduino, Node.js, Ruby, JavaScript, Python, C, PHP, .NET, Java, iOS, Android, and BeagleBone. It also provides connectivity over Ethernet, WiFi, or 3G/4G links.

In discussing the inspiration for this kit, Khan spoke of the changing landscape of the M2M industry. In the past, it comprised specific companies including car, tractor, and large shipping businesses. Now, everything from retail to healthcare products are being communications-enabled. This shift means that the industry can no longer rely on a handful of experts. With M2X, AT&T is striving to provide a collaborative ecosystem to build solutions. ■

1. The M2X Developer Kit supports a variety of platforms including Ruby, JavaScript, Android, iOS, and BeagleBone. (Graphics courtesy of AT&T)



2. The control center provides a one-stop shop for storage, analytics, and management for a variety of devices.