High Throughput Satellite (HTS) Communications for Government and Military Applications

Where You Want It
When You Want It

“D” D’Ambrosio
EVP, Government Solutions, O3b Networks

MILCIS 2015
10 November 2015
Location: Canberra
A Very Different Satellite Solution

- **O3b Networks**
  8,062 km (5,009 miles)

- **GEO Operators**
  36,000 km (22,369 miles)

- A different kind of satellite constellation:
  - MEO reduces delay by 75% and increases throughput significantly compared with GEO
  - Lower cost to build and launch

- O3b is the first satellite constellation built with IP and mobile networks in mind
  - O3b's cost advantage enables the business case for sites that are not possible with GEO or fiber
  - O3b's higher throughput and lower latency dramatically improves satellite service
Each satellite has 12 steerable antennas
• In the nominal Gateway-homed configuration:
  • 10 antennas used for customer beams
  • 2 antennas used for Gateway connectivity
  • Each antenna (beam) is independently steerable to any location within +/- 65° latitude
  • Customer beams have 216 MHz of capacity in each direction, 432 MHz in total per beam

• Loopback beams can also be configured to provide localized connectivity up and down in the same beam
  • 216 MHz of total bandwidth is divided up between forward and return directions
  • Used as a VSAT solution within a single beam

• Beams on a single satellite
  • Can be stacked at the same location to provide additional capacity
  • Additional single satellite capability
    - Can be cross-strapped so two beams provide communication links between two sites on same satellite
    - Communications can occur directly between government remote terminals and/or government gateways, bypassing O3b teleports.
    - A highly secure and reliable communications configuration
O3b Satellites
Final Assembly at Thales, Cannes, France
O3b Coverage Map & Gateways
O3b - World Divided into 7 Regions

Optimal coverage zone:
177 countries, 70% of world’s population, 90%+ of DoD facilities and AORs

Customers can connect to fiber infrastructure through Regional Gateways
All satellite regions overlap allowing for make before brake
O3b Networks Constellation Update

- Successful launch of Satellites 1-4, MAR14
  - Arianespace from French Guiana
- Satellites 5-8 launched, JUL14
  - Full Commercial Service Q314
- TT&C tracking from O3b Gateway sites in Hawaii, Australia, Greece, and Peru all working normally
  - All gateways operational
- Service currently active between Hawaii Gateway and Cook Islands since MAR14
  - Throughput has exceeded 1.6GBPS
- Satellites 9-12 launched, DEC14
  - Commercial service for all 12 satellites
    - All satellites in commercial service since Q115
- Additional 8 satellites under construction
  - Items to be built into next 8 satellites
    - which will be applied as a S/W patch to the current in-orbit satellites
      - TT&C Encryption
      - Secure Beam Mobility
- Additional satellites increase beam availability
- Satellites 13-16 scheduled launch, DEC17
O3b Networks’ Products for Government Market

Key features

1. Latency of <150 msec
   • High quality voice and video

2. Affordable, scalable bandwidth up to and beyond 1+ Gbps
   • Meet existing requirements at lower cost and emerging requirements with existing budgets

3. Coverage where and when needed
   • 90 % of DOD facilities and AORs
   • Focused coverage with the ability to move spot beams

4. Solutions for fixed sites and maritime users
   • Secure

5. Roadmap to implement ground infrastructure to U.S. MAC I

Benefits

1. Provides Reachback in support of cloud-based applications, big data and analysis of ISR sensor data

2. Support real time, secure HD video conferencing and sensor feeds connecting decision makers and tactical operators

3. Enhances command and control (C2) and tactical flexibility with BYOD tactical networks

4. Expand bandwidth options for maritime platforms/task forces

5. Supports military and commercial encryption without spoofing

State of the Art Commercial Solutions Adapted for Government Requirements
Government Network Centric Operations

• Today’s Network Centric Warfare demands ever higher connections from the front line to command centers

• Internet connectivity provides a vital lifeline
  o Additional benefit, troop moral and welfare

• Latency
  o Low latency (<150 msec) for time critical applications

• Worldwide Coverage
  o Satellite constellation provides common frequencies and performance worldwide

• Applications
  o High bandwidth traffic – or ultra-high by stacking beams
  o Government Applications and Cloud
    • Troop Welfare (Internet, Communications, Medical)
  o Rapid response disaster recovery
  o Potential for multiple application (Space and Ground) using common equipment
Encryption Over Medium Earth Satellite (MEO) Network

- Validated and characterized the performance of U.S. Government High Grade cryptographic solutions over O3b
- High Assurance Internet Protocol Encryptor (HAIPE)
- All encryption testing used the HAIPE v4.1 compliant devices
- Network jitter never exceeded 2ms during any phase of testing
- Total latency was not observed in excess of 142ms
- These network characteristics are not only ideal for the application of HAIPE devices
  - Should be found acceptable to nearly any user’s application.
- All encryption devices worked over the O3b system
U.S. Government Test & Evaluations (T&E)

- **U.S. Naval Space and Warfare Command (SPAWAR), CODA Lab, On-going**
  - SSC-Pacific San Diego
- **Commander, U.S. 7th Fleet, TRIDENT WARRIOR 2015 (TW-15)**
  - COMSEVENTHFLT PANDARRA NET Exercise
  - USS Fort Worth (LCS-3) Limited Objective Experiment (LOE)
- **U.S. Naval Special Warfare Command, TRIDENT SPECTRE 2015 (TS-15)**
  - Navy M80 Stiletto Vessel (SEAL Delivery)
    - One maritime terminal on vessel
    - All Data encrypted
  - National Reconnaissance Office (NRO)
- **Joint Communication Support Element (JCSE)-USSOCOM/USCENTCOM OCT14**
  - Sponsored by SES-GS, O3b GDP
    - J6 of both staffs attended
- **U.S. NAVAIR/Special Communications Requirements Division (SCRD) Q2/Q415**
  - Conducts all T&E for:
    - White House Communications Agency (WHCA)
    - Special Operations (SOCOM)
    - Various I-Agencies; NGA, CIA, DIA,
    - Law Enforcement Agencies; FBI, US Marshalls,
- **National Geospatial-Intelligence Agency (NGA), Q415**
  - Exercise Enterprise Challenge 2015
- **U.S. Marine Corps Tactical Systems Support Activity (MCTSSA) Q415/Q116**
  - Q315, new AvL 0.85cm /Q415, new AvL 2.4m Flyaway terminal
Operational Concept – 4GLTE Services at the Tactical Edge Today - Leverage Position for Migration

Communications on the move, Multi-echelon voice calling, Improved SA Accuracy, Range Extension, Web 2.0 Tools, Video Capture, UAS Support, Edge Devices, Sensor Integration

- 4GLTE Services at the Tactical Edge Today
- Leverage Position for Migration
- Communications on the move
- Multi-echelon voice calling
- Improved SA Accuracy
- Range Extension
- Web 2.0 Tools
- Video Capture
- UAS Support
- Edge Devices
- Sensor Integration
• Installed Orbit 1.2m maritime antenna system
• Operational since 20 May 2014
• Full make-before-break seamless connectivity
• Uplink (return): 150 Mbps
• Downlink (forward): 400 Mbps
• Latencies < 150 msec
• O3b latency performance supports 4G LTE standards
USS Fort Worth (LCS-3) – Trident Warrior 2015 (TW15)

- US 7th Fleet Sponsored/Directed
- 1.2m Orbit System/ViaSat modem
- Perth Gateway, US IP Routed
- Limited Objective Exercise 1, UNCLAS APR15
- Limited Objective Exercise 2 CLAS AUG 15
- Navy enclave (NIPERNET/SIPERNET)
- O3b Reachback to PACOM, PACFLT, 7thFLT SPAWAR, LCSRON, SURFLT
- Demonstrating 4G/LTE (Oceus) throughout LCS-3
  - 30MIN Live Virtual Tour of LCS-3 underway
  - PAO Event
Trident Warrior 2015 – USS Fort Worth (LCS-3)

- Onboard LCS-3 since March 2015
  - O3b & 4G/LTE

- US 7th Fleet conducting experiments in 2 phases
  - Phase I – NIPERNET
  - Phase II – SIPERNET

- VIPs Observing Phase I
  - Commander Seventh Fleet
  - Commander US Pacific Fleet & Staff
  - USN Balboa Hospital San Diego, Staff
  - Commander US SPAWAR and Staff
  - Commander, US Naval Surface Forces
  - Commander, US Naval Aviation Forces
  - Chief of Navy, Royal Australian Navy
  - Chief of Staff, Japan Maritime Self-Defense Force

- US Chief of Naval Operations (CNO) used as Public Affairs opportunity through virtual tour
USS Fort Worth (LCS-3) Hangout Tour

- Went from LCS-3 to Perth Australia O3b Gateway via O3b Satellite
- O3b Perth to Pentagon via Terrestrial (11581mi; 18637 km)
- From Pentagon where you got the tour (live)
- Total Latency satellite 150ms; terrestrial 300ms = 450ms
- GEO alone latency 500ms
  - if add terrestrial= 800ms
Naval Special Warfare Command
M80 Stiletto - Trident Spector 2015 (TS-15)

- Joint Expeditionary Base
  - One 1.2m Orbit system, ViaSat modem
  - Beam, Vernon Gateway, US IP routed
  - O3b Reach back from a Special Warfare Vessel responsible for SEAL delivery
  - Single antenna 20sec to reacquire satellite
    - System encrypted; No data lost
  - Demonstrating 4G/LTE with connectivity to O3b Networks
U.S.M.C. Tactical Systems Support Activity (MCTSSA) Terminal Testing
1 MEF DAWN BLITZ
Supporting 3rd Fleet & Shield Aviation with Reach Back for the Ares UAV

- Shield Aviation’s Ares UAV Group 3 UAV
  - Utilizing a FLIR STAR SAFIRE 380 HD (1080p)
  - NAVAIR Flight Clearance
  - 150 Lbs of Payload
  - 1 ISU 90
  - 14 hours endurance time

- O3b Networks
  - O3b 85cm Transportable Terminal
  - RTT 139 ms
  - 24/7 ops using generator in remote environment

Through put over O3b on 6 Sep 2015 at HOLF
NAVAIR, Special Communications Requirements Division (SCRD) – is a key leader within the US Navy and is responsible for providing full life-cycle support of naval aviation aircraft, weapons, and systems operated by Sailors and Marines. The SCRD supports sensitive programs. NAVAIR Focus Areas are increase speed to the Fleet through program of record planning execution, and rapid response to urgent warfighter needs.
Went from SCRD to O3b Gateway Vernon, TX via O3b satellite Vernon Gateway to O3b HQ The Hague terrestrial (4920mi; 7917 km) Total Latency satellite 150ms; terrestrial 200ms = 350ms GEO alone latency 500ms if add terrestrial = 700ms
EDA Demonstration Objectives

- FTP large file – simulating pulling data from the HQ
- Simultaneous videos on you tube on multiple devices
  - laptop, smart phones, etc.
- Live HD video
- Had 17 devices doing HD 4G simultaneously
- All of the tests above are over 4G/LTE back to O3b satellite to gateway to internet to The Hague.
• Have been discussing with **DOD-CIO, DISA** and all **DOD agencies** the use of hybrid terminals
  • Military-Ka and Commercial-Ka (Mil-Ka & Com-Ka)

• **Discussions with the following vendors:**
  • **Harris** – Commercial Broadband Satellite Program (CBSP)
    - Force Level Variant (AS, CVN, LCC, LHA, LHD, LPD-17, and T-AH)
    - Unit Level Variant (CG, DDG, FFG, LCS, LPD-4, and LSD)
    ▪ Revise hybrid from C, X, and Ku-Bands to X-Band and Ka Band (Mil & Com)
  
  • **Raytheon** – Navy Multiband Terminal (NMT)
    - Revise Ka to be both Mil-Ka & Com-Ka
  
  • **TeleCommunication System (TCS)** – Warfighter Information Network – Tactical (WIN-T)
    - Revise SIPR/NIPR Access Point (SNAP) and SNAP lite terminals to Mil-Ka & Com-Ka
  
  • **Boeing – Defense, Space & Security**
    - Next generation terminals designed to MIL-Ka standards vice Ku
    ▪ Being revamped to be Mil-Ka and Com-Ka capable
  
  • **Gilat Satellite Networks** – RaySat
    - Development of O3b Network Terminals
  
  • **AvL Technologies** – New terminal development
    - 85cm COTM terminal (completed)
    - 2.4 meter transportable terminal
    ▪ loop back terminal
Applying FLV O3b Ka-band Upgrade to the Fleet

- Attract and retain quality staff through improved Crew Welfare
- Consolidate IT infrastructure (Data Center Hosting)
- Improve Customer Satisfaction and attract new more affluent passengers with greater connectivity
- Drive up usage and revenue from bandwidth Services: more voice calls, Facebook, IM/Text/Skype chat and video conference, etc.
- Add new services to the Passenger Experience
- Improve Voice Call Quality
- 100 times throughput of previous service (Ku)
  - Previous terminal 2.4m; current O3b 2.2m
- Previously 4.5 Mbps
- 150 Mbps (Uplink from Oasis)
- 350 Mbps (Downlink)
- Broadband in and around the ship
  - Petabyte of internal data transfer per day
- Mobile Voice, Video and Data ship wide (4G/LTE)
  - With NIPRNet and SIPRNet access
- Improve Operational and Readiness
- Improve Voice Call Quality
- 50 times throughput of current capability
  - Current CBSP terminal 2.7m requires modification
- CVN currently 20 Mbps (Aggregate)
- With FLV O3b Ka-band upgrade: 1Gbps
  - 470 Mbps (Uplink from CVN)
  - 530 Mbps (Downlink)
Connect with us:

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