Advanced VSAT Networking Infrastructures
Solutions for Offshore

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WaveStream at a Glance

Vision: Lead Satcom Industry with Innovative Commercial and Defense Products and Solutions, enabling our Customers to Excel

Strategy for Growth
- HTS and Ka-band Broadband Services
- Focus on Satellite-on-the-Move

Key Figures for YE 2013
- Revenues = $235m
- Employees = ~970
Innovative Product Portfolio

VSAT Network System
- SkyEdge II-c
- Hubs
- Remote Units
  - IP
  - WebEnhance
  - Access
  - Pro
  - Taurus/Accent
  - Gemini
  - Capricorn
- NetEdge multi-Star Gateway

BUCS & SSPAs
- C-Band
- Ku-Band
- Ka-Band
- X-Band

Low-profile SOTM Antennas
- SR 2000
- SR 3000/20
- SR 5000
- ER 7000
- SR 250
- ER 5000

Defense & HLS
- MLT 1000
- SatTrooper
- BlackRay 1000
- GLT 1000

NOC Operation

Customization
The Oil & Gas Value Chain

Upstream
Field Production Operations

Field Development
Exploration

Field Processing
Production Operations

Long Distance Transportation

Midstream
Transport, Trading & Storage

Storage

Refining

Downstream
Manufacture, Chemicals & Retail

Gas Distribution

Manufacturing

Field Pipeline Gathering

Wholesale & Retail Marketing

Consumer
Increasing and Changing Needs

Past requirements

- Navigation and Positioning
- E-mail, nb Internet, VoIP
- TV Reception – crew
- Min 99.5% Link Availability
- Upload rates of 128 to 256 Kbps

Present and future requirements

- Corporate apps (CRM, SAP, DB, VC).
- Remote Video Surveillance
- Digital Oil Field
- HR applications (Security Training, Certification Classes, Corporate Training, etc)
- Crew welfare (Internet, TV, VoD, VoIP)
- Min 99.8% Link Availability
- Upload rates of 1 Mbps and up
- Multi topology
Challenges and Impacts

Challenges
- Moving / none-stable installations
- International Connectivity
- Critical reliability
- Mix of applications / shared link
- Different topologies
- Optimize Satellite Capacity

Applications
- Corporate apps (CRM, SAP, DB, VC).
- Remote Video Surveillance
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International Connectivity

- Many of the service providers span different regions
- Connecting with IPM MPLS backbones
- Support of VLANs, IPv6 readiness will become critical
BW efficiency is important

- More bandwidth is required
- Satellite capacity is expensive and frequently scarce
- Minimize footprint on the rig
- Maximal utilization of links
  - Highest modulations – 32 APSK on the FW, 16 APSK return
  - Hybrid return channel pools – VSAT switch channel types
  - Payload compression
  - Local content caching

2 Msps
8PSK 4/5
256 Ksps
QPSK 3/4
128 Ksps
QPSK 2/3
Approach

• High bandwidth vs. efficiency in one solution
• Minimize external equipment – all-in-one solution
• Optimize recreational solution
Choosing between two technologies

**TDMA**

MF-TDMA – with dynamic RT BW allocation per site

Good for:
- Many sites sharing a BW pool – over subscription – low overall bandwidth
- Low average activity ratio per site
- Medium maximal transmission rate
- Single channel utilization is average (Overheads)

**SCPC**

Continuous – fixed allocation per site

Good for:
- Small number of sites – no over subscription
- High activity ratio per site – or all peaks at the same time
- Excellent single channel utilization – and high maximal transmission rate
- Lowest latency

The Service Gap requires a compromise in some cases

Opportunity
SkyEdgeII ACCENT - Dual Waveform

- A hybrid solution – best of both worlds
- Switches between SCPC (link efficient) and VSAT (network efficient) in seconds

SkyEdge II Accent

MF-TDMA  135 Mbps / 6 Mbps
Up to 24 Mbps / 24 Mbps in SCPC mode
Dual VLAN ports
Optimized Bandwidth Allocation

Better Space Segment Utilization, Higher Performance

Option 1: SCPC – Best for continuous throughput. Requires more bandwidth

Option 2: DAMA – Efficient for multiple sites with lower frequency of use

New Approach: Dual Mode – Each site can switch between SCPC and DAMA
Minimize footprint and reduce external equipment

**SkyEdgeAccess**
BUILT-IN connections for IP and Voice

**Other Solutions**
External equipment req’d

EXTERNAL EQUIPMENT REQUIRED
ROUTERS, SWITCHES, ATA GATEWAYS

- VLAN 1
- VLAN 2
- VLAN 3
- VLAN 4
- FXS
- SPRASE

- OFFICER
- MANAGER
- LAN
- STAFF
- LAN
- VIDEO
- CONF
- PHONE OR FAX
  (UP TO 4 LINES)
Cnooc

- 3rd largest oil company in China
- Focus on exploration and production of offshore crude oil and natural gas
- Integrated voice, video, data, Internet
- Star and Mesh
- Upgrade legacy SCPC network
- Offshore rigs, production platforms, HQ

Need

Solution

- **SkyEdge II** network with Access VSATs
- Support star, mesh, embedded voice
- Efficiency bandwidth use
Managing the bandwidth on the rig

OFFICE MISSION-CRITICAL APPLICATIONS GET HIGH PRIORITY AND ADJUSTABLE BIT RATE

 MANAGEMENT HAS HIGHEST PRIORITY

VLAN1

OFFICE STAFF GETS LOWER PRIORITY, UNAUTHORIZED WEBSITES CAN BE AUTOMATICALLY RESTRICTED

VLAN3

VLAN2

TORRENTS

facebook

YouTube

twitter
Optimizing Recreational Traffic
Technologies
QoS Assurance per Application

- Automatic allocation of bandwidth for real-time and critical applications
- VoIP auto call admission control & jitter reduction
Robust Communications

Adaptivity = Higher Availability

- Bi-directional adaptivity
  - High efficiency in clear sky (>95%)
  - Robust communications during rain
  - Increased availability with Ku-band
  - Availability of ~99.99%
Resilience Solutions

*Multi-layered protection schemes*

1. Remote site redundancy – VSAT/Antenna
2. Local and geographic hub-redundancy
3. Multi-Star topology as backup for the terrestrial interconnection
New concepts for connectivity on the rig
Private cellular network
Small Cell over satellite
3G Small Cell – private network
Closed user group (CUG)

- HSPA+ data rates
  21.1 Mbps / 5.7 Mbps
- 24 concurrent users
- HSPA Tx power 5Watt (37dBm) on top of cabinet (2 x N-type connector)
- Rx sensitivity -120dBm@AMR12.2kbps
- Rx space diversity
- Integrated Wi-Fi AP (2x2 MIMO)
  - 2.4 GHz; 802.11 b/g/n; up to 26dBm Tx power
- Integrated wireless backhaul with embedded antenna up to 100 Mbps
  - LOS, nLOS and NLOS
  - PTP and PTMP backhaul topologies support
Flat antennas for drilling campaigns
up to 8 Mbps 2-way links while moving
Example - Petrobras

- multi-national Brazilian Oil Company
- Exploration, production, distribution

- SkyEdge and SkyEdge II Hubs
- connecting supply boats and rigs
- Including antenna, VC, 800 Mhz radio, CCTV
- Enhanced End to End QoS – Diff Serv
- Primary and backup
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Summary

- Remote O&G platforms continue to push the envelope of needs
- More capabilities – higher links – more efficient
- VSAT Technology continues to improve
- New and better way to create more reliable services
THANK YOU!

Q & A