OSB at a glance

- Founded in August 2007.
- Headquarter in Hanoi and 2 branches in Ho Chi Minh City and Vung Tau
- Joint venture company in Myanmar (Satcom Business)
- Working in Satcom industry as
  - System Integrator
  - VSAT Service Operator (Licensed in Vietnam)

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Content

- Challenges in the Satcom Market
- New Technologies & Applications
- Questions and Discussion

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CHALLENGES IN THE SATCOM MARKET
Challenges

MBPS PRICE GOING DOWN TRENDS

- Satcom
- Wireless
- Cable

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## Challenges

<table>
<thead>
<tr>
<th>Market demand</th>
<th>Limitation of Satcom</th>
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<tbody>
<tr>
<td>High Speeds and High Volumes Data</td>
<td>High cost</td>
</tr>
<tr>
<td>Terminal toward personal perspective</td>
<td>Terminal size bigger than others</td>
</tr>
<tr>
<td>Real time and multimedia Applications</td>
<td>High latency</td>
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<tr>
<td>Increasing demand for services and application</td>
<td>Exhausted of resources (Orbit slot/ Spectrum)</td>
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</tbody>
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Challenges

What Happens in an Internet Minute?

639,800 GB of global IP data transferred

204 million Emails sent

47,000 App downloads

$83,000 In sales

61,141 Hours of music

20 million Photo views

3,000 Photo uploads

320+ New Twitter accounts

100,000 New tweets

615 Botnet infections

1,300 New mobile users

100+ New LinkedIn accounts

277,000 Logins

6 million Facebook views

2+ million Search queries

30 Hours of video uploaded

1.3 million Video views

And Future Growth is Staggering

Today, the number of networked devices = the global population

By 2015, the number of networked devices = 2x the global population

In 2015, it would take you 5 years to view all video crossing IP networks each second
Broadcasting sector?

• SD TV is changing to HDTV and UHDTV.
• 3D TV starting in demand.
• Interactive TV needed.
• Mobility in favor.

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NEW TECHNOLOGIES & APPLICATIONS
Satcom responses to Market by improving Technologies

1. Higher bandwidth efficiency
2. Lower latency
3. Smaller terminal
4. Enrich resources

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1. Higher bandwidth efficiency

- High modulation scheme
- Carrier in carrier
High modulation scheme

- Lower roll-offs (5%, 10%, 15%)
- High modulation scheme (adding 64, 128 and 256APSK)
- Adaptive Coding and Modulation (ACM)

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High modulation scheme: efficiency gains up to 51%
New Technologies and Applications

Carrier in Carrier

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Carrier in Carrier

- Bandwidth saving
- Reduce BUC/HPA and/or antenna size
- Reduce power requirement
- More power on satellite needed

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2. Lower latency

- Lower height of Obit: more and more MEO used nowadays.

- Geostationary Orbit (GEO) - 250-280 milliseconds
- Medium Earth Orbit (MEO) - 110-130 milliseconds
- Low Earth Orbit (LEO) - 20-25 milliseconds
3. Smaller terminal

- Smaller antenna
- Smaller HPA
- Smaller Modem
4. Enrich resources

• HTS (High Throughput Satellite)
• Higher frequency & Wider bandwidth
• Encourage utilization of existing allocated spectrum

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HTS (High Throughput Satellite)

- Gigabit of throughput
- High-level frequency re-use and spot beam technology
- Mostly Ka-band

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Higher frequency & Wider bandwidth

- Ka-band: Uplink 26.5 – 40 GHz; Downlink 18 – 20 GHz
- Bandwidth is up to several hundreds of MHz
Encourage utilization of existing allocated spectrum

- Encourage usage of planned bands that allocated to satellite communication
- Use maximum frequency band that allocated to satellite communication (for example Extended C-band etc…)

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Encourage utilization of existing allocated spectrum

- Equipment available for planned and extended bands
- New satellites with planned and extended bands

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C-band ext frequency allocation

- Downlink: 3.4 – 3.700 GHz

4G frequency allocation

- TDD band number 42: 3.4 – 3.6 GHz; number 43: 3.6 – 3.8 GHz

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Overlap frequency

- C-band: 3.4 - 3.7 GHz
- 4G
Mobility

- Aeronautical
- Mobile Land
- Maritime

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Aeronautical

Commercial

Military

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New Technologies and Applications

Mobile Land

Military

DSNG

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Mobile Land

Passenger Transportation
(Rail, Buses, Ferrier…)

OSB
Opportunity Solution and Business
New Technologies and Applications

Maritime

Cargo

Passenger Vessel

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Maritime

Military

Oil rig support vessel

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QUESTIONS & DISCUSSION
Question for Discussion

• What are coming technologies that meet the market’s demand and support competitive price (per Mbps)?
• Which can be killer applications by Satcom?
• How to further improve bandwidth utilization?
THANK YOU FOR LISTENING