“Global broadband connectivity through LEO constellations”

Broadband India Forum – New Delhi, 20-21 November 2018

Tony Azzarelli - Vice President Global Licensing and Spectrum
Digital Divide is everywhere

Not everyone is connected to the internet ...

% of unconnected households

Europe: 17.9%
Americas: 40.0%
CIS Arab States: 39.9%
Asia & Pacific: 59.7%
Africa: 61.0%
Developed: 18.7%
Developing: 65.9%
World Avg: 53.6%

Source: International Telecommunications Union (Geneva)
Exponential grown in data consumption is causing strain in connectivity

Satellite infrastructure can provide the needed connectivity:
- at no cost for governments
- and at lower cost per bit

Sources: Cisco VNI Global IP Traffic Forecast, 2016-2021
OneWeb System Overview

**Constellation**

- **Up to 882 satellites**
  - Small & low cost satellites
  - 1200 km altitude in polar orbit
  - 1\textsuperscript{st} satellite launch Q1-2019
  - Services from 2020/2021

**Ground Segment**

- **Satellite terminals**
  - Low cost and low power
  - Easy to install and without pointing
- **40 gateway sites across the globe**
  - Connected by global core network
Backhaul Architecture

“Fibre in the Sky”

OneWeb Pipe

Global capacity of 8 Tbps
Latency of less than 50 ms
A truly global 5G enabler

Access link
- WiFi, LTE, 5G

MNOs
ISPs
Telcos

End-Users of
MNOs, Telcos, ISPs
OneWeb Benefits and Key Advantages

- **Truly global coverage**
- **Works in obstructed terrain** (average elevation ~70°)
- **Low latency** (~50 ms)
- **High broadband speeds** (up to 100/450 Mbps)
- **Seamless and Ubiquitous mobility**

... truly global 5G enabler
OneWeb Serves Multiple Markets

Home / Small Enterprises
IoT / M2M / 5G small cells

Schools and Hospitals

Community Centres

Rural and Remote

Oil and Gas
Maritime

On-bard communications

Trains and vehicles

Connected cars

Public Protection and
Disaster Relief

Emergency

Roads / Motorways

Cellular Backhaul

PROPRIETARY TO ONEWEB
Satellite Equipment

- Under development
- 0.3 to 0.7 m size
- Speeds up to 100/450 Mbps
- Parabolic & Phased array
- Low radiated power (35-39 dBW)
- High elevation operations

mechanical parabolic
active phased array
passive phased array
Gateway Deployment Overview

Indicative Gateway Locations
Satellite Manufacturing

Joint Venture

• Simple satellite architecture
• High volume / Low cost production
• Size - ~1 cubic meter & ~150 kg
• Lifetime of more than 5 years
• De-orbit Capability
Satellite Manufacturing
Spectrum Requirements

• OneWeb operates in the Ku-band and Ka-band frequency allocations

<table>
<thead>
<tr>
<th></th>
<th>User Link (Ku-band)</th>
<th>Gateway Link (Ka-band)</th>
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<tbody>
<tr>
<td>Space-to-Earth</td>
<td>10.7 - 12.75 GHz</td>
<td>17.8 - 20.2 GHz</td>
</tr>
<tr>
<td>Earth-to-space</td>
<td>14.0 - 14.5 GHz</td>
<td>27.5 - 30 GHz</td>
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</tbody>
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• Allocations are assured by the ITU Radio Regulations set at WRC-2000

• Protection of GSO systems assured through Article 22 limits
  – ITU confirmed (Jan 2018) that OneWeb complies with these limits
OneWeb fosters Clean Space by Taking Responsible Measures

• Launch license from the UK

• OneWeb system features:
  • Positional knowledge of satellites (by GPS and radars)
  • Maneuverability and deorbiting of satellite
  • Spacecraft designed for demise at re-entry
  • High reliability of deorbit components (e.g., electric propulsion)
  • In-orbit flight coordination
  • Deorbiting infant mortality at launch phase