Stratospheric communication platform for digital society

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SoftBank Corp.
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Arrival of a Super-digital Society
Digitalization Accelerating in All Industries

(Source) NEDO TSC research and analysis report
Prepared by our company based on "Social Changes and Expected Innovations after the COVID-19 Disaster," June 2020
Towards the new era beyond 5G, communication platform needs to evolve to provide enriched connectivity for all things, information and humans.
NTN (Non-Terrestrial Network)

An approach from the sky which provides internet coverage efficiently

Dense Urban  Urban  Rural  Super Rural  Maritime / Sky
HIBS (High-altitude IMT Base Stations) as an essential part of NTN

Direct connectivity to existing user devices and significantly low latency due to the shorter distance from the ground.
Direct connectivity to existing user devices

No need to replace for specific device

※According to international rules (Radio Regulations), in HIBS service it is possible to use frequency bands identified for land mobile service (there is a WRC-23 agenda item for expansion of frequency bands for HIBS usage).
Uninterrupted coverage during disaster

- HIBS can provide seamless services to wherever emergency communication is necessary
- In the case that disconnection caused by significant hurricanes, earthquakes and tsunami, HIBS can restore the communication platform in one day by immediate takeoff from the nearby hanger
Remote area coverage

- HIBS can broadly cover around 200 km in diameter, which will offer cost-effective services to the remote areas where with no network yet.
- Areas where they have challenges to build ground stations such as isolated islands, mountainous areas and deserts, HIBS can contribute to cover above the sky.
3D Area coverage

- HIBS is capable of providing services not only to the ground but also the sky so that the network can be leveraged to the flight vehicles like drones and air taxis.
For Sustainable Development

Connecting Societies Around the World

New Communication System that Uses the Stratosphere

Sustainable System (zero CO2 emissions during flights)

Wide-area Coverage

Realizing a Connected Society by Bridging the Digital Divide

*SoftBank and HAPS Mobile supports the Sustainable Development Goals (SDGs).
HIBS technology
already around the corner
HAPS Alliance

By accelerating HAPS/HIBS technologies and development building a cooperative ecosystem

Aviation

- Promote and build standards and guidelines for the upper airspace while cooperating with ICAO, FAA and other aviation regulators

Interoperability

- Develop product specifications
- Standardization of HAPS/HIBS network interoperability

Commercialization

- Publish case studies/whitepapers
- Joint pilot/Proof of Concepts
- Build a cooperative HAPS/HIBS ecosystem

Telecom

- Advocate for global harmonization of HAPS/HIBS spectrum at global/national level
- Influence commercial standards including 3GPP NTN

* SOURCE: HAPSMobile website
* SOURCE: HAPSALLIANCE website
HA member’s test flight: HAPSMobile

Successful Test Flight on September 21, 2020

Delivered LTE Connectivity from Sunglider (Fixed-Wing Autonomous Aircraft in the Stratosphere)
The HAPS technology has been tested on the aircraft with a wingspan of up to 28 m, the total flight time is more than 1000 hours, the maximum flight altitude is 19 km, the flight time is 52 hours.

- at an altitude 16 500m
- at an latitude 54°
- at an altitude 16 000m
- at an latitude 54°
- at an altitude 16 000m
- at an latitude 54°

Test flight – June 5, 2021
Payload weight 3 kg

Test flight – June 6, 2021
Payload weight 4 kg

Test flight – June 23-24, 2021
Payload weight 6 kg


Weight balance tests
Energy balance tests
Static & dynamic tests
Collecting telemetry data
Test flights area – Belarus
HA member’s test flight: Sceye

Announced a significant milestone including a successfully flight at an altitude of 64,600 ft (19.7 km) and the record-setting data connection for a range of 140km
HA member’s test flight: DT

Conducted the world's first successful demo of LTE connectivity and fully integrated into a commercial mobile network from the low stratosphere

Basic concept of spectrum usage

IMT spectrum assigned to MNOs can be used for HIBS service link

Local MNO’s mobile service

All communications via HIBS will go through local MNO's network and will be subject to all local rules

HIBS Service carrier’s carrier

Ground-Based IMT Base Station

Dense Urban  Urban  Rural
WRC-23 Agenda Item 1.4
- Use of HIBS in IMT identified frequency bands below 2.7GHz -

For proper regulatory action, necessary technical studies are being conducted.

2020 | 2021 | 2022 | 2023 | 2024 | 2025
---|---|---|---|---|---
Studies in ITU-R (e.g. Sharing and Compatibility) | | | | | | Additional Identification
Consideration on Regional positions (e.g. Inter-American Proposals) | | | | | |
Current Regulations | | | | | |

WRC-23

Supports on AI1.4 under the CITEL preparation process are helpful
Other components of NTN

As the technology evolves, existing terrestrial user terminals can also be considered for satellite communications in the future. Proper regulations for such usage are expected to be coordinated for global rules in timely manner.
Data communication platform is indispensable for the digital society, especially during the era having a lot of disasters even pandemic situation like these days.

NTN especially HIBS is beneficial to the world to fill the gap of accessibility to the internet, both horizontally and vertically.

Technology to utilize the stratosphere layer of the sky is just around the corner, commercial service will be seen right after the proper rulemaking.

Supports on WRC-23 AI 1.4 from CTU administrations under the CITEL preparatory process is helpful to realize the flexible use of HIBS.
Today’s challenge will be tomorrow’s normal
WRC-23 Agenda Item 1.4

1.4 to consider, in accordance with Resolution **247** (WRC-19), the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;

**resolves to invite the ITU Radiocommunication Sector** in Resolution 247

<table>
<thead>
<tr>
<th>1</th>
<th>to study spectrum needs, as appropriate, for high-altitude platform stations as IMT base stations to provide mobile connectivity in the mobile service taking into account:</th>
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<tbody>
<tr>
<td></td>
<td>the existing identification in 2GHz frequency band;</td>
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<td>the usage and deployment scenario envisioned for high-altitude platform stations as IMT base stations as complementary for terrestrial IMT networks;</td>
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<td>the technical and operational characteristics and requirements of high-altitude platform stations as IMT base stations;</td>
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<tr>
<td>2</td>
<td>to conduct and complete in time for WRC-23, taking into account the results of studies already performed and those in progress within ITU-R, sharing and compatibility studies to ensure the protection of services, without imposing any additional technical or regulatory constraints in their deployment, to which the frequency band is allocated on a primary basis, including other IMT uses, existing systems and the planned development of primary allocated services, and adjacent services, as appropriate, for certain frequency bands below 2.7 GHz, or portions thereof, globally or regionally harmonized for IMT, i.e.:</td>
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<td>694-960 MHz;</td>
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<tr>
<td></td>
<td>1 710-1 885 MHz (1 710-1 815 MHz to be used for uplink only in Region 3);</td>
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<td>2 500-2 690 MHz (2 500-2 535 MHz to be used for uplink only in Region 3, except 2 655-2 690 MHz in Region 3);</td>
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<td>to study appropriate modifications to the existing footnote and associated resolution in the identification in recognizing b) in order to facilitate the use of high-altitude platform stations as IMT base stations with the latest radio interface technologies of IMT;</td>
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<td>4</td>
<td>to study the definition of high-altitude platform stations as IMT base stations (HIBS) including possible modifications to the provisions of the Radio Regulations, as appropriate;</td>
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<td>5</td>
<td>to develop ITU-R Recommendations and Reports, as appropriate, taking into account resolves to invite ITU-R 1, 2, 3, and 4 above,</td>
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