Stratospheric communication platform for digital society

November 16, 2021 SoftBank Corp.

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Arrival of a Super-digital Society









(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

Communication platform development

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)





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.

via Ground-stations



For Sustainable Development

Connecting Societies Around the World

New Communication System that Uses the Stratosphere







Wide-area Coverage



Sustainable System (zero CO2 emissions during flights)



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

Telecom



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

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

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)



HA member's test flight: UAVOS



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

https://bit.ly/3jlPbsu

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

SCEYE	INVAASTRUCTUURE CONNECTIVITY OMSERVATION SCIENCE AADUT CONTACT MEDIA
	Dewritian Download Materials
	SCEVE REACHES STRATOSPHERE; FLIES AT 64,000 FT.
	"We view the successful flight and the record setting data connection as a significant milietone for our technology one that could dissolve the rural broadband barrier," and Scyse CDO Mikkel Vestergand Francisen.
	SETS LONG RANGE RECORD IN DATA CONNECTION
	JOINS CONSORTIUM TO DELIVER BROADBAND TO NAVAJO NATION
	ROSINLEL, KIN-Scepe, a develope of high-aktude platform nations (HARS), provided today that is successfully launded as transmospheric platforms and fine such mathum of 4 ACOM. The amouncement cores on the heak of Socyh long-array second for markening data connection in log-HRNA sta distance at NACOM. NMM financial support from the States of the Neiscitz, the company daio priva constraint of New Naces-Sate and telecommunications companies and trabal entities to plot delawy of universal brackbard access to the Navajo Nacion.
	* SOLIRCE: https://www.scave.com/scave.press.releases/scave.reaches.stratosphere.flies.at.6/00

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



Rural

Dense Urban

Urban

WRC-23 Agenda Item 1.4

- Use of HIBS in IMT identified frequency bands below 2.7GHz -



2020	2021	2022	2023	2024	2025
Studies i	n ITU-R (e.g. Sharir	ng and Compatibility		Additional Ide	ntification
Consideration on	Regional positions(e	e.g.Inter-American P	roposals) WRC	-23	
	C	urrent Regulation	S		New

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 Dense Urcoordinated for global rules in timely manner ritime / Sky



Summary

- 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.



High Altitude Platform Station

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 <u>highaltitude platform stations as IMT base stations</u> (<u>HIBS</u>) 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

 the existing identification in 2<i>GHz frequency band</i>; the usage and deployment scenario envisioned for high-altitude platform stations as IMT base stations as complementary for terrestrial IMT networks; the technical and operational characteristics and requirements of high-altitude platform stations as IMT base stations; 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.: 694-960 MHz; 1710-1 885 MHz (1 710-1 815 MHz to be used for uplink only in Region 3); 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); 3 to study appropriate modifications to the existing footnote and associated resolution in the identification in <i>recognizing b</i>) in order to facilitate the use of high-altitude platform stations as IMT base stations with the latest radio interface technologies of IMT:
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platorin stations as here base stations with the fatest radio interface technologies of here,
4 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;
5 to develop ITU-R Recommendations and Reports, as appropriate, taking into account resolves to invite ITU-R 1, 2, 3, and 4 above,