# Section B – Interim Report

**Paper name - Authors**

**WiFi NETWORKS ON DRONES**

*Antonio Guillen-Perez, Ramon Sanchez-Iborra, Maria-Dolores Cano, Juan Carlos Sanchez-Aarnoutse and Joan Garcia-Haro*

*The Paper* WiFi NETWORKS ON DRONES consist of Quantitative data since they made comparison between two WIFI nodes using values that obtained while doing their research. *During this research paper the researches focused on Extending the capacity or coverage of wireless systems through the deployment of aerial communication networks To do so, an Intel Galileo development board was appropriately configured and equipped as a WiFi node playing either the role of an access point in the infrastructure mode or of an intermediate hop in the ad-hoc operational mode. This device was then integrated onboard a drone. After They compared both WiFi modes in terms of coverage area, throughput, and energy efficiency.* Comparing both modes of operation, they found that the level of received signal in the infrastructure mode was significantly higher than in the ad-hoc mode. This increase in the signal level for the infrastructure mode was reflected also in a better throughput. *The Results of comparing coverage, throughput, and energy efficiency of the two WiFi operational modes revealed a better performance of the infrastructure mode regarding received signal strength and bandwidth, but a worse behaviour in terms of current consumption compared with the ad-hoc mode.*

**Paper name - Authors**

**Coverage Aspects of Temporary LAP Network**

Joonas S¨ae, Syed Fahad Yunas, and Jukka Lempi¨ainen

*The* Quantitative research carried out studies the coverage aspects of a low altitude platform (LAP) system that can form a temporary communication network. The system consists of multiple autonomous drones equipped with dual-band Wi-Fi access points (APs) with ad hoc capabilities to form a mesh network During the testing phase they noted that the altitude of the drones does not provide much gain for coverage, i.e. the coverage area for higher drone hovering altitudes is not significantly larger in rural environment. As a result, the drone hovering altitudes should be kept rather low.

The results show that more drones are needed to cover (dense) urban than rural environment and the drone altitude should also be higher in urban areas compared with the rural areas.

**Paper name - Authors**

**Emergency Broadband Access Network using Low Altitude Platform**

Hadi Hariyanto, Hariyo Santoso, Anggoro K. Widiawan

Emergency Broadband Access Network (EBAN) is a balloon-based broadband wireless access flies in low altitude (100- 500 meter) offering various emergency applications. The emergency team can use WIFI coverage from EBAN sky station to get internet access, VoIP, video conference and tailored emergency applications EBAN Sky Station carries three WiFi 2.4 GHz access points and one 5.8 GHz access point as a peering backhaul with ones in the ground station. The fact that the EBAN Sky Station can fly above 200 meter, the client should be able to transmit a relatifely high power. According to the trial 200 mW WiFi clients are still able to get connected at radius 4-5 km from EBAN Sky Station. They concluded that the WiFi provides an acceptable performance for internet access. However, the link path between transmitter (APs) and receiver must be line of sight which this is a challenge for users in urban area

**Paper name - Authors**

**Proposal of Autonomous Flight Wireless Nodeswith Delay Tolerant Networks for Disaster Use**

Noriki Uchida, Noritaka Kawamura, Tomoyuki Ishida, Yoshitaka Shibata

The quantitve research carried out includes a Samsung galaxy sIII which it actively supports DTN routings for the Disaster Information System (DIS) with the use of Android Developer Tools (ADT) 22.3.0 installed on the device. The mobile device is connected to a parrot AR.drone. the AFW automatically flies for seeking possible wireless nodes, send and receive disaster information by the proposed DTN routings, and return to the possible stations that wireless charge units are equipped when the battery needs to charge. The objective for this study was to Improve the efficiency of the DTN routings. By introduced the DTN with the Data Triage Method that is based on the order queue approach with the user policies under disaster The results suggested some considerable subjects for the future studies including the effect of the winds, the accuracy target point of GPS, and the avoidance of obstacles such as trees or buildings.

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**Paper name - Authors**

**Backhaul-aware Robust 3D Drone Placement in 5G+ Wireless Networks**

Elham Kalantari, Muhammad Zeeshan Shakir, Halim Yanikomeroglu, and Abbas Yongacoglu

This paper investigates how different types of wireless backhaul offering various data rates would affect the number of served users. Two approaches, namely, network-centric and user-centric, are introduced and the optimal 3D backhaul-aware placement of a drone-BS is found for each approach. Their objective is to integrate drone-BS with the existing cellular network infrastructure that offers coverage for users who are not be served by the terrestrial network due to the lack of resources such as bandwidth. The results proven that the network-centric approach maximizes the total number of served users regardless of their required rates, while the user-centric approach would maximize their sum rate. The wireless backhaul peak rate and the bandwidth of a drone-BS are considered as the limiting factors in both the network-centric and user-centric approaches in a typical HetNet.

**Paper name - Authors**

**Evaluation of Wireless Network Communication by Autonomous Flight Wireless Nodes for Resilient Networks**

Noriki Uchida, Mizue Kimura, Tomoyuki Ishida, Norio Shiratori, Yoshitaka Shibata

This paper proposes an Autonomous Flight Wireless Nodes (AFW) for the resilient networks that consists of Delay Tolerant Networks and Never Die Networks which is aiming to communicate with isolated areas. In the proposed system an AR.Drone2.0 is used for the drone, and Raspberry Pi is used for the control unit of the AR.Drone. IP network based drones support data transmission by the autonomous flight with seeking possible wireless stations and sending the message data by the proposed resilient network The results show the unstable data transmission when the drone is flying, and it is supposed that additional functions might be required for the seeking mode and data transmission mode in the proposed method.

**Paper name - Authors**

Drone-Assisted Public Safety Wireless Broadband Network

Xu Li, Dongning Guo*,* Huarui Yin, Guo Wei

This paper proposes a drone-assisted multi-hop device-to-device (D2D) communication scheme to extend the network coverage over regions where it is difficult to deploy a land-based relay. A drone is deployed to assist the communication between a base station and a terminal device using Rayleigh fading model for hops between nearby devices. While performing tests it was found that the position of the drone should be carefully selected. When the distance between the base station and the terminal device is small, it is not necessary to deploy the drone since the data rate with the drone at the mid position is even smaller than that without the drone when the distance between the base station and the terminal device is no more than 450 meters under time division and 250 meters under frequency division. As the distance increases, deploying the drone at the optimal position could highly increase the data rate. It was concluded that With fixed transmit power, the drone is needed only if the distance between the base station and station and the terminal device exceeds a certain threshold.

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