

Plane Chat: Technical Report

Project for the course *Wireless Networks For Mobile Applications*

1st Gianluca Bresolin

University of Padua: Computer Science

University of Padua

Padua, Italy

gianbres02@gmail.com

Abstract—Plane Chat abstract.

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group creation and message exchange by instantiating peer-to-peer connections via the *Multipeer Connectivity* framework provided by *Apple*, thereby creating an ad-hoc network.

I. INTRODUCTION

Wireless networks have become an integral part of our daily lives, enabling communication and connectivity in various environments. Those networks have gained a significant importance over the years, especially due to the widespread adoption of mobile devices, with applications that rely on wireless communication to provide services and functionality.

In relation to wired networks, wireless networks present different and unique challenges and characteristics that mainly depend on the scenario in which they are deployed. Those challenges require the design and implementation of specialized protocols and technologies to ensure network operation and performance.

Specifically, *ad-hoc* wireless networks do not require any pre-existing infrastructure and allow the construction of temporary networks with no wires and no administrative intervention required. Ad-hoc networks differ significantly from existing wired networks: the lack of physical connections between devices indeed allows for greater mobility and flexibility, which makes the topology of interconnections dynamic and constantly changing, with nodes that have to discover where others are. Moreover, since users will not wish to perform any administrative actions to set up such networks, we do not assume that every device is within communication range of every other device. Those characteristics make the design of protocols for ad-hoc networks particularly challenging, as they must be able to adapt to the dynamic nature of the network and to the possible lack of complete connectivity.

In this report, to investigate the design and implementation challenges of ad-hoc wireless networks, we present *Plane Chat*, a mobile *iOS* application enabling users to create groups and chat with each other during flights. Given the inherent constraints of such environments, the app is designed to work in a situation where devices are in close proximity without relying on pre-existing infrastructure, such as Wi-Fi access points or cellular networks. Therefore, the app facilitates

To overcome the *Multipeer Connectivity* limitation of having a maximum of eight devices per session and enhance network scalability in order to allow more users to join the same group and chat with each other, the application leverages the framework as a link-layer substrate. Consequently, we implement the *Destination-Sequenced Distance-Vector* (DSDV) routing protocol at the network layer to facilitate multi-hop communication between devices.

At the application layer, the message dissemination follows a "best-effort" delivery model. To maintain low overhead and simplicity, the protocol does not implement any acknowledgement (ACK) mechanism or retransmission logic. Consequently, the application operates under an unreliable communication paradigm, where the delivery of packets to all nodes is not strictly guaranteed.

The remainder of this report is organized as follows: Section II provides an overview of the *Plane Chat* application, including its features and functionalities. Section III describes the design and implementation of the system. Section IV presents the experimental setup and results obtained from testing the application. Finally, Section V concludes the report and discusses potential future work and improvements for the *Plane Chat* application.

II. PLANECHAT

III. SYSTEM DESIGN AND IMPLEMENTATION

A. *Multipeer Connectivity Framework*

B. *DSDV Protocol*

IV. EXPERIMENTAL SETUP AND RESULTS

V. CONCLUSIONS

REFERENCES