POLITECNICO DI TORINO
Repository ISTITUZIONALE

A Demonstration for Content Delivery on Wi-Fi Direct Enabled Devices

Original
A Demonstration for Content Delivery on Wi-Fi Direct Enabled Devices / Casetti C.; Chiasserini C.F.; Curto Pelle L.; Del Valle C.; Duan Y.; Giaccone P.. - ELETTRONICO. - (2015). ((Intervento presentato al convegno IEEE WoWMoM 2015 tenutosi a Boston, MA, USA nel June 2015.

Availability:
This version is available at: 11583/2603980 since: 2016-01-24T08:22:55Z

Publisher:
IEEE - INST ELECTRICAL ELECTRONICS ENGINEERS INC

Published
DOI:10.1109/WoWMoM.2015.7158180

Terms of use:
openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

23 July 2018

A Demonstration for Content Delivery on Wi-Fi Direct Enabled Devices

Claudio Casetti, Carla Fabiana Chiasserini, Luciano Curto Pelle, Carolina Del Valle, Yufeng Duan, Paolo Giaccone
Department of Electronics and Telecommunications
Politecnico di Torino, Italy

***Abstract*—In our companion WoWMoM 2015 paper [1], we propose a content-centric routing mechanism for Wi-Fi Direct networks. In that paper, we showed how to implement a Wi-Fi Direct multi-group network with unrooted Android devices that supports bidirectional communication between different groups. We devised on it a content-centric application, denoted as Multi-Group Content (MGC), that enables content request and delivery in a distributed and cooperative way. Finally, we demonstrated our application with Android devices to fully validate our approach and assess its performance.**

Aim of the current demonstration is to allow demo session attendees to experiment MSG and assess its behavior and performance in real time.

I. Preliminaries

We provide here some background information on the adopted technology and the proposed application during the demonstration.

A. Wi-Fi Direct technology

Wi-Fi Direct is a recent Wi-Fi standard of Wi-Fi Alliance aiming at enabling devices to connect directly without existing infrastructure. Devices, also referred as peers in Wi-Fi Direct, form groups to communicate with each other. In each group, one device acts as the Group Owner (GO) and the others are the Clients, associated to the GO, as shown in Fig. 1. Note that a Wi-Fi Direct group works as an infrastructure Wi-Fi BSS where the GO behaves as an Access Point (AP) broadcasting beacons. Thus a legacy Wi-Fi supported device can join the group by associating to the GO as a Station. The GO holds the passphrase for legacy Wi-Fi devices to authenticate themselves and associate to the GO. A device connected to the GO through Wi-Fi Direct is called a P2P Client whereas that associated to the GO via Wi-Fi is called a Legacy Client, as shown in Fig. 1.

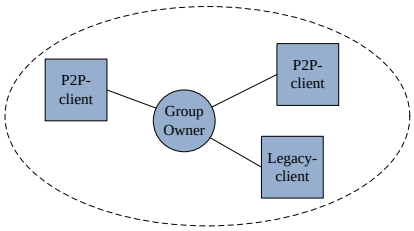

Fig. 1: A basic Wi-Fi Direct Group composed of a Group Owner, 2 P2P Clients and a Legacy Client.

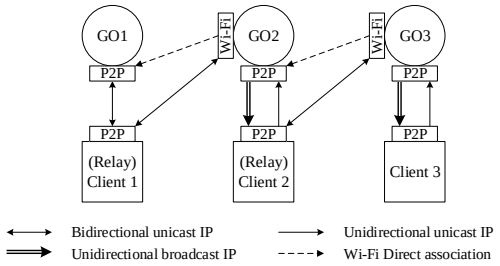

Fig. 2: Multi-group topology based on Wi-Fi Direct. The picture refers to the example network with three groups and a linear topology. The P2P clients in Groups 1 and 2 are used as Relay Clients. GO2 and GO3 are the bridge nodes with respect to their left side group (Group 1 and 2, respectively).

B. Multi-group communication

In standard implementations of Wi-Fi Directin Android, devices can only communicate within the same group. Thus in [1] we proposed and implemented a physical multi-group topology, shown in Fig. 2, where a device works as a bridge node. This bridge node connects two groups by acting as a GO in one group and as a Legacy Client in the other group. Each GO elects a Relay Client in its group, which is in charge of traffic tunneling for inter-group communication [1]. Note that when a Relay Client leaves, the GO also takes care of the election of a new Relay Client.

C. Application for content-centric routing

MGC is an application developed on unrooted Android systems (smart phones and tablets), able to transfer contents (e.g. images, videos and texts) or to provide a network service (e.g., remote printing, HTTP-socks proxy) in a multi-group Wi-Fi Direct network. Once a network using Wi-Fi Direct technology is established, the following threes phases can be implemented through MGC :

- *Content publishing*. The user publishes the content items it wishes to share. Such items are advertised to all groups with the help of Relay Clients and GOs. A summary information (holder, title, etc.) of registered content is then disseminated throughout the network. Each device lists all the items available locally and remotely.
- *Content request*. The user requests a content. If the content is remotely available, the request is forwarded

to the content provider, with the cooperation of the Relay Clients and of the GOs.

- *Content delivery*. Once a content provider receives a request, it transfers the content toward the requester. The nodes on the forward path traveled by the request will cooperate to transfer the content in the reverse direction and eventually deliver it to the requester node.

The protocols and mechanisms enabling these procedures are fully described in our companion paper [1].

II. Demonstration

We will demonstrate our application on five Google Nexus 7 tablets. The demonstration will be organized in two main phases: a preliminary explanation to introduce the overall network architecture and to describe the application, and the actual hand-on demonstration.

The devices are placed on a desktop, as shown in Fig. 4. To fully demonstrate all the functionalities we developed, a dedicate topology is established in which the first group is composed of 3 devices and the second of 2 devices. For the sake of explanation, each device is identified by a printed label reporting the role (GO, Relay Client, Client) and a printed copy of the scheme in Fig. 5 is also shown as reference for the audience.

A. Preliminary explanation

We start to describe the general Wi-Fi Direct multi-group architecture, explaining the role of each device. Then we briefly describe the user interface (UI) of Fig. 3 available in each tablet. At the top of the UI, the list of discovered nearby devices is shown. The information of the local device is shown under the devices list, including the device name, the role (Group Owner, Relay Client, Client) and the IP/MAC addresses, which are the key information to identify a device and understand its role in the proposed network architecture.

In the middle of the UI, an operation panel enables the user to select the operations to run, such as discovering nearby devices, displaying group information, registering and requesting content, specifying local content file location, disconnecting from a Wi-Fi Direct Group. At the bottom of the UI, each device provides a catalog of some local content items (e.g., video, picture, data file) and lists all remote items that have been published by the other devices.

B. Hand-on demonstration

The interaction with the audience will occur in two phases. First, the interested attendee will be invited to take any of the available tablets and try to publish one local content, using a button in the UI. He will be invited to see the effect of this operation on the other tablets, observing that the list of remote content items at the other devices include also the content that has just been published. Second, the attendee will be invited to download a remote content, not available locally. At the end of the download, the application will provide some statistics about the data transfer (e.g., received bytes, delay, throughput).

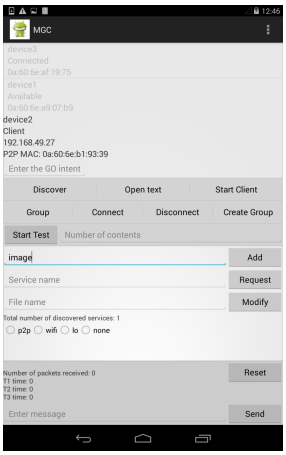

Fig. 3: The main user interface (UI) of the application illustrated during the demonstration.

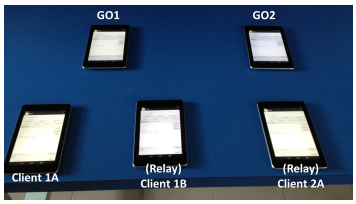

Fig. 4: The placement of the five tablets, forming two Wi-Fi Direct groups: 3 devices in the left group and 2 devices in the right group.

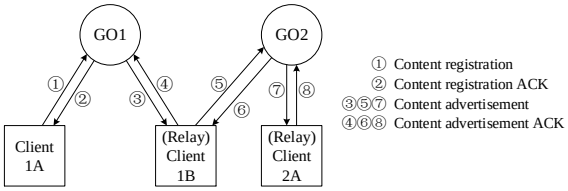

Fig. 5: Scheme showing the role of each device and the message exchange triggered by a new content available in Client 1A.

We expect that the hand-on demonstration with the tablets will last few minutes; this will allow a larger audience to interact with the demonstration. We also expect that the demonstration will foster the discussion on the proposed scheme and increase the interest on [1].

References

[1] C. Casetti, C. Chiasserini, L. C. Pelle, C. D. Valle, Y. Duan, and P. Giaccone, "Content-centric routing in Wi-Fi Direct multi-group networks," in *IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)*, Boston, USA, June 2015.