Droid-Fi: Android Smartphone
As Wi-Fi Router

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Abstract—
Internet access has become basic necessity now days. Almost every application on smart phones requires internet access. In most of cases internet on mobiles is through WiFi or through telecommunication network. In large institutes or organizations free WiFi access is provided all around. Even after taking care of coverage of WiFi routers and having deployed enough routers technically, there remain areas in organization or institutes where WiFi range is minimal or non-accessible. In this work, Android Smartphone is used as WiFi router for catering to such areas. Here solution is proposed to the problem and different aspects of application and constrains are analyzed.

Keywords — WiFi, Smartphone, Range extension.

I. INTRODUCTION

Android Mobile phones have evolved from merely being phones to full-fledged computing and communications devices, as embodied by smartphones. Driven by the near-ubiquitous worldwide reach of the cellular infrastructure and the phenomenal growth in the number of cellular subscribers, smartphones are rapidly evolving into users’ primary Internet access device. In fact, the number of wireless data subscribers in some countries already exceeds the number of wire line data subscribers. For example, in India as of June 2009, there were about 127 million wireless Internet subscribers but only 14 million wire line Internet subscribers.

As more and more users access the Internet on their phones, it may be difficult to justify an additional broadband subscription for their home computers, especially in the emerging markets of the world. Even in developed countries where users subscribe to wireless Internet access on their smartphones as well as wire line Internet access for their home computers, users must rely on the spotty availability of WiFi hotspots while on the go. It is in situations like this, where multiple users, such as family members or colleagues, do not have access to a wired or WiFi Internet connection at home or while traveling, that a system like Cool-Tether would have the most utility, by allowing users to create high-speed on-the-fly WiFi hot-spots using multiple smartphones.

In public places, there can be many locations where Wi-Fi may not be accessible because of poor range. Even after deployment of multiple hotspots coverage may not be full proof. Because of obstructions (like walls, interference with other signals) complete coverage for given area is not possible. Increasing number of Wi-Fi hotspots is obvious but costly solution. Instead, use of potentially available resources like Smartphone is desirable. In Smartphone there is facility to use it as a hotspot for Wi-Fi. This facility can be exploited to create a hybrid network to extend the range of Wi-Fi in given area. In this paper, hybrid architecture of Wi-Fi is explored and an implementation on Android phones of same is discussed. This paper is organized as, section II discusses the related work carried out till date.

II. RELATED WORK

Work till date proves that this is feasible to implement the WiFi router on smartphone. Also study has been done on advantages of using WiFi network than GSM. In [1], authors have discussed in details Cool-Tether application. This application helps a smartphone to be WiFi hotspot. This is advantageous to share the GSM internet network on mobile with other mobiles or devices. But limitation here is that it does not share the WiFi access with other devices. Area wise WiFi hotspot usage for better performance is depicted in [2] by authors. They propose opportunistic routing for better performance. Here is limitation is again there is only consideration of WiFi hotspots and not availability of smartphones or use of smartphones as WiFi hotspot.

Authors of [3] have done feasibility study of the problem. They prove that a smartphone can be used as WiFi router for extending range of WiFi hotspot. This is very advantageous in areas of low or no range of WiFi. Figure 1 shows conceptual representation of areas with low coverage of Wi-Fi. Black circled area can be seen where coverage from all the three hotspots is lacking.[3]
Smartphone works as router between Wi-Fi hotspot and end device. This allows a smartphone to share and extend the range of Wi-Fi. This is applicable in areas where range of Hotspot is only in particular section of given area.[3] In figure 2 it is shown how using smartphone as router extends the range of access of Wi-Fi.

Authors of [3] prove that it is completely in capacity of the smartphone to run a router software for extending range of WiFi. In this paper system to implement the routing software on Android smartphone is proposed.

III. DESIGN AND IMPLEMENTATION

A. This Android Smartphones:

Android Smartphones provide APIs for manipulating and developing all sorts of applications. Android is operating system with core of linux kernels. This gives lot of scope for developing newer and promising systems. Here, WiFi facilities given by Android smartphones is exploited to support the application.

B. Router Application:

Wifi APIs provide scope to access the WiFi through application. Router application will have two threads running in parallel. One will support receiving data from WiFi and other to send WiFi data. As discussed in [3] layer 3 implementation approach will be used here. Android smartphone will act like router between WiFi hotspot and other devices connected to it. Figure 3a and 3b shows design in details.
Description of different modules in the design is as follows. In Thread 1, Receive data module receives data from WiFi module when data is coming from WiFi access point. Process data module process data from WiFi access point to detect the IP address of receiver. Once the IP address is found then Send to SP module sends data to desired destination.

In Thread 2, Receive from SP module takes data coming from smartphone or other connected devices. Then Process SP data module checks the packet and forwards it. Send data module is used to send data to WiFi access point.

A. Applications

1. Extending Range in Boundary Area: Areas where boundary of WiFi access point is reached, an Android phone can be used to extend the range. This allows extended range.

2. Sharing the Best Access possible: In areas where access is substantially varying, a user having maximum access to WiFi can share it with others.

3. Control on Access: In scenarios like class rooms where limited access is expected, teacher can control the access through his/her smartphone.

B. Constraints

Users will not be motivated to share the access without given proper motivation or incentives. Also, there can be serious security breach in case the person sharing the access is listening to conversations between sender and receiver. This can be Man-in-Middle attack.

IV. CONCLUSION

This work presents design of WiFi router on Android based phone. It proposes solution for extending WiFi range to areas where range is very low or non accessible. This work also explores applications and constraints faced by solution.

REFERENCES


