

# Seamless Handover between Bluetooth and WIFI Using Packet Content Transfer Method

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**ABSTRACT**-Next generation wireless communications will likely rely on integrated networks consisting of multiple wireless technologies. Hybrid networks based, for instance, on systems such as Bluetooth and WiFi technologies can combine their respective advantages on coverage and data rates. In such environment, WiFi/Bluetooth should seamlessly switch from one network to another, in order to obtain improved performance or at least to maintain a continuous wireless connection. This paper proposes a new user algorithm for handover between Bluetooth and Wifi, which combines a trigger to continuously maintain the connection and another one to maximize the user throughput. Moreover, we detail the implementation of that algorithm follow packet content transfer method and session transfer among heterogeneous deployment.

**Keywords** : Bluetooth, Wifi, handoff, wireless access, mobility.

## I. INTRODUCTION

The objective of handover is that users can access any service (such as voice, video or data) through any communication network, anywhere at any time with a device. In particular, services could be started on one device that attaches to one network and later be easily switched to another network using same device. This paper overcomes some limitations of wireless networks such as frequent discontinuation or session drop in absence of specific network. Significance of proposed method is that without interruption of service to user channel changes to one assigned to new network. Wireless communications is a fast-growing technology that enables people to access networks and services anywhere. All of these scenarios have become a reality from a technological point of view and successful experiments are being carried out around the world to add more to these technologies. Mobility is clearly one of the major advantages of wireless. Another advantage lies in the way new wireless users can dynamically join or leave the network, move among different environments, create ad hoc networks [2] for a limited time and then leave. Disadvantage is that unavailability of network of particular technology users are unable to access services, proposed method providing fully connectionless services independent of particular network it can switch from one network to another as per users need here, we are dealing with Bluetooth and Wifi technologies. Bluetooth and IEEE 802.11 (Wi-Fi) [1][3] are two communication protocols which define a physical layer and a MAC layer for wireless communications within a short range (from a few meters up to 100 meters) with low power consumption

(from less than 1 mW up to 100 mW). Both protocols use a spread spectrum technique in the 2.4 GHz band. So we propose method to access internet without interruption in case of network unavailability by switching from Bluetooth to WIFI vice versa using packet transfer content method. The rest of the paper is organized as follows: section II gives brief overview of handover and frame formats of Bluetooth and wifi. Section III provides related work in switching over heterogeneous technologies. Section IV presents proposed scheme in terms of packet and session transfer and V gives simulation results. Finally, section VI comes to conclude and gives future scope of the study.

## II. DESCRIPTION

### A. Handoff

Any wireless device needs to connect to multiple connection points and perhaps multiple networks at the same time as it moves from one location to another. The process to support the change from one wireless point of connection to another is referred to as handover [7]. Whenever, a mobile node moves away from a wireless point of connection, the signal level degrades, due to parameters like distance, interference. In such situations a handoff procedure is called to maintain connectivity between mobile node and the network so that services can be accessed flawlessly and without interruption. Because of the limitation of transmission power and coverage, handoff is thus necessary and frequently employed when a mobile node is roaming. In this paper, handover process between Bluetooth and Wi-Fi network to access internet services has been explained. In cellular communication [5], handoff occurs from one base station to another as per location and signal strength for a mobile terminal without interruption of voice calls but these handoffs are within same access technology and these

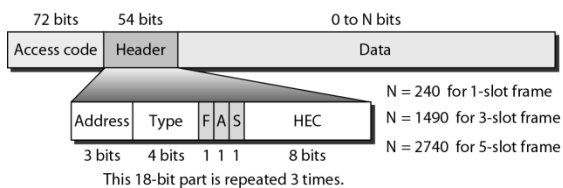
handovers are based on infrastructure also .Unlike these proposed mechanism is based on adhoc network and amongst different access technologies , but general handoff process is similar as in cellular communication. General handoff process stepwise is shown in table below describing three steps starting from handoff initialization then goes to handoff prepration and ends at handoff execution under these steps detail description is given.

**Table I.**  
General handoff process

Handoff Initialization	Handoff prepration	Handoff execution
New link search	New link setup	Connection Transfer
Network Discovery	Layers connectivity	Handoff Signalling
Network Selection		Packet reception
Handover negotiation		

*B . Description of frame formats*

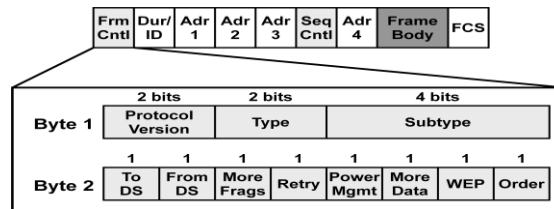
Bluetooth is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks and so on A Bluetooth LAN is an ad hoc network, which means that the network is formed spontaneously.



**Figure 1.** Bluetooth data frame

This figure depicts basic data frame of link layer control adaption protocol of Bluetooth[6]. As handover is done over link layer therefore it is required to brief frame formats of Bluetooth and WIFI . Link layer control services are designed to provide the exchange of data between user across LAN using MAC control link. The aim of the IEEE 802.11 standard is to provide wireless connectivity to devices that require a quick installation inside a WLAN (Wireless Local Area Network).

It defines the MAC procedures for accessing the physical medium, which can be infrared or radio frequency. Mobility is handled at the MAC layer, so handoff between adjacent cells is transparent to layers built on top of an IEEE 802.11 device.



**Figure 2.** Wifi frame format

MAC frames of WIFI[6] are of three types:

One is control frame used to assist the delivery of data frames ,second is management frame used to establish initial communication between station and access point and third is data frame which carry information.

III. RELATED WORK

Many methods have been proposed to support handover in wireless communication. Mostly these methods are IP based[8]. Implementation of session transfer based on such methods require the IP address of destination device during session transfer ,which degrades seamless mobility due to interruption in ongoing application. The situation gets even worse when user is unaware that IP address entered is incorrect. Some methods are location assisted method[9] such an approach requires a dedicated infrastructure that consists of location servers whose design proves to be an added complexity to the entire scheme and thus ,the session transfer cannot be carried out in an adhoc manner. Ubiquitous computing[9] also allows users to access their services using any device anytime anywhere in flexible manner based on current content where services starts on one device connected to a network and handover is done to another device connected to another network. This is a different scheme where real time application session transfers from one to another device but in the method proposed in this paper is different in many aspects from other methods as switching is carried over the same device platform from one to another network i.e, work is carried out taking network as basic unit and moreover since no location server is required hence the complexity to design develop, debug and maintain such a system is entirely removed, thirdly ,as no dependence over IP address is observed hence, the failure rate due to insertion of wrong IP address and subsequent interruption of services is drastically reduced.

IV. PROPOSED WORK

In this paper the proposed method is packet content transfer method and session transfer between Bluetooth and WIFI when accessing WAP (internet) .The algorithm for proposed method is as follows :

- Device must be capable to work in multiple network environment.
- If device moves from one point to another (device must check the strength of beacon signals from the network continuously )
- If the signal strength degrades then freeze the last successfully received packet of Bluetooth/WIFI.
- Search for newly available network.
- Associate to the new network as a valid client (as per all security measures and with authentication)
- Fetch source and destination address of packet

received successfully, fetch current packet concurrently. payload

- Acquire MAC packet of bluetooth/ WIFI ,
- insert the above source and destination address
- Using payload, identify the current data.
- Adjust the source address via payload.

adjusts the last source destination address in the MAC frame of Bluetooth network i.e, due to which a handover take place and the entire fragments of the data packet remain intact. Time required for such a processing will be negligible and hence services are never interrupted and no requirement to resume whole process ,it will automatically starts after the last delivered packet .in this way proposed algorithm for packet content transfer and session transfer is successfully carried out.

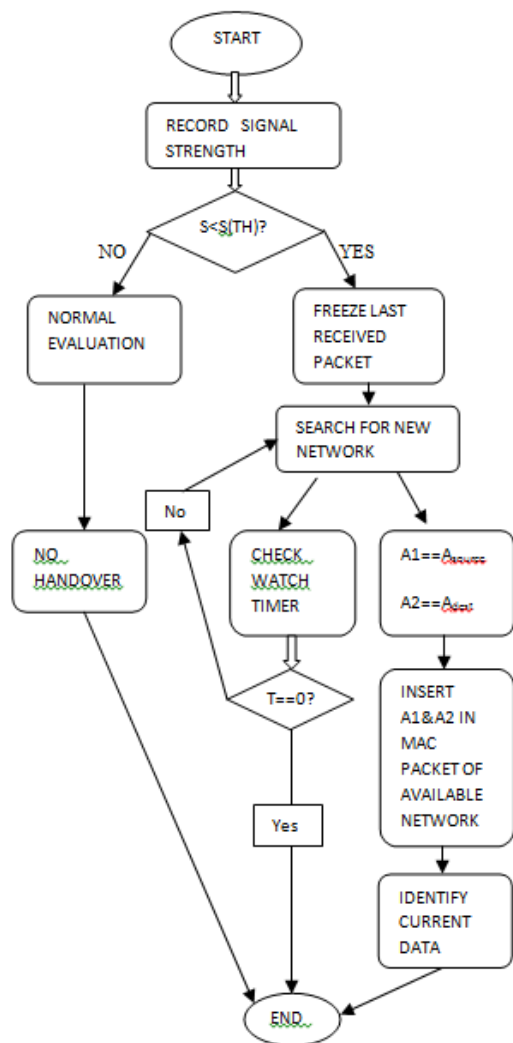


Figure 3. Flowchart of algorithm

Above algorithm can be explained as follows : a device with the above feature starts accessing WAP services using WIFI from a certain location from where it is displaced to a different location. During this displacement, the device recursively parses through the algorithm described above, and checks the strength of beacon signals, as the device detects that the signal strength for the given network has fallen below its nominal threshold values, the device immediately stores the last successfully received data it following the packets and searches for the availability of another network. It then connects to the available Bluetooth network as per decisions made by above algorithm and

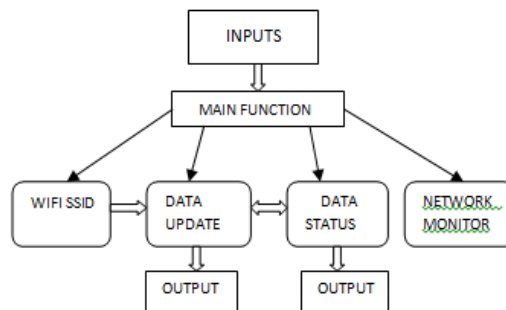


Figure 4. block diagram of proposed model

Main function of proposed model is divided in 4 Different modules using thread synchronization. Module 1 shows Wifi SSID to determine network identity. Module 2 updates whole data taking input from module 1 update Wifi SSID, downloading speed, byte received per second and shows name of current network connection. Module 3 is a window showing status of received data by bidirectionally communicating with module 2. Module 4 is independent module monitors above three module and prioritize work of above modules using thread synchronization.

### V. SIMULATION RESULTS

Simulations are carried out on visual studio framework 4.5. this model enables handover and Seamless session transfer among heterogenous technologies. Proposed model based on some parameters evaluate result showing switching between Bluetooth and wifi networks.

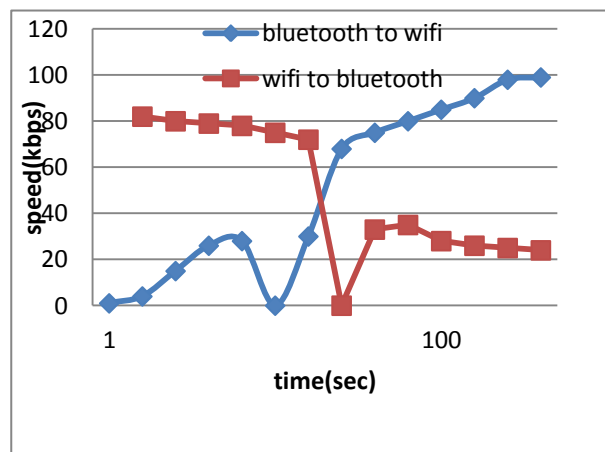


Figure 5. speed vs time graph

This graph represents variation in speed when network switches from bluetooth to wifi vice versa. There are two points where speed goes zero ,then abruptly increases after some milliseconds ,these points represents current network disconnection and available network connection where first speed for msec down to zero as soon as it gets another network it starts downloading data with speed depending on whether network is PAN or wifi.

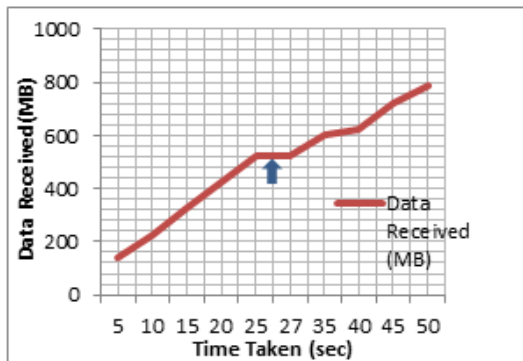


Figure 6. data received vs time graph

This graph represents data received per second depending on network connection continuity. Arrow shows point of network disconnection where for small time received data remain at constant with increase in time, after connecting from other network again data starts downloading ie again graph starts increasing as per byte received per second.

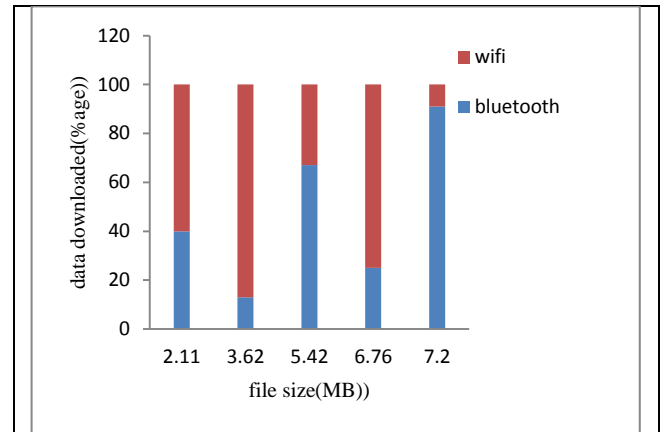


Figure 7. distribution per network (%) vs file size

This figure 7. represents distribution of file size as per network example : file having size 200 kb starts downloading with 40 percent using bluetooth network and remaining 60 percent using wifi network, graph shows percentage of data downloaded using wifi /Bluetooth networks. Using percentage as a criterion graph represents handover between hybrid networks as from total amount of data some percent is downloaded using one network and in unavailability of that network switching occurs and remaining data is downloaded using another network.

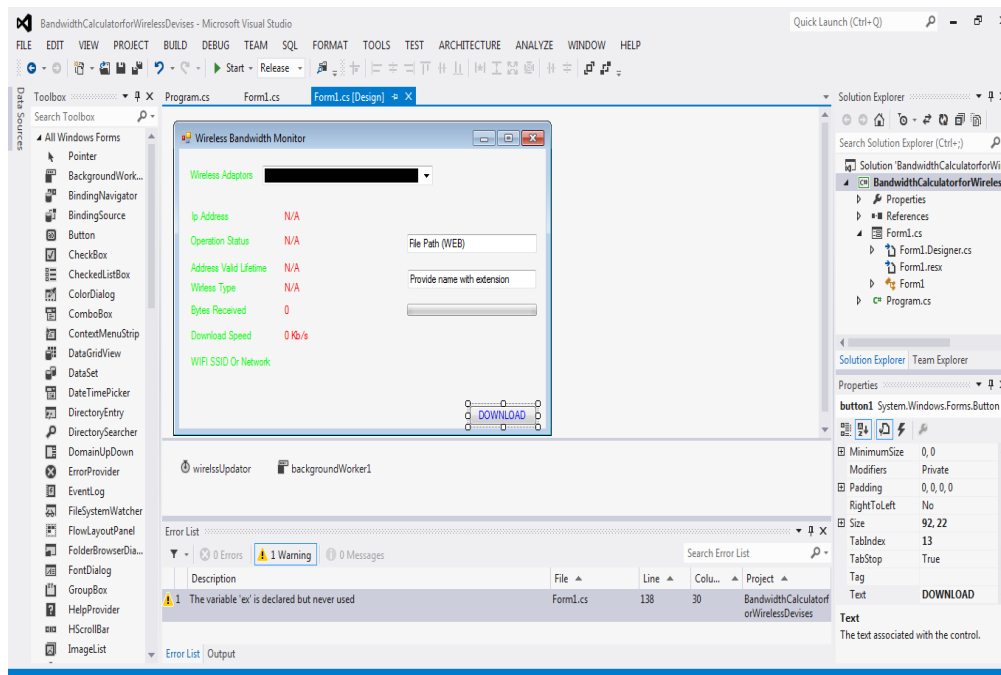


Figure 8. Actual model (downloader)

This picture is showing the actual model , a visual studio platform which is used to carried out the proposed work and the window entitled “wireless bandwidth monitor” is a downloader used to switch from one network to another(

here technologies used are Bluetooth and WIFI). User provides file path and file name to be downloaded and without interruption of services this downloader will provide handoff as per algorithm discussed in this paper. Above

simulation results are carried out on the basis of working of this model.

## VI. CONCLUSION

In this paper a method for transfer of packet content over bluetooth (Wireless PAN 802.15.1) and WIFI (Wireless LAN IEEE 802.11), session transfer, and a purely connection less service has been proposed. The proposed method provides a seamless session transfer method using a single device to access internet contents. This results in uninterrupted session transfer using flawless handover between heterogenous technologies.

As a future work, firstly the concept to include more heterogenous technologies like wimax, 2G, 4G can be incorporated secondly, further enhancements in the Bluetooth framework that will be based on Ultra-Wide Band (UWB) can also be incorporated. Since, UWB based systems function at a very high-speed, and involve precisely timed impulses for transmitting information over a very wide spectrum, thus the proposed algorithm can bring seamless and virtually impossible to detect switching between two networks.

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