

A Study on Ad hoc wireless Networks

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Abstract— Wireless ad hoc networks (also referred to as packet radio networks and multi-hop radio networks) consist of mobile nodes communicating over a shared wireless channel. Contrary to cellular networks, where the nodes are restricted to communicate with a set of carefully placed base stations, in wireless ad hoc networks there are no base stations; any two nodes are allowed to communicate directly if they are close enough, and nodes must use multi-hop routing to deliver their packets to distant destinations. The lack of wired infrastructure, the nature of the wireless channel, and the mobility of the nodes create many challenging problems in the link, network, and higher layers of the OSI hierarchy. On the other hand, the lack of wired infrastructure and their topology make these networks ideal for many applications, from personal area networks, to search and rescue operations, to massive networks of millions of sensors. It is therefore expected that, once all the technological issues are solved, wireless ad hoc networks will become an integral part of our society's communication network infrastructure.

I. INTRODUCTION

An ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of existing network infra-structure or centralized administration. Due to the limited transmission range of wireless network interfaces, multiple network hops may be needed for one node to exchange data with another across the network. In such a network, each mobile node operate not only as a host but also as a router, forwarding packets for other mobile nodes in the network, that may not be within the direct reach wireless transmission range of each other. Each

node participates in an ad hoc routing protocol that allows it to discover multi hop paths through the network to any other node. The idea of an ad hoc network is sometimes also called an infrastructure-less networking, since the mobile nodes in

the network dynamically establish routing among themselves to form their own network on the fly. Some examples of the possible use of ad hoc networks include students using laptop computers to participate in an interactive lecture, business associates sharing information during a meeting, soldiers relaying information for situational awareness on the battlefield, and emergency disaster relief personnel coordinating efforts after a hurricane or earthquake

ROUTING

A lot of work has already been done in the area of unicast routing in ad hoc networks. These routing protocols can be broadly classified into two categories:

- ☐ Table driven
- ☐ Source initiated (demand driven)

TABLE DRIVEN ROUTING PROTOCOLS

Table driven routing protocols attempt to maintain consistent, up to date routing information from each node to every other node in the network.

These protocols require each node to maintain one or more tables to store routing information, and they respond to changes in network topology by propagating updates throughout the network in order to maintain a consistent

network view. The areas in which they differ are the number of necessary routing related tables and the methods by which changes in network structure are broadcast. Some of such routing protocols are:

- ☐ Destination Sequence Distance Vector Routing
- ☐ Cluster Head Gateway Switch Routing
- ☐ Wireless Routing Protocol

SOURCE INITIATED ROUTING PROTOCOLS

A different approach from table driven routing is source initiated on demand routing. This type of routing creates routes only when desired by the source node. When a node requires a route to a destination, it initiates a route discovery process within the network.

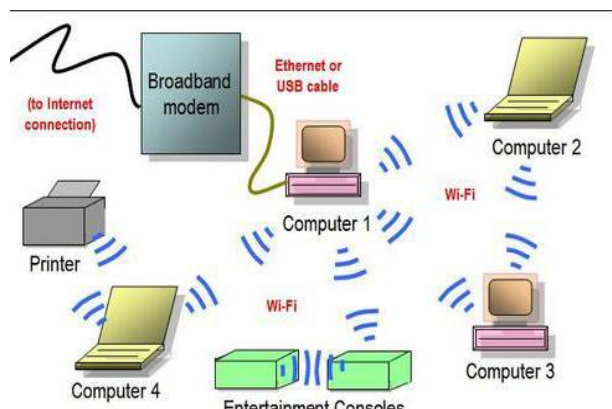
The following protocols fall in this category:

- ☐ Ad Hoc On Demand Routing Protocol
- ☐ Dynamic Source Routing
- ☐ Temporally Ordered Routing Algorithm
- ☐ Associativity Based Routing
- ☐ Signal Stability Routing

WIRELESS NETWORK ARCHITECTURES

In planning the wireless network, we will have to determine which wireless network architecture to adopt in the network environment. There are two architectures available, namely standalone and centrally coordinated wireless network.

STANDALONE ARCHITECTURE (AD HOC MODE)



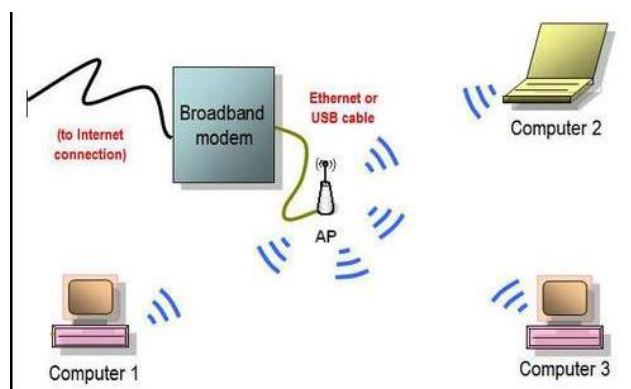
By using ad hoc mode, all devices in the wireless network are directly communicating with each other in peer to

peer communication mode. No access point (routers/switches) is required for communication between devices.

For setting up ad hoc mode, we need to manually configure the wireless adaptors of all devices to be at ad hoc mode instead of infrastructure mode, and all adaptors must use the same channel name and same SSID for making the connection active.

Ad hoc mode is most suitable for small group of devices and all of these devices must be physically present in close proximity with each other. The performance of network suffers while the number of devices grows. Disconnections of random device may occur frequently and also, ad hoc mode can be a tough job for network administrator to manage the network. Ad hoc mode has another limitation is that, ad hoc mode networks cannot bridge to wired local area network and also cannot access internet if without the installation of special gateways.

CENTRALLY COORDINATED ARCHITECTURE (INFRASTRUCTURE MODE)



The other architecture in wireless network is centrally coordinated (infrastructure mode). All devices are connected to wireless network with the help of Access Point (AP). Wireless APs are usually routers or switches which are connected to internet by broadband modem.

Infrastructure mode deployments are more suitable for larger organizations or facility. This kind of deployment helps to simplify network management, and allows the facility to address operational concerns. And resiliency is also assured while more users can get connected to the network subsequently. The infrastructure mode provides improved security, ease of management, and much more scalability and stability. However, the infrastructure mode incurs extra cost in

deploying access points such as routers or switches. An infrastructure mode wireless network has the characteristics as below:

The wireless centralized controller coordinates the activity of access point.

- ☐ The controller is able to monitor and control the wireless network by automatically reconfiguring the access point parameters in order to maintain the health of the network.
- ☐ The wireless network can be easily expanded or reduced by adding or removing access points and the network can be reconfigured by the controller based on the changes in RF footprint.
- ☐ Tasks such as user authentication, fault tolerance, control of configuration, policy enforcement and expansion of network are done by the wireless network controller.
- ☐ Redundant access points can be deployed in separate locations to maintain control in the event of an access point or switch failure.

AD HOC NETWORKS AND THE INTERNET

The growth of the Internet in the early 1990's, combined with cheaper computing and radio equipment (e.g. IEEE 802.11 wireless LAN and Bluetooth devices), saw an increasing focus of the research and engineering community on ad hoc networks. In 1997, the Internet Engineering Task Force (IETF) established the Mobile Ad Hoc Networks (MANET) Working Group to create and standardize new routing protocols (i.e. rules for finding a path between two Internet nodes) that cope with the dynamics and multi-hop paths present in ad hoc networks. Today, not only are there the handful of routing protocols published by the MANET WG, but more than 50 protocols proposed for varying scenarios. With publicly available routing protocols and nearly all new laptops and handheld computers being equipped with wireless capabilities, businesses are starting to realise the potential of commercial ad hoc network applications. Companies such as Mesh Networks, Green Packet, PacketHop and Firetide are offering products and solutions based on ad hoc networking technology, with applications such as Law Enforcement, Intelligent Transport Systems, Community Networking and Home Networks in mind. However, the commercial technology available today is still a long way from the full potential of ad hoc networks. Fundamental problems must still be solved before ad hoc networks can fully enable a ubiquitous computing and communications environment

ADVANTAGE

1. Easy to setup: No additional Software is needed and It's FREE
2. Nowadays, By default Wi-fi or Wireless Card is included when you bought a computer especially in laptops. Even if it's not included USB type Wifi is now cheap.
3. Portability and Mobility
4. No more wires and additional devices such as hub and routers

MAIN DISADVANTAGE

If you'll share or connect other computers and devices to the Internet. The computer that is connected to the Internet (Gateway) must always be turned on. Unlike using a router, you can turn off any computers in the network. Read more: Internet Connection Sharing (ICS) in Ad Hoc Connection

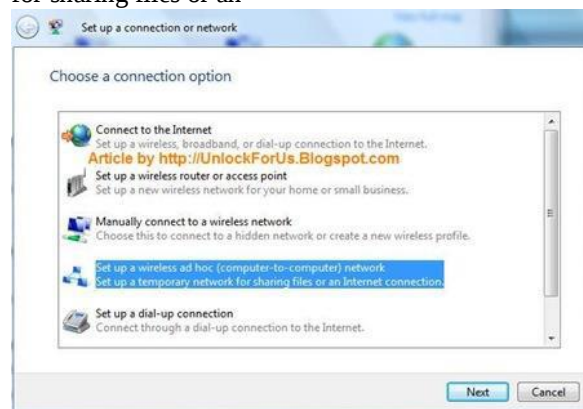
Distance: Computers and devices in ad hoc connection must be within 30 feet of each other (although you can extend this by using a passive repeater by simply creating a parabolic antenna using a USB type Wi-fi and other types of antenna)

AD HOC WIRELESS NETWORK (AUTOMATIC IP ADDRESS CONFIGURATION)

WINDOWS VISTA

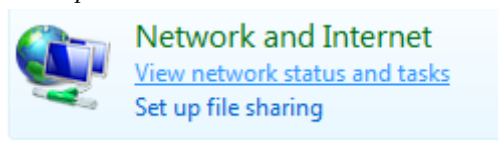
1. LAUNCHING SETUP A NETWORK OR CONNECTION WINDOW

Window Choose "Set up a wireless ad hoc (computer-to-computer) network Set up a temporary network for sharing files or an Internet connection



There are several ways to access this Window, here they are:

- Right-Click the Wireless Network Icon in the Taskbar's Notification Area > Connect to a Network > At the Bottom, Click the *Setup a Connection or Network*
- Right-Click the Wireless Network Icon from the Notification Area > Network and Sharing Center > In the Left Pane, choose *Setup a Connection or Network* link
- Start Menu > Connect To Button > At the Bottom, Click the *Setup a Connection or Network* link
- Using the New Control Panel View: Start Menu > Control Panel > View network status and tasks > In the Left Pane, choose *Setup a Connection or Network* link



Using the Classic Control Panel View: Start Menu > Control Panel > Network and Sharing Center > In the Left Pane, choose *Setup a Connection or Network* link

2. CREATING AD HOC NETWORK WINDOW



"Set up a wireless ad hoc network"

An ad hoc network (sometimes called a computer-to-computer network) is a temporary network used for sharing files, presentations, or an Internet connection among multiple computers and devices.

Computers and devices in ad hoc networks must be within 30 feet of each other.

If you're currently Connected to a wireless network, you might be disconnected when you set up this network."

Click *Next Button* to Start Creating Ad hoc Network.

3. WRITE THE NETWORK NAME, PASSWORD (SECURITY KEY) AND OTHER SECURITY OPTIONS (NO AUTHENTICATION (OPEN)/WEP/WPA2-PERSONAL)

Give your network a name and choose security options

Network name:

Security type: [Help me choose](#)

Security key/Passphrase: ☒ Display characters

[Visit http://UnlockForUs.Blogspot.com](http://UnlockForUs.Blogspot.com)

☒ Save this network

4. CLICK THE NEXT BUTTON TO CREATE AND CONNECT TO THE NETWORK

The MyAdhocNetwork network is ready to use

This network will appear in the list of wireless networks and will stay active until everyone disconnects from it. Give the network name and security key (if any) to people you want to connect to this network.

Wireless network name: MyAdhocNetwork

Network security key: 12345

To share files, open [Network and Sharing Center](#) in Control Panel and turn on file sharing.

To be able to activate the Ad hoc Network that you have just created, more than 1 computers or devices must be connected to the network.

SETTING UP THE IP-ADDRESS IN VISTA/XP

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address:

Subnet mask:

Default gateway:

1. From my previous tip: Open the Network Connections

type and launch the command: **ncpa.cpl** or **Control ncpa.cpl**

2. Right-Click the Wireless Network Connection > Properties > Internet Protocol Version 4 (TCP/IPv4) > Properties Button > Select "Use the following IP address:"

Examples: Class C - Most Common Hom Configuration

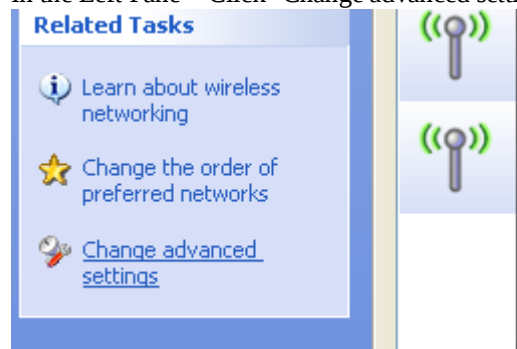
Range: 192.168.0.0 - 192.168.255.255

To Connect: Right-Click the Wireless Icon > Connect to a Network > Find the name of the ad hoc Network > Click the

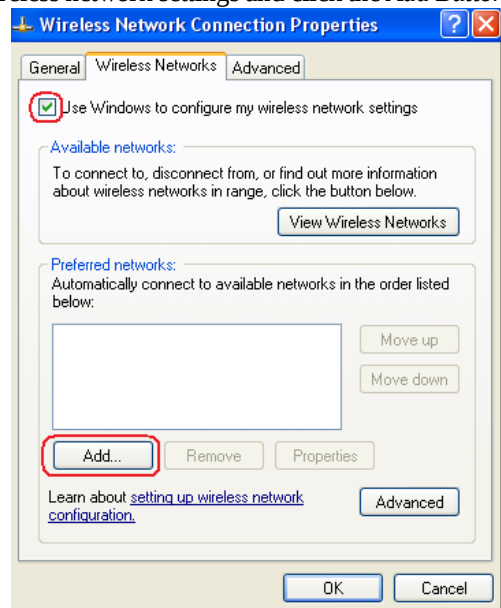
Connect Button > Input the Passphrase or Security Key and finally Click the Connect Button again.

Right-Click the Wireless Network Icon > Choose View Network Wireless Networks

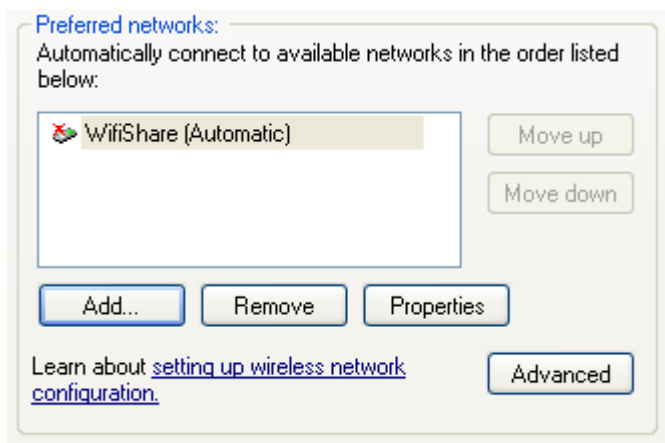
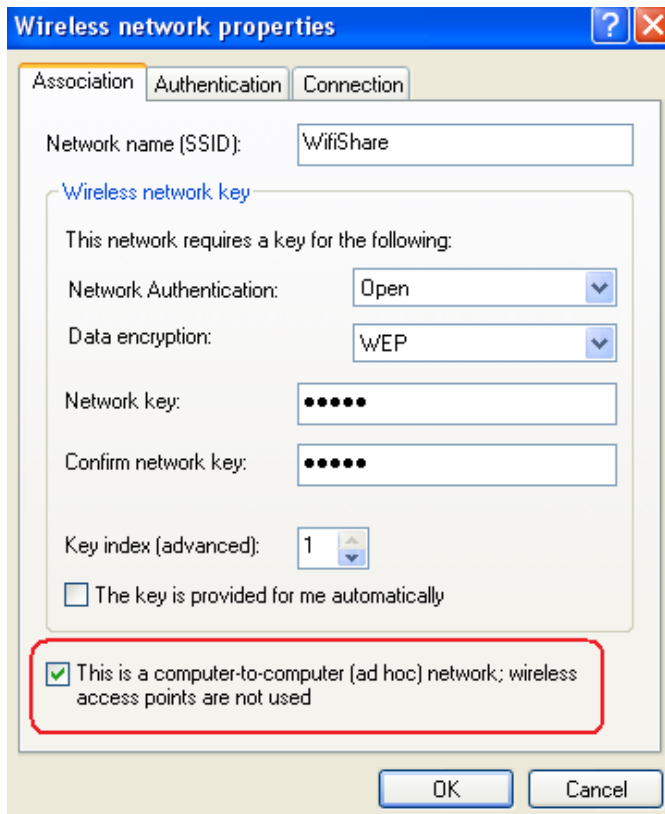
In the Left Pane > Click "Change advanced settings" link



Make sure that you are using Windows to configure your wireless network settings and click the Add Button



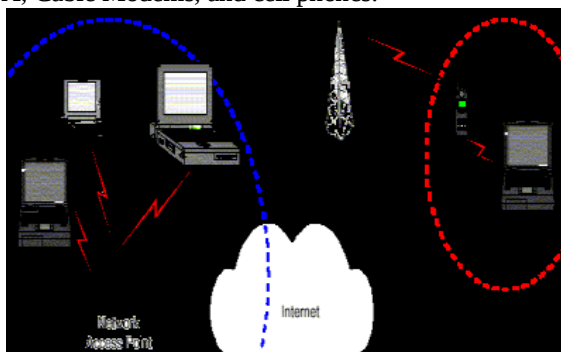
Enter the Network Name (SSID), Set the Network Authentication, Data Encryption, Network key and Choose the option "This is a computer-to-computer (ad hoc) network; wireless access points are not used."



NETWORK ACCESS POINTS

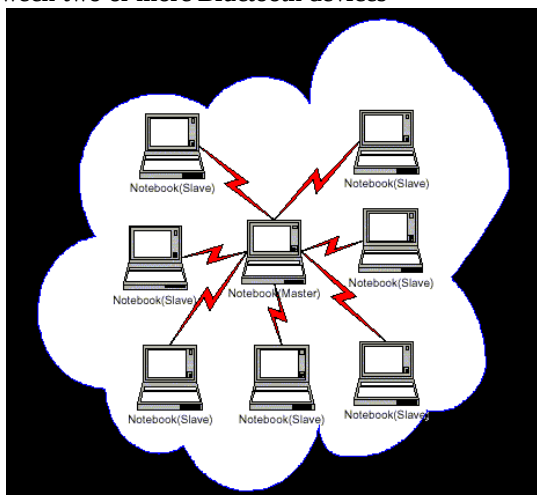
In this scenario, the radio and host controller appear to be a direct bus connection to a network interface device with network access. A network access point is a device that contains one or more Bluetooth radio devices and acts as a

bridge, proxy, or a router between a network (10baseT, GSM, etc) and the Bluetooth network. Each network access point can allow one or more computing devices to gain access to it, and each of these computing devices will have access to all of the LAN's shared resources. Network access points will provide access to other networks technologies such as, ISDN, Home PNA, Cable Modems, and cell phones.



GROUP AD-HOC NETWORKS

Group ad-hoc networking is a collection of mobile hosts that co-operatively create an ad-hoc wireless network without the use of additional networking hardware or infrastructure. In addition, the PAN profile focuses on the following simple personal ad-hoc networking scenarios consisting of a single Bluetooth piconet with connections between two or more Bluetooth devices



PAN SCENARIOS STACK

Network access points and group ad-hoc networks are two different services. Network access points provide network services to each of the Bluetooth devices connected. Group ad-

hoc networks are designed to allow one or more Bluetooth devices to become part of an ad-hoc network. Both Network Access Points and Group Ad-hoc Networks provide the facility for applications to use IP and other networking protocols.

ROLES/CONFIGURATIONS

The following roles are defined for the PAN profile.

- **Network Access Point (NAP) and NAP service** - A Bluetooth device that supports the NAP service is a Bluetooth device that provides some of the features of an Ethernet bridge to support network services. The device with the NAP service forwards Ethernet packets between each of the connected Bluetooth devices, referred to as PAN users, see below. A device with the NAP service will simply be called a NAP. The NAP and the PAN User exchange data using the Bluetooth Network Encapsulation Protocol (BNEP). The device with the NAP service has an additional network connection to a different network media in which the Ethernet packets are either exchanged via Layer 2 bridging or Layer 3 routing mechanism.
- **Group Ad-hoc Network (GN) and GN service** - A Bluetooth device that supports the GN service is able to forward Ethernet packets to each of the connected Bluetooth devices, the PAN users, as needed. The Group Ad-hoc Network and the PAN User exchange data using the Bluetooth Network Encapsulation Protocol (BNEP) [1]. Group Ad-hoc Networks do not provide access to any additional networks. Instead, Group Ad-hoc Networks are intended to allow a group of devices to form temporary network and exchange information.
- **PAN User (PANU)** - This is the Bluetooth device that uses either the NAP or the GN service. PANU supports the client role for both the NAP and GN roles.

The presentation of this profile will continue with the simplifying assumption that each device involved with each of the profile has a single Bluetooth radio.

REFERENCES

- [1] C K Toh, Ad Hoc Mobile Wireless Networks, Prentice Hall Publishers , 2002.
- [2] P. Gupta and P.R. Kumar. Capacity of wireless networks. IEEE Transactions on Information Theory, Volume 46, Issue2, March2000.



- [3] Jinyang Li, Charles Blake, Douglas S. J. De Couto, Hu Imm Lee, and Robert Morris, Capacity of Ad Hoc Wireless Networks, in the proceedings of the 7th ACM International Conference on Mobile Computing and Networking, Rome, Italy, July 2001
- [4] Wu S.L., Tseng Y.C., "Wireless Ad Hoc Networking, Auerbach Publications", 2007 ISBN 978-0-8493- 9254-2
- [5] Muaz Niazi, Amir Hussain, Agent based Tools for Modeling and Simulation of Self-Organization in Peer-to-Peer, Ad Hoc and other Complex Networks, Feature Issue, IEEE Communications Magazine, Vol.47 No.3, March 2009, pp 163– 173.Paper
- [6] Chun, B. G. and Baker, M. 2002. Evaluation of packet scheduling algorithms in mobile ad hoc networks. ACM SIGMOBILE Mobile Computing and Communications Review. 6 (3), (2002), 36-49.
- [7] Faruque, M. N., Ahmad, S. N. and Kumar, M. 2011. *Performance of QoS Wireless Ad hoc Network for AODV Protocol using Fuzzy Based Techniques*. International Journal of Electronics and Communication Technology. 2 (2) (2011).
- [8] Gomathy, C. and Shanmugavel, S. 2005. *Supporting QoS in MANET by Fuzzy Priority Scheduler and Performance Analysis with Multicast Routing Protocols*. EURASIP Journal on Wireless Communication and Networking. 3 (2005), 426-436.
- [9] Manoj, K., Sharma, S.C., Vijay, S. and Dixit, A. 2008. *Performances Analysis of Wireless Ad-hoc Network Using OPNET Simulator*. International Conference on Intelligent Systems and Networks. (ISN-08) ISTK Haryana. (2008), 267-270.
- [10] Wu S.L. and Tseng Y.C. 2007. *Wireless Ad Hoc Networking*, Auerbach Publications. (2007). ISBN 978-0-8493- 9254-2 J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.