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A Comparative Study On: (i)Routing Algorithms for Data dissemination in Wireless Sensor Networks. (ii)Wired and Wireless Sensor Networks.

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Abstract:*Data dissemination is the process of dispersal or transfer of data to the end-users.The main aim of wireless sensor nodes is to recognize and accommodate data from target domain ,convert the data into usable and desired form and broadcast the information back to its specific sources ,where the underlying application inhabit.In order to perform this task accurately and in an well organized manner we require the development of certain energy efficient routing protocols which sets up different paths in the middle of sensor nodes and the data sink.*

The Purpose of this paper is to compare various data dissemination protocols and provide detailed information on which protocol is more efficient and why. The paper also provides a detailed comparison between wireless and wired networks.

Keywords:*Flat based routing protocols,Hierarchical routing protocols, Wired network,Wireless network.*

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I. Introduction:

Wireless sensor networks (WSNs) have many wirelessly connected sensor nodes spread over any region or area to take control or maintain many environmental or physical conditions[1].WSNSs are used in various applications, e.g. to monitor area, health care, air pollution etc., to detect forest fire, landslide etc[1].The term wired network can be defined as the connection of n nodes through wired connection[2]. The wired cables are mostly Ethernet. The data are transmitted between these nodes using different topology like Bus- topology, Mesh –topology, Star topology etc[2]. The term wireless network stands for the network where the connections are made without the physical wired connection[2]. Wireless networks are of different types like Wireless LAN, Wireless PAN, Wireless Ad-hoc network etc. These networks are preferred according to the usage[2]. Nowadays, the wireless network is preferred over wired due to low cost and mobility[2].

The manner in which the data and queries are redirected between the base station and the location where the target phenomena is detected is a crucial aspect of wireless sensor networks.one of the uncomplicated approaches in achieving this task is to enable each sensor node to exchange data directly with the base station. Data redirection between the sensors and the base stations is implemented through multi-hop packet transmission,since it saves a lot of energy and also reduces communication interference between sensor nodes competing to access the channel.Whenever any specific event takes place within the monitored area ,data collected by the sensors are directed to the base station using multi-hop paths.Sensor nodes have the ability to aggregate data on their way to base station.Multi-Hop wireless sensor network is a network in which intermediate nodes actively participate in forwarding data packets between the source and the destination.The principal task of the routing algorithm is to decide which set of intermediate nodes is to chosen to form a data forwarding path between the source and the destination.Routing in an large scale networks proved to be a challenging task as it solutions must justify multiple challenge design requirements.

II. Literature Review

In this review paper we have analyzed different existing routing protocols for data dissemination and gathering,also we have analyzed the major differences between wireless and wired networks through a practical experiment.

II(A)EXPERIMENTATION PERFORMED TO COMPARE WIRELESS AND WIRED NETWORK.

A wireless and wired university management system server was created utilizing cisco packet tracer to compare the major differences between wired and wireless networks.

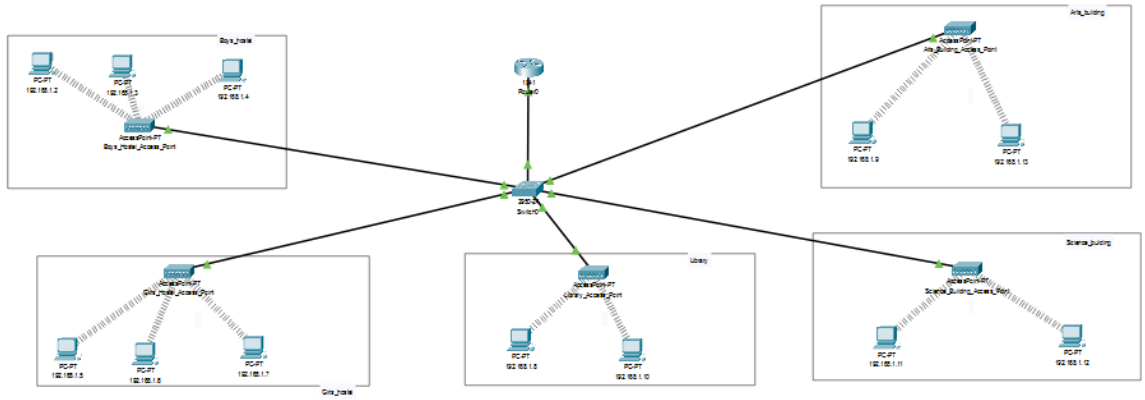

Fig 1.1 University Management Portal(WIRELESS NETWORK)

Fig 1.1 Represents university management portal.The university consists of various clusters such as boys hostel,girlshostel,library,artsbuilding,sciencebuilding.The university main server is connected with the following:
(a)Boys hostel access point
(b)Girls hostel access point
(c)Library access point
(d)Arts building access point
(e)Science building access point.
All the connections are made in such a way that if the university wants to communicate with any of its clusters,it must be able to communicate with minimum or no interference.

The concept of wireless sensor networks is utilized in the above experiment.The default gateway for all the computers is kept As 192.168.1.1.

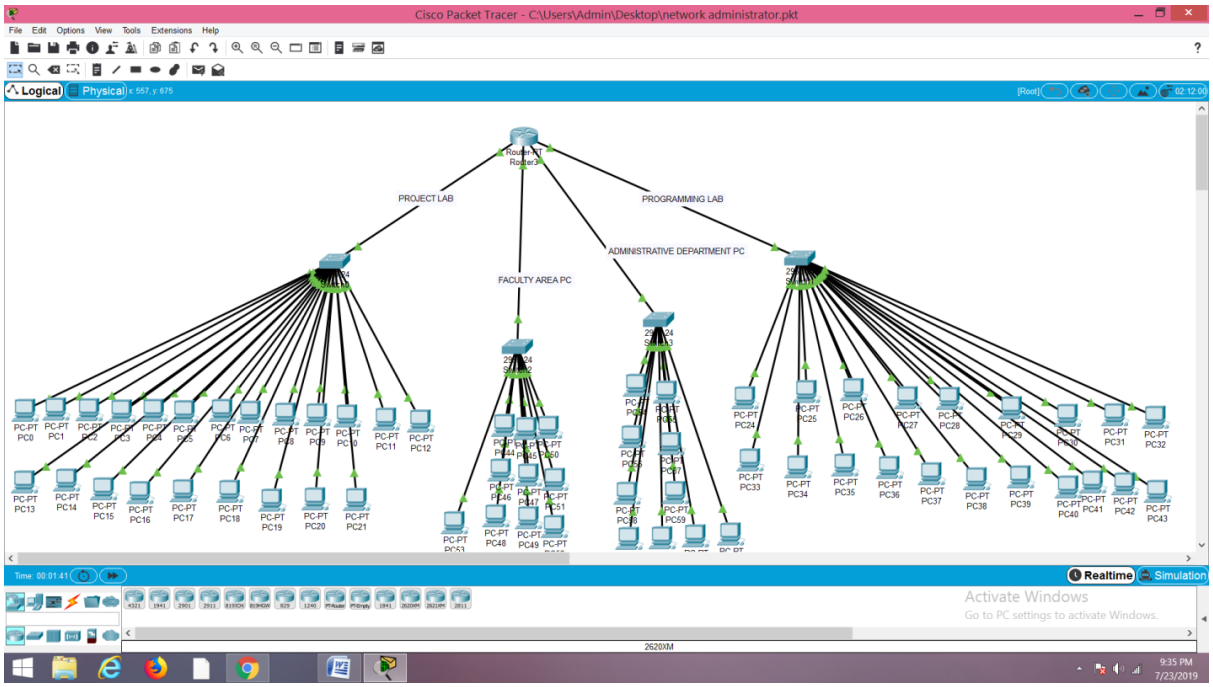

Fig 1.2 University Management Portal(WIRED NETWORK)

The University in wired network consists of the following:

a. A project lab.

b. A programming lab.

c. Faculty area
d. Administrative department

Based on the topology which we have created it consists of 4 labs a project lab,programminglab,faculty area ,administrative area respectively.i have used one single router and connected it with 4 different switches and within the switches we have connected the pc the entire topology is created in such a way that all the 4 labs will be able to send/communicate with each other.

For example:when a packet is sent from project lab to programming lab then first the switch receives the packets and forwards the packet to the router then the router reads the network address information in the packet to determine its ultimate destination.

II(B)THEORETICAL ANALYSIS OF ROUTING PROTOCOLS
(i)BASIC THEORY:
The routing protocols give detailed information about how communication takes place between nodes and how information is passed from one node to the other.
In wireless sensor routing protocols are divided into 3 categories:
(a)Flat-based routing protocols
These types of routing protocols are further divided into 3 types of flat routing schemes namely flooding,forwarding and data-centric based routing.Every node plays a similar role and sensor nodes collaborate to perform the sensing task[3]. All nodes in the sensor network plays an equal role in collection information.In this type of network, it is not possible to assign a particular identification (ID) to each node due to the large number of sensor nodes[4].In flat routing protocols nodes sends data to the sink node with the help of several intermediate nodes or multi-hop. .This leads to a data-centric routing approach in which the sink sends a query to a group of particular nodes in a region and waits for a response[4].
(i)FLOODING AND GOSSIPING
Flooding makes use of an reactive approach wherein each node which receives a data packet sends the packet to all its neighbours. It will continue this process until the maximum number of hops for the packet is reached or until the packet reaches its destination.

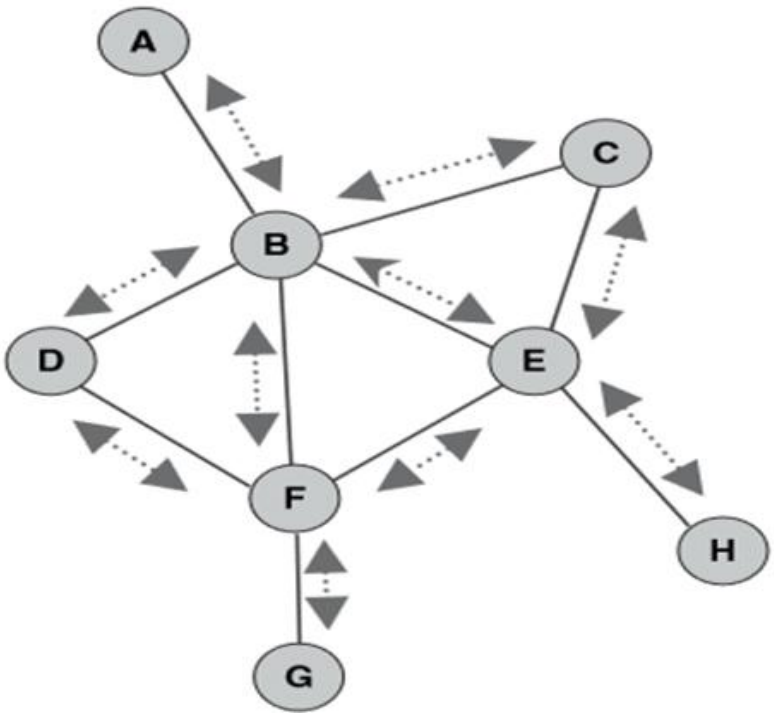

Fig 1.15 Flooding

Hop count,time-to-live effect can be added in order to prevent a packet from circulating in a network indefinitely.

However, this protocol raises few drawbacks such as: impulsion, overlap and resource blindness[4].

Its major advantages are it requires low cost maintenance and it has a very simple forwarding rule.

In gossiping each node sends the incoming packet to its randomly selected neighbour.Upon receiving the packet, the neighbor selected randomly chooses one of its own neighbors and forwards the packet to the chosen. This process continues iteratively until the packet reaches its intended destination node.

Gossiping will help to reduce multiple copies of the same packet traversed in the network by selecting a random node for packet relaying[4]. This avoids the problem of impulsion but the delay to reach destination may be large in some cases[4].

(ii)Sensor Protocols for Information via Negotiation (SPIN)

In spin protocol sensor nodes negotiate with each other before forwarding the actual data using meta-data .meta-data gives a complete description about the actual data.This ensures that there is no redundant data sent throughout the network[4]. It is designed to address the deficiencies of flooding by negotiation and resource adaptation[4]. Spin protocol uses 3 types of messages such as ADV,REQ,DATA.three-way handshake protocol concept is used in spin protocol.one of the major advantages of this protocol is that each node in the network needs to know only its single hop neighbour.

The SPIN family of protocols includes many protocols. These contains SPIN-PP, SPIN-EC, SPIN-BC and SPIN – RL

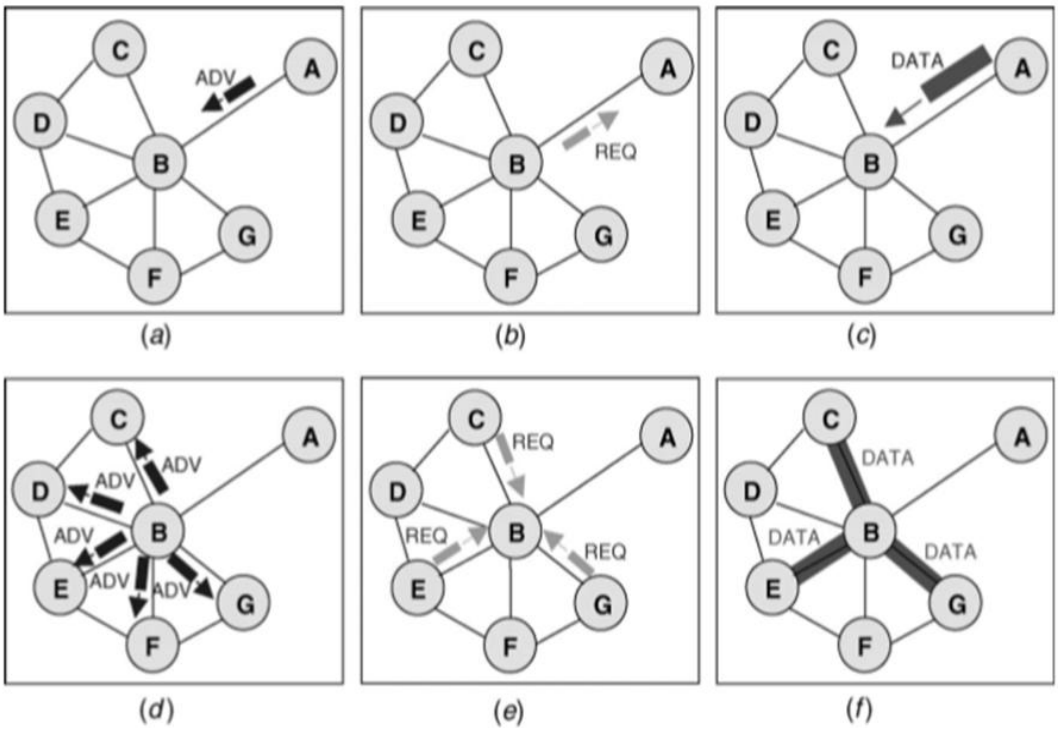

Fig 1.16 Represents the basic behaviour of SPIN protocol.

The data source advertises its data to its immediate neighbour,by sending an ADV message.Node B expresses interest in receiving the advertised data hence sends an REQ message to Node A.upon receiving the data node B advertises its data to its immediate neighbour Only three neighbors, nodes C, E, and G, express interest in the data. These nodes issue a REQ message to node B, which eventually delivers the data to each of the requesting nodes.

(b)Hierarchical routing protocol

(i)Low-Energy Adaptive Clustering Hierarchy.

It is a routing algorithm developed to collect and deliver data to the data sink.it extends the network lifetime,reduces energy consumption of sensor nodes.

Leach organizes the network into a set of clusters,each cluster consists of a cluster head which is responsible for carrying out multiple tasks.

The first task consists of collection of data from the members of cluster.upon receiving the data the cluster head aggregates the data in order to remove redundancy from it.The second main task is to transmit the aggregated data to the base station it is done through single hop.The third main task of the cluster head is to create a TDMA-based schedule where each node in the cluster is assigned a time slot which can be used for transmission of data.

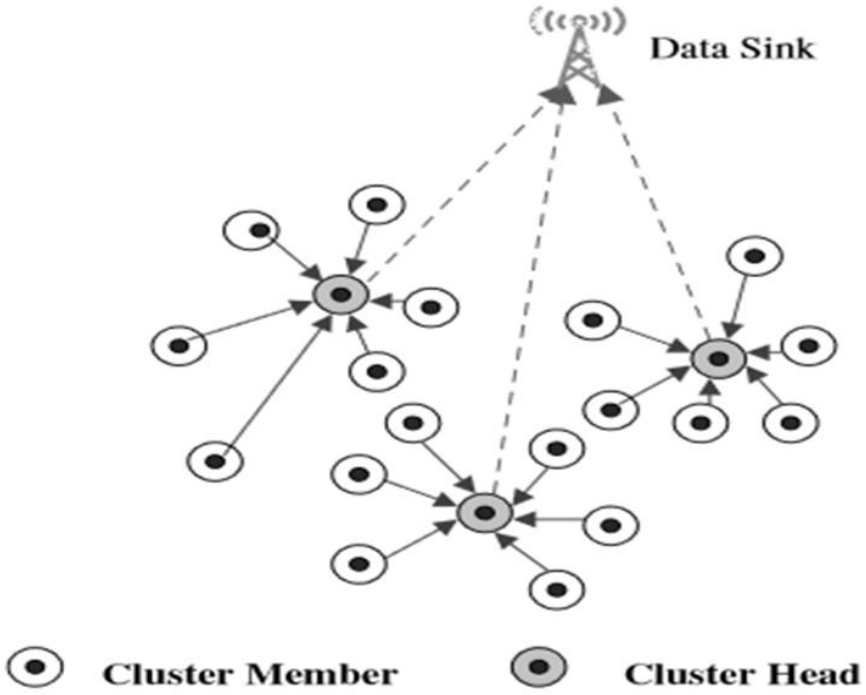

Fig 1.17 Leach Network model.

(ii)Power-Efficient Gathering in Sensor Information Systems (PEGASIS).

They belong to the family of routing and information gathering protocols.pegasis uses a chain structure for data gathering and dissemination .it has 3 stages namely chain formation,leader selection and data transmission.

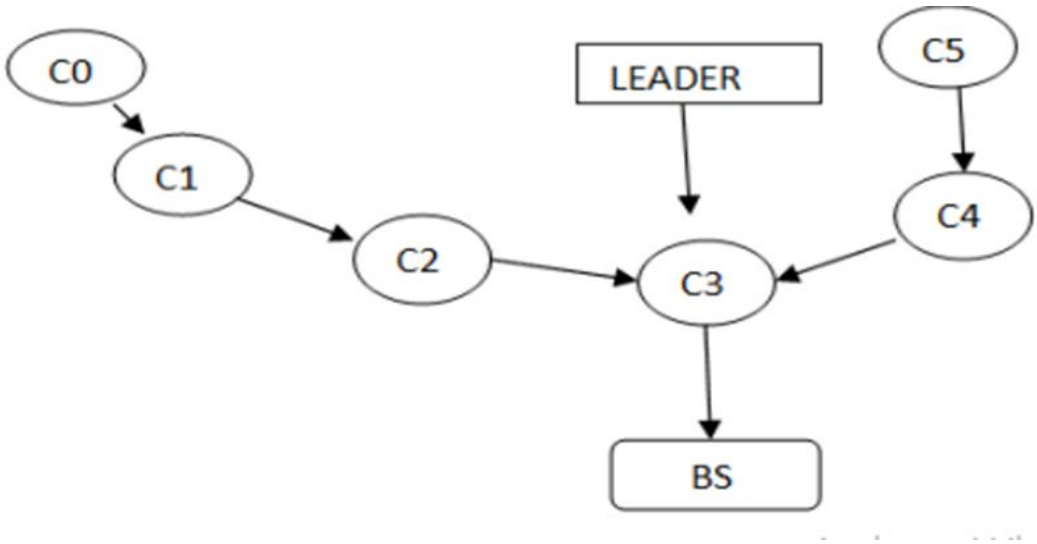

Fig 1.18 Data transmission in pegasis.

(c) Location based routing protocol.

II(C)RESULTS:

(i)The following results were obtained in the experiment displayed in fig 1.1

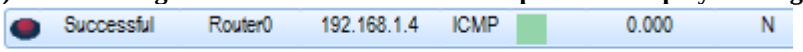

Fig 1.3 The above figure shows that the message sent from the university main router to boys hostel was successful.

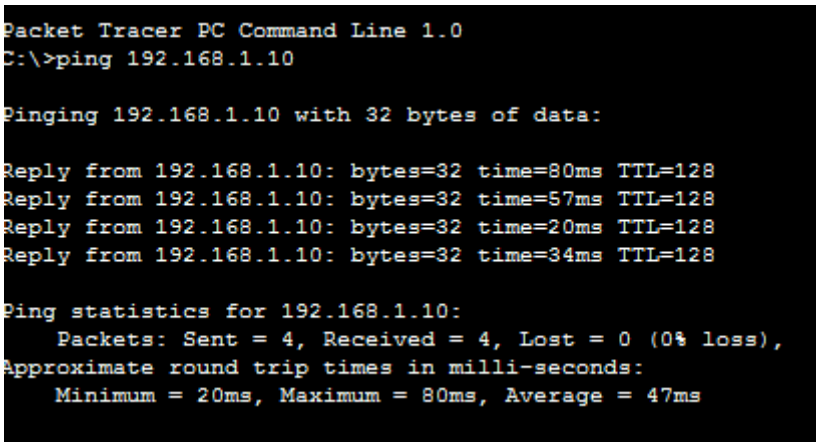

Fig 1.4 proves that the connection established between boys hostel to library was successful.

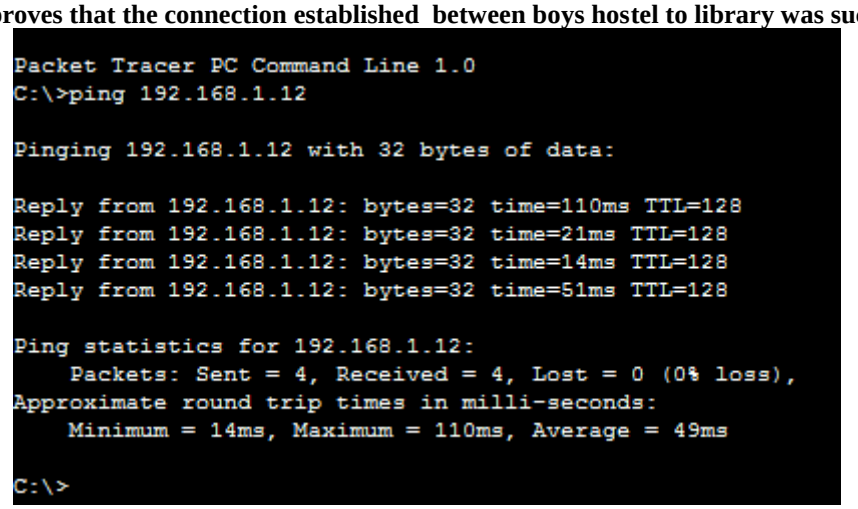

Fig 1.5 proves that the connection established between boys hostel to science building was successful.

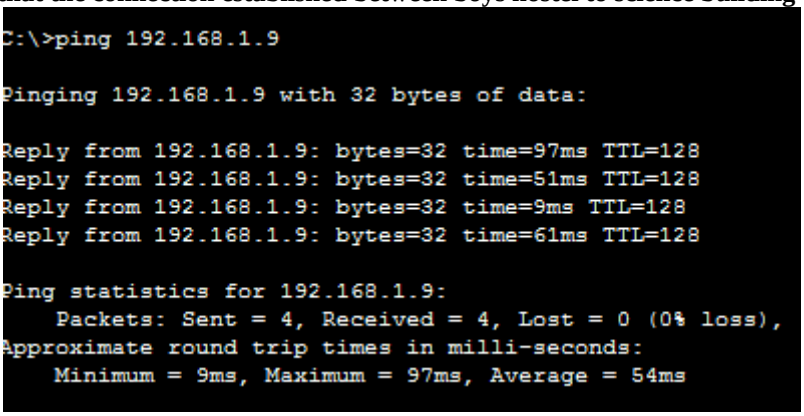

Fig 1.6 proves that the connection established between boys hostel to arts building was successful.

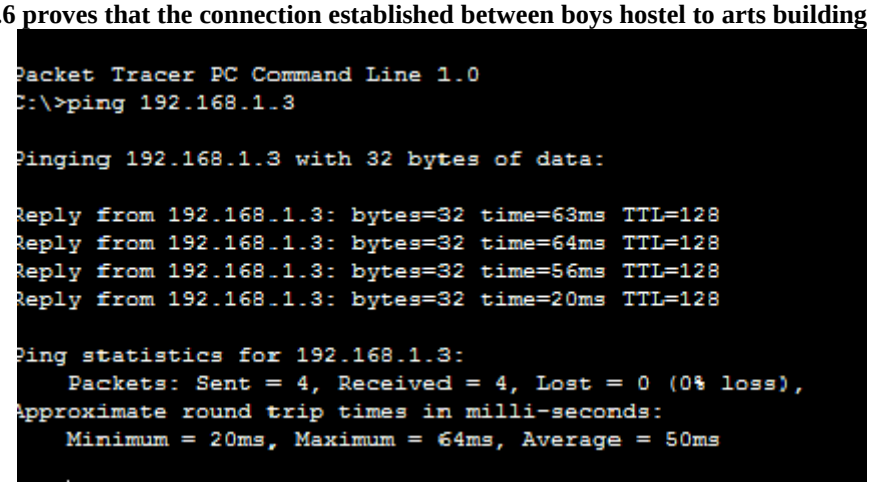

Fig 1.7 proves that connection established between boys hostel to girls hostel was successful.

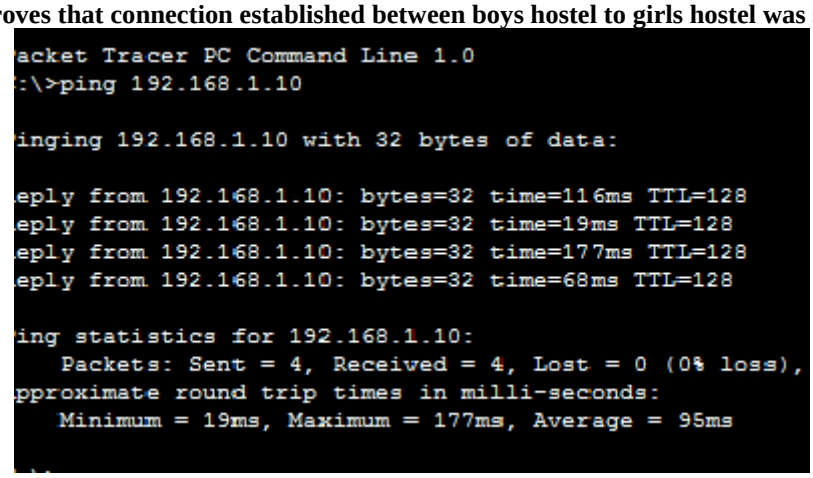

Fig 1.8 proves that communication between girls hostel to library was successful.

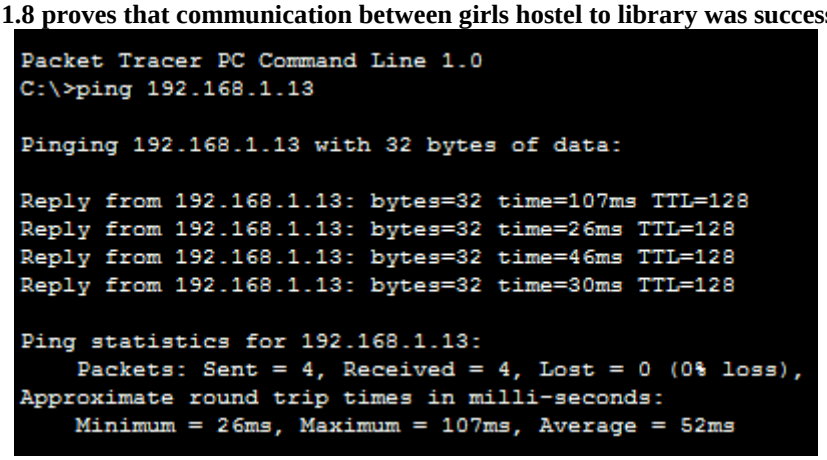

Fig 1.9 proves that connection established between the girls hostel to arts building was successful.

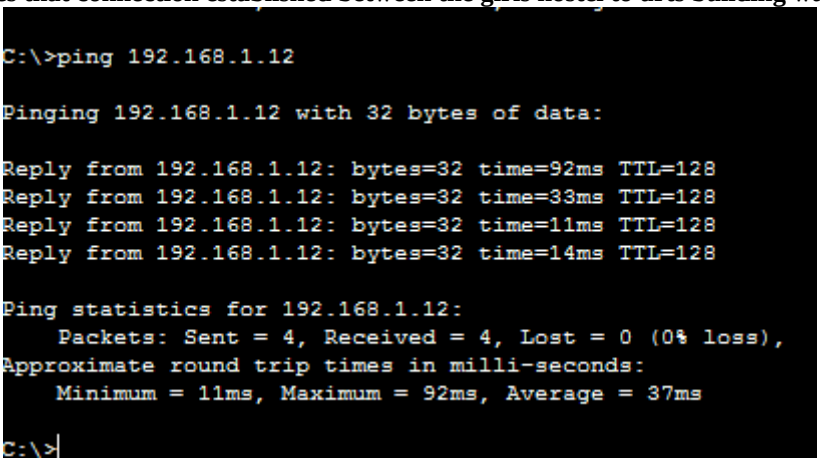

Fig 1.10 proves that the connection established between girls hostel and the science building was successful.

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#



Router con0 is now available
```

Fig 1.11:Router configuration commands.

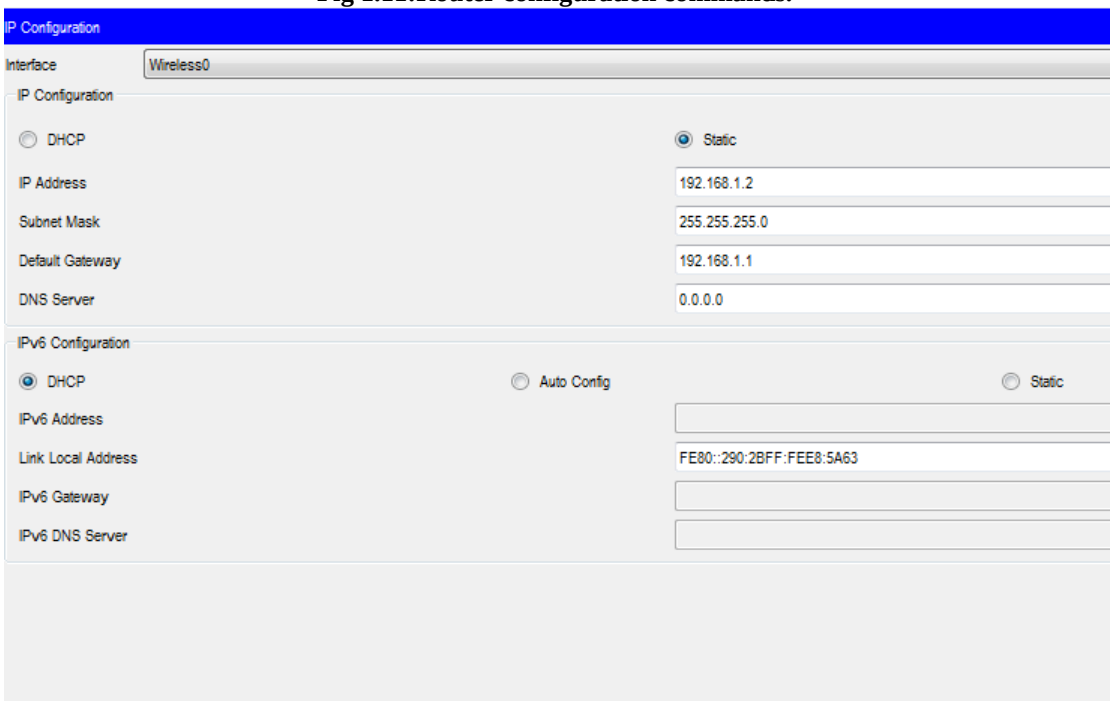

Fig 1.12:IP Configuration of one of the devices.

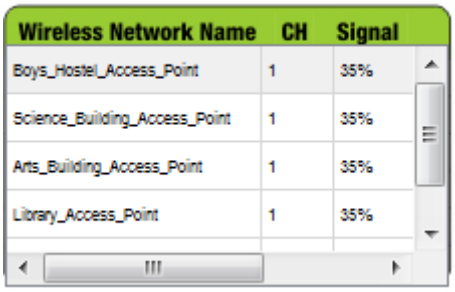

Fig 1.13:List of wireless network connections name used in experiment.

(ii)The following results were obtained in the experiment displayed in fig 1.2

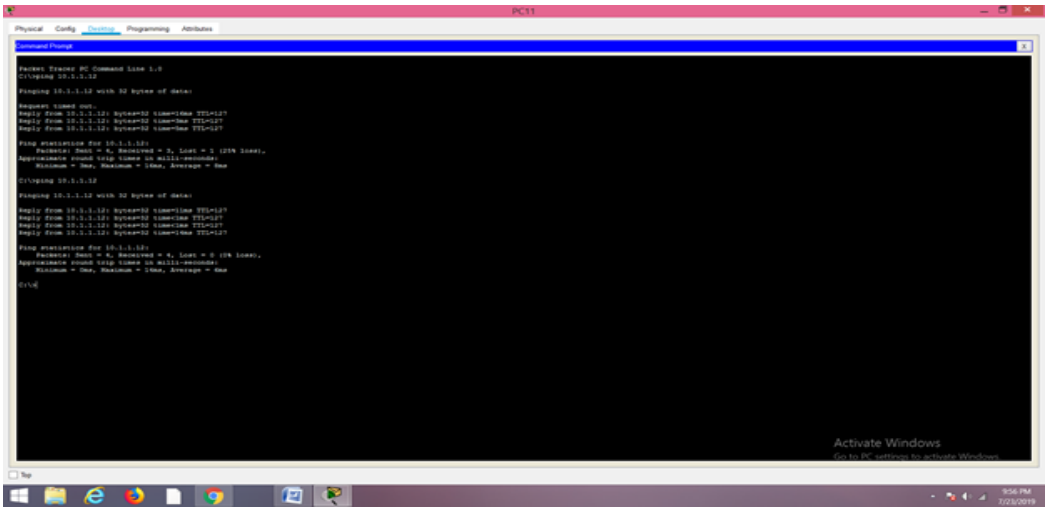

Fig 1.14 proves that the connection established between the project lab and the programming lab was successful.

II(D)OBSERVATIONS:

(i)Based on the experiment performed the following findings were obtained between a wired and a wireless network.

Table 1. Summary of Comparison between Wired and Wireless Networks based on experimentation results.

SR.NO	Network Type	Characteristics	Remarks.
1	Wired	Implementation phase	Difficult to implement when compared with wireless network
2	Wireless	Implementation phase	Easy to implement when compared with wired networks.
3	Wired	Complexity	More complex to understand.
4	Wireless	Complexity	Easy to understand.
5	Wired	Security	Security of wired networks proves to be the best when compared with wireless networks.
6	Wireless	Security	Security of wireless networks is weak when compared with wired network
7	Wired	Speed And BandWidth	Wired devices operate at a very high speed.The speed of wired device can be upto 100 mbps
8	Wireless	Speed And BandWidth	Wired devices operate at a low speed when compared with wireless device.The speed of wireless device can be up to 54 mbps
9	Wired	Cost	Wired networks are not cost efficient
10	Wireless	Cost	Wireless networks are cost efficient
11	Wired	Reliability	The reliability of Wired networks is much better than wireless networks
12	Wireless	Reliability	The reliability of Wireless networks is poor when compared with wireless networks. For eg:in fig 1.1 if the router fails the entire network will fail.

(i)Based on the study the following findings were obtained on the following protocols.

Table 2 Advantages and Drawbacks of various protocols

SR.NO	Protocol name	Advantages	Drawbacks
1	Flooding	Simple routing strategy,no costly topology maintenance is needed	Traffic impulsion,overlap problems ,resource blindness
2	Gossiping	Simple packet forwarding rule,no costly topology	Delay in transmission of packets to the destination

		maintenance is needed ,avoids the problem of impulsion	increases in some cases.
3	Spin	Reduces consumption of energy compared to flooding,metadata negotiation almost halves the redundant data	Does not guarantee delivery of data, Not good for applications requiring reliable data delivery,
4	Leach	increases lifetime of sensor network,single hop routing from nodes to cluster heads saves energy,cluster head aggregates the entire data which results in traffic reduction in the network[5].	Does not give an idea about the number of cluster heads in networks,if cluster head dies then the cluster becomes useless as data will never reach destination[5].
5	Pegasis	When a sensor node dies, the chain is reconstructed to bypass the dead node,since it is based on greedy chain protocol leads to lessen the overhead caused due to many cluster heads,Head node receives all the aggregated data and sends to the base station[6].	Uses multihop communication to reach the base station hence energy utilized is more, assumes that all sensor nodes have the equal level of energy and are likely to die at the same time[6].

Table 3 : Describes characteristics of flat routing protocols

Routing protocols	**classification**	**scalability**	**Mobility**	**Negotiation- based**	**Data Aggregation**	**Multipath**	**QOS**	**Power Usage**	**Query Based**
Flooding	Flat	No	Limited	No	No	Simplest	No	Large	No
Gossiping	Flat	Limited	Limited	No	No	Simplest	No	Large	No
Spin	Flat/Data Centric	Limited	No	Yes	Yes	No	No	Limited	Yes

III. Conclusions

III(A)Comparison between wired and wireless network.

In wired networks the data are transmitted among nodes using different kinds of topology such as Bus-topology ,Mesh-Topology,Star-topology etc,while in wireless network transmission of data takes place without any physical wired connection.Based on the experimentation performed ,it proves that one of the major advantage of using wireless network over wired network is that wireless network are cost efficient,but it lacks security.Any Intruder can enter the access point and make an entry into your network to perform malicious activities.Wired network provides a better security when compared with wireless network but it proves to be more costly when compared with wireless network.Also the experiment proves that wireless networks are easy to understand as well as to implement,while wired networks are complex to implement because it contains many physical connections(Fig 1.2) all nodes in the network are connected through wire which thereby makes it hard to understand.

III(B)Comparison between various protocols.

This paper gives a general overview about various routing protocols along with their advantages and disadvantages.It also describes the characteristics of various flat routing protocols.

IV. Future Scope

In future ,I aim to improve the contribution of any one of the protocols in terms of its energy consumption,throughput,packet delivery ratio,end-to-end delay.

V. Acknowledgement

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