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Attack Detection and Secured Network Communication in Wireless Body Area Network

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Abstract: This work considers the realisation of a human body implanted with biomedical sensors, operating wireless protocols of variable frequency, and measuring more than one physiological parameter of the body. Various nodes that are linked together to form a network of biomedical or other sensors placed at the nodes make up a wireless body area network. The implementation and introduction of the intra-body network were covered in our earlier publication, "Realization of Wireless Body Area Network utilising GNS3 tool for Health Monitoring," which has the DOI 10.17148/IJARCCE.2018.7459. The redistribution of paper routes and BGP will be discussed in this article, and efforts will be made to mimic them using the GNS3 tool. The use of a routing protocol to advertise routes that are learned by some other means, such as by another routing protocol, static routes or directly connected routers can be referred to as route redistribution. The moral behind route redistribution [1] is the content of this paper and its implementation in the constitution of the Body Area Network. Enhanced Interior Gateway Protocol which is an Interior Gateway Protocol is the protocol of choice for our project. The use of EIGRP in simulation of the inter-body network is being propounded by us. Various Routing policies will be simulated in the paper.

Keywords: Enhanced Interior Gateway Routing Protocol (EIGRP), realize a typical ISP network using a Network Simulation Tool, Redistribution, internal BGP, external BGP, Routing policies, variable frequency and 3-way handshaking.

I. INTRODUCTION

Body Area Networking (BAN) is a contemporary and special field of networking and wireless communication in which packets are forwarded to a specific destination within the human body. This is possible only when the sensors or computers or other electronic components at the nodes are properly interconnected and every node is reachable. In this project efforts were made to interconnect all the nodes within an autonomous body using a dynamic routing protocol such as the OSPF. Inter body communication was also made possible using Virtual-Links configured between two boundary routers of the two autonomous systems. Inter body communication between two or more autonomous human bodies were also made possible by configuring OSPF on routers and dividing the networks into logical areas (backbone area and other areas called the non-backbone areas). [2-4] In case of inter-body networking, an external routing protocol is essential. Since a human body is considered to be one Autonomous System with a unique Autonomous System Number (ASN), the frequency and protocols that are running in them may differ. BGP which is subdivided into iBGP and eBGP possess that property to enable inter-body or inter-Autonomous System communication. Differences in routing protocol characteristics, such as metrics, Administrative Distance, classful and classless capabilities can effect redistribution. The above parameters must be taken into consideration while achieving route redistribution. Running different routing protocols is often part of a network design. In this case, route redistribution is a necessity.

II. SOFTWARE REQUIREMENTS SPECIFICATION

Software requirement specification performs the overall description of the Wireless Body Area Network and its applications.

A. Functional Requirements

Functional requirements define the functionality of a system to be developed.
The functional requirements of the proposed system are:

- Route redistribution between two different routing protocols in the network.
- Use of eBGP between two Autonomous Systems.
- Configuration of iBGP within the AS.
- Transmission of selected physiological parameters to another AS by handshaking and receiving desired physiological parameters.

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B. Non-functional Requirements

Non-functional requirements play the behaviour and performance of the system at its critical stages.

- Scalability

Provisions will be made to accommodate more sensors to monitor various other physiological parameters when the need arises, BGP is highly scalable.

- Security

The system will provide secured transfer of data between nodes and between Autonomous Systems (AS).

- Steps are taken to achieve immaculate response time.

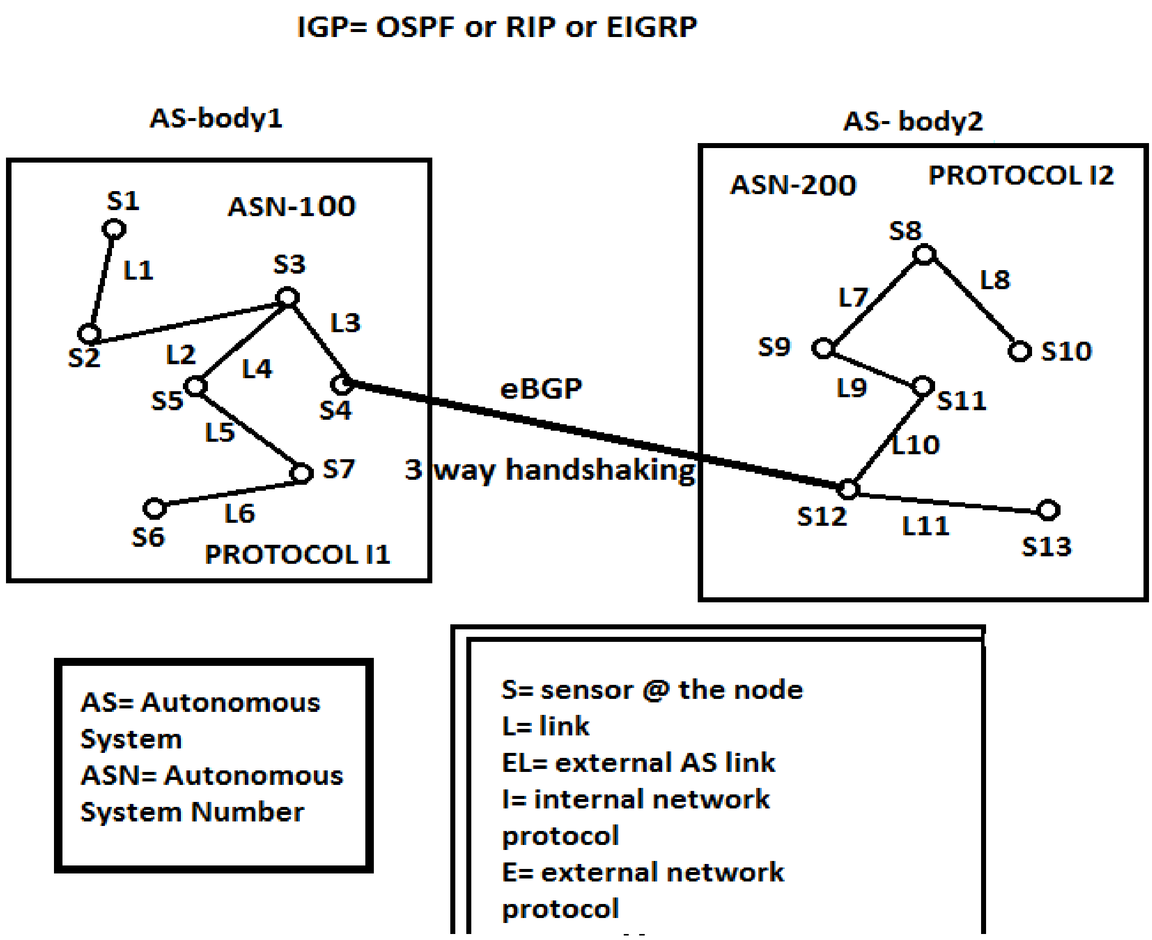

Figure 1 shows the system design of an inter-body network

III. PREREQUISITES

A. METRICS

Each protocol uses different metrics. The metrics must be defined when redistributing routes. Defining a metric that is understandable to the receiving protocol is must.

B. ADMINISTRATIVE DISTANCE (AD)

A router running more than one routing protocol and learns a route to the same destination using both routing protocols, then AD must be considered.

C. eBGP and iBGP

BGP is an Exterior Gateway Protocol. BGP is subdivided into external BGP and internal BGP. External BGP is configured at the Autonomous Border Routers (ABR). Internal BGP is configured within the AS.

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IV. SYSTEM DESIGN

The system design of aninter-body network is as shown in figure 1. Autonomous System with ASN = 100 consists of several nodes and links which form the intra-body network. IGP like RIP, OSPF [2] or/and EIGRP runs in the AS. The requirement of a static route is also not ruled out. Similarly AS with ASN=200 is also shown in the figure. eBGP is configured between the two Autonomous Systems to enable inter-body communication. Figure 2 shows the process of 3-way handshaking. This ensures controlled transfer of data between the two ASs. The established connection must be terminated. Figure 3 shows the connection termination by one side. [5-7]

The steps involve:

1. The left side transmits a FIN message to the right.
2. The right side responds with an ACK message.
3. Right side sends FIN message to left.
4. The left side waitsfor 120 seconds and then enters the closed state.

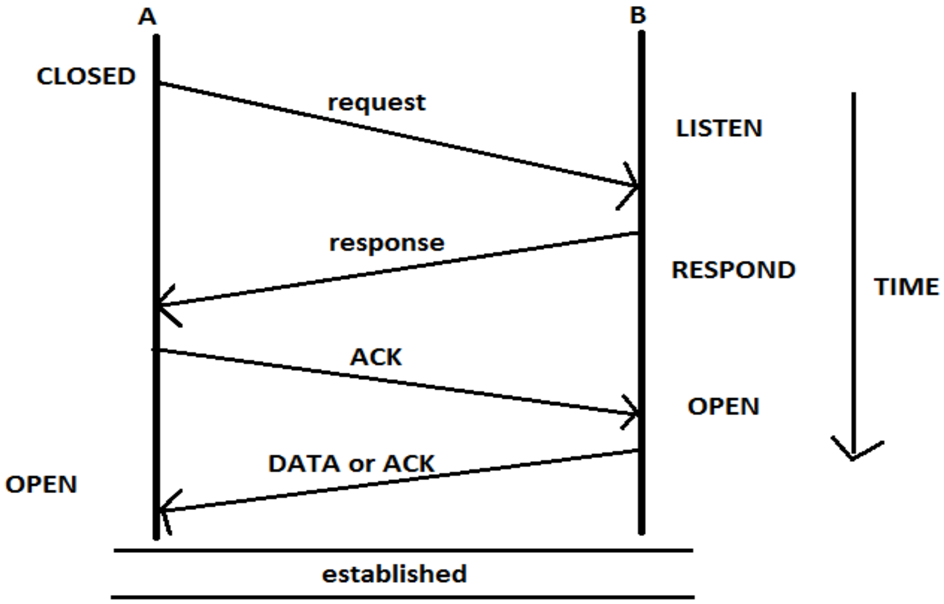

Figure 2 shows the process of the 3-way handshaking

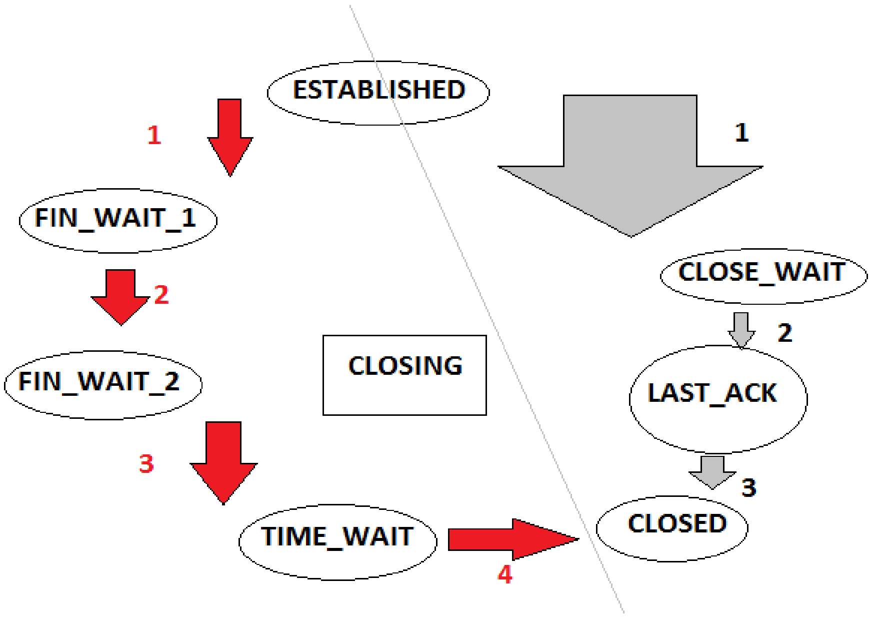

Figure 3 shows the connection termination by one side.

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V.SIMULATIONS AND RESULTS

Figure 4 and 5 shows the simulation result when the router at S4 tried to ping S12 and when S4 tried to ping S8 respectively. This shows the external body or inter-body communication [3][9] between ASN=100 and ASN=200. Figure 6 shows the redistribution between OSPF and RIP. Figure 7 shows the effort to ping after route-redistribution.[8]

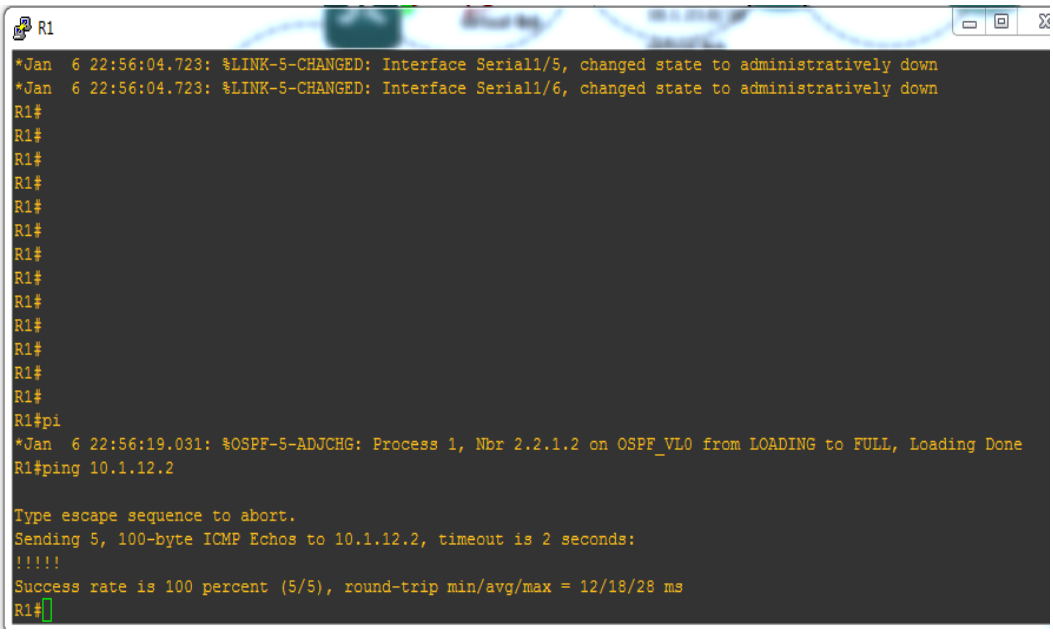

Figure 4 shows the simulation result when the router at S4 tried to ping S12

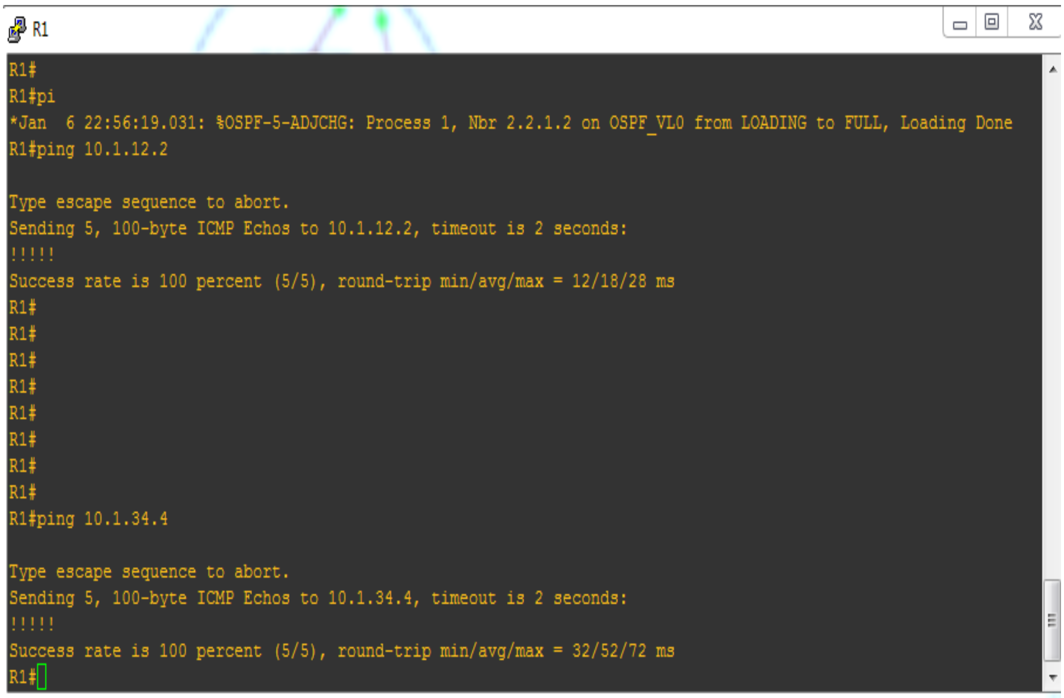

Figure 5 shows the simulation result when the router at S4 tried to ping S8

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```
router ospf 2
 log-adjacency-changes
 redistribute rip subnets
 network 10.1.54.5 0.0.0.0 area 0
!
router rip
 version 2
 redistribute ospf 2 metric 2
 network 10.0.0.0
 no auto-summary
!
ip forward-protocol nd
no ip http server
no ip http secure-server
```

Figure 6 shows the route redistribution.

```
S2(config-if)#^Z
S2#
S2#
S2#
S2#
S2#
S2#
S2#
*Aug 19 23:05:51.091: %SYS-5-CONFIG_I: Configured from console by console
S2#ping 10.1.12.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.12.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/49/68 ms
S2#
```

Figure 7 shows the effort to ping after route-redistribution.

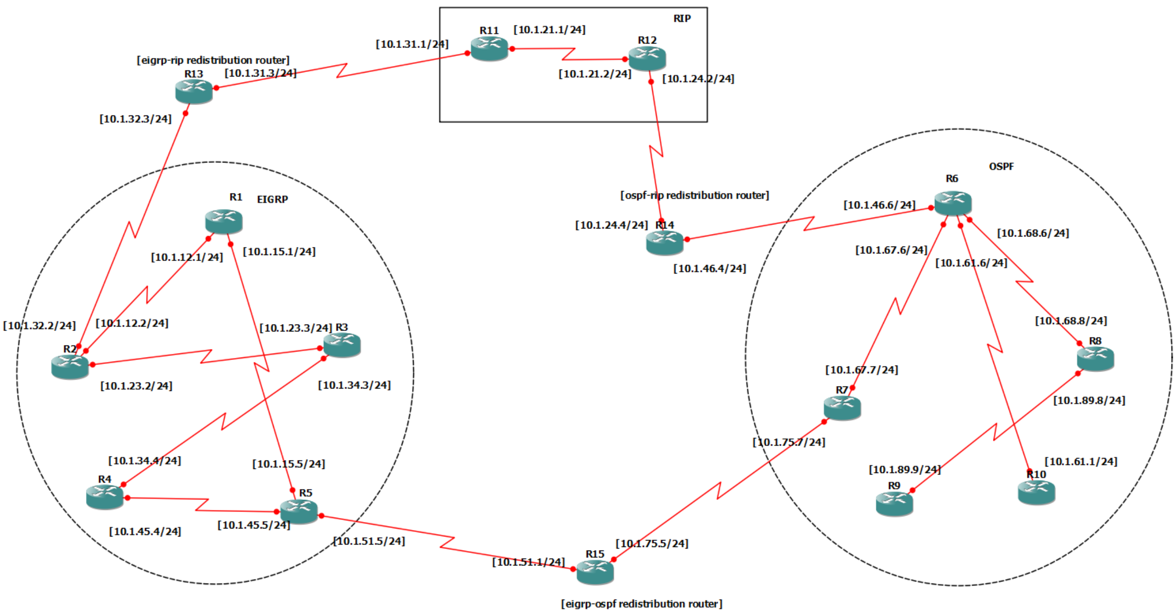

Figure 8 shows the topology with Backup network

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Backup network in the topology is implemented with RIP protocol. If any of the link in the topology is lost or damaged the data is sent to the desired destination through this backup network. Figure 8 shows the topology with backup network. The above topology consists of an intra-body network which is implemented with EIGRP and OSPF routing protocols. The inter-body communication is established by using a redistribution router that imports and exports RIP to OSPF and vice versa, OSPF to EIGRP and vice versa, RIP to EIGRP and vice versa. Figure 9 shows Packet tracing through interbody network. Figure 10 shows Packet tracing through intrabody network.

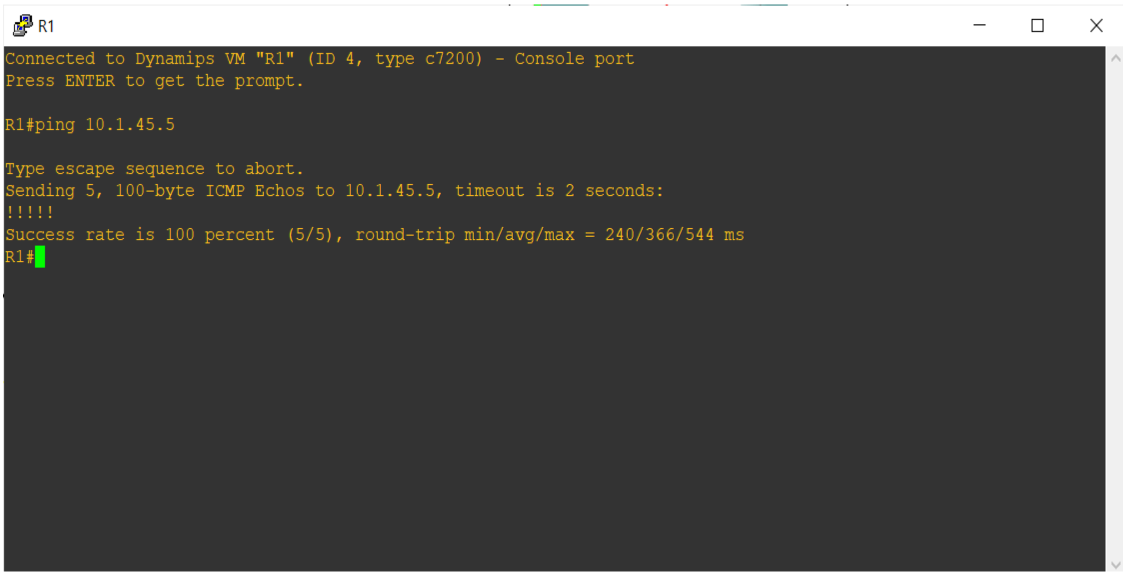

Figure 9 shows Packet tracing through interbody network.

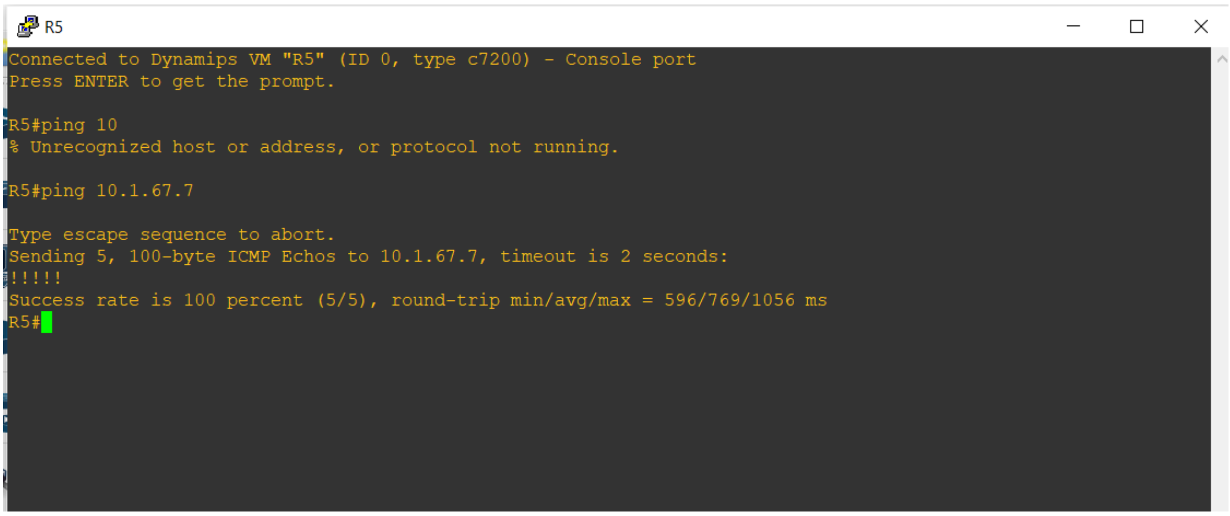

Figure 10 shows Packet tracing through intrabody network.

VI. CONCLUSIONS

In this project, we provided a brief overview of the current proposals related to WBANs and their possible application. Four design challenges have been tackled: network architecture, security, packet tracing and connectivity. It would be a failure on the part of researchers to see physical connections like wires or foils running all round the body. A high impedance shoe is essential in situations where electrons flow through the body and carry the information/data. Since human body is a very good conductor of electricity and acts as a short to the flow of charges in the body. A very good alternative for the above is the wireless Body Area Network. The transmission and reception of data takes place within the circumference of a body (an AS) or between two or more AS. The former is called Intra-AS Communication and the latter is called Inter-AS communication. We have adopted a wireless data routing and sharing system using various protocols that suits the present technological scenario. A sophisticated network consisting of sensors at nodes designed to operate autonomously and to connect to various other sensors and appliances. Controlled redundancy in the network

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and load balancing. Effective dynamic routing protocols on routers. Static routing and tunnels configured wherever necessary. The mechanism can work with other security solutions such as database activity monitoring, white listing, and data loss prevention to strengthen the security of the network and infrastructure. We have also employed a backup network that makes the communication on even in some connectivity problem. Inter-body area network is the communication between two autonomous bodies having their own internal routing policies and frequencies. In this paper we have configured IGP [10-14] inside the Autonomous System (AS) and eBGP between the ASs. Route redistribution is essential here because of the use of a routing protocol to advertise routes that are learnt by some other means, such as by another routing protocol, static routes or directly connected routes.

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OUR GUIDE

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