WIRELESS ADHOC MULTI ACCESS NETWORKS OPTIMIZATION USING OSPF ROUTING PROTOCOL BASED ON CISCO DEVICES.

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ABSTRACT

One of the most attractive field for research for researchers and authors so the Wireless adhoc networks. So, this paper will describe the background and basic features of Open Short Path First (OSPF) routing protocol due to multi-access networks. Explaining and practice on the OSPF configuration commands. Describe, modify and calculate the metric (Cost) used by OSPF due to adhoc networks. Illustrating the Election parameters made by DR/BDR (Designated and Back Designated) Routers used in multi-access wireless networks. This paper will use OSPF routing protocol because of its average administrative distance with all routing protocols.

KEYWORDS

Adhoc, Wireless Networks, Cisco Access Points, Adhoc using Cisco devices.

1.INTRODUCTION:

Route Source	Administrative Distance
Connected	0
Static	1
EIGRP summary route	5
External BGP	20
Internal EIGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
External EIGRP	170
Internal BGP	200

Fig1. Default Administrative Distance

The OSPF routing protocol history is designed especially on the links state (Link speed) over view due to Djkstra algorithm. It began to operate in the world in 1987 then the released was been made.

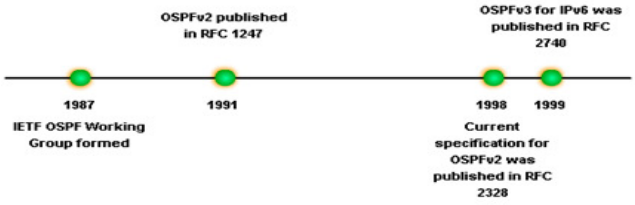

Fig2. OSPF Development timeline

2. ILLUSTRATING THE PROBLEM:

This paper aim is actually to make all end devices under coverage area and under control. adhoc network of multi-access end devices major issue is the time delay and Packets which dropped during the transmission process. OSPF Routing Protocol can be handled in this paper because of its high signal transmission ratio, average administrative routing protocol distance, high authentication and encryption algorithm that already defined. OSPF primary feature is the using of the links speed only however all other protocols used the hops as primary feature. This will gain much more accurate results in the Adhoc wireless networking case.

3.OSPF working phenomena:

OSPF invented to correct the wrong paths made by RIP Routing Protocol. Whichinvented by the routing table entry algorithm called BelmmanFord (Hops Theory).[1]Note that Network Layer (Layer3) on the Open System Interconnection (OSI) model will be ussed. The packet encapsulation in the sending criteria must be defined as OSPF Message Encapsulation packet header contains router ID, area ID and Type code for OSPF packet type.

Fig3. Encapsulation OSPF Message

Internet Protocol (IP) packet header contains source IP address, destination IP address and protocol field set to 89.[2] The data link frame header contains source Multi Access Card (MAC) address and Destination MAC address. There are 5 types of packet messages for the OSPF listed as bellow.

Type	Packet Name	Description
1	Hello	Discovers neighbors and builds adjacencies between them
2	Database Description (DBD)	Checks for database synchronization between routers
3	Link-State Request (LSR)	Requests specific link-state records from router to router
4	Link-State Update (LSU)	Sends specifically requested link-state records
5	Link-State Acknowledgement (LSAck)	Acknowledges the other packet types

Fig.4 OSPF Packets Type

OSPF not only good due to administrative distance but also it is very good in the authentication andencryption purposes for important data. Routers will only accept routing information from other routers that have been configured with the same password or authentication information

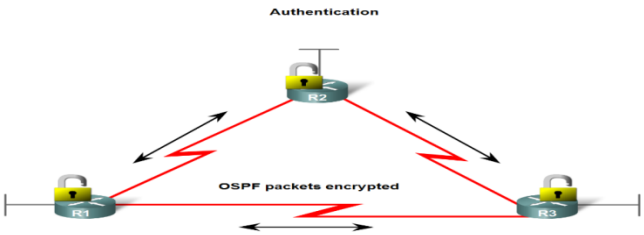

Fig.5 Showing Authentication

4. USED NETWORK'S DEVICES:

It is urgent to use network devices in this research, that's why routing must be made using high speed, reliable routers. This options are only exists in cisco devices. So a 3X 2600 series cisco routers (2621XM) routers with 2 -38db antennas will be used to make sure the coverage are is good enough and can cover about 1Km.[3]

Fig.6. Cisco 2800 Series Catalyst Router

5. DESIGNED SCHEMA TO WORK ON:

This schema is designed using Cisco packet tracer simulator. We will use 3 2611xm routers as mentioned. The 3 routers connected directly by smart serial interfaces not wirelessly (to check the connection first).[4] The DCE interfaces used only to establish the connection with the universal rate of 64000 bit/sec. every router have its own network of end devices. Ip configuration as listed below and as shown and configured in Appendix A, B and C:

Table1: Schema Design

Device/interface	IP Address+ Subnet mask	Device/interface	IP Address+ Subnet mask
Adhoc 1	172.16.1.18 255.255.255.192	R3/Lo0	10.3.3.3 255.255.255.255
Adhoc 2	10.10.10.2 255.255.255.0	R3/S0/0/0	192.168.10.5 255.255.255.252
Adhoc 3	172.16.1.35 255.255.255.248	R3/S0/0/1	192.168.10.10 255.255.255.252
R1/Lo0	10.1.1.1 255.255.255.255	R1 – R2 Cost	64 Kbps
R1/S0/0/0	192.168.10.1 255.255.255.252	R2-R3 Cost	128 Kbps
R1/S0/0/1	192.168.10.6 255.255.255.252	R1-R3 Cost	256 Kbps
R2/Lo0	10.2.2.2 255.255.255.255	R1 LAN	172.16.1.16 255.255.255.192
R2/S0/0/0	192.168.10.2 255.255.255.252	R2 LAN	10.10.10.0 255.255.255.0
R2/S0/0/1	192.168.10.9 255.255.255.252	R3 LAN	172.16.1.32 255.255.255.248

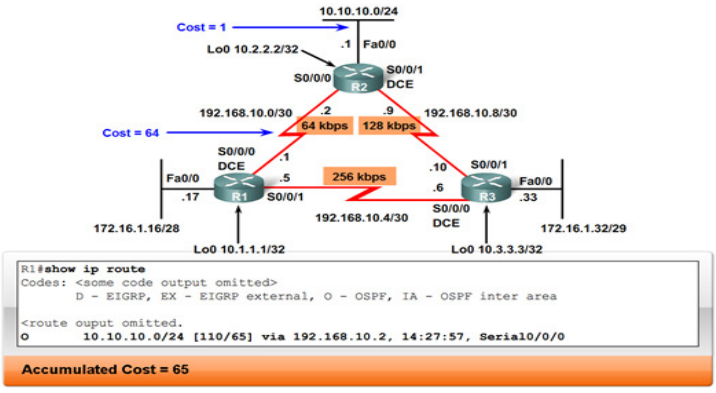

Fig7. OSPF Path cost (a)

6. OSPFPATH COST METRIC

Usually there is a difference in actual bandwidth and the used bandwidth [5].So, the actual speed can be determined using the bandwidth. The main Reason is the routing table has best path information. The show interface command will display interface's bandwidth. Serial links used as shown in as bellow figure.

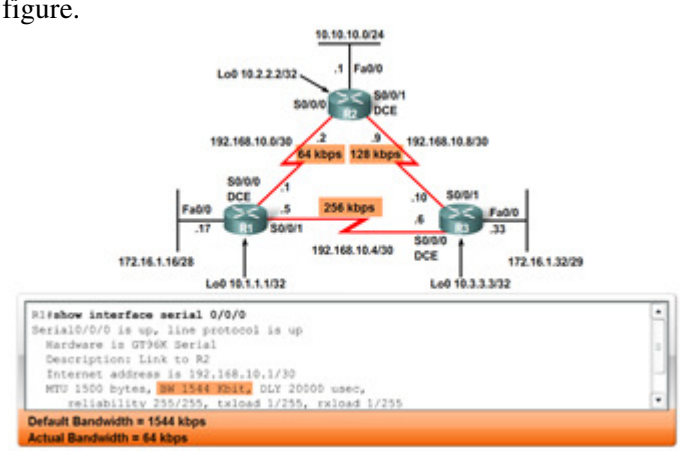

Fig8. OSPF Path Cost (b)

7. CONFIGURATION OF OSPF ROUTER

Configuration the path cost of a must be configured in link both sides of a serial link should be configured with the samebandwidth. Commands used to modify bandwidth valueBandwidth command

Router(config-if)#bandwidth 64

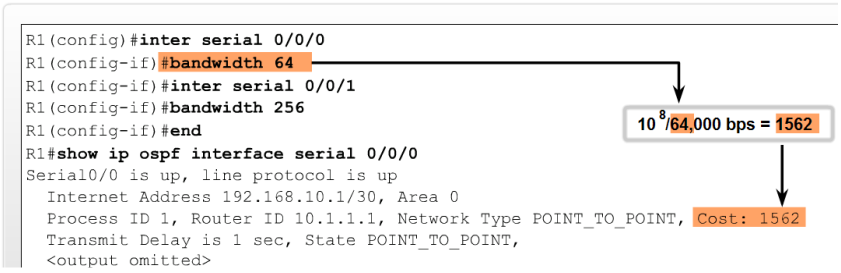

Fig9. OSPF bandwidth configuration

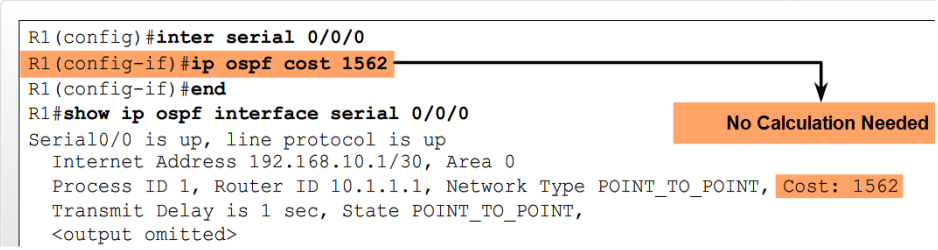

Fig10. OSPF bandwidth configuration

Editing the Cost of the link linking between bandwidth command and the ipospf path cot command. Ipospf cost command. Sets cost to a specific value then the calculated OSPF Cost already calculated.[6]

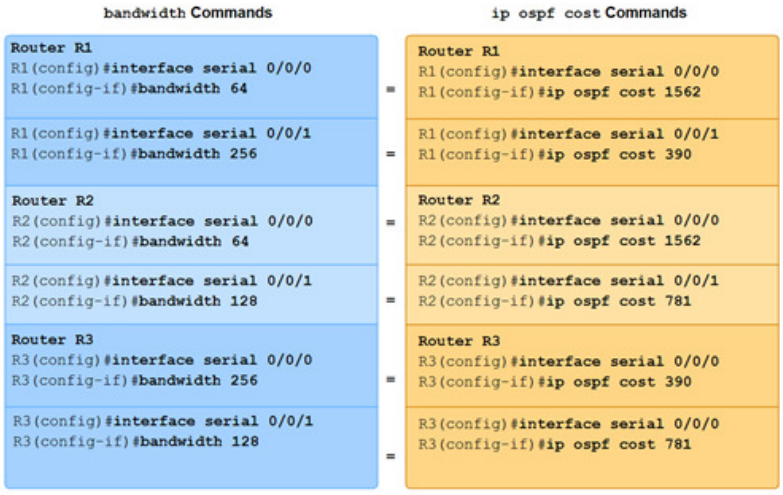

Fig11. Equivalent commands of bandwidth and ip PSPF commands

8. OSPF AND MULTI-ACCESS NETWORKS

Differences in Multi-access Networks, Point-to-point.[7]Broadcast Multi-access, Non broadcastMulti-access (NBMA), Point-to-multipoint and virtual links.

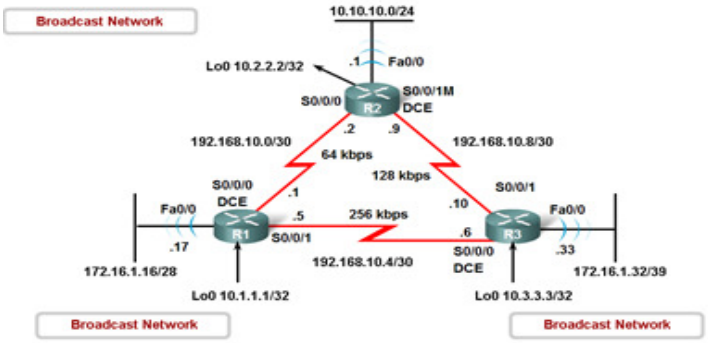

Fig12. OSPF Network types used

2 challenges presented by multi-access networks, multiple adjacencies and Extensive Link State Advertisement (LSA) flooding.[8]

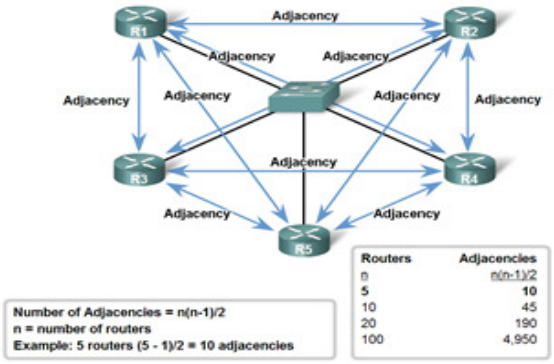

Fig13. No. Of Growth of paths

an acknowledgement of receipt must be sent back to transmitting router due to flooding of LSA and . [9]

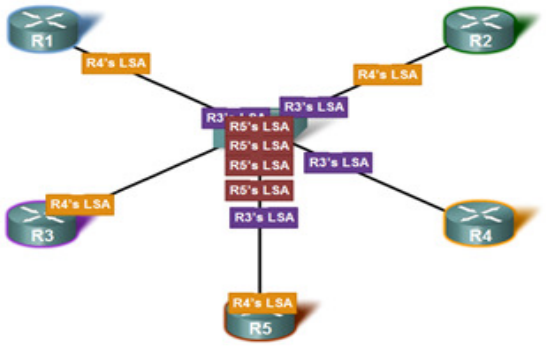

Fig14. LSA Flooding Scenario

Solution to LSA flooding issue is the use of designated router (DR) and Backup designated router (BDR). The DR & BDR selection is Routers are elected to send and receive LSA.[10]

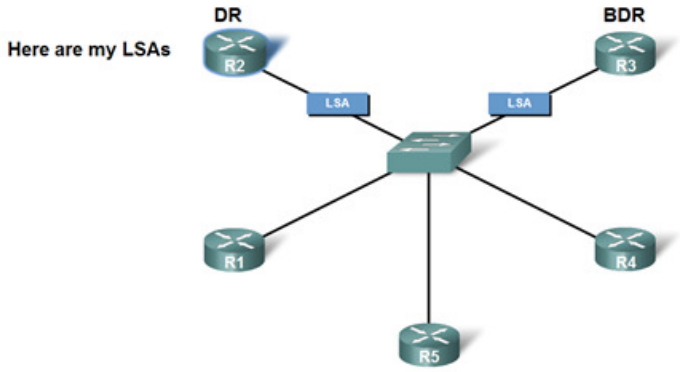

Fig15. DR/BDR Listens.

Various DR routers send LSAs through multicast ip address of 224.0.0.6 to DR & BDRrouters ,DR forward LSA via multicast address 224.0.0.5 to all other routers.[11]

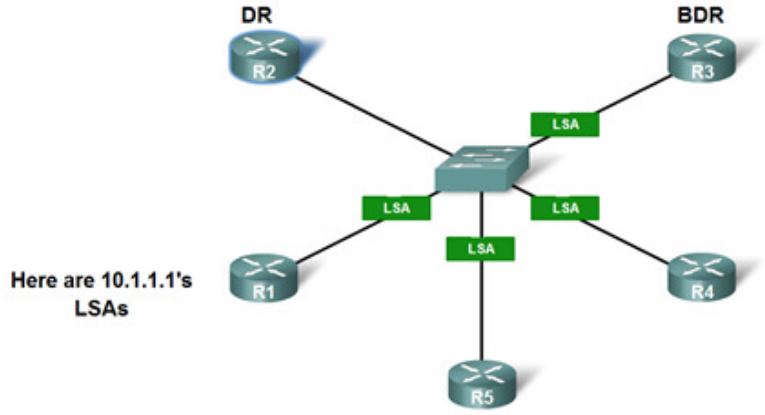

Fig16. DR sends LSAs

9.CONCLUSIONS

Using OSPF in Multi-access networks of wireless Adhoc with cisco solutions products like routers, switches and access points; it can be easy to make the entire network under coverage with minimum time delay and legacy. In this paper, Appling on real life network as it is and with all right configurations of OSPF on routers, we were able to decrease the time delay and legacy from 22mSec to only 12mSec. This will define a revolution in the adhoc networking in fields of time based like military services.

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Appendix A

Controller (Routers) Configuration
For Controller 1:

```
Router>enable
Router#configure terminal

Router(config)#hostname Base 1
Controller1(config)#interface fastEthernet 0/0
Controller1(config-if)#ip address 172.16.1.18 255.255.255.192
Controller1(config-if)#no shutdown
Controller1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Controller1(config-if)#ip address 11.0.0.1 255.0.0.0
Controller1(config-if)#no shutdown
Controller1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Controller1(config)#interface serial 0/3/0
Controller1(config-if)#ip address 12.0.0.1 255.0.0.0
Controller1(config-if)#clock rate 64000
Controller1(config-if)#no shutdown
Controller1(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up

Controller1(config)#line console 0
Controller1(config-line)#password adhoc1admin
Controller1(config-line)#login

Controller1(config)#line vty 0 4
Controller1(config-line)#password adhoc1admin
Controller1(config-line)#login
```

Controller1(config)#ip route 13.0.0.0 255.0.0.0 12.0.0.2

Appendix B

For Controller 2:

```
Router>enable
Router#configure terminal

Router(config)#hostname Base2
Controller2(config)#interface fastEthernet 0/0
Controller2(config-if)#ip address 13.0.0.1 255.0.0.0
Controller2(config-if)#no shutdown
Controller2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up


Controller2(config)#interface fastEthernet 0/1
Controller2(config-if)#ip address 14.0.0.1 255.0.0.0
Controller2(config-if)#no shutdown
Controller2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Controller2(config)#interface serial 0/1/0
Controller2(config-if)#ip address 12.0.0.2 255.0.0.0
Controller2(config-if)#no shutdown
Controller2(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up

Controller2(config)#line console 0
Controller2(config-line)#password adhoc1admin
Controller2(config-line)#login

Controller2(config)#line vty 0 4
Controller2(config-line)#password adhoc1admin
Controller2(config-line)#login
Controller2(config)#ip route 10.0.0.0 255.0.0.0  12.0.0.1
```

Appendix C

For Controller 3:

```
Router>enable
Router#configure terminal

Router(config)#hostname Base3
Controller2(config)#interface fastEthernet 0/0
Controller2(config-if)#ip address 14.0.0.1 255.0.0.0
Controller2(config-if)#no shutdown
Controller2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Controller2(config)#interface fastEthernet 0/1
```

```
Controller2(config-if)#ip address 15.0.0.1 255.0.0.0
Controller2(config-if)#no shutdown
Controller2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Controller2(config)#interface serial 0/1/0
Controller2(config-if)#ip address 12.0.0.3 255.0.0.0
Controller2(config-if)#no shutdown
Controller2(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up

Controller2(config)#line console 0
Controller2(config-line)#password adhoc1admin
Controller2(config-line)#login

Controller2(config)#line vty 0 4
Controller2(config-line)#password adhoc1admin
Controller2(config-line)#login
Controller2(config)#ip route 10.0.0.0 255.0.0.0  12.0.0.1
```

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