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Analysis of RIPv2, OSPF, EIGRP Configuration on router Using CISCO Packet tracer

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Abstract-In this modern era the computer communication network is growing rapidly, Computer communication networks are based on a technology that provides the technical infrastructure, where routing protocols are used to transmit packets across the Internet .Routing protocols specify how routers communicate with each other by spreading information. The router has prior knowledge about the adjacent networks, which can assist in selecting the routes between two nodes. There are various types of routing protocols being widely used. Enhanced Interior Gateway Routing Protocol (EIGRP) Routing Information protocol (RIP) and Open Shortest Path First (OSPF)have been considered as the pre-eminent routing protocols for real-time applications In this paper, we have analyzed and simulated a proposed wired Local Area Network using different routing protocols. Therefore configuration of these different routing protocols are done using CISCO packet tracer simulator.

Index Terms: **EIGRP, OSPF, RIP, VLSM.**

I. INTRODUCTION

A Routing Protocol is a protocol that specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network [7]. Routing algorithms are responsible for selecting the best path for the communication a border way we can say that A routing protocol is the language a router speaks with other routers in order to share information about the reach ability and status of network [1].Routing is often contrasted with bridging .The primary difference between both of them are the layer in which they are working. Metrics such as such as path bandwidth, reliability, delay, current load on that path etc are used by routing algorithms to determine the optimal path to a destination. The Routing is proceeding in such a way that first it shares information with its immediate neighbours, then thorough out the entire network.

A. Classification of Routing protocols

The routing is established by the configuration of routing tables in the routers .There are two different way to configure routing tables in router. They are static routing and dynamic routing. The figure 1 depicts the classification of routing protocols.

Static routing is simply the process of manually entering routes into the routing table of a device using its a configuration file that is loaded when the routing device starts up. In static routing, all the changes in the logical network layout need to be manually done by the system administrator. However, dynamic routing allows routers to select the best path when there is a real time logical network layout change.

Static routing is easy to implement in small networks. They are very safe and predictable as the route to the destination is always the remains same .Doesn't require any routing algorithm or update mechanisms. Hence no requirement of extra resources such as CPU and memory. But Dynamic routing protocols work well and Suitable in all typologies where multiple routers are required. They are scalable and automatically determine better routes if there is a change in the topology. The ability to scale and recover from internetwork faults makes dynamic routing the better choice for medium, large, and very large inter network. The dynamic routing protocol is further classified into distance vector routing protocol and link state routing protocol. Distance vector protocol uses simple algorithms to calculate cumulative distance value between routers based on hop count. But link state protocols uses sophisticated algorithm that maintain complex data base of inter network topology

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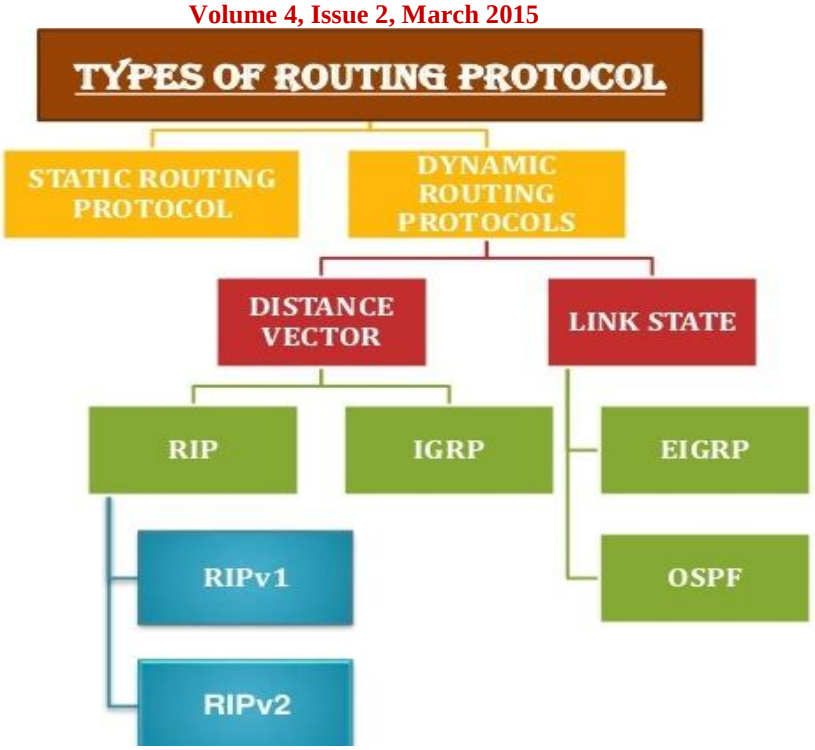

Fig 1: Routing protocol classification

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II. INTERIOR GATEWAY (IGP) VS EXTERIOR GATEWAY (EGP)

A collection of routers under a common administration is termed as an ***autonomous system*** (AS) otherwise known as a routing domain.

■ ***Interior gateway protocols (IGP)*:** IGP are routing with in a routing domain that is, routing inside an autonomous system

■ ***Exterior gateway protocols (EGP)*:** Used for inter-autonomous system routing, that is, routing between autonomous systems.

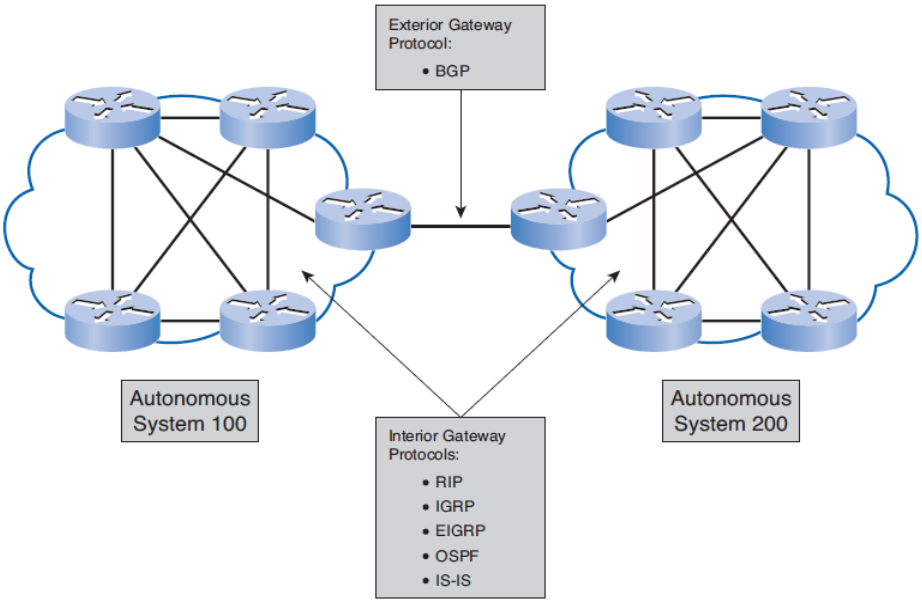

Fig: 2 (IGP vs EGP)

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A. Routing Information Protocol (RIP)

Routing information protocol is a standards-based, distance-vector, interior gateway protocol used by routers to trade routing information. Interior gateway means it should be used for the routers in same domain network . The metric used in RIP to find out the best path between two locations is Hop count. Hop count is the number of routers the packet must go through till it reaches the destination network. The maximum allowable number of hops a packet can go across in an IP network implementing RIP is 15 hops. Routers using RIP publicize information about each subnet to their neighbours. Their neighbour in turn passes the information to the nearby neighbours of their own and so on until all the routers are alert of information.

RIP has two versions, Version 1 (RIPv1) and Version 2 (RIPv2). RIPv1 (RFC 1058) is classful, and thus does not include the subnet mask with its routing table updates. Because of this, RIPv1 does not support Variable Length Subnet Masks (VLSMs). When using RIPv1, networks must be contiguous, and subnets of a major network must be configured with identical subnet masks. RIPv1 sends updates as broadcasts to address 255.255.255.255.RIPv2 (RFC 2543) is classless, and its include the subnet mask with its routing table updates. The enhancement of RIPv2 are it is fully supports VLSMs, allowing discontinuous networks and varying subnet masks. Encrypted authentication can be configured between RIPv2 routers.

B. Open Shortest Path First (OSPF)

Open Shortest Path First (OSPF) is a link-state routing protocol and. It computes the shortest path tree for each route using a method based on Dijkstra algorithm, a shortest path first algorithm. This interior gateway protocol (IGP) is most popular in large enterprise networks. OSPF is used to determine the best route for delivering the packets within an IP networks. It gathers link state information from available routers and constructs a topology map of the network. The topology determines the routing table presented to the Internet Layer which makes routing decisions based solely on the destination IP address found in IP packets. It exhibits faster routing compared to RIP. OSPF detects changes in the topology, such as link failures and converges on a new loop-free routing structure within seconds. Each OSPF router stores the local network connection state with Link State Advertisement (LSA) and advertises to the entire AS. [8] LSA is a packet that contains all relevant information regarding a router's links and the state of those links. Each router receives the LSA generated by all routers within the AS. The LSA collection then forms Link State Database (LSDB). Each LSA is the description of the surrounding network topology of a router. Hence, the LSDB reflects the AS network topology[2].Based on the link-state database, each router or system calculates a shortest-path spanning tree, with itself as the root, using the SPF algorithm. OSPF has five different packet types. Each packet has a specific purpose in OSPF route.

1. Hello packet.
2. Database description.
3. Link state request packet.
4. Link state update.
5. Link state acknowledgment packet.

C. Enhanced Interior Gateway Routing Protocol (EIGRP)

The Enhanced Interior Gateway Routing Protocol (EIGRP) is an enhancement of IGRP. A hybrid routing protocol which provides significant improvements on IGRP. EIGRP replaced IGRP in 1993. It having a higher convergence than any other IGP and it is scalable because of VLSM and route information. To implement the routing the EIGRP maintains three unique tables to assist in routing traffic, they are neighbour table, topology table and routing table. EIGRP saves all routes rather than the best route to ensure the faster convergence. EIGRP keeps neighbouring routing tables and it only exchange information that it neighbour would not contain. This property of EIGRP helps to reduce the unwanted traffic in the network. EIGRP is commonly used in large networks, and it updates only when a topology changes but not periodically unlike old Distance-Vector protocols such as RIP. EIGRP metric is based on its bandwidth, delay, reliability and load.

EIGRP uses the following four key technologies that combine to differentiate it from other routing technologies:
1) Neighbour discovery/recovery mechanism: Enables routers to dynamically learn about other routers on their directly attached networks

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2) Reliable transport Protocol: It is responsible for guaranteed, ordered delivery of EIGRP packets to all neighbours.
3) DUAL Finite State Machine: DUAL embodies the decision process for all route computations
4) Protocol Dependent Modules: EIGRP's protocol-dependent modules are responsible for network layer protocol-specific requirements

III. COMPARATIVE STUDY OF RIP, OSPF & EIGRP

The Table 1 describes the prime differences of RIP, OSPF and EIGRP protocols.

Protocols Comparison				
Feature	Rip V1	Ripv2	OSPF	EIGRP
Type	Distance vector	Distance vector	Link state	Hybrid
Algorithm	Bellman- ford	Bellman- ford	Dijkstra	DUAL
Class full/class less	Class full	Class less	Class less	Class less
Metric	Hop count	Hop count	cost	Bandwidth/delay
Timers update (Hello/Dead)	30 sec	30 sec	Triggered when network change occurs, send periodic update LSA refreshes every 30 minutes	Triggered (LAN 5/15, WAN 60/180
Administrative distance	120	120	110	Internal 90 External 170
Authentication	No	YES	MD5 Authentication	MD5 Authentication
Hop limit	15	15	224	None
Convergence	slow	slow	fast	Very fast
Type of updates	Full table	Full table	Only changes	Only changes
Support VLSM	No	Yes	Yes	Yes
Network size	Small	Small	Large	Large
Split Horizon Sensitive	No	No	Yes	Yes
Area Types	-	-	Backbone, stubby, Notso-stubby, totally stubbing	-

Table (1) Comparison of RIP, EIGRP, OSPF

IV. CONFIGURATION USING CISCO PACKET TRACER SIMULATOR

Cisco Packet Tracer is a powerful network simulation that allows educates to experiment with network behavior and ask "what if" queries. It's an integral part of Networking Academy comprehensive learning experience, It provides simulation, visualization, authoring, assessment, and collaboration capabilities and facilitates the teaching and learning of complex technology concepts. The simulation-based learning environment helps educates develop skills such as decision making, creative and critical thinking, and problem solving. In this work we have configured the same network using various dynamic configuration protocols such as RIPv2,EIGRP and OSPF.Various typologies such as star , bus, tree are used in side this network.

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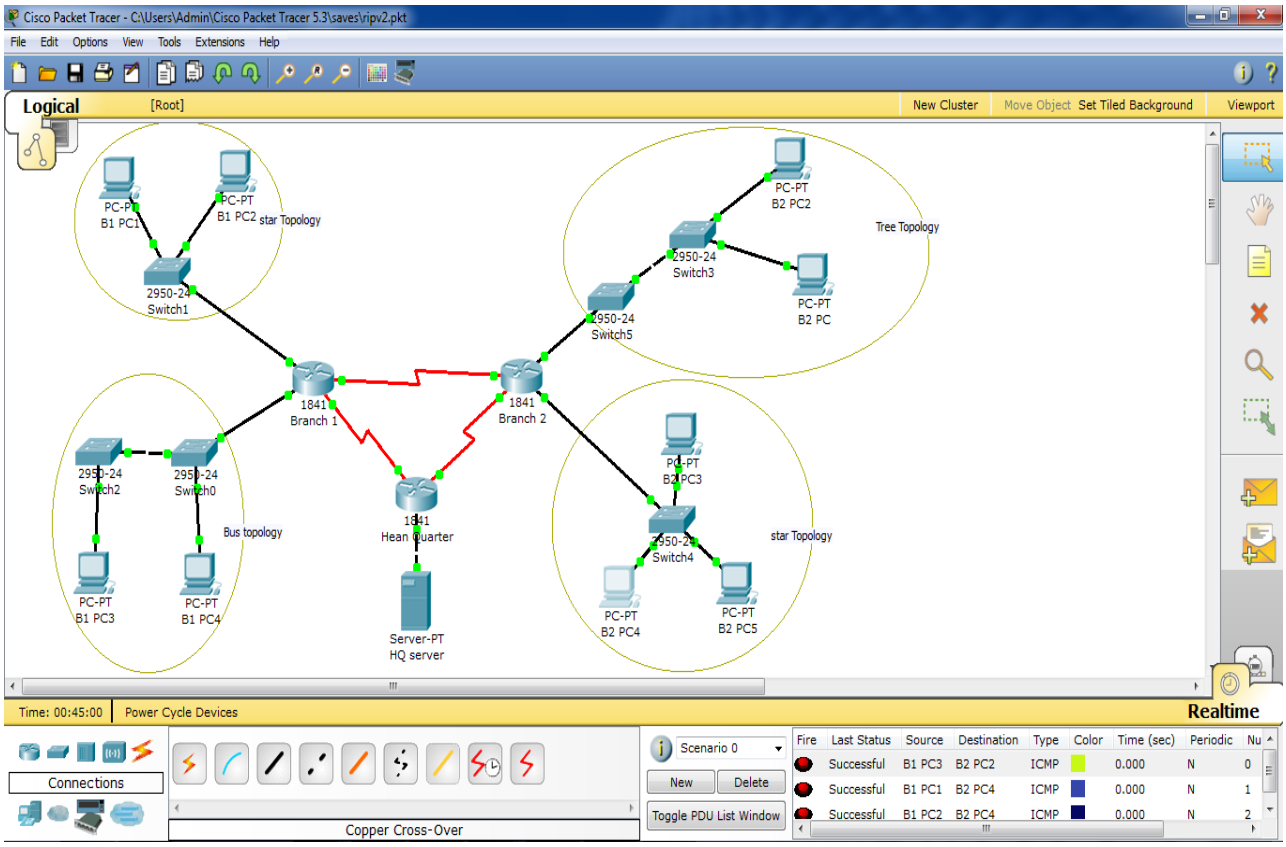
Step 1: Create the topology using different networking devices. Specification of the network hardware devices are mentioned in tables (2)(3)(4).



Router	Specification	FastEthernet0/0	FastEthernet0/1	Serial0/1/0	Serial0/1/1
Head Quarter	1841 Router0	80.80.80.1/8	--	60.60.60.1/8	70.70.70.1/8
Branch 1	1841 Router0	10.10.10.1/8	20.20.20.1/8	50.50.50.1/8	60.60.60.1/8
Branch 2	1841 Router1	30.30.30.1/8	40.40.40.1/8	50.50.50.2/8	70.70.70.1/8

Table (2).Router configuration specifications

PC	IP Address	Default Gateway
B1 PC3	10.10.10.2/8	10.10.10.1
B1 PC4	10.10.10.3/8	10.10.10.1
B1 PC1	20.20.20.2/8	20.20.20.1
B1 PC2	20.20.20.3/8	20.20.20.1
B2 PC1	30.30.30.2/8	30.30.30.1
B2 PC2	30.30.30.3/8	30.30.30.1
B2 PC3	40.40.40.2/8	40.40.40.1
B2 PC4	40.40.40.3/8	40.40.40.1
B2 PC5	40.40.40.4/8	40.40.40.1

Table (3) PC Configuration

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Sl no:	Device name	Specification
1	Switch	Switch 2950-24
2	End devices	PC, Generic Server
3	Connections	Copper cross over, Copper straight through, Serial DCE

Table (4) Specification of other network devices

Step 2. Serial DCE cable is used to make the connection between the routers with clock rate 64000.
Step 3. Copper Cross-over cable is used to connect two switches and copper straight through cable is used to connect switch to end devices and router to switch.
Step 4.Configuration on Router branch 1 Using RIPv2 protocol.

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 60.0.0.0
Router(config-router)#no auto-summary
Router(config-router)#exit
Router(config)#
```

In the same way we can configure Router banch2, Head quarter using their respective network address.

Step 5. Configuration of Branch 2 using EIGRP protocol

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z
Router(config)#router eigrp 1
Router(config-router)#network 30.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 70.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
```

In the same way we can configure Router banch1, Head quarter using their respective network address
Step 6. Configuration router Head quarter using OSPF protocol.

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 60.0.0.0 0.255.255.255 area 0
Router(config-router)#network 70.0.0.0 0.255.255.255 area 0
Router(config-router)#network 80.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#
```

In the same way we can configure Router banch1, branch2 using their respective network address

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V. SUMMARY OF COMPARISON

Routing plays an important role to determine the efficiency of network communication. All routing protocols are defined based on an algorithm, and this algorithm must describe some procedures in order to make the routing protocols operate correctly
These procedures are:

- A procedure to receive and send information about the network.
- A procedure to find the best path to a destination and install the route in the routing table.
- And finally, a procedure to detect, react and inform to other devices about changes in the network topology

RIPv2 is not suited for complicated networks as its convergence is limited to certain degree. This class routing protocol using hope count as the measure for route selection. It supports VLSM .Mechanism like split horizon, and route poisoning are used to prevent from incorrect or wrong routing information[4].The main advantage of using RIP is it uses the UDP (User Datagram Protocol) and reserved port is 520 [5].

EIGRP calculates routes according to information such as network bandwidth, total delay, path reliability, path loading, so the routes table is more accurate. During normal operation, usage of network resource is very low; only hello packets are transmitted on a stable network. When a change occurs, only routing table changes are propagated, not entire routing table; this reduces the load the routing protocol itself places on the network .Loop-free and fast convergence. The cipher text authentication mode with MD5 algorithm is supported .EIGRP support Variable Length Subnet Mask routes aggregation by configuration, is reduces transmission of routing information and save bandwidth. No complicated area setting and it need not adopt different configuration to different network interface. It only needs to start EIGRP process on routers, and uses network command to configure interface.

OSPF is a type of internal routing protocol of the autonomous system based on link state. it dynamically finds and propagates routes by collecting and forwarding autonomous system link state. Perhaps its is well suited for networks with any size. OSPF is a real loop-free routing protocol .OSPF support two types of packet authentication modes. One is the common clear text authentication mode; the other is the cipher text authentication mode with MD5 algorithm.OSPF can divide the autonomous system into different areas according to the topology. Thus when the area border router (ABR) transmits routing information to other areas, it generates the brief LSA with the unit of segment. It will decrease the LSA number in the autonomous system and complexity of route calculation.

VI. CONCLUSION

Routing protocols aim at finding the best path in the network to ensure its connectivity. Each routing protocol has its own standards to judge a route quality by using metrics like next hop count, bandwidth and delay. In this work the network is demonstrated using the simulator Cisco packet Tracer, with various routing protocols. .After comparison we find that the best protocol is EIGRP because it provides better performance than RIPv2 and OSPF, in terms of fast convergence time. While comparing OSPF and RIP, OSPF dominates RIP in terms of average throughput and instant delay in different size of network. For the routing traffic the OSPF was the one with the most traffic sent and was the last one to send routing traffic on the other hand EIGRP was the first one to send traffic but RIP protocol had the least traffic as it sends only the number of hops. Dividing an OSPF autonomous system into independent routing areas allows area topology abstraction, reducing route overhead, table size, and convergence time, while providing some isolation from bad routing data. On the contrary, areas reduce connectivity, while increasing configuration complexity, routing path length, and traffic concentration The Interior routing protocol OSPF is widely being used in the computer networking.

REFERENCES

[1] Behrouz A. Forouzan, “TCP/IP Protocol Suite”, McGraw-Hill Education Press. P. 269. ISBN 0-073-37604-3. Retrieved on March 25, 2009.

[2] B. Fortz and M. Thorup, “Optimizing OSPF/IS–IS weights in a changing world,”IEEE Journal on Selected Areas in Communications, vol. 20, no. 4, pp. 756 767, May 2002.

[3] Lammle, Todd. (2011). Cisco Certified Network Associate Study Guide, Wiley Publishing, Inc., Seventh Edition.

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 4, Issue 2, March 2015

[4] P. Kalamani, M. Venkatesh Kumar , M. Chithambarathanu, Reji Thomas, Comparison of RIP, EIGRP, OSPF, IGRP Routing Protocols in Wireless Local Area Network (WLAN) by using OPNET Simulator tool - A Practical Approach - IOSR-JCE,e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 16, Issue 4, Ver. VI (Jul- Aug. 2014).

[5] Rajan, R., Shipra, S."WLAN Performance Improvisation by Fine Tuning IEEE 802.11Parameters", International Journal of Computer Applications, April 2012.

[6] Tanenbaum, Andrew s. Computer Networks. s.l.: Pearson Education, 2003.

[7] R.Devi, B.Sumathi, T.Gandhimathi, G.Alaiyarasi,Performance Metrics of MANET in Multi-Hop Wireless Ad-Hoc Network Routing Protocols, International Journal of Computational Engineering Research (IJCER) ISSN: 2250-3005.

[8] V.Vetriselvan, Pravin R.Patil, M.Mahendran, Survey on the RIP, OSPF, EIGRP Routing Protocols, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014, 1058-1065.

[9] http://www.ehow.com.

[10] http://cisco.acad.net.

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