



Network Design and Implementation of Dynamic Routing Protocols with Security

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LITERATURE REVIEW

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Abstract

Network Protocols defines the optimized paths to send data and Network routing information from source to destination. Dynamic routing is a process where a router can forward data via different routes for a given destination, based on the current conditions of the communication circuits within a system. Static and Dynamic are two types of Routing Protocols, Exterior Gateway Protocol (EGP) and Interior Gateway Routing (IGR) are two classes of dynamic routing Protocols. (IGR) is classified into two types as distance vector routing and link-state routing. This review paper, discuss about the various routing Protocols from IGR type, like Routing Information Protocol (RIP), Open shortest path first (OSPF), Enhanced Interior Gateway routing protocol (EIGRP), EGP class protocol like and Static routing. This paper discuss about how cisco Packet Tracer software can be used for implementation of protocol with enhanced security.

Keywords—OSPF, EIGRP, RIP, Static Routing, Packet Tracer, cryptography Standard.

INTRODUCTION

Routing is the key factor of network communication system for selecting first-class paths in a network which is normally performed by router. Routing protocols defines the set of rules and conductions for the exchange of routing tables between routers. Routing of packets is finished in two ways, i.e. static routing and dynamic routing.

In static routing administrator manually enters the routes within the router table wherein as in dynamic routing it takes place routinely the use of routing protocols like RIP, IGRP, EIGRP, OSPF, and so forth. Verbal exchange among routing protocols is dependent on the routing set of rules which is solely depending on the metrics used to locate the path to switch the records across networks. Routing Information Protocol (RIP), Open Shortest Path First (OSPF), and Enhanced Interior Gateway Routing Protocol (EIGRP).

Routing protocols

A routing protocol specifies how routers communicate with each other to distribute information that enables them to select routes between nodes on a computer network.

There are two main types of routing protocols: Static routing and dynamic routing. Static routing assumes that the network is fixed, meaning no nodes are added or removed and routing tables are therefore only manually updated Ref[1]. Dynamic or adaptive routing, more commonly used for internetworking, allows changes in the network topology by using routing tables that update with each network change. In this report we will only consider dynamic routing protocols. Within the class of dynamic protocols, we can have Interior or Exterior Gateway Protocols. EGP's deals with routing information between different autonomous. An example of an EGP is Border Gateway Protocol (BGP). The three routing protocols we chose to compare are IGP's, protocols that exchange routing information within an AS. These protocols can either use distance vector (such as RIP and EIGRP) or link-state algorithms (such as OSPF) to optimize convergence times. In this paper we will compare the three dynamic routing protocols shown on the right of the classification chart below: RIP, OSPF and EIGRP. Is shown in fig[1.1]

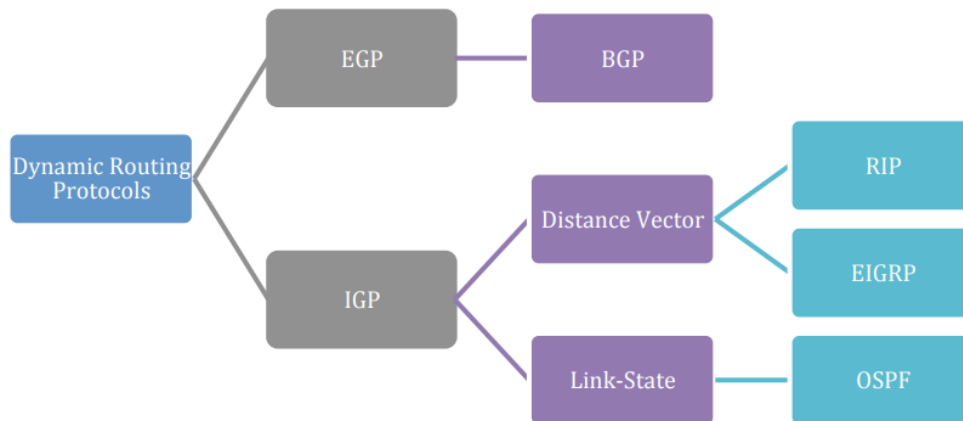


Figure 1.1: Classification of Routing Protocols

Routing Information Protocol (RIP): The Routing Information Protocol (RIP), which is a distance-vector based algorithm, is one of the first routing protocols implemented on TCP/IP. Information is sent through the network using UDP. Each router that uses this protocol has limited knowledge of the network around it. This simple protocol uses a hop count mechanism to find an optimal path for packet routing. A maximum number of 16 hops are employed to avoid routing loops. However, this parameter limits the size of the networks that this protocol can support. The popularity of this protocol is largely due to its simplicity and its easy configurability. However, its disadvantages include slow convergence times, and its scalability limitations. Therefore, this protocol works best for small scaled networks[1],[8] has Ref (1) and (8)

RIP Attributes:

- The Algorithm used is a Distance Vector.
- The metric depends on the count of hops.
- The maximum Hop count in RIP is 15.
- Every 30 seconds the routing table will be updated.
- It also gives the traffic in topology with updates.

Open Shortest Path First (OSPF) Open Shortest Path First (OSPF) is a very widely used link-state interior gateway protocols (IGP). This protocol routes Internet Protocol (IP) packets by gathering link-state information from neighbouring routers and constructing a map of the network. OSPF routers send many message types including hello messages, link state requests and updates and database descriptions. Djisktra's algorithm is then used to find the shortest path to the destination. Shortest Path First (SPF) calculations are computed either periodically or upon a received Link State Advertisement (LSA), depending on the protocol implementation. Topology changes are Dynamic Routing Protocols EGP BGP IGP Distance Vector RIP EIGRP Link-State OSPF ENSC427- Final Project 8 detected very quickly using this protocol. Is shown in table [1]. Another advantage of OSPF is that its many configurable parameters make it a very flexible and robust protocol. Contrary to RIP, OSPF has the disadvantage of being too complicated Ref[2]

OSPF characteristics:

It mostly shows the non-loop routes.

- The routing table is updated automatically according to the network inside.
- It uses Less Bandwidth. D. Static Routing

Enhanced Interior Gateway Routing Protocol (EIGRP) EIGRP is a Cisco-developed advanced distance-vector routing protocol. Routers using this protocol automatically distribute route information to all neighbours. The Diffusing Update Algorithm (DUA) is used for routing optimization, fast convergence, as well as to avoid routing loops. Full routing information is only exchanged once upon neighbour establishment, after which only partial updates are sent. When a router is unable to find a path through the network, it sends out a query to its neighbours, which propagates until a suitable route is found. This need-based update is an advantage over other protocols as it reduces traffic between routers and therefore saves bandwidth. The metric that is used to find an optimal path is calculated with variables bandwidth, load, delay and reliability. By incorporating many such variables, the protocol ensures that the best path is found. Also, compared to other distance-vector algorithms, EIGRP has a larger maximum hop limitation, which makes it compatible with large networks. The disadvantage of EIGRP is that it is a Cisco proprietary protocol, i.e., it is only compatible with Cisco technology networks Ref [3],[5].

EIGRP Attributes:

Superior distance-vector algorithm.

- Utilizes Reliability bandwidth, delay, and load as metrics.
- Allows hop count till 255.
- Scalable.
- Fast convergence.

Static Routing

Static routing is a form of routing that occurs when a router uses a manually-configured routing entry, rather than information from dynamic routing traffic Ref [3].

Static routing has certain disadvantages:

- Manually configuring and maintenance of Routing Table is Difficult and also not time efficient.
- Configuring Routers will not be Possible in Huge Networks due to its high traffic.
- Network Administrator has complete charge over Altering the information of the routers.
- The result is not as expected or will not work well if any topological changes take place in the networks; maintenance becomes cumbersome.
- Needs Total Information about the complete network for proper implementation.

S.NO	Author	Title	Protocols	configuration	Security
1	K. Narasimha M.Vamshidhar Reddy Sandeep Kumar	Network Design and Implementation of Dynamic Routing Protocols Using Packet Tracer	OSPF, EIGRP, RIP, Static Routing	Yes	Plaintext
2	Shewaye Sirika Smita Mahajine	Survey on Dynamic Routing Protocols	RIP, IGRP, EIGRP, OSPF, GNS-3, OPNET, packet tracer.	Yes	Plaintext
3	Kiavash Mirzahosseini Michael Nguyen Sarah Elmasry	Analysis of RIP, OSPF, and EIGRP Routing Protocols using OPNET	OSPF, EIGRP, RIP, Static Routing	Yes	Plaintext
4	Sheela Ganesh	Dynamic Routing Protocol implementation decision between EIGRP, OSPF and RIP based on Technical Background Using OPNET Modeler	EIGRP, OSPF, RIP, Dynamic Routing Protocol, Network Convergence, CPU Utilization	Yes	Plaintext
5	NARESH	Performance Evaluation of UMTS Under OSPF, EIGRP and IGRP	EIGRP, OSPF, RIP, Dynamic Routing Protocol, Network Convergence	Yes	Plaintext
6	P.Bramarambika V. Sai Santosh	Design and Implementation of Dynamic Routing Protocols	OSPF, RIP, Dynamic Routing Protocol	Yes	Plaintext
7	Michael Nguyen Sarah Elmasry	Implementation decision between EIGRP, OSPF	EIGRP, OSPF	Yes	Plaintext
8	Anil Kumar	OSPF, and EIGRP Routing Protocols	EIGRP, OSPF, RIP, Dynamic Routing Protocol	Yes	Plaintext

Table 1: Literature review summary

EVALUATION OF RIP, EIGRP AND OSPF TABLE COMPARISON OF RIP, EIGRP and OSPF

Matrix of Protocols, Features				
Feature	RIP1 Ref[1][8]	RIP2 Ref[1][8]	EIGRP Ref[3][5]	OSPF Ref[2]
Variety	Distance Vector	Distance Vector	Advance Distance Vector	Link State
Algorithm	Bellman-Ford	Bellman-Ford	Dual	DijKstra
Classful/classless	Class Full	Class Full	Classless	Class Less
Metrics	Hop Count	Hop Count	Delay and bandwidth	Cost
Update timer	30	30	Automatic	Automatic
AD amount	120	120	Internal 90 External 170	110
Authentication	NO	Yes	MD5	MD5
Maximum Hop	15	15	255	NO
Convergence	Slow	Slow	Very Fast	Fast
Update Type	Full table	Full table	Only Changes	Only Changes
VSLM Support	No	No	Yes	Yes
Network Size	Small	Small	Large	Very large
Split Horizon	No	No	Yes	Yes
Area Type	-	-	-	5 Types

Encrypt passwords on Cisco routers and switches

In this paper how to set passwords on cisco switches or router. But passwords does add to the security of the device here there is small problem. The password is stored in plain text. Anyone who gets access to the switch can easily see all the passwords by typing command “show running-config or show startup-config”.

Enhancement

In this project we will see how to encrypt passwords with crypto standard on Cisco routers or switches.

Conclusions

I have reviewed several articles related with how the networking Protocols tells the simplest paths to send data from source to destination in secure and also gives details on how routers send information between one another so that to complete its goal.

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