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Comparative Analysis and Performance between RIP Routing and DHCP Server Configuration in Cloud Computing Environment

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ABSTRACT: *Cloud computing is a combination of technologies that make up a network for the delivery of computing services. It requires hardware for infrastructural purposes and software to deliver the on-demand services over the internet. It is a time period that includes virtualization, networking, and distributed computing, software and web services. A cloud consists of numerous elements such as data center, clients and distributed servers. It includes flexibility, fault tolerance, high availability, scalability, reduced overhead for users, reduced cost of ownership, on demand services etc. In today's network communication, it's miles hard without routing protocols and DHCP server as they play a vital role in the direction, dedication to send site visitors fast and determines how the conversation is completed in router to a head the packets from source to end (destination). There are such a lot of routing protocols and server to be had like Static and dynamic routing protocols DHCP server. In this paper, we surveyed RIP routing protocols and DHCP server based on their configuration.*
KEYWORD: *DHCP server, Dynamic Routing, Cloud Computing, Cloud Networking, Cisco packet Tracer port.*

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I. INTRODUCTION

Cloud Computing provides us a means by which we can access the applications as utilities, over the internet; it allows us to create, configure, and customize applications online. It is a fast rising area in computing research and industry today. It has the potential to make the new idea of 'computing as a utility' in the near future. The Internet is often represented as a cloud and the term "cloud computing" arises from that analogy. Cloud computing is the dynamic provisioning of IT capabilities (hardware, software, or services) from third parties over a network. It is generally supposed that there are three basic types of cloud computing: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS)[1]. In IaaS grids or clusters, virtualized servers, memory, networks, storage and systems software are delivered as a service. Perhaps the best known example is Amazon's Elastic Compute Cloud (EC2) IaaS Provide access to computational resources, i.e. CPUs. And also provide (managed and scalable) resources as services to the user. PaaS typically makes use of dedicated APIs to control the behavior of a server hosting engine which executes and replicates the execution according to user requests. 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. But today we discuss about RIP routing protocols.

Here, I point out the rest of the paper is planned as follows. Covers the literature review section II and III DHCP server, IV RIP Routing, V Cloud Computing, VI Methodology, VII Cloud Service Models, VIIICloud Computing Deployment Model, IX Cloud Networking, X Cisco Packet Tracer, XI Comparative Analysis Literature Review, XII Troubleshooting for Rip Routing, XIII Troubleshooting for DHCP, XIV Command Line for RIP Routing, XV Command Line for DHCP Server, XVI Findings, XVIIConclusion.

II. LITERATURE REVIEW

DHCP failover is the replication of a DHCP server which is considered as the primary DHCP server to a partnering DHCP server. Internet Engineering Task Force (IETF) recommends the underlying protocol for DHCP failover (IETF, 2003)[2]. The major concept is to share the scope of the DHCP server by a failover system. To load balance and other redundant purposes, the primary DHCP server and the partnering DHCP server can use same sub netting. In a failover environment,DHCP servers share the components and settings of a failover enabled DHCP.As our problem statement implies, we are intending to solve the existing problems of Internet access in Dominican Republic by assessing the severity of the problem and afterwards proposing DHCP failover system. Hence, our main concern is to ensure the availability of Internet access without interruption. The main benefit of DHCP failover is to ensure the high availability which is our aim on this study(Lemon, 2003) [3]. We intend to help improve availability of DHCP service to increase the availability of internet access in Dominican Republic.DHCP failover can ensure the sustainability of a network even when one is down. In our case, if the primary server is down or the partnering severs is down, we are not out of service because of the virtue of DHCP failover as the service still exists as the DHCP failover share the scope of the services. Though there are some disadvantages of redundant DHCP service which is the main backbone of DHCP failover, it is yet considered a great method to ensure high availability (Lin, etal., 2011) [4]. There are some proposed novel methods to apply DHCP failover (DHCPF) in solving real world problems (Fan, et al., 2007). We intend to follow the Microsoft manual to set up ourDHCP failover as prototype for the Dominican Republic.

Many researchers in the past have compared the performance of the dynamic routing protocols i.e. RIP, IGRP and IS-IS based on different parameters. Ahmad Karim &Minhaj Ahmad Khan (2011) showed the behavior of routing protocols for medium to large scale networks [5]. He evaluated these protocols on the basis of quantitative metrics such as CPU processing power, point to point throughput, and point to point queuing delay. Results show that IS-IS protocol uses only 0.0004% of the CPU processing capability, whereas RIP produces greater point to point throughput and also has the highest point to point queuing delay.

III. DHCP SERVER

A Dynamic Host Configuration Protocol (DHCP) server is a device or system which controls DHCP. It assigns IP addresses to client computers that connect to it in order for those clients to become part of the network. The DHCP server considerably reduces configuration efforts because an administrator does not have to manually assign each computer with IP addresses and other IP-related settings. It also a protocol used to provide quick, automatic, and central management for the distribution of IP addresses within a network.

Every device on a TCP/IP-based network must have a unique uncast IP address to access the network and its resources. Without DHCP, IP addresses must be configured manually for new computers or computers that are moved from one subnet to another, and manually reclaimed for computers that are removed from the network.

The network administrator establishes DHCP servers that maintain TCP/IP configuration information and provide address configuration to DHCP-enabled clients in the form of a lease offer. The DHCP server stores the configuration information in a database, which includes [6]:

- Valid TCP/IP configuration parameters for all clients on the network.
- Valid IP addresses, maintained in a pool for assignment to clients, as well as excluded addresses.
- Reserved IP addresses associated with particular DHCP clients. This allows consistent assignment of a single IP address to a single DHCP client.

The lease duration, or the length of time for which the IP address can be used before a lease renewal is required.

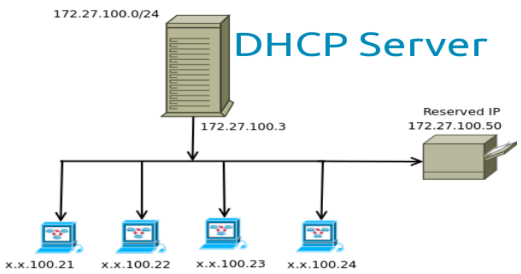


Fig 1: DHCP Server

Benefits of DHCP

The DHCP Server service provides the following benefits:

i. **Reliable IP address configuration**. DHCP minimizes configuration errors caused by manual IP address configuration, such as typographical errors, or address conflicts caused by the assignment of an IP address to more than one computer at the same time.

ii. **Reduced network administration.** DHCP includes the following features to reduce network administration [10]:

- Centralized and automated TCP/IP configuration.
- The ability to define TCP/IP configurations from a central location.
- The ability to assign a full range of additional TCP/IP configuration values by means of DHCP options.
- The efficient handling of IP address changes for clients that must be updated frequently, such as those for portable computers that move to different locations on a wireless network.
- The forwarding of initial DHCP messages by using a DHCP relay agent, thus eliminating the need to have a DHCP server on every subnet.

IV. RIP ROUTING

Dynamic routing is a networking technique that provides optimal data routing. Unlike static routing, dynamic routing enables routers to select paths according to real-time logical network layout changes. In dynamic routing, the routing protocol operating on the router is responsible for the creation, maintenance and updating of the dynamic routing table. In static routing, all these jobs are manually done by the system administrator. Dynamic routing uses multiple algorithms and protocols. The most popular are Routing Information Protocol (RIP) and Open Shortest Path First (OSPF).

Typically, dynamic routing protocol operations can be explained as follows:

i. The router delivers and receives the routing messages on the router interfaces.

ii. The routing messages and information are shared with other routers, which use exactly the same routing protocol.

iii. Routers swap the routing information to discover data about remote networks.

iv. Whenever a router finds a change in topology, the routing protocol advertises this topology change to other routers.

Dynamic routing is easy to configure on large networks and is more intuitive at selecting the best route, detecting route changes and discovering remote networks. However, because routers share updates, they consume more bandwidth than in static routing; the routers' CPUs and RAM may also face additional loads as a result of routing protocols.

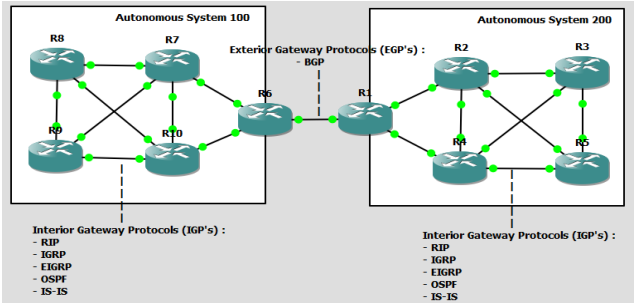


Fig 2: RIP Routing

V. CLOUD COMPUTING

Cloud computing is a combination of hardware and software based computing resources delivered as a network service. Cloud computing is a type of computing that relies on shared computing resources rather than having local servers or personal devices to handle applications. In its most simple description, cloud computing is taking services and moving them outside an organization's firewall. Applications, storage and other services are accessed via the Web. The services are delivered and used over the Internet and are paid for by the cloud customer on an as-needed or pay-per-use business model.

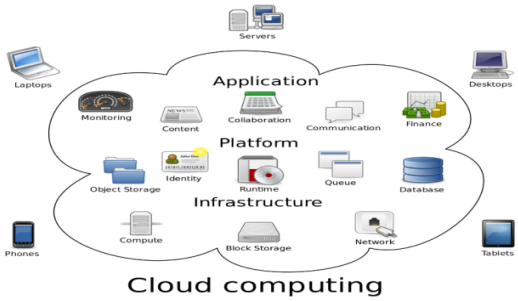


Fig 3: Cloud Computing

Characteristics of Cloud Computing

1.On-demand self-service: A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

2.Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops and workstations).

3.Resource pooling: Resource pooling means that multiple customers are serviced from the same physical resources. Providers' resource pool should be very large and flexible enough to service multiple client requirements and to provide for economy of scale.

4. Rapid elasticity: Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand.

5.Measured service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth and active user accounts).

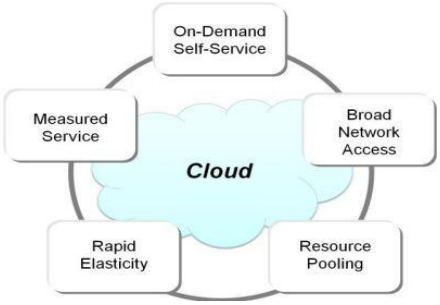


Fig 4: Cloud Characteristics

VI. METHODOLOGY

We prepare this paper in terms of the qualitative and quantitative method both. In our paper we try to give the theoretical idea about the RIP Routing, DHCP Server and Cloud Computing Environment. In the calculating portion we try to find the performance between this two system of the networking. For this paper we follow this steps:

Step 1: Collect data from secondary source
Step 2: Collect data from research and conference paper
Step 3: Analysis those source
Step 4: Troubleshooting of that environment
Step 5: Configuration the two system using Command Line Interface
Step 6: Find the response time between this two different approach.

VII. CLOUD SERVICE MODELS

The cloud service providers three different services based on different capabilities such as SaaS (Software as a Service), PaaS (Platform as a Service), IaaS (Infrastructure as a Service).

1.Infrastructure as a Service(IaaS): Infrastructure as a service (IaaS) is a service model that delivers computer infrastructure on an outsourced basis to support enterprise operations. Typically, IaaS provides hardware, storage, servers and data center space or network components; it may also include software.

2.Platform as a Service: PaaS provides the runtime environment for applications, development and deployment tools etc. PaaS provides all of facilities required to support the complete life cycle of building and delivering web application and services entirely from the internet.
Example: Google app's and Force.com are example of PaaS.

3.Software as a Service: SaaS is a model of software deployment where an application is hosted as a service provided to customers across the Internet. User can access SaaS by using a thin client through a web browser. CRM, Office Suite, Email, games, etc. are the software applications which are provided as a service through Internet.

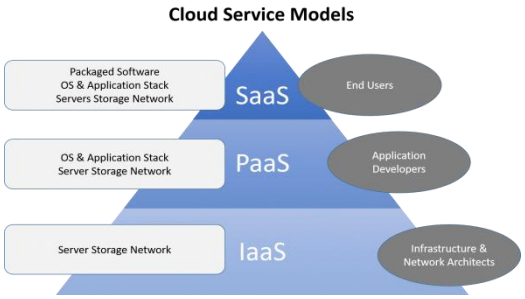


Fig 5: Cloud Infrastructure

VIII. CLOUD COMPUTING DEPLOYMENT MODEL

Depending on infrastructure ownership, there are four deployment models of cloud computing:
1.**Public cloud:** This cloud can be used by any one. Generally, it required significant investment. Practically large organizations owned them like Microsoft, Amazon, and Google.
2. Private Cloud: The cloud infrastructure that is managed and operated for one organization only, so that a consistent level of control over security, privacy, and governance can be maintained is called private cloud. It is also known as Internal Cloud. It may be managed by the organization or a third party.
3. Hybrid Cloud: The hybrid is the combination of public and private cloud. However, the critical activates are performed using private cloud while the non-critical activities are performed using public cloud.
4. **Community cloud:** This type of cloud is generally set up a group or organization, to share information among them. Outside of this group, no one can share information from this cloud. Generally, research based organization built this type of cloud.

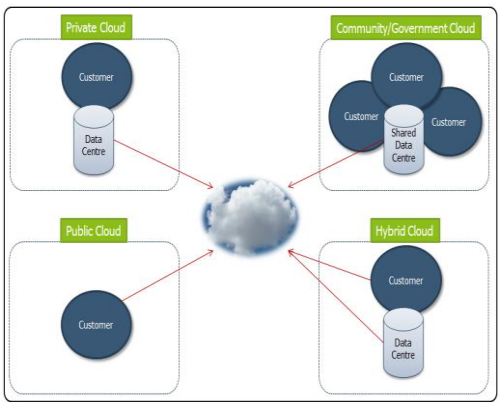


Fig 6: Cloud Models

IX. CLOUD NETWORKING

Cloud networking (and Cloud based networking) is a term describing the access of networking resources from a centralized third-party provider using Wide Area Networking (WAN) or Internet-based access technologies. Cloud networking is related the concept of cloud computing, in which centralized computing resources are shared for customers or clients. In cloud networking, the network can be shared as well as the computing resources. It has spurred a trend of pushing more network management functions into the cloud, so that fewer customer devices are needed to manage the network[7].Cloud networking is a form of Software Defined Networking (SDN) technology, in which groups of networking switches and access devices can deploy

over the wide area as shared, virtual resources. Other terms that describe this shift include Software-Defined WAN (SD-WAN) and Cloud WAN.

Fig 7: Cloud Networking

X. CISCO PACKET TRACER

Cisco packet tracer is a simulation software tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks [8]. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface.

Cisco 2600 Series Interface Numbering

Model	Ethernet (10BASE-T)	Token-Ring (RJ-45)	Fast Ethernet (10/100	Network Module Slot	WAN Interface Card Slots	Advanced Integration Module Slots
Cisco 2610	1			1	2	1
Cisco 2610XM			1	1	2	1
Cisco 2611	2			1	2	1
Cisco 2611XM			2	1	2	1
Cisco 2612	1	1		1	2	1
Cisco 2613		1		1	2	1
Cisco 2620			1	1	2	1
Cisco 2620XM			1	1	2	1
Cisco 2621			2	1	2	1
Cisco 2621XM			2	1	2	1
Cisco 2650			1	1	2	1
Cisco 2650XM			1	1	2	1
Cisco 2651			2	1	2	1
Cisco 2651XM			2	1	2	1
Cisco 2691			2	1	3	2

XI. COMPARATIVE ANALYSIS

Dynamic routing is when protocols are used to find networks and update routing tables on routers. A routing protocol defines a set of rules used by a router when it communicates by routing information between neighbor routers [9].

Routing protocols	**Routed protocols**
i. Routing protocols are used between routers to determine paths and maintain routing tables.	i. After the path is determined, a router can route a routed protocol.
ii. Routed protocols are protocols that are routed over an Internetwork (IP, AppleTalk, IPX).	v. Routing protocols use algorithms to route routed protocols through the Internetwork (RIP, IGRP, OSPF).
v. Routed protocols are used BETWEEN routers to direct traffic.	i. Routing protocols allow routers to share information about known networks with other networks.

XII. TROUBLESHOOTING FOR RIP ROUTING

R1#show IP protocols

*** IP Routing is NSF aware ***

Routing Protocol is "rip"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Sending updates every 30 seconds, next due in 0 seconds
Invalid after 180 seconds; hold down 180, flushed after 240
Redistributing: rip
Default version control: send version 2, receive version 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
192.168.21.0
Routing Information Sources:
Gateway Distance Last Update
Distance: (default is 120)

R2#show IP protocols
*** IP Routing is NSF aware ***
Routing Protocol is "rip"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Sending updates every 30 seconds, next due in 26 seconds
Invalid after 180 seconds; hold down 180, flushed after 240
Redistributing: rip
Default version control: send version 2, receive version 2
Interface Send Receive Triggered RIP Key-chain
FastEthernet0/0 2 2
Loopback0 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
2.0.0.0
192.168.12.0
Routing Information Sources:
Gateway DistanceLast Update
Distance: (default is 120)

XIII. TROUBLESHOOTING FORDHCP
DHCPClient# Hostname: DHCPClient
DHCP: new entry. add to queue, interface FastEthernet0/0
DHCP: s Discover attempt # 1 for entry:
Temp IP address: 0.0.0.0 for peer on Interface: FastEthernet0/0
Temp sub net mask: 0.0.0.0
DHCP Lease server: 0.0.0.0, state: 1 Selecting
DHCP transaction id: 289
Lease: 0 secs, Renewal: 0 secs, Rebind: 0 secs
Next timer fires after: 00:00:04
Retry count: 1 Client-ID: cisco-cc00.1ab0.0000-Fa0/0
Client-ID hex dump: 636973636F2D636330302E316162302E
303030302D4661302F30
DHCP Server show IP DHCP pool
Pool MYPOOL:
Utilization mark (high/low): 100 / 0
Subnet size (first/next): 0 / 0
Total addresses: 254
Leased addresses: 0
Pending event: none
1 subnet is currently in the pool:
Current index IP address range Leased addresses

192.168.12.1 192.168.12.1 - 192.168.12.254 0

XIII. COMMAND LINE FOR RIP ROUTING

Router> enable
Router# configure terminal
Router(config)# router rip
Router(config-router) #bfd all-interfaces
Router(config-router) # end

Router 1

Router1(config)#router rip
Router1(config-router) # network 10.0.0.0
Router1(config-router) # network 192.168.1.252
Router1(config-router) # network 192.168.1.248

Router 2

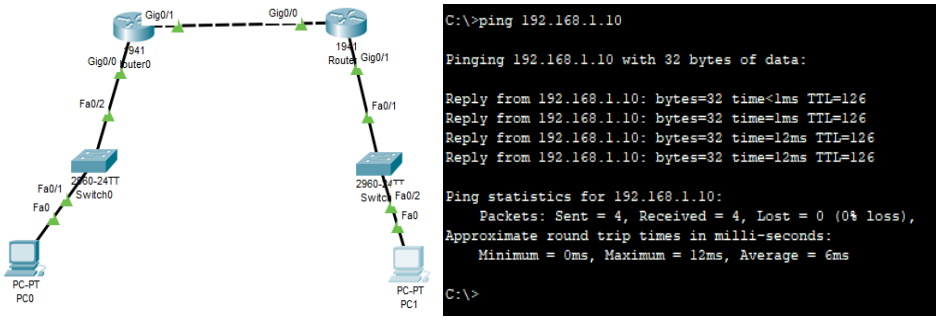
Router2(config)#router rip
Router2(config-router) # network 192.168.1.244
Router2(config-router) # network 192.168.1.248

XIV. COMMAND LINE FOR DHCP SERVER

Floor1(config)#ipdhcp excluded-address 192.168.0.1 192.168.0.50
Floor1(config)#ipdhcp pool Floor1DHCP
Floor1(dhcp-config) #network 192.168.0.0 255.255.255.0
Floor1(dhcp-config) #default-router 192.168.0.1
Floor1(dhcp-config) #dns-server 192.168.0.1

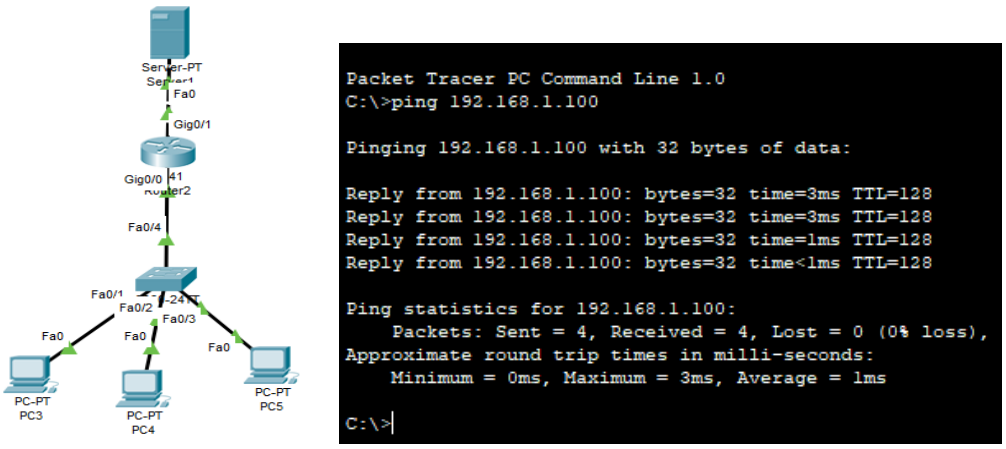
XV. FINDINGS

RIP Routing



For configuring the RIP routing we use three IP. IP 1 is 192.168.1.10, IP 2 is 192.168.2.10 and IP 3 is 192.168.3.10. Then we ping from 192.168.3.10 to 192.168.1.10.

DHCP server



For configuring the DHCP server we use only one IP that is IP 192.168.1.99. Then this server generates three IP for the three PC. Then we ping from 192.168.1.102 to 192.168.1.100.

From this point of view, we understand that DHCP server takes maximum 3ms where RIP routing takes maximum 12ms. So that we see DHCP server gives better response rather than the RIP routing.

XVI. CONCLUSION

In this paper we try to simulate RIP routing and DHCP server. For this simulation we choose the SaaS model of the cloud computing and make the public cloud and then we create this environment for getting the output of this two different types of approach. And we test the response time between the RIP routing and DHCP server. We try to build up a comparison between these two configurations. So that we can easily use DHCP server for the better performance though it is very costly but it needs proper maintaining and monitoring in every time.Though the DHCP server is very costly and its need to proper maintain so that this DHCP server is used by the big companies or rich professional sectors where they can monitor every time for giving the better performance from this server.

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