"IMPROVE THE EFFICIENCY OF ELECRONICS ROUTER DEVICE "

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ABSTRACT

Study of data communication electronics router device in Computer Networks or data communication network is such a distinctive mobile computing optimal router device which is used in any computer networks and that can be come across in world applications of algorithms. The router is a physical or virtual internetworking device that is designed to receive, analyze, and forward data packets among the computer networks. A router examines a destination IP address of a given data packet, and it uses the headers and forwarding tables to decide the best way to transfer the packets between the networks.

2. INTRODUCTION

Computer traffic jam problem is not single day or once in a week problem; it will be possible in daily life. So, its suggested or computing to choose a best optical path from source to destination in best possible way. [1] Many people frequently deal with this question when planning trips with their cars. There are also many applications like logistic planning or traffic simulation that need to solve a huge number of such route queries.

Current commercial solutions usually are slow or inaccurate. The gathering of map data is already well advanced and the available computer networks get very big, covering many millions of computer junctions.[6] Thus, on the one hand, using simple-minded approaches yields very slow or expensive for the service provider if he has to make a lot of computing power available. On the other hand, using antagonistic heuristics yields inaccurate results.

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For the client, this can mean a waste of time and money. For the service provider, the developing process becomes a difficult balancing act between speed and sub optimality of the computed routes. Due to these reasons, there is a considerable interest in the development of more efficient and accurate route planning techniques.

Here we use Remote sensing technology (Help in find out remotely shortest route in large area) is a technology used for obtaining information about a target through the analysis of data acquired from the target at a distance. It is composed of three parts, the targets - objects or phenomena in an area; the data acquisition - through certain instruments; and the data analysis - again by some devices.

 This definition is so computer that the vision system of human eyes, sonar sounding of the sea floor, ultrasound and x-rays used in medical sciences, laser probing of atmospheric particles, and are all included. The target can be as big as the earth, the moon and other planets, or as small as biological cells that can only be seen through microscopes.

1. **1 ROUTER**

A router is a device that connects two or more packet-switched networks or sub networks. It serves two primary functions: managing traffic between these networks by forwarding data packets to their intended IP addresses, and allowing multiple devices to use the same Internet connection.

There are some popular companies that develop routers; such are **Cisco**, **3Com**, **HP**, **Juniper**, **D-Link**, **Nortel**, etc. Some important points of routers are given below:

o A router is used in **LAN** (Local Area Network) and **WAN** (Wide Area Network) environments. For example, it is used in **offices** for connectivity, and you can also establish the connection between distant networks such as from **Bhopal** to

o It shares information with other routers in networking.

o It uses the routing protocol to transfer the data across a network.

o Furthermore, it is more **expensive** than other networking devices like switches and hubs.

o A router works on the **third layer** of the OSI model, and it is based on the IP address of a computer. It uses protocols such as ICMP to communicate between two or more networks. *It is also known as an* **intelligent device** *as it can calculate the best route to pass the network packets from source to the destination automatically.*

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o A virtual router is a software function or software-based framework that performs the same functions as a physical router. It may be used to increase the reliability of the network by virtual router redundancy protocol, which is done by configuring a virtual router as a default gateway. A virtual router runs on commodity servers, and it is packaged with alone or other network functions, like load balancing, firewall packet filtering, and wide area network optimization capabilities.

o **WHY ROUTERS?**

o A router is more capable as compared to other network devices, such as a hub, switch, etc., as these devices are only able to execute the basic functions of the network. For example, a hub is a basic networking device that is mainly used to forward the data between connected devices, but it cannot analyze or change anything with the transferring data. On the other hand, the router has the capability to analyze and modify the data while transferring it over a network, and it can send it to another network. For example, generally, routers allow sharing a single network connection between multiple devices.

2.2 HOW DOES ROUTER WORK?

A router analyzes a destination IP address of a given packet header and compares it with the routing table to decide the packet's next path. The list of routing tables provides directions to transfer the data to a particular network destination. They have a set of rules that compute the best path to forward the data to the given IP address.

Routers use a **modem** such as a cable, fiber, or DSL modem to allow communication between other devices and the internet. Most of the routers have several ports to connect different devices to the internet at the same time. It uses the **routing tables** to determine where to send data and from where the traffic is coming.

A routing table mainly defines the default path used by the router. So, it may fail to find the best way to forward the data for a given packet. For example, the office router along a single default path instructs all networks to its internet services provider.

There are two types of tables in the router that are **static and dynamic**. The static routing tables are configured manually, and the dynamic routing tables are updated automatically by dynamic routers based on network activity.

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FEATURES OF ROUTER

o A router works on the 3rd layer (Network Layer) of the OSI model, and it is able to communicate with its adjacent devices with the help of IP addresses and subnet.

o A router provides high-speed internet connectivity with the different types of ports like gigabit, fast-Ethernet, and STM link port.

o It allows the users to configure the port as per their requirements in the network.

o Routers' main components are central processing unit (CPU), flash memory, RAM, Non-Volatile RAM, console, network, and interface card.

o Routers are capable of routing the traffic in a large networking system by considering the sub-network as an intact network.

o Routers filter out the unwanted interference, as well as carry out the data encapsulation and decapsulation process.

o Routers provide the redundancy as it always works in master and slave mode.

o It allows the users to connect several LAN and WAN.

o Furthermore, a router creates various paths to forward the data.

APPLICATIONS OF ROUTERS

There are various areas where a router is used:

o Routers are used to connect hardware equipment with remote location networks like **BSC, MGW, IN, SGSN**, and other servers.

o It provides support for a fast rate of data transmission because it uses high STM links for connectivity; that's why it is used in both wired or wireless communication.

o Internet service providers widely use routers to send the data from source to destination in the form of e-mail, a web page, image, voice, or a video file. Furthermore, it can send data all over the world with the help of an IP address of the destination.

o Routers offer access restrictions. It can be configured in a way that allows for few users to access the overall data and allows others to access the few data only, which is defined for them.

o Routers are also used by software testers for WAN communications. For example, the software manager of an organization is located in Agra, and its executive is located at a different place like Pune or Bangalore. Then the router provides the executive the method to

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share his software tools and other applications with the manager with the help of routers by connecting their PCs to the router using WAN architecture.

o In wireless networks, by configuring VPN in routers, it can be used in the client-server model, which allows sharing the internet, video, data, voice, and hardware resources. As shown in the below picture:
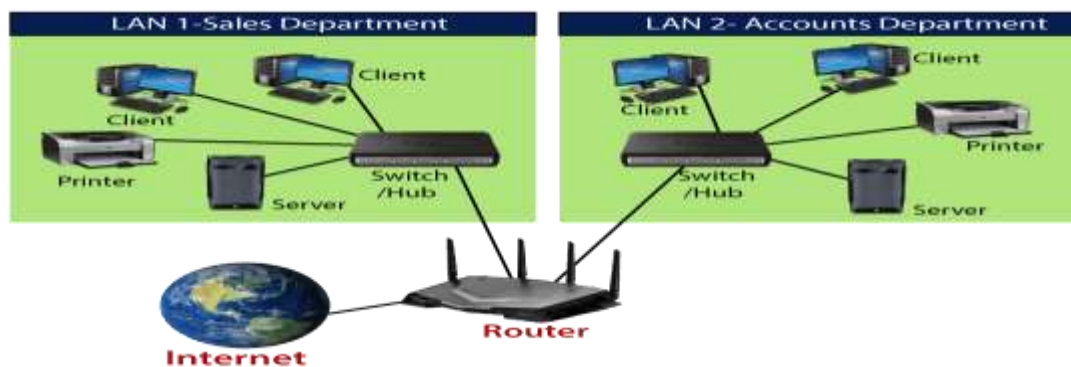
FIG-1, NETWORK CONNECTED WITH SWITCHES AND SERVERS.

o In modern times, routers have the facility of inbuilt USB ports within the hardware. They have enough internal storage capacity. External storage devices can be used with routers to store and share data.

o Routers are used to set up the operation and maintenance center of an organization, which is known as the NOC center. All equipment at a distant location are connected by routers on optical cable at a central location, which also offer redundancy through the main link and protection link topology.

TYPES OF ROUTERS

There are various types of routers in networking; such are given below:

1. WIRELESS ROUTER: Wireless routers are used to offer Wi-Fi connectivity to laptops, smartphones, and other devices with Wi-Fi network capabilities, and it can also provide standard ethernet routing for a small number of wired network systems.

Wireless routers are capable of generating a wireless signal in your home or office, and it allows the computers to connect with routers within a range, and use the internet. If the connection is indoors, the range of the wireless router is about 150 feet, and when the

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connection is outdoors, then its range is up to 300 feet.

2. BROUTER: A brouter is a combination of the bridge and a router. It allows transferring the data between networks like a bridge. And like a router, it can also route the data within a network to the individual systems. Thus, it combines these two functions of bridge and router by routing some incoming data to the correct systems while transferring the other data to another network.

3. CORE ROUTER: A core router is a type of router that can route the data within a network, but it is not able to route the data between the networks. It is a computer communication system device and the backbone of networks, as it helps to link all network devices. It is used by internet service providers (ISPs), and it also provides various types of fast and powerful data communication interfaces.

4. EDGE ROUTER: An edge router is a lower-capacity device that is placed at the boundary of a network. It allows an internal network to connect with the external networks. It is also called as an access router. It uses an External BGP (Border Gateway Protocol) to provides connectivity with remote networks over the internet.

There are two types of edge routers in networking:

o **Subscriber edge router**
o **Label edge router**

The **subscriber edge router** belongs to an end-user organization, and it works in a situation where it acts on a border device.

The **label edge router** is used in the boundary of Multiprotocol Label Switching (MPLS) networks. It acts as a gateway between the LAN, WAN, or the internet.

5. BROADBAND ROUTERS: Broadband routers are mainly used to provide high-speed internet access to computers. It is needed when you connect to the internet through phone and use voice over IP technology (VOIP). All broadband routers have the option of three or four Ethernet ports for connecting the laptop and desktop systems. A broadband router is configured and provided by the internet service provider (ISP). It is also known as a **broadband modem**, asymmetric digital subscriber line (**ADSL**), or digital subscriber line (**DSL**) modem.

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BENEFITS OF ROUTER

There are so many benefits of a router, which are given below:

o **Security:** Router provides the security, as LANs work in broadcast mode. The information is transmitted over the network and traverses the entire cable system. Although the data is available to each station, but the station which is specifically addressed reads the data.

o **Performance enhancement:** It enhances the performance within the individual network. For example, if a network has 14 workstations, and all generate approximately the same volume of traffic. The traffic of 14 workstations runs through the same cable in a single network. But if the network is divided into two sub-networks each with 7 workstations, then a load of traffic is reduced to half. As each of the networks has its own servers and hard disk, so fewer PCs will need the network cabling system.

o **Reliability:** Routers provide reliability. If one network gets down when the server has stopped, or there is a defect in the cable, then the router services, and other networks will not be affected. The routers separate the affected network, whereas the unaffected networks remain connected, without interrupting the work and any data loss.

o **Networking Range:** In networking, a cable is used to connect the devices, but its length cannot exceed 1000 meters. A router can overcome this limitation by performing the function of a repeater (Regenerating the signals). The physical range can be as per the requirement of a particular installation, as long as a router is installed before the maximum cable range exceeds.

ROUTING PROTOCOLS

Routing protocols specify a way for the router to identify other routers on the network and make dynamic decisions to send all network messages. There are several protocols, which are given below:

Open Shortest Path First (OSPF): It is used to calculate the best route for the given packets to reach the destination, as they move via a set of connected networks. It is identified by the Internet Engineering Task Force **(IETF)** as Interior Gateway Protocol.

Border Gateway Protocol (BGP): It helps manage how packets are routed on the internet via exchange of information between edge routers. It provides network stability for

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routers if one internet connection goes down while forwarding the packets, it can adapt another network connection quickly to send the packets.

Interior Gateway Routing Protocol (IGRP): It specifies how routing information will be exchanged between gateways within an independent network. Then, the other network protocols can use the routing information to determine how transmissions should be routed.

Enhanced Interior Gateway Routing Protocol (EIGRP): In this protocol, if a router is unable to find a path to a destination from the tables, it asks route to its neighbors, and they pass the query to their neighbors until a router has found the path. When the entry of routing table changes in one of the routers, it informs its neighbors only about the changes, but do not send the entire table.

Exterior Gateway Protocol (EGP): It decides how routing information can be exchanged between two neighbor gateway hosts, each of which has its own router. Additionally, it is commonly used to exchange routing table information between hosts on the internet.

Routing Information Protocol (RIP): It determines how routers can share information while transferring traffic among connected group of local area networks. The maximum number of hops that can be allowed for RIP is 15, which restricts the size of networks that RIP can support.

3. REVIEW OF PREVIOUS WORK

In this section, we explain briefly the key principle of the most significant vehicles routing approaches in the literature; then we classify them into three categories. A. Vehicles routing approaches There are a number of route planning algorithms applied in computer networks. The main approaches proposed in the literature are briefly described below. 1) Dijkstra algorithm: Classical Dijkstra algorithm is a process of finding the path with the lowest cost (i.e. usually refers to the shortest path) from one node to all nodes in a city map. Its computation complexity is $O(n2)$ with n being the number of nodes in network [6]. Dijkstra is one of the optimal algorithms based on labeling method. In addition, other labeling algorithms like Bellman-Ford-Moore, incremental Graph, threshold, topological ordering, etc. are also used to find shortest path. F. Benjamin [7] states that for finding the shortest path from one-to-one problem, it is worthwhile to consider Dijkstra algorithm since this algorithm is terminated as soon as the destination node is labeled, which also means that the

shortest path is found. The other algorithms can only find optimal path when full shortest path tree is calculated meaning that shortest paths to all the nodes in the graph are found. Therefore, for searching the shortest path for one-to-all problem, incremental Graph is more efficient. 2) A* algorithm: A* is considered as a variant of Dijkstra algorithm but it uses a heuristic function rather than optimal search mechanism. Hence, A* restricts the search space and reduces the computational time. In traffic application, the search space is restricted to the area where traffic congestion has changed. Examples of A* algorithms extension are RTA* and a LRTA* [8] proposed for real-time applications. They usually use the direct distance between current location and the destination as a heuristic function. 3) Tabu search: Tabu search [9] has been applied to route planning problem by Liao et al in [10]. It is a local search based meta-heuristic with run through several iterations. During each iteration, the best solution in the neighborhood of the current solution is chosen as the new current solution, even if the solution cost is increased. Hence, a bad local optimal solution is mitigated. A short-term memory, known as the Tabu-list, is required to store attributes of recently visited solutions. This helps to avoid short term cycling. The search stops after a fixed number of iterations or after a number of consecutive iterations without any improvement to the best known solution [11]. 4) ANT based colony: This meta-heuristic is inspired from ant nature, when real ants communicate and cooperate with each other to find short paths from their nest to food sources [11]. When one ant finds a path from the colony to a food source, they lay down a chemical compound; known as pheromone on the ground and form a trail. If other ants find such a path, they are more likely to follow it instead of wandering randomly. This eventually leaves more pheromones and leads more ants to follow that path. The idea of ant colony algorithm is to simulate this behavior. When we apply this algorithm to VRP, the ants keep a memory about the visited nodes and the estimated time to reach them. Ant based control approach [12] has been used for searching the shortest paths in VRP as it is able to react to dynamic changes of traffic conditions. 5) Genetic Algorithms (GA): Genetic algorithms are used to solve routing search and optimization problems. GA is meta-heuristics inspired from a natural metaphor. It simulates the way species evolve and adapt to their environment, according to the Darwinian principle of natural selection. In the beginning, a randomly or heuristically population is generated. Then, this cycle is repeated for a number of generations. When applied to vehicle routing problems, the classical GA solution scheme is modified [11]. Since GAs always have routes in a population during a search, it is possible for the route to be reevaluated in a short time using another route in the population and the constraints regarding all amenities in driving

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can be reflected in search [2]. 6) Hybrid Genetic Algorithms: Kanoh et.al [13] proposed a hybrid approach which combines Genetic Algorithm with Dijkstra to solve a dynamic multi-objective problem. This algorithm finds the solution simultaneously for three objective functions: route length, travel time and ease of driving. In order to apply GA to traffic system, their approach uses Dijkstra to calculate the initial population of high-quality routes. From that initial population, this approach applies GA to generate later routes generations.

4. IDENTIFICATION OF RESEARCH GAP AND PROBLEM

Computer traffic jam problem is not single day or once in a week problem; it will be possible in daily life. So, its suggested or computing to choose a best optical path from source to destination in best possible way. [1] Many people frequently deal with this question when planning trips with their cars. There are also many applications like logistic planning or traffic simulation that need to solve a huge number of such route queries.

 Let us consider the following naive route planning method:

1. Look for the next sensible motorway.

2. Drive on motorways to a location close to the target.

3. Leave the motorway and search the target starting from the motorway exit.

   Of course, it is true that this fast method does not always yield the optimal solution, but, in many cases, we obtain a reasonable approximation (pro- vided that source and target are not too close together and that we travel in a country whose motorway network is well developed).[5] This naive route planning method is based on a simple rule of thumb: when we are on our way to a remote target and pass by a city on a motorway, it usually does not pay to leave the motorway and look for a faster way through the city; in other words, usually, we can safely ignore all 'less important' city streets and stick to the 'more important' motorway since we know that the motorway provides the fastest way.

5. EXPECTED IMPACT ON ACADEMICS AND INDUSTRY

To obtain a robust implementation, we include extensive consistency checks in assertions and perform experiments that are checked against reference implementations, i.e., queries are checked against Dijkstra's algorithm and fast preprocessing algorithms are checked against naive implementation. Moreover, we created our own visualization tools [9] that can handle large graphs and are able to illustrate our route planning approaches. By this means,

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several possibilities for further improvements have been discovered and utilized.

It is understood that first tunnel was constructed by Egyptians and Babylonians about 4000 years ago. It was built to connect two buildings in Babylon.

6.   FUTURE WORK AND RESEARCH PLANNING METHODOLOGY

Advanced route planning is very enormous field of research. Whenever we have some traffic jam related problem in computer network. Here we reduce them all problems and we provide the solution of shortest route in networks using suitable algorithm through the system. Here we find the optimal path or shortest route planning in computer networks, then easily we can find out the specific route after applying this algorithm. We also reduce the daily life traffic jam problem by this research and also find the shortest route for meerut city computer network using advanced technology for rapid train project & also we update technology of the delhi rapid train project in tunnel techniques with latest device for security purpose of human life. It will be done trough computer system automatically . This will be the conclusion after completing the thesis .

6.1MAJOR INPUTS

Here we use a Satellites for analysis path in any network or in meerut city which play a major role to provide the timely and cost effective information about the resources of the city. With the increased availability and improved quality of multi-spatial and multi-temporal remote sensing data as well as new analytical techniques, it is now possible to monitor urban land cover/ land-use changes and urban sprawl in a timely and cost-effective way.

The technique that is used here is well known for the classification of the crops in the world, it is known as NDVI method of classification. Here this technique is used for the land cover classification of the Meerut city for find out shortest path planning in network. It is found that this technique is a very fast and efficient method of analysis. Here we introduce basic data structures, algorithms with some notations and this notation will be used in this thesis. All the fundamental part will be covered from Graphs, but that will be used in some different directions.

When dealing with point-to-point queries in a server environment (e.g., route planning systems that provide their services in the internet), transit-node routing can provide excellent response times as long as we consider a static scenario.

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6.2 AIM AND OBJECTIVES

Basic aim of our study is to provide minimum safe and secure path to human life & also analyze the Remote Sensing Data that we have received from the national remote sensing agency (space department, government of India); Integrating Spectral, Temporal and Spatial Features of the Objects in the area of satellite image processing. Here the multi-spectral remote sensing data is used to find the spectral signature of different objects of the Meerut city for the land cover classification, how the use of land changes according to time and also performed the temporal analysis to analyze the impact of climate over the surface.

7. CONCLUSION

As we have studied that use of Dijkstra and warshal's algorithms, which is a classical solution of graph theory this algorithm we can use as a protocols in router devices. All these algorithms having different benefits-and one common many-to-many approach. The evaluation is done in a far-reaching practical studying using outsized real world in a computer networks with approximate 3.25 crores junctions. A point to point doubt is then performed in a bidirectional manner such as forward and backward. Forward will count from source and backward from the target. Highway –node routing is associated in both the directions with hierarchical approach. This technique is conceptually effortlessness and quick processing, which allows the implementation of update routines that are able to react in fast processing manner like traffic jams.

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