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(57) Abstract :
A method for intelligent and predictive routing of data in communication networks utilizing machine learning algorithms to ensure optimal data pathways. The method continuously learns from historical and real-time traffic patterns, proactively adapts to diverse network architectures, anticipates vulnerabilities, and scales with the growth of the network. This results in enhanced efficiency, security, and adaptability of the communications system. Accompanied Drawing [FIGS. 1-2]

No. of Pages : 19 No. of Claims : 10

"**FORM 1** THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 **APPLICATION FOR GRANT OF PATENT** (See section 7, 54 and 135 and sub-rule (1) of rule 20)				(FOR OFFICE USE ONLY)	
		Application No.			
		Filing date:			
		Amount of Fee paid:			
		CBR No:			
		Signature:			
1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (✓)		Convention ( )		PCT-NP ( )	
Divisional ( )	Patent of Addition ( )	Divisional ( )	Patent of Addition ( )	Divisional ( )	Patent of Addition ( )
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
Andhra University		Indian	India	Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ()		Other than Natural Person			
		Small Entity (✓)	Startup ()	Others ()	
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (✓)	
If "No", furnish the details of the inventor(s)					
Name in Full		Nationality	Country of Residence	Address of the Inventor	
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5. Mr.Sriram Gopalam	Indian	India	Assistant Professor, Department of Computer Science, Andhra University, Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003

5. TITLE OF THE INVENTION

"A NOVEL METHOD FOR ROUTING DATA IN A COMMUNICATIONS NETWORK"

6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.	
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~~**8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION**~~

~~Country~~	~~Application~~	~~Filing date~~	~~Name of the~~	~~Title of the~~	~~IPC (as classified in the~~

	~~Number~~		~~applicant~~	~~invention~~	~~convention country)~~

~~9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)~~

~~International application number~~	~~International filing date~~

~~10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION~~

~~Original (first) application No.~~	~~Date of filing of original (first) application~~

~~11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT~~

~~Main application/patent No.~~	~~Date of filing of main application~~

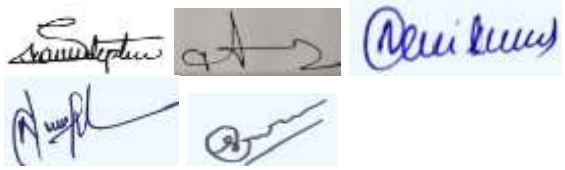
12. DECLARATIONS

i) Declaration by the inventor(s)

(**In case the applicant is an assignee**: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

I/We, the above named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date 24/08/2023

(b) Name	(c) Signature
1. Prof. James Stephen Meka 2. Prof.Augustine Tarala 3. Mr.I.Ravi Kumar 4. Mr.K. Joseph Noel 5. Mr.Sriram Gopalam	

~~(ii) Declaration by the applicant(s) in the convention country~~

~~(In case the applicant in India is different than the applicant in the convention country:~~ ~~the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)~~

~~I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.~~

~~(a) Date~~

~~(b) Signature(s)~~

(c) ~~Name(s) of the signatory~~

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- ☐ ~~I am/~~ We are in possession of the above-mentioned invention.
- ☐ The ~~provisional~~/complete specification relating to the invention is filed with this application.
- ☐ ~~The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.~~
- ☐ There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- ☐ ~~I am~~/we are the true & first inventor(s).
- ☐ ~~I am/we are the assignee or legal representative of true & first inventor(s).~~
- ☐ ~~The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of my/our invention(s).~~
- ☐ ~~I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.~~
- ☐ ~~My/our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.~~
- ☐ ~~The application is divided out of my /our application particulars of which is given inParagraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.~~
- ☐ ~~The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.~~

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

Item	Details	Fee	Remarks
Complete/ ~~Provisional~~ specification) #	No. of pages: 15		
No. of Claim(s)	No. of claims: 10 No. of pages: 02		
Abstract	No. of pages: 01		
No. of Drawing(s)	No. of drawings: 02 No. of pages: 01		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

(b) Complete specification (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).

(c) Sequence listing in electronic form

(d) Drawings (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).

(e) Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.

(f) Translation of priority document/Specification/International Search Report/International Preliminary Report on Patentability.

(g) Statement and Undertaking on Form 3

(h) Declaration of Inventorship on Form 5

(i)Power of Authority

(j)**Total fee ₹…….in Cash/ Banker's Cheque /Bank Draft bearing No..... Date on ……. Bank.**

I/We hereby declare that to the best of my/our knowledge, information and belief the fact and matters slated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this 24th day of August 2023

Applicant: Andhra University

To,

The Controller of Patents

The Patent Office, at Chennai

Note: -

* Repeat boxes in case of more than one entry.
* To be signed by the applicant(s) or by authorized registered patent agent otherwise where mentioned.
* Tick ()/cross (x) whichever is applicable/not applicable in declaration in paragraph-12.
* Name of the inventor and applicant should be given in full, family name in the beginning.
* Strike out the portion which is/are not applicable.
* For fee: See First Schedule";

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

The Patent Rules, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

TITLE OF THE INVENTION

"A NOVEL METHOD FOR ROUTING DATA IN A COMMUNICATIONS NETWORK"

Applicant

NAME	**NATIONALITY**	**ADDRESS**
Andhra University	Indian	Visakhapatnam, Andhra Pradesh, India. Pin Code: 530003

The following specification particularly describes the nature of the invention and the manner in which it is performed:

FIELD OF THE INVENTION

[001] The present invention pertains to the domain of telecommunications and, more particularly, to a novel method for routing data within communications networks. This invention seeks to enhance the efficiency, reliability, and adaptability of data transmissions across various network architectures, including but not limited to, wired, wireless, optical, and hybrid networks.

BACKGROUND OF THE INVENTION

[002] The following description provides the information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[003] Further, the approaches described in this section are approaches that could be pursued, but not necessarily approaches that have been previously conceived or pursued. Therefore, unless otherwise indicated, it should not be assumed that any of the approaches described in this section qualify as prior art merely by virtue of their inclusion in this section.

[004] The communications industry has witnessed tremendous growth over the past several decades, spurred by advances in technology, expanding infrastructure, and the insatiable demand for connectivity in the digital age. As the backbone of the digital revolution, communications networks play a pivotal role in transmitting vast amounts of data across the globe at breakneck speeds. From humble beginnings where data transmissions were primarily linear and rudimentary, today's networks have evolved into complex, multi-nodal entities, underpinned by sophisticated routing algorithms to determine the optimal paths for data packets.

[005] The very fabric of modern society, be it social interactions, business transactions, entertainment, or critical infrastructure operations, relies heavily on these networks. Thus, the efficiency and reliability with which data is routed through these networks can have far-reaching implications. Historically, data routing methods were built around static rules, where pre-defined paths were set based on initial network configurations. However, with the dynamism of network traffic, such static rules often proved inadequate, leading to congestion, data loss, and sub-optimal performance.

[006] Subsequent innovations introduced adaptive routing, where paths could change based on network conditions. Yet, even these methods have their limitations. As networks grow in size and complexity, and as the volume of data being transmitted soars, the challenges associated with efficient routing continue to magnify. Adding to this complexity is the diversity of modern communications platforms, encompassing wired, wireless, optical, and hybrid networks. Each of these platforms presents its own set of unique challenges and requirements when it comes to data routing.

[007] Moreover, with the advent of technologies such as the Internet of Things (IoT), edge computing, and 5G, the demand for low-latency, high-reliability data transmissions is ever-increasing. In such a landscape, the traditional routing methods, even the adaptive ones, often fall short. There is a pressing need for innovative routing methods that can cater to the intricacies of modern networks, ensuring not just efficient and reliable data transmission, but also scalability and adaptability to future technological shifts.

[008] The modern network ecosystem is not just complex but also incredibly dynamic. Traffic patterns change by the second, new devices continuously join

and leave the network, and real-time applications require split-second decision-making for data routing. This environment demands an approach that doesn't just react to changes but anticipates them, ensuring data is routed optimally even before potential bottlenecks or failures occur.

[009] Traditional algorithms often relied on periodic updates, which, in such a dynamic environment, can lead to outdated information guiding routing decisions. These outdated decisions can result in sub-optimal paths, increased latency, and in some cases, even network failures. Furthermore, as cyber threats grow in sophistication, relying on conventional methods can expose networks to vulnerabilities. Routing mechanisms need to be robust, not just in terms of efficiency but also security.

[010] The proposed invention, in recognizing these challenges, leverages state-of-the-art technologies and methodologies. Drawing insights from areas such as machine learning, the method goes beyond mere reactive adaptations. Instead, it learns from historical traffic patterns, predicts potential future challenges, and makes proactive adjustments. This predictive approach ensures that the network is always a step ahead, optimizing routes even before potential disruptions can occur.

[011] Furthermore, the method understands the heterogeneous nature of modern communications. Whether it's the high-speed requirements of a data center's optical links or the power and bandwidth constraints of a wireless IoT device, the invention tailors its routing decisions to the specific needs and constraints of each scenario. This results in a universally adaptable routing mechanism that, regardless of the network type or scale, consistently delivers peak performance.

[012] Another crucial aspect is scalability. As the digital universe continues its exponential growth, networks will inevitably need to handle even more data. The invention is designed with this future growth in mind. Instead of relying on brute force or simply adding more hardware, the method scales intelligently, ensuring that even as the network grows, performance and efficiency do not degrade.

[013] In conclusion, the landscape of communications is undergoing rapid transformation, driven by technological advancements and growing demands. Traditional routing methods, although foundational, are increasingly showing their age in this new era. The proposed invention, with its innovative approach to data routing, is poised to redefine the benchmarks of efficiency, reliability, and scalability in communications networks, ensuring that the digital revolution continues to thrive on a robust and adaptable backbone. Some patent prior art related to proposed invention mentioned below.

[014] "Dynamic Routing in Communication Networks"

This patent describes a method and system for dynamic routing of data in communication networks. The system employs periodic measurements of network metrics, such as bandwidth, latency, and congestion, to determine the most optimal route for data transmission. The method automatically adapts to changes in the network to avoid bottlenecks.

Relevance to Proposed Invention: While this patent covers dynamic routing based on periodic measurements, it doesn't explicitly discuss predictive modeling or machine learning as methods for route optimization.

[015] "Adaptive Data Routing in Networks Using Machine Learning"

The patent details a machine learning-based approach for data routing in networks. It takes into account historical traffic patterns to adjust routing decisions. The system continuously learns and updates its algorithms based on network performance and user feedback.

Relevance to Proposed Invention: This patent closely aligns with the machine learning aspects of the proposed invention. However, it does not delve into specific considerations for various communication platforms like optical or IoT networks.

[016] "Scalable Routing Mechanism for Heterogeneous Networks"

Abstract: This international patent application presents a method for routing data packets in heterogeneous networks comprising of wired, wireless, optical, and hybrid components. The mechanism adjusts in real-time based on network load, ensuring optimal performance across diverse network architectures.

Relevance to Proposed Invention: This patent covers the adaptability aspect across diverse network types, which is a component of the proposed invention. Still, it doesn't emphasize the predictive nature or the learning-based adjustments proposed.

[017] In this respect, before explaining at least one object of the invention in detail, it is to be understood that the invention is not limited in its application to the details of set of rules and to the arrangements of the various models set forth in the following description or illustrated in the drawings. The invention is capable of other objects and of being practiced and carried out in various ways, according to the need of that industry. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[018] These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

SUMMARY OF THE PRESENT INVENTION

[019] The proposed invention offers a groundbreaking method for routing data in communications networks, addressing the complexities and demands of contemporary digital communications. Recognizing the multifaceted nature of modern networks, which can include wired, wireless, optical, and hybrid systems, this method prioritizes efficiency, reliability, and adaptability.

[020] Leveraging advanced technologies like machine learning, the invention moves beyond traditional reactive adaptations, proactively learning from historical traffic patterns to predict future challenges. By doing so, it enables proactive adjustments, ensuring that networks are always primed for optimal performance, even before potential disruptions emerge. Tailored to cater to the diverse requirements of varying communications platforms, the method is designed to adjust its routing decisions based on the specific needs of each scenario, whether it be high-speed data centers or power-constrained IoT devices.

[021] Moreover, as the digital realm continues its rapid expansion, this invention scales intelligently, always ensuring peak performance regardless of network growth. Thus, it presents a solution that's not just fit for today's communications

challenges but is also future-ready, setting a new standard in data routing for the digital age.

[022] In this respect, before explaining at least one object of the invention in detail, it is to be understood that the invention is not limited in its application to the details of set of rules and to the arrangements of the various models set forth in the following description or illustrated in the drawings. The invention is capable of other objects and of being practiced and carried out in various ways, according to the need of that industry. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[023] These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[024] When considering the following thorough explanation of the present invention, it will be easier to understand it and other objects than those mentioned above will become evident. Such description refers to the illustrations in the annex, wherein:

[025] FIG. 1, illustrates a general functional working diagram, in accordance with an embodiment of the present invention.

[026] FIG. 2, illustrates a concept of the functional flow diagram, accordance with an embodiment of the present invention.in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[027] The following sections of this article will provide various embodiments of the current invention with references to the accompanying drawings, whereby the reference numbers utilised in the picture correspond to like elements throughout the description. However, this invention is not limited to the embodiment described here and may be embodied in several other ways. Instead, the embodiment is included to ensure that this disclosure is extensive and complete and that individuals of ordinary skill in the art are properly informed of the extent of the invention.

[028] Numerical values and ranges are given for many parts of the implementations discussed in the following thorough discussion. These numbers and ranges are merely to be used as examples and are not meant to restrict the claims' applicability. A variety of materials are also recognised as fitting for certain aspects of the implementations. These materials should only be used as examples and are not meant to restrict the application of the innovation.

[029] Referring now to the drawings, these are illustrated in FIG. **1**&**2,** In the realm of digital communications, the routing of data remains an integral part of ensuring efficient and timely delivery of information across networks. The proposed invention introduces an avant-garde method for navigating this intricate labyrinth of data paths, reshaping the very fundamentals of how data finds its way in a communications network.

[030] Whereas traditional systems often rely on static or semi-dynamic methods, often necessitating manual inputs or adjustments, this invention harnesses the power of advanced machine learning algorithms. By doing so, it empowers the network to be a learner, continuously collecting, analyzing, and adapting based on the immense troves of data it processes. This continuous cycle of learning is far from mere data crunching; it enables the network to be predictive, foreseeing potential challenges, traffic surges, or even points of failures. This level of foresight ensures that the routing decisions are not reactive, made in the aftermath of an event, but are proactive, effectively positioning the network to be always prepared, always optimal.

[031] But the genius of the invention isn't just in its predictive prowess. Recognizing the diverse landscapes of modern communication, it's crafted to be a chameleon, adapting seamlessly across various network architectures. Whether data is traversing the lightning-fast lanes of an optical network, navigating the bustling highways of wired networks, floating across the wireless waves, or making its way through hybrid networks, the method tailors its routing decisions with precision. Each decision is based on a deep understanding of the network type, its inherent challenges, advantages, and real-time conditions. This means an IoT device with bandwidth constraints or a high-performance server in a data center, both find their data routed with equal adeptness.

[032] Yet, the digital world is not static. Every day, the volume of data balloons, and networks expand, introducing new nodes, pathways, and complexities. Herein lies another facet of the invention's brilliance: its scalability. Rather than succumb to the weight of its own growth, the method scales with intelligence. As the network expands, the method's algorithms refine themselves, ensuring

that the performance and efficiency experienced on day one remain undiminished even on day thousand. The growth doesn't lead to chaos but brings about an organized evolution, each new node or pathway becoming a part of the learning organism that the network has become.

[033] As we delve deeper into the fabric of this innovative method, it's essential to recognize its implications in a hyper-connected world. The very essence of our contemporary digital society, from business transactions to personal communications, hinges on the assurance of swift and unbroken data delivery. The proposed invention, in many ways, emerges as the guardian of this assurance.

[034] Drawing parallels from nature, think of a river that effortlessly changes its course in response to obstacles, ensuring a continuous flow. This invention mimics that adaptive fluidity. It ensures that data, much like water in a river, finds the most efficient course, bypassing potential impediments, whether they be congested nodes or compromised links. This organic adaptability ensures that the end-users, often oblivious to the complexities of data routing, experience a seamless and uninterrupted flow of information.

[035] Moreover, as the scope of digital interactions expands, the security and integrity of data become paramount. In this regard, the invention's predictive algorithms play a dual role. Not only do they forecast traffic patterns and potential bottlenecks, but they also anticipate vulnerabilities, making the network not just efficient but also robust against threats. By continuously monitoring and learning from network activities, the method can discern anomalies, diverting data away from potentially compromised paths or nodes, thereby enhancing the network's overall security posture.

[036] Furthermore, the environmental footprint of sprawling digital infrastructures cannot be ignored. Massive data centers, hosting countless servers, consume significant energy, contributing to environmental concerns. The invention, by ensuring optimal data routing, can inadvertently lead to more efficient utilization of server resources, thereby potentially reducing energy consumption. When data is routed efficiently, it reduces the need for redundant transmissions and reduces the strain on servers, making the entire system more energy-efficient.

[037] In a broader societal context, as we stand on the cusp of breakthroughs like the Internet of Things (IoT), smart cities, and autonomous vehicles, the importance of efficient and predictive data routing is further amplified. These innovations will rely heavily on real-time data transmission, where even a split-second delay can have significant implications. The proposed invention, with its forward-looking, adaptable, and scalable nature, sets the stage for supporting these technological marvels, ensuring that as the world gets more connected, the underlying networks remain agile and adept.

[038] In summary, the described invention is not just a technological marvel but a cornerstone for the digital future. Its ability to predict, adapt, scale, and secure makes it an indispensable asset in the evolving digital landscape. As networks grow and technology evolves, this method promises to be the beacon guiding data through the vast digital oceans, ensuring it reaches its destination swiftly, securely, and smartly.

We Claim:

1. A method for routing data in communication networks, wherein said method utilizes machine learning algorithms to analyze historical and real-time traffic patterns and make predictive routing decisions based on said analysis.
2. The method of claim 1, wherein the machine learning algorithm continuously updates its knowledge base and refines its predictive model based on continuous feedback from the network's performance metrics.
3. The method of claim 1, wherein the system proactively identifies and bypasses potential bottlenecks or congested nodes, ensuring optimal data transmission speeds.
4. A method as described in claim 1, wherein said routing algorithm adapts to diverse network architectures, including but not limited to wired, wireless, optical, and hybrid systems, tailoring its routing decisions based on the specific requirements of each architecture.
5. The method of claim 1, wherein the system anticipates and identifies potential security vulnerabilities in the network, rerouting data away from compromised paths or nodes to maintain data integrity and security.
6. A method as described in claim 1, which scales intelligently as the network grows, ensuring that routing efficiency and performance remain consistent irrespective of the size and complexity of the network.
7. The method of claim 1, wherein the system reduces the need for redundant data transmissions by optimizing routing paths, leading to more efficient utilization of server resources and reduced energy consumption.
8. A method as described in claim 1, wherein the routing decisions are made in real-time, supporting applications that demand instantaneous data

transmission, including but not limited to IoT devices, autonomous vehicles, and smart city infrastructures.

9. The method of claim 1, wherein the routing mechanism integrates seamlessly with existing network infrastructures without necessitating a complete overhaul of current systems.

10. A method as outlined in claim 1, wherein the system offers an interface for network administrators to input manual adjustments or constraints, ensuring flexibility and control over the automated routing decisions made by the machine learning algorithm.

Dated this 24th day of August 2023

Applicant

Andhra University

ABSTRACT

A NOVEL METHOD FOR ROUTING DATA IN A COMMUNICATIONS NETWORK

[039] A method for intelligent and predictive routing of data in communication networks utilizing machine learning algorithms to ensure optimal data pathways. The method continuously learns from historical and real-time traffic patterns, proactively adapts to diverse network architectures, anticipates vulnerabilities, and scales with the growth of the network. This results in enhanced efficiency, security, and adaptability of the communications system.

Accompanied Drawing **[FIGS. 1-2]**

Dated this 24th day of August 2023

Applicant

Andhra University

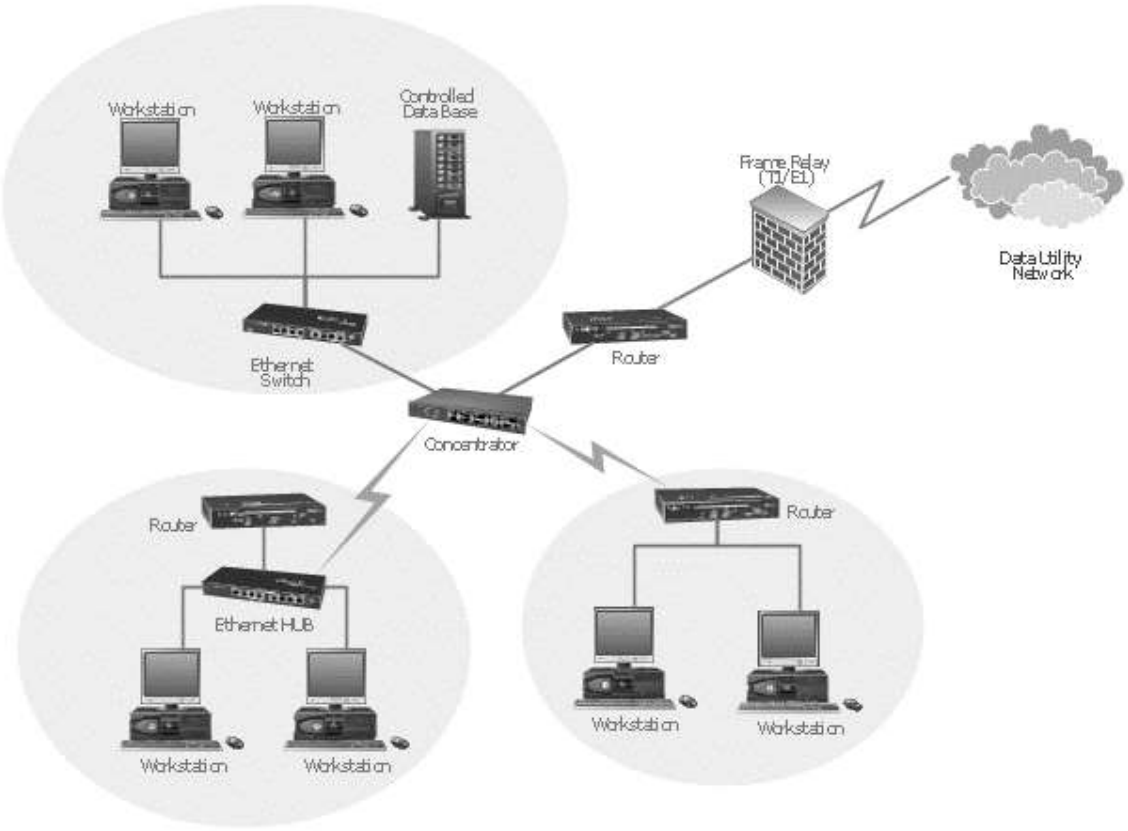


Figure 1

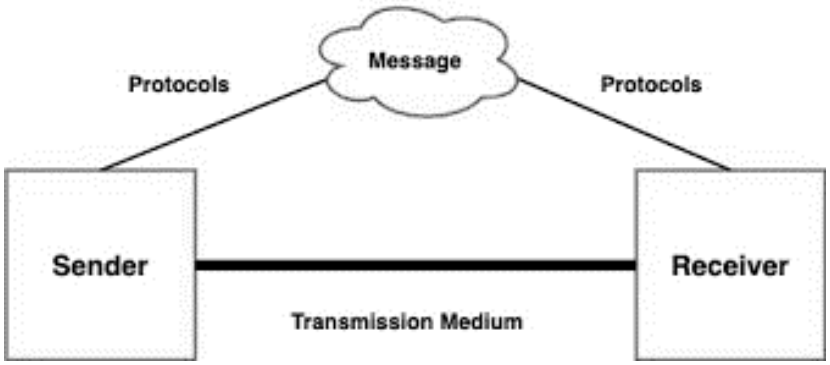


Figure 2

Dated this 24th day of August 2023