Maratha Vidya Prasarak Samaj's
Karmaveer Adv. Baburao Ganapatrao Thakare College Of Engineering
Nashik-13.
(NAAC ACCREDITED INSTITUTE WITH 'A' GRADE)

DEPARTMENT OF ELECTRONICS &TELECOMMUNICATION ENGG.

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Department Vision:-

To be recognized as an excellent department offering competent technical education to create competent electronics & telecommunication engineers for the benefit of the common masses.

Department Mission:-

Committed to serve the needs of society through innovative teaching learning processes, promoting industry-institute interaction to provide competent and cultured electronics and telecommunication engineers.

Program Educational Objectives:-

1. *To impart state of art technical education in the Electronics & Telecommunication Engineering.*
2. *To promote society beneficial projects and activities.*
3. *To develop soft skill, team work, professional ethics and multidisciplinary approach for the career enhancement.*
4. *To bridge the gap between Industry-Institute through collaboration with Industries, Institutions and Universities.*
5. *To provide suitable infrastructure and facilities in tuned with advancing technological evaluation.*

Greeting,

Department of Electronics and Telecommunication Engineering is celebrating Engineers Day by unveiling technical newsletter "TeChronicle" VOL7, ISSUE-3 on 15th September 2025. The Government of India decided to mark the birth anniversary of Mokshagundam Visvesvaraya to remember his exceptional contributions in the field of Engineering.

Role and Use of Data Centers and Cloud Servers in Electronics & Telecommunication Engineering

[Aditya Patil & Deepesh Bhope(S.Y.E&TC)]

Abstract

The rapid advancement of digital communication technologies has brought a revolutionary transformation in the field of Electronics and Telecommunication Engineering. In the modern era, almost every digital service such as mobile communication, cloud-based applications, online streaming platforms, and Internet of Things (IoT) systems depends on powerful computing infrastructure operating in the background. Data centres and cloud servers form the backbone of this infrastructure by enabling efficient storage, processing, and transmission of massive volumes of data in real time.

These systems ensure high-speed communication, reliability, scalability, and security, which are essential for modern telecommunication networks. This paper presents a comprehensive study of data centers and cloud computing, focusing on their architecture, working principles, role in communication systems, real-world applications, advantages, challenges, and future scope in Electronics and Telecommunication Engineering.

Reference:

Ministry of Electronics and Information Technology (MeitY), "Digital India Programme,"
Available: https://www.meity.gov.in

Role of Data Centers in Telecommunication Engineering

[Avinash Gholap & Soham Paradkar (S.Y.E&TC)]

Backbone of Communication Networks

Data centres act as the core operational units of modern telecommunication networks, where all major data processing and network management activities are carried out. In advanced communication systems such as 4G and 5G networks, critical operations including call routing, signal processing, subscriber authentication, traffic management, and billing systems are executed within these facilities.

These operations are performed at extremely high speeds to ensure that communication services are delivered without delay or interruption. Data centers are designed with highly reliable infrastructure that includes redundant systems, backup power supplies, and multiple communication links. This ensures continuous service availability even in case of hardware failures or network issues.

In addition, data centers function as Network Operation Centers (NOCs), where engineers continuously monitor network performance, analyze traffic patterns, and detect faults in real time. This allows quick resolution of issues and ensures efficient network operation. As a result, data centers play a crucial role in maintaining the stability, reliability, and performance of telecommunication systems.

Reference:

Telecom Regulatory Authority of India (TRAI), "Telecom Performance Indicators Report,"
Available: https://www.trai.gov.in

Tata Communications Tier IV Data Centre, GIFT City, Gandhinagar, Gujarat, India

Data Center Architecture and Working

[Krishna Pawar, S.Y.E&TC]

A data center is a highly complex and integrated system consisting of multiple components that work together to provide reliable computing services. At the heart of the data center are high-performance servers, which are responsible for executing applications, processing user requests, and handling computational tasks. These servers are arranged in racks and operate continuously to support large-scale data processing.

Storage systems are another critical component, as they store vast amounts of digital information including multimedia content, databases, and application software. These systems use advanced technologies such as solid-state drives and distributed storage to ensure fast access and high reliability.

Networking infrastructure, including routers, switches, and optical fiber communication links, enables high-speed data transfer between servers and external networks. This ensures seamless communication across different parts of the network.

Power systems such as uninterrupted power supplies and backup generators are used to maintain continuous operation even during power failures. Cooling systems, including air and liquid cooling technologies, are essential to regulate temperature and prevent overheating of equipment. The proper coordination of all these components ensures efficient and reliable operation of the data center.

Reference:

Cisco Systems, "Data Center Networking Architecture," Available: https://www.cisco.com

Edge Computing and Content Delivery

With the increasing demand for real-time applications, traditional centralized data processing is no longer sufficient. Edge computing has emerged as a modern approach in which data processing is performed closer to the end user. This reduces the distance that data must travel, resulting in faster response times and improved system performance.

Edge data centers are strategically located near users to support applications that require low latency and high speed. These include online gaming, video streaming, augmented reality, autonomous vehicles, and smart city systems. By processing data locally, edge computing reduces network congestion and enhances the overall efficiency of communication systems.

In 5G networks, edge computing plays a vital role by enabling ultra-low latency communication and supporting advanced applications. It represents a significant shift in the design and operation of modern telecommunication networks.

Reference:

IEEE Communications Society, "Edge Computing Technologies," Available: https://standards.ieee.org

Role of Cloud Servers in E&TC Engineering
[Ritesh Bachhav & Aditya Deore (S.Y.E&TC)]

Concept and Working of Cloud Computing
Cloud computing is a technology that provides computing resources such as storage, processing power, and software applications over the internet. Cloud servers are virtual systems hosted within large data centers, allowing users to access resources remotely without the need for physical infrastructure.
This system operates on the principle of virtualization, where physical hardware is divided into multiple virtual machines that can be used by different users simultaneously. This ensures efficient utilization of resources and reduces hardware costs.
Cloud computing has transformed telecommunication systems by enabling flexible, scalable, and cost-effective solutions for data management and processing. It allows service providers to deliver high-quality services without the need for extensive physical infrastructure.
Reference:
Amazon Web Services (AWS), "Overview of Cloud Computing," Available: https://aws.amazon.com

Scalability and Flexibility in Communication Systems
One of the most important features of cloud computing is its ability to scale resources according to demand. Telecommunication networks experience varying traffic conditions, with peak usage during certain periods and lower demand at other times.
Cloud systems can dynamically allocate resources during high traffic conditions to maintain performance and reduce latency. Similarly, resources can be reduced during low demand to optimize energy consumption and cost.
This flexibility ensures efficient utilization of resources and allows telecom operators to provide reliable services to users. It also supports the rapid deployment of new applications and services, making cloud computing an essential component of modern communication systems.
Reference:
Microsoft Azure, "Cloud Scalability and Performance,"
Available: https://learn.microsoft.com/en-us/azure

IoT and Smart Applications
Cloud platforms play a crucial role in enabling Internet of Things applications by processing and analyzing data generated by connected devices. IoT devices continuously collect data from the environment and transmit it to cloud servers for analysis.
This enables a wide range of applications such as smart cities, remote healthcare monitoring, industrial automation, and intelligent transportation systems. Cloud computing provides the computational power required to analyze large datasets and generate meaningful insights in real time.
The integration of IoT with cloud computing enhances communication efficiency and enables advanced automation and decision-making capabilities in modern systems.
Reference:
NASSCOM, "IoT and Cloud Integration Report,"
Available: https://nasscom.in
Real-Life Example
A common real-life example of data centers and cloud computing is video streaming services. When a user plays a video, the request is transmitted through the telecommunication network to a data center. The cloud server processes the request and retrieves the required content from storage.
The content is then delivered back to the user through high-speed communication networks within seconds. When multiple users access the service simultaneously, cloud systems distribute the workload across multiple servers to ensure smooth performance and avoid network congestion.
This example clearly demonstrates how data centers and cloud servers work together to provide efficient and reliable digital services.
Reference:
Google Cloud, "Cloud Computing in Media Streaming," Available: https://cloud.google.com

Latest Technical News:
[Manish Deore & Tushar Dhole (S.Y.E&TC)]
Rapid Growth of AI-Driven Data Centers
The demand for artificial intelligence applications has significantly increased the need for high-

performance data centers. Modern AI models require massive computational power, which is driving the development of advanced data center infrastructure equipped with GPUs and high-density servers. Telecom operators and cloud providers are investing heavily in AI-ready infrastructure to support applications such as machine learning, automation, and real-time analytics. This trend is transforming traditional data centers into intelligent processing hubs capable of handling complex workloads efficiently.

Reference:

TierPoint, "Top Data Centre Industry Trends 2026," Available: https://www.tierpoint.com

Emergence of Edge Computing in 5G Networks

With the expansion of 5G technology, edge computing is becoming a critical component of modern telecommunication systems. Instead of relying on centralized data centers, data processing is now performed closer to users, reducing latency and improving performance. This development supports applications such as autonomous vehicles, smart cities, and industrial automation. Telecom operators are increasingly deploying distributed edge infrastructure to meet the growing demand for real-time services.

Reference:

Tietoevry, "Key Telecom Trends 2026," Available: https://www.tietoevry.com

Shift Towards Sovereign Cloud and Data Security

Governments and organizations worldwide are focusing on data sovereignty, ensuring that sensitive data is stored and processed within national boundaries. This has led to the development of sovereign cloud infrastructure, where local control, security, and compliance are prioritized. Telecom operators are playing a key role in building secure and region-specific cloud environments to meet regulatory requirements and enhance trust in digital systems.

Reference:

Omdia & Telecom Reports, "Telecom Trends 2026," Available: https://omdia.tech.informa.com

Massive Investments in Data Center Infrastructure

Recent industry developments show a significant increase in investment in data center infrastructure. Telecom companies and cloud providers are allocating billions of dollars to expand their data center capacity to meet the growing demand for cloud services. This expansion is driven by increasing data consumption, digital transformation, and the rise of AI-based applications.

Reference:

Reuters, "Iliad Data Center Investment News," Available: https://www.reuters.com

Energy Challenges and Green Data Centers

As data centers consume large amounts of energy, there is a growing focus on sustainable and energy-efficient solutions. New technologies such as long-duration energy storage and renewable energy integration are being developed to support the increasing power demands of data centers. Companies are investing in green data centres to reduce environmental impact while maintaining high performance and reliability.

Reference:

Reuters, "Energy Storage for Data Centres," Available: https://www.reuters.com

Development of Space-Based Data Centers

One of the most innovative developments in recent years is the concept of space-based data centers. Companies are exploring the possibility of deploying data centers in orbit to handle large-scale computing tasks and reduce energy constraints on Earth. These systems use advanced optical communication and satellite networks to process and transmit data. Although still in the early stages, this technology has the potential to revolutionize global communication and computing infrastructure.

Reference:

Nature Electronics & Industry Reports, "Space-Based Data Centers," Available: https://datacentremagazine.com

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