SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING-IOT Including CS&BCT

COURSE NAME : 19SB602 FULL STACK DEVELOPMENT FOR NEXT GENERATION IOT

III YEAR / VI SEMESTER

Unit V - NG-IoT-Next Generation Internet of Things
Topic :5G IOT Networks

5G IOT Networks

- 5G stands for **Fifth Generation** wireless technology.
- Enables **ultra-fast,** **low-latency,** **and** **high-capacity** communication.
- Powers the next wave of **IoT (Internet of Things)** with improved speed and connectivity.
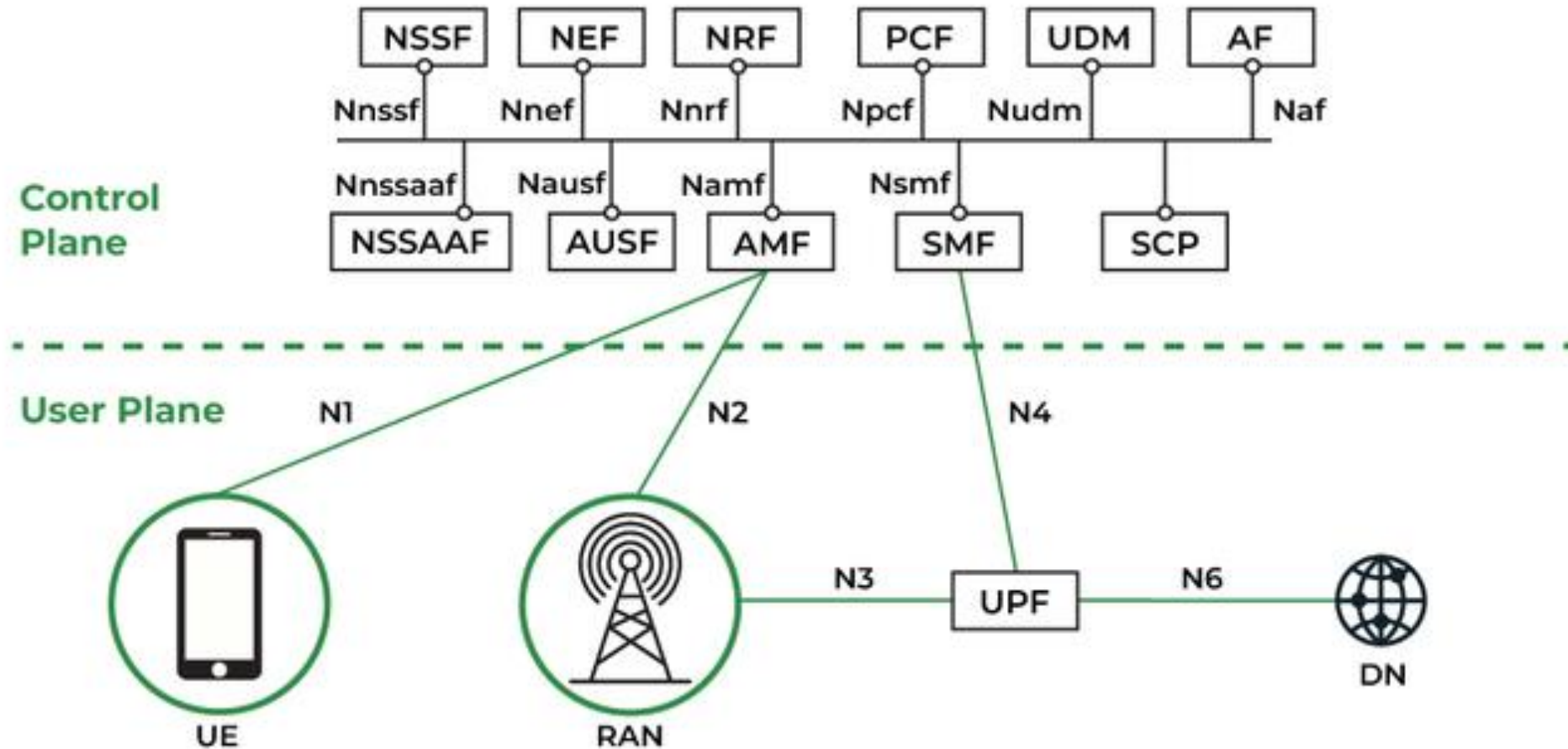- Supports **massive device deployments**, real-time data transfer, and automation.

Key Features of 5G for IoT

- **High Data Speeds:** Up to 10 Gbps, ideal for rich media and real-time monitoring.
- **Ultra-Low Latency:** As low as 1 ms for real-time responsiveness.
- **Massive Device Connectivity:** Can support up to 1 million devices per km².
- **Improved Reliability:** Critical for healthcare, autonomous vehicles, and industrial IoT.
- **Energy Efficiency:** Enhanced battery life for IoT sensors and devices.
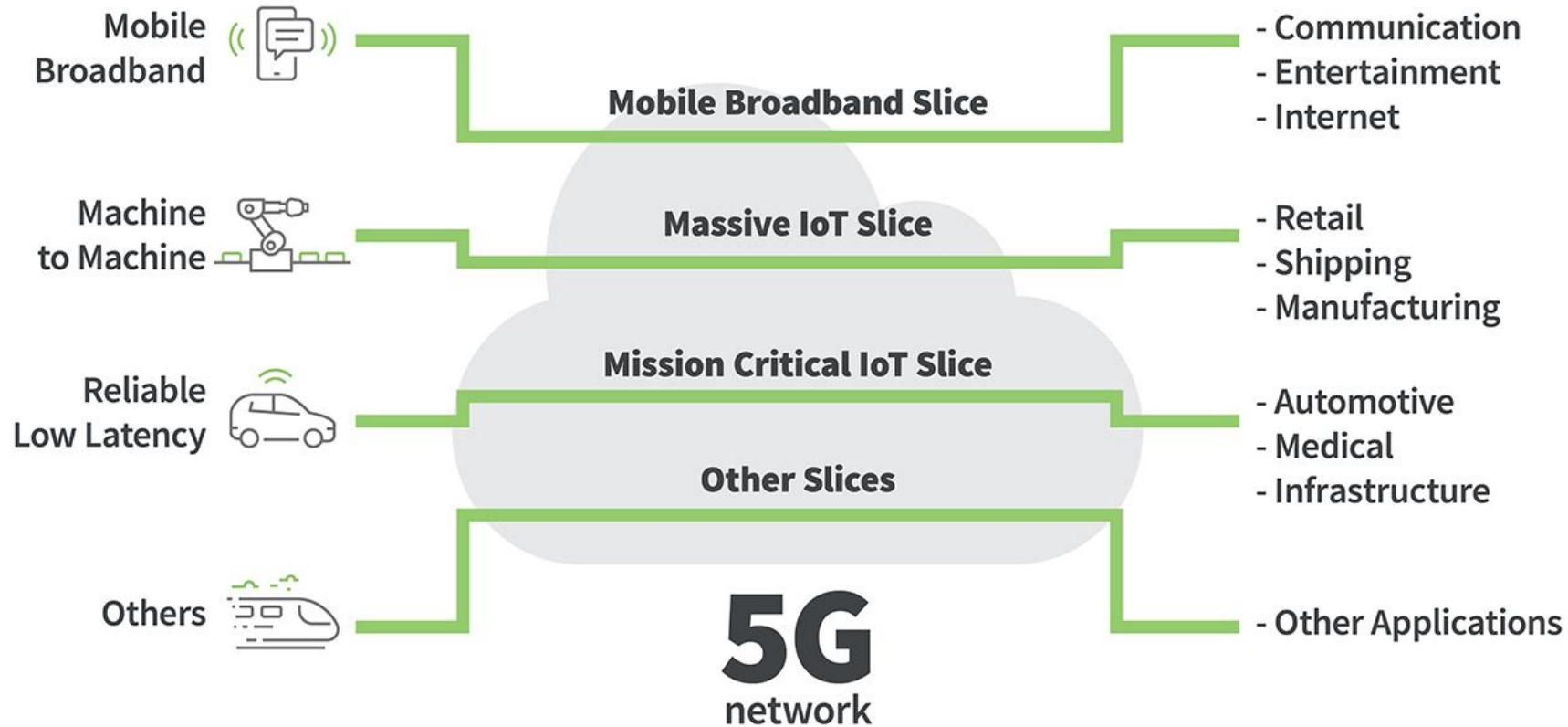
Architecture of 5G IoT Network

- **Core Network:** Software-defined, cloud-native architecture.
- **Edge Computing:** Data processed near the source for minimal delay.
- **Radio Access Network (RAN):** Supports high-frequency mm Wave and sub-6 GHz bands.
- **Network Slicing:** Virtual networks tailored for specific IoT applications.

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Functions of 5G network:

- **NRF(Network Repository Function):** All of the 5G network functions (NFs) in the operator's network are stored centrally in the Network Repository Function (NRF). The NRF provides a standards-based API that enables 5G NFs to register and find one another. A crucial element needed to execute the new service-based architecture (SBA) in the 5G core is NRF.

- **PCF (Policy Control Function):** Policy Control Function makes it simple to develop and implement policies in a 5G network. PCF will help you monetize and reap the rewards of 5G because it was created and designed using cloud-native principles to address the demands of 5G services.

Functions of 5G network:

- **BSF (Binding Support Function):** The Session Binding Function on the Diameter Routing Agent (DRA) used in 4G is comparable to the 5G Binding Support Function (BSF). When numerous Policy Control Function (PCF) systems are installed in the network, it becomes a necessary necessity.

- **SCP (Service Communication Proxy):** By granting routing control, resiliency, and observability to the core network, Service Communication Proxy (SCP) enable operators to securely and effectively operate their 5G network. To address many of the issues brought on by the new service-based architecture (SBA) in the 5G core, SCP makes advantage of IT service mesh (ISTIO) and adds crucial capabilities to make it 5G-aware.

Functions of 5G network:

- **NSSF (Network Slicing Selection Function):** In the 5G environment, where a variety of services are offered, the NSSF (Network Slicing Selection Function) system is a solution to choose the best network slice available for the service requested by the user.

- **UDM (Unified Data Management)& UDR (User Data Repository):** UDM is cloud-native and created for 5G, similar to Home Subscriber Server (HSS) in LTE. It is in charge of creating the credentials needed for authentication, granting access depending on user subscription, and sending those credentials to the other network functions. It retrieves the credentials from the User Data Repository (UDR). Different key 5G features are supported by the UDM network function. In order to complete the authentication process, it creates authentication credentials. Based on user subscriptions, it approves network access and roaming.

Functions of 5G network:

- **AUSF (Authentication Server Function):** 5G authentication and Key Agreement method 5G AKA are carried out via the authentication server function. In order to manage hidden or privacy-protected subscription identifiers, AUSF also provides additional functionality. During the registration process, AMF(Access and Mobility Function) is in charge of choosing the proper Authentication Server Function (AUSF).

- **NWDAF (Network Data Analytics Function):** The 5G Network Data Analytics Function (NWDAF) is intended to improve the end-user experience by streamlining the production and consumption of key network data as well as generating insights and taking appropriate action. By expediting the production and consumption of core network data, creating insights, and acting on these insights, NWDAF is intended to address market fragmentation and proprietary solutions in the field of network analytics.

WORKFLOW

1.IoT Devices
- •Sensors, actuators, and smart objects that collect data from the environment.

2.IoT Gateway
- •Aggregates data from IoT devices and ensures protocol translation and local processing.
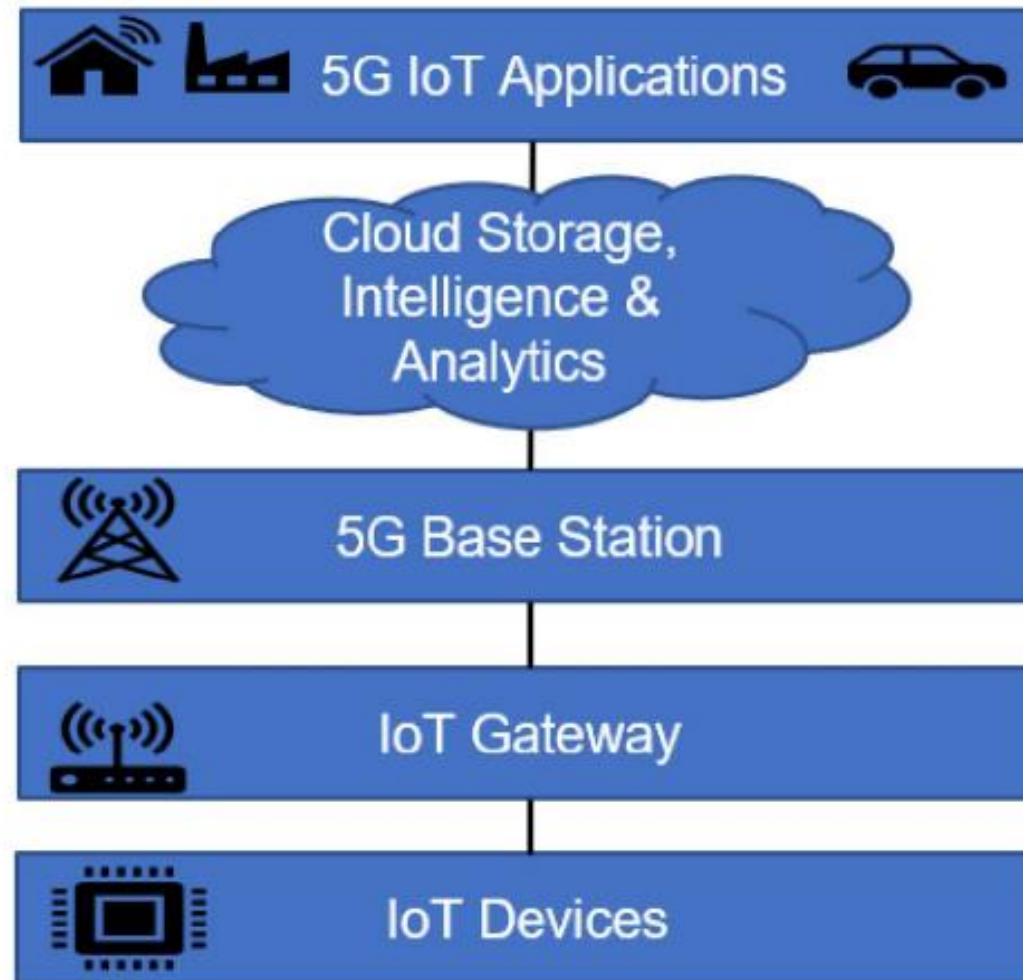
3.5G Base Station
- •Provides ultra-fast, low-latency wireless communication to the gateway and connects to the core network.

4.Cloud Storage, Intelligence & Analytics
- •Centralized cloud platform for storing data, applying AI/ML algorithms, and performing real-time analytics.

5.5G IoT Applications
- •Smart homes, smart factories, autonomous vehicles, and other applications leverage processed data for decision-making.

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Benefits of 5G in IoT

•Ultra-low latency (1 ms)

•Higher device density (up to 1 million devices/sq km)

•High reliability and network slicing

•Real-time analytics and edge computing

Use Cases of 5G IoT

- **Smart Cities**: Traffic control, waste management
- **Healthcare**: Remote surgery, patient monitoring
- **Industry 4.0**: Automated factories, predictive maintenance
- **Transportation**: Connected cars, autonomous driving

Challenges and Future Scope

- **Challenges**:
    - High deployment cost
    - Security and privacy concerns
    - Interoperability
- **Future Scope**:
    - Integration with AI and blockchain
    - Expansion in rural and remote areas
    - Development of autonomous ecosystems

CONCLUSION

5G is transforming IoT with lightning-fast speeds, massive device connectivity, and intelligent edge computing.It enables real-time communication across industries, from smart cities to autonomous vehicles.With low latency and high scalability, 5G allows IoT ecosystems to expand effortlessly.Integrated AI further enhances decision-making and automation at the network edge. Thus, 5G acts as a vital catalyst for the next wave of global digital transformation.

Any Query????

Thank you……