List and explain the essential characteristics of cloud computing as per NIST

The National Institute of Standards and Technology (NIST) defines cloud computing through a set of essential characteristics that distinguish cloud services from traditional IT. Below are the five essential characteristics of cloud computing as per NIST, along with their explanations:

---

1. **On-Demand Self-Service**
    - **Explanation:**
      Users can automatically provision computing capabilities such as server time and network storage without human intervention from service providers. This means that resources are available whenever customers need them, enabling rapid deployment and flexibility.

---

1. **Broad Network Access**
    - **Explanation:**
      Cloud services are available over the network and accessed through standard mechanisms that promote use by heterogeneous platforms (e.g., mobile phones, laptops, and workstations). This characteristic ensures that services are accessible from various devices and locations, increasing the convenience and usability for end users.

---

1. **Resource Pooling**
    - **Explanation:**
      The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer

demand. Resource pooling leads to economies of scale, providing efficient allocation of cloud infrastructure and enhanced flexibility.

---

1. **Rapid Elasticity**

   - **Explanation:**
     Cloud resources can be scaled up or down quickly and dynamically in response to changes in demand. This “elasticity” enables businesses to handle workload fluctuations efficiently, ensuring that they pay only for the resources that are used without the need for over-provisioning.

---

1. **Measured Service**

   - **Explanation:**
     Cloud systems automatically control and optimize resource usage by leveraging a metering capability. This means that the provider monitors, controls, and reports resource usage, offering transparency for both the provider and the consumer. Billing is typically based on the measured usage of the resources (e.g., storage, processing power, bandwidth), ensuring an efficient and cost-effective consumption model.

Summary

These five characteristics—on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service—form the core attributes of cloud computing as defined by NIST. Together, they enable a flexible, scalable, and cost-efficient model of computing that can adapt quickly to changing user demands, making cloud services an attractive solution for a wide range of applications and businesses.