**5G Non-Standalone (NSA) Base Station v/s 5G Standalone (NSA) Base Station**

**5G Non-Standalone (NSA) Base Station**

**Architecture**

* **Dual Connectivity**: NSA base stations (gNodeBs) work in conjunction with existing 4G LTE eNodeBs. Devices are connected to both 4G and 5G networks simultaneously.
* **Control and User Plane**: The control plane is managed by the 4G LTE network (eNodeB), while the user plane (data traffic) can be managed by both 4G LTE and 5G NR (New Radio).
* **Dependence on 4G Core**: The 5G NSA base stations rely on the 4G LTE core network (Evolved Packet Core - EPC) for control signaling.

**Interfaces**

* **X2 Interface**: Connects 4G LTE eNodeB to 5G NR gNodeB, allowing coordination and dual connectivity.
* **S1 Interface**: Connects eNodeBs to the EPC.
  + **S1-U**: Handles user plane traffic.
  + **S1-MME**: Manages control plane signaling.
* **Xn Interface**: Used between gNodeBs for handover and other inter-gNodeB functions.

**Features**

* **Rapid Deployment**: Faster to deploy since it uses existing 4G infrastructure.
* **Incremental Upgrades**: Allows for incremental upgrades and investments as operators can leverage existing 4G LTE networks.
* **Improved Throughput**: Enhanced data speeds through the combination of 4G and 5G.

**5G Standalone (SA) Base Station**

**Architecture**

* **Independent Operation**: SA base stations (gNodeBs) operate independently of the 4G LTE network and are connected directly to the 5G core (5GC).
* **Dedicated 5G Core**: All signaling and data traffic are managed through the 5G core network, enabling full 5G capabilities.
* **Enhanced Network Features**: Supports advanced 5G features such as network slicing, ultra-reliable low latency communications (URLLC), and enhanced mobile broadband (eMBB).

**Interfaces**

* **NG Interface**: Connects gNodeBs to the 5G core.
  + **NG-C (N2)**: For control plane signaling.
  + **NG-U (N3)**: For user plane traffic.
* **N1 Interface**: Connects the user equipment (UE) to the Access and Mobility Management Function (AMF) for control signaling.
* **N2 Interface**: Connects gNodeBs to the AMF for signaling.
* **N3 Interface**: Connects gNodeBs to the User Plane Function (UPF) for data transport.
* **Xn Interface**: Used between gNodeBs for handover and other inter-gNodeB functions.

**Features**

* **Full 5G Capabilities**: Unlocks the full potential of 5G technology, including lower latency, higher capacity, and support for a larger number of devices.
* **Advanced Services**: Enables advanced services such as network slicing and more efficient network management.
* **Future-Proof**: Designed to support future 5G developments without relying on 4G infrastructure.

Summary :

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| **5G Non-Standalone (NSA) Base Station** | **5G Standalone (SA) Base Station** |
| Relies on existing 4G infrastructure. | Operates independently with a dedicated 5G core. |
| Uses dual connectivity with 4G LTE for control plane and both 4G and 5G for user plane. | Uses 5G core for both control and user plane. |
| Interfaces include X2 and S1. | Interfaces include NG (N2 and N3), N1, and Xn. |