Multi Connection

DD Owned by David Cherney DISH •••
Last updated: Aug 22, 2023 • Initializing...

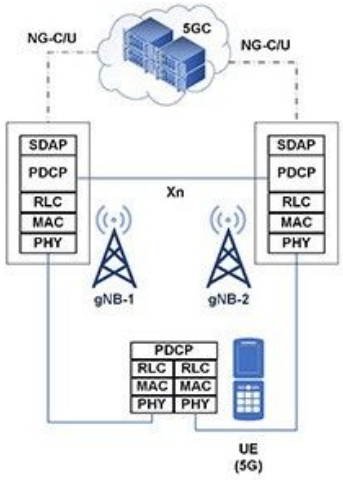
Definition: Multi-connectivity is a single UE consuming radio resources from multiple cells (DUs).

The term ‘multi-connectivity’ is denoted MC.

Please contrast the definition of MC with a related concept; carrier aggregation is a single UE consuming multiple radio resources from a single base station.

MC Techniques by Anchoring Layer

Data sent from or to different DUs can be reassembled into a single data stream upon arrival with the help of a Xn connection between base stations. This can be done at any of several layers.



Definition: The layer at which a multi connection scheme reassembles information is the multi-connection anchoring layer.

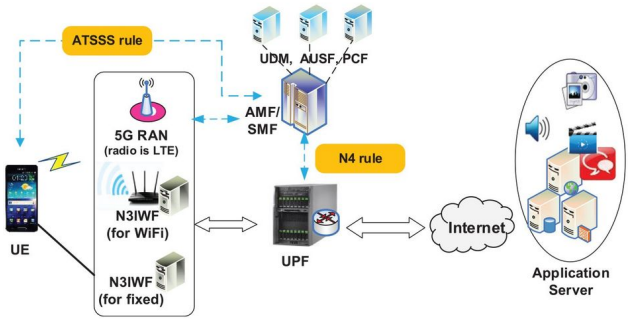
The delineation below presents MC schemes at various MC anchoring layers.

- Physical
  - Multiple transmission and reception point (mTRP)
  - Coordinated multi-point (CoMP)
    - includes multiple point coordination wherein scheduling and link adaption are coordinated between transmission points
    - includes multipoint transmission wherein multiple DUs transmit
    - includes dynamic point selection, wherein the transmitting DUs change in time for mobility
- Data Link (MAC or medium access control layer)
  - new radio unlicensed with carrier aggregation (NR-U with CA)
    - uses simultaneous NR and unlicensed spectrum.
    - is technically not MC since it uses one cell
- packet data convergence protocol (PDCP) (I think this is data link layer too)
  - NR dual connectivity (NR-DC)
    - two 5G radio connections
  - multi-radio dual connectivity (MR-DC)
    - one 4G and one 5G connection
  - NR-U with dual connectivity (NR-U with DC)

        - one base station on unlicensed spectrum, the other on NR
    - NR dual active protocol stack (DAPS)
        - uses simultaneous connection to multiple cells to facilitate seamless handoff
        - UE initially connects with a primary cell (PCell), then connects for a second cell (SCell) that it is likely to hand off to. If the UE goes into CM state `idle` then back to `connected` it connects to a new primary cell called the secondary primary cell (SPCell).
    - LTE WLAN
        - a 4G tool for offloading some traffic to a WiFi connection. Splitting from application traffic steering, switching, and splitting (ATSSS below) is the 5G analogy.
- Network
    - LTE WLAN radio level integration with IPSec (LWIP)
        - for 4G
- Transport layer multi-connection anchoring techniques
    - ATSSS via Multi-path TPC (MP TCP)
    - ATSSS via multi-path QUIC (MP QUIC)

ATSSS

Often UE have access to several access technologies to the 5G core. For example, a UE might have access to NG-RAN, LTE-RAN, satellite, WiFi, and wired ethernet connection.



- Steering is separately selecting an access type for each SDF within a PDU.
- Switching is moving a SDF from one access type to another.
- Splitting is allowing some of the packets for an SDF to flow over one access type, and other packets from the same SFD to flow over a different access type.

Together these options comprise access traffic steering, switching, and splitting (ATSSS), specified in release 16.