5G Radio Access Network

Huy Bui, Apr 2021

Agenda

Introduction
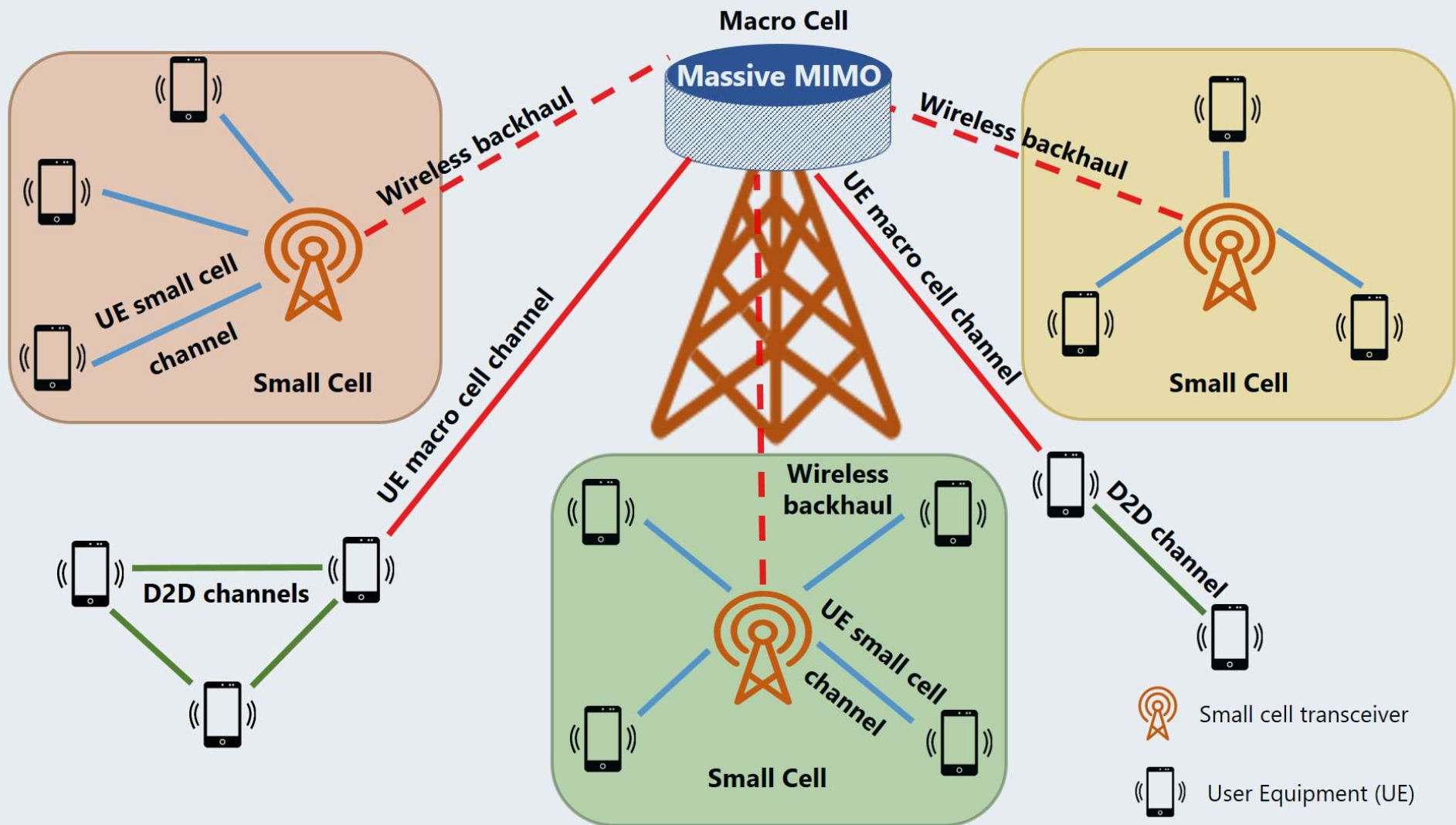
Definition

Logical Channels

Logical Channels
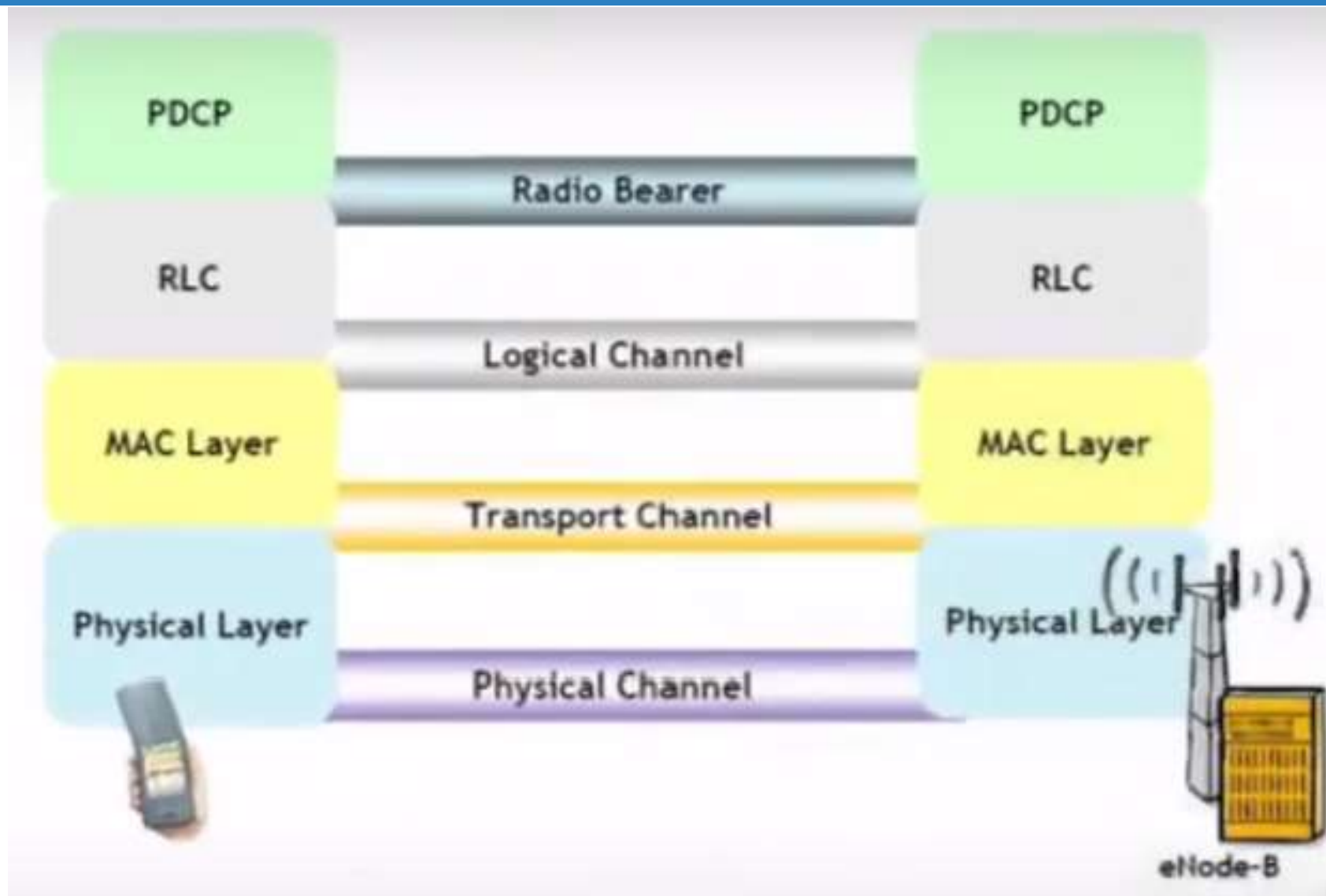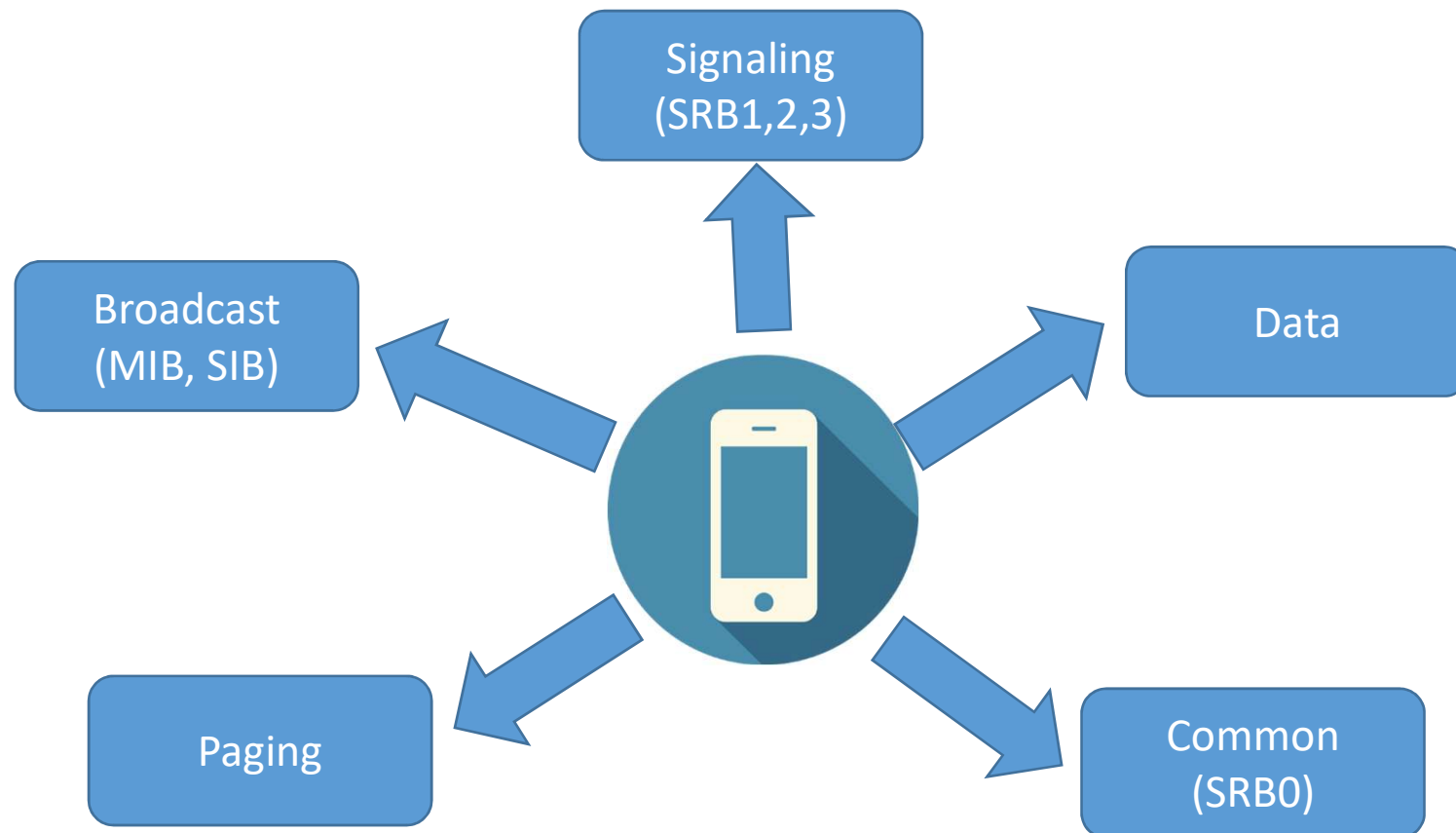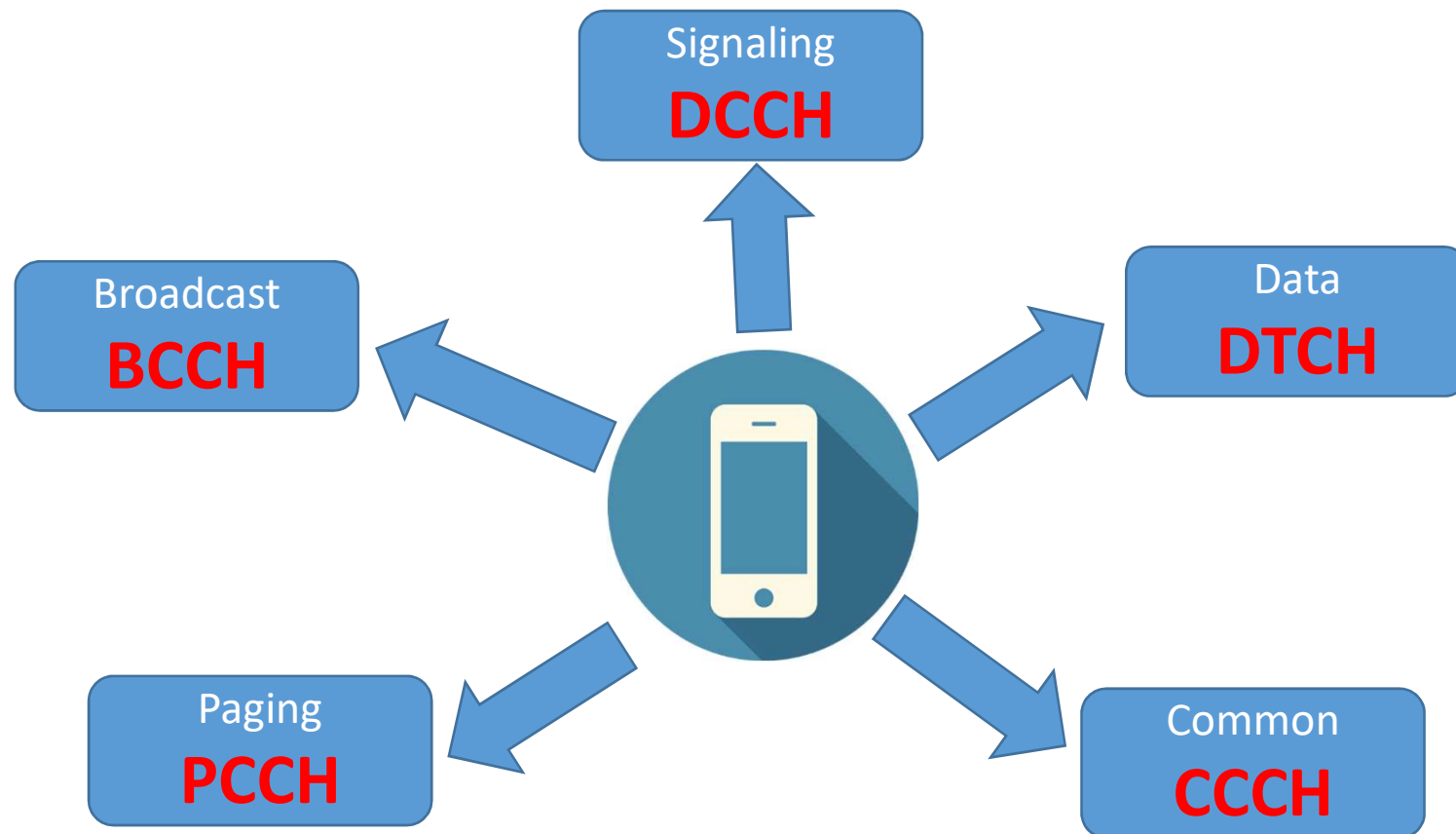
Logical channels

❖ **BCCH**
- System information (MIB, SIB) in SA
- Downlink only

❖ **PCCH**
- Paging message for LTE_IDLE UE in SA
- Downlink only

❖ **CCCH**
- Initial access signaling for RRC_IDLE UE

❖ **DCCH**
- Dedicated signaling with one UE

❖ **DTCH**
- IP User Plane Data

Transcript Channel

PCCH BCCH CCCH DCCH DTCH MAC Control

Logical Channel Priotization (UL only)

(De) Multiplexing

control

HARQ Random Access Control

MAC

PCH BCH DL-SCH UL-SCH RACH

Transport

PSS SSS PBCH DMRS CSI-RS SRS DMRS PDCCH DMRS PT-RS PDSCH DMRS PT-RS PUSCH DMRS PUCCH PRACH

PHY

SSB (SS Block)

-------- (Dotted Line)

This does not mean direct mapping between channels. It indicates a kind of indirect relation. For example, scheduling or HARQ response etc

Transport Block

Transport Channels

❖ **BCH (Broadcast channel)**

- Transmit MIB

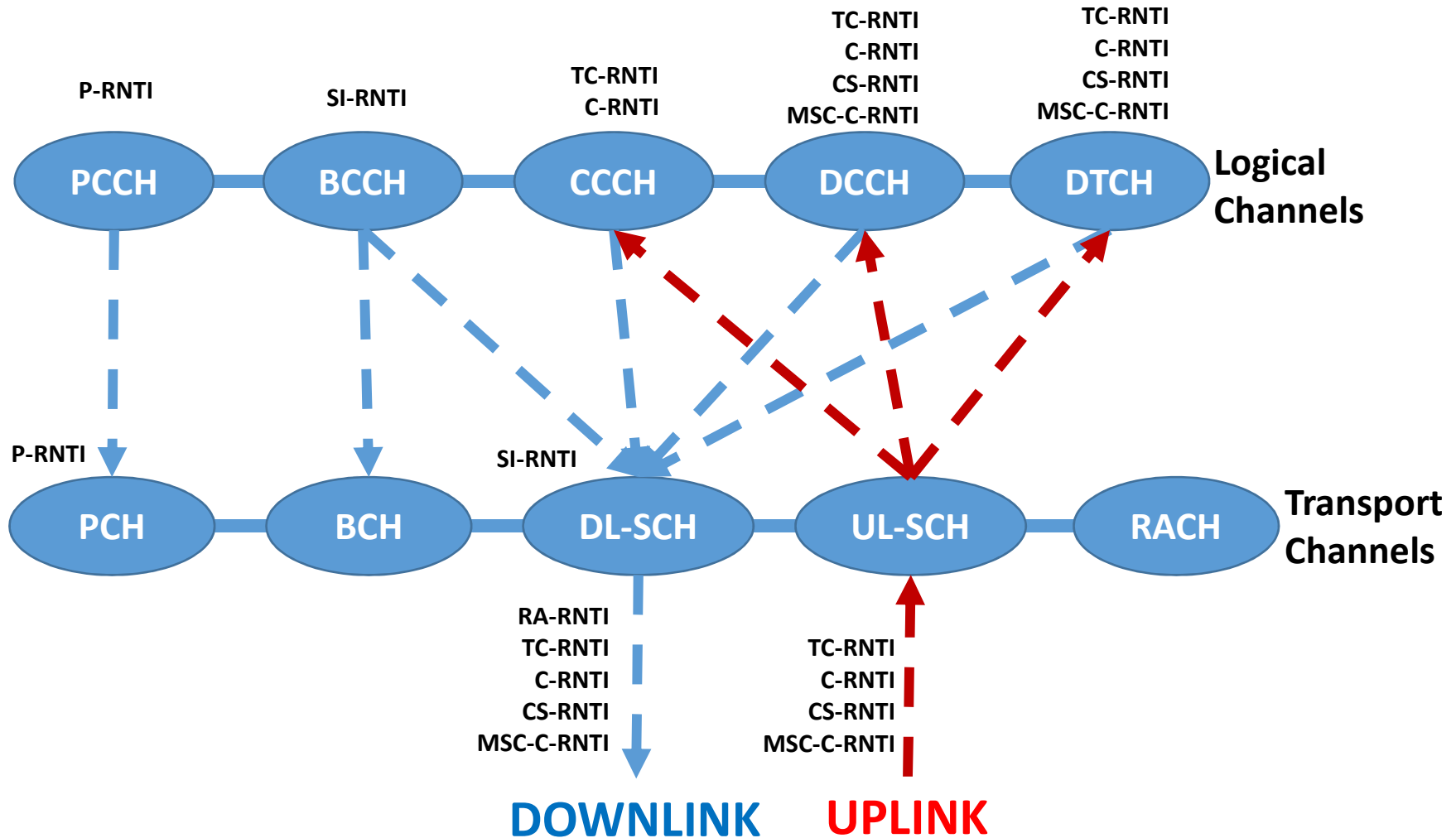❖ **PCH (Paging channel)**

- Transmit paging message

❖ **RACH (Random access channel)**

❖ **DL-SCH (Downlink shared channel)**

- Transmit downlink data in 5G
- Transmit SIB
- Support all 5G features:
  - **Dynamic Rate Adaption**
  - **Channel Aware scheduling**
  - **HARQ**
  - **Spatial Multiplexing**

❖ **UL-SCH (Uplink shared channel)**

Transport channels mapping

P-RNTI

SI-RNTI

TC-RNTI
C-RNTI

TC-RNTI
C-RNTI
CS-RNTI
MSC-C-RNTI

TC-RNTI
C-RNTI
CS-RNTI
MSC-C-RNTI

PCCH — **BCCH** — **CCCH** — **DCCH** — **DTCH**   **Logical Channels**

P-RNTI

SI-RNTI

PCH — **BCH** — **DL-SCH** — **UL-SCH** — **RACH**   **Transport Channels**

RA-RNTI
TC-RNTI
C-RNTI
CS-RNTI
MSC-C-RNTI

TC-RNTI
C-RNTI
CS-RNTI
MSC-C-RNTI

DOWNLINK   **UPLINK**

Physical Channels

❖ **PBCH(Physical broadcast channel)**

❖ **PRACH(Physical Random-access channel)**

- Not carry transport block

❖ **PDSCH(Physical downlink shared channel)**

- Unicast data transmission
- Random access response
- System information

❖ **PDCCH(Physical downlink control channel)**

- DCI (Downlink Control Information)
- Scheduling decision
- PD-SCH related information
- Scheduling grant for uplink data
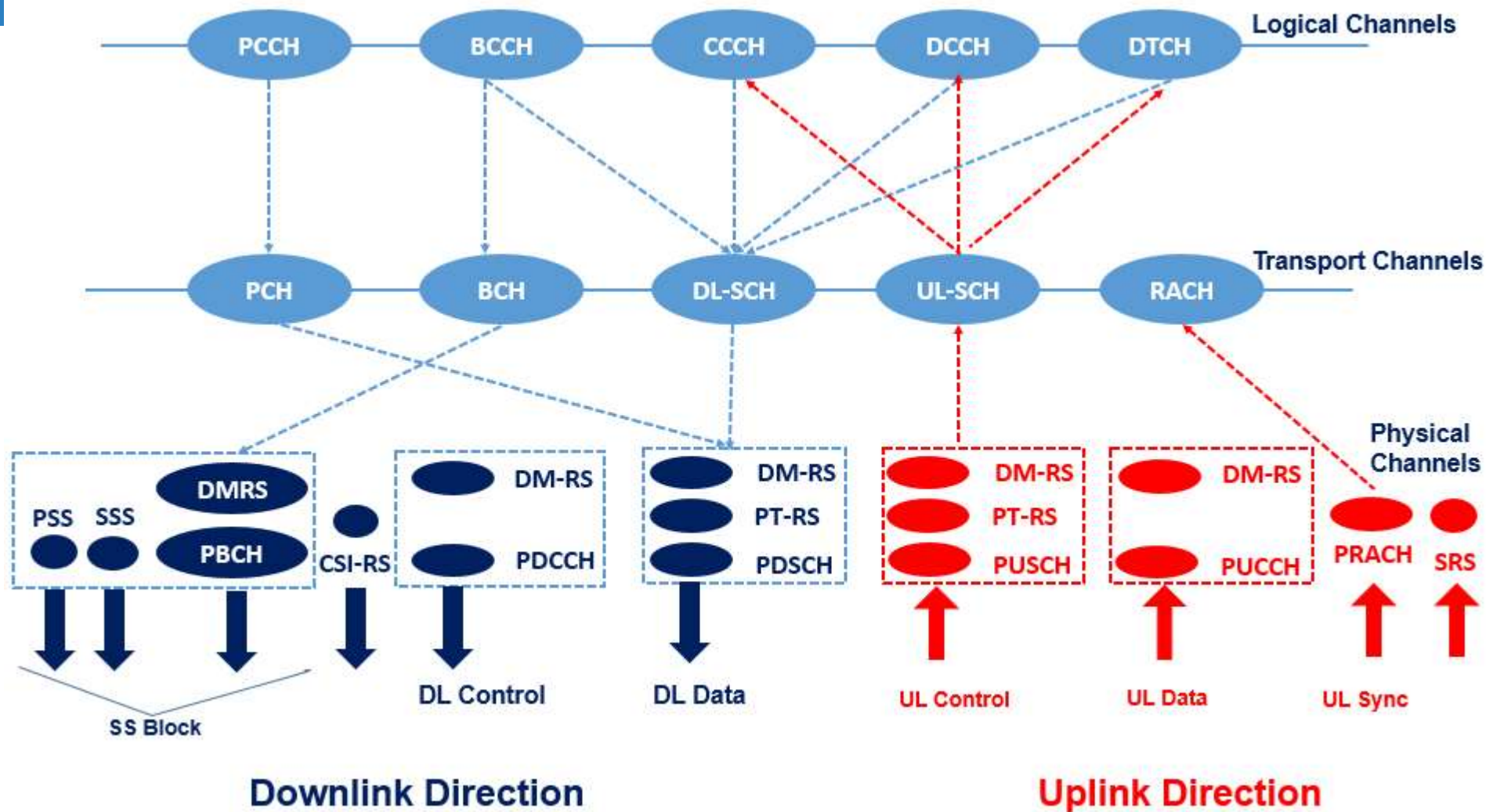
Physical Channels

❖ **PUSCH(Physical uplink shared channel)**

- Uplink data
- DRX algorithms for device power saving

❖ **PUCCH(Physical uplink control channel)**

- Uplink control information(UCI)
- PU-SCH related information
- HARQ ACK/NACK
- CQI Report

Physical Channels mapping

Reference Signal

❖ **Demodulation Reference Signal (DMRS)**
   - Used for channel estimation and demodulation

❖ **Phase Tracking Reference Signal (PTRS)**
   - Used for PDSCH phase tracking

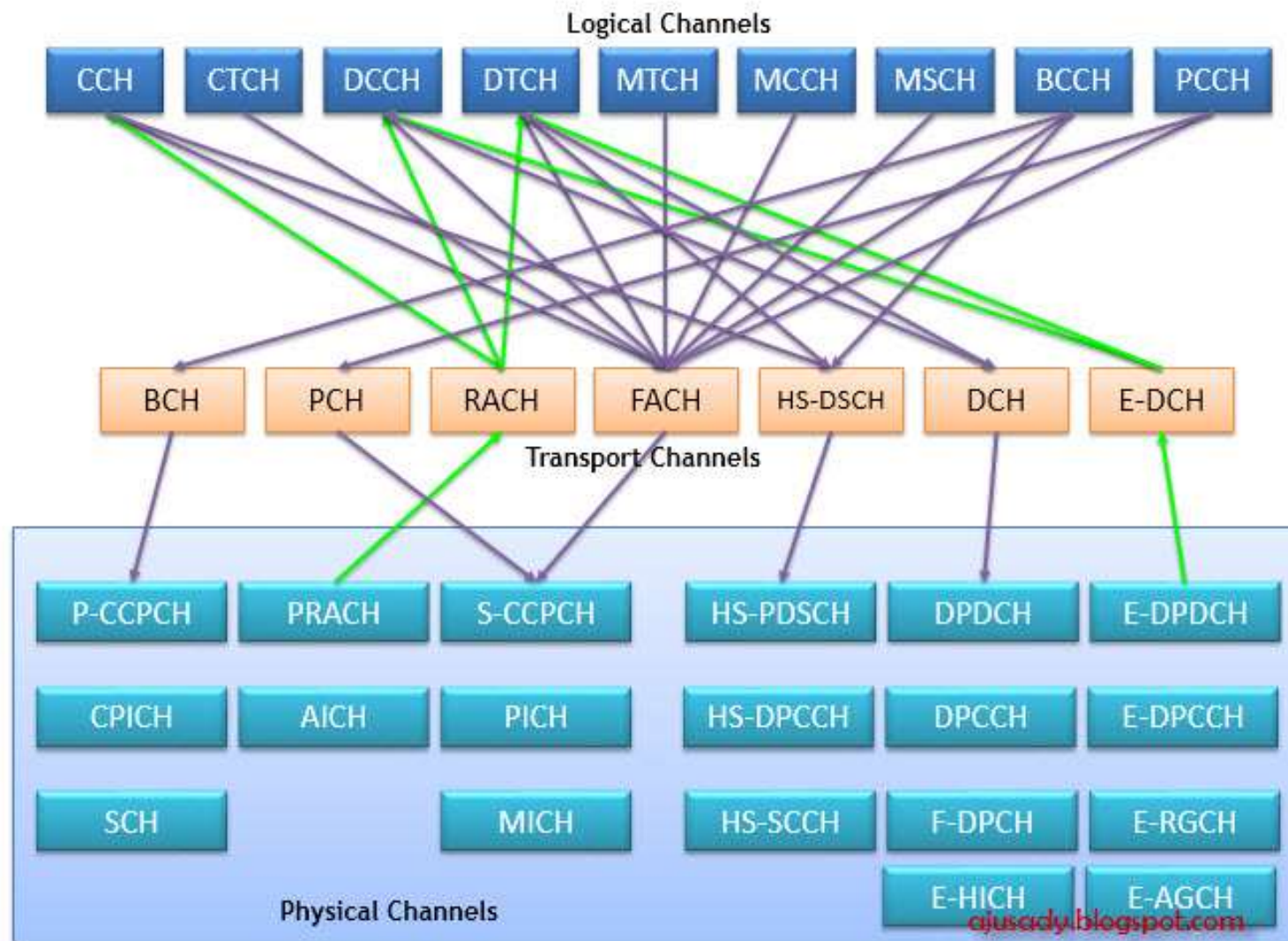❖ **Sounding Reference Signal (SRS)**
   - System uses the SRS for resource scheduling, link adaptation, Massive MIMO, and beam management

❖ **Channel State Information Reference Signal (CSI-RS)**
   - Used for getting CSI (channel state information)
   - Used for beam management

❖ **References: 3GPP TS 38.211, TS 38.212, TS 38.213**

UMTS Channels mapping

Q&A