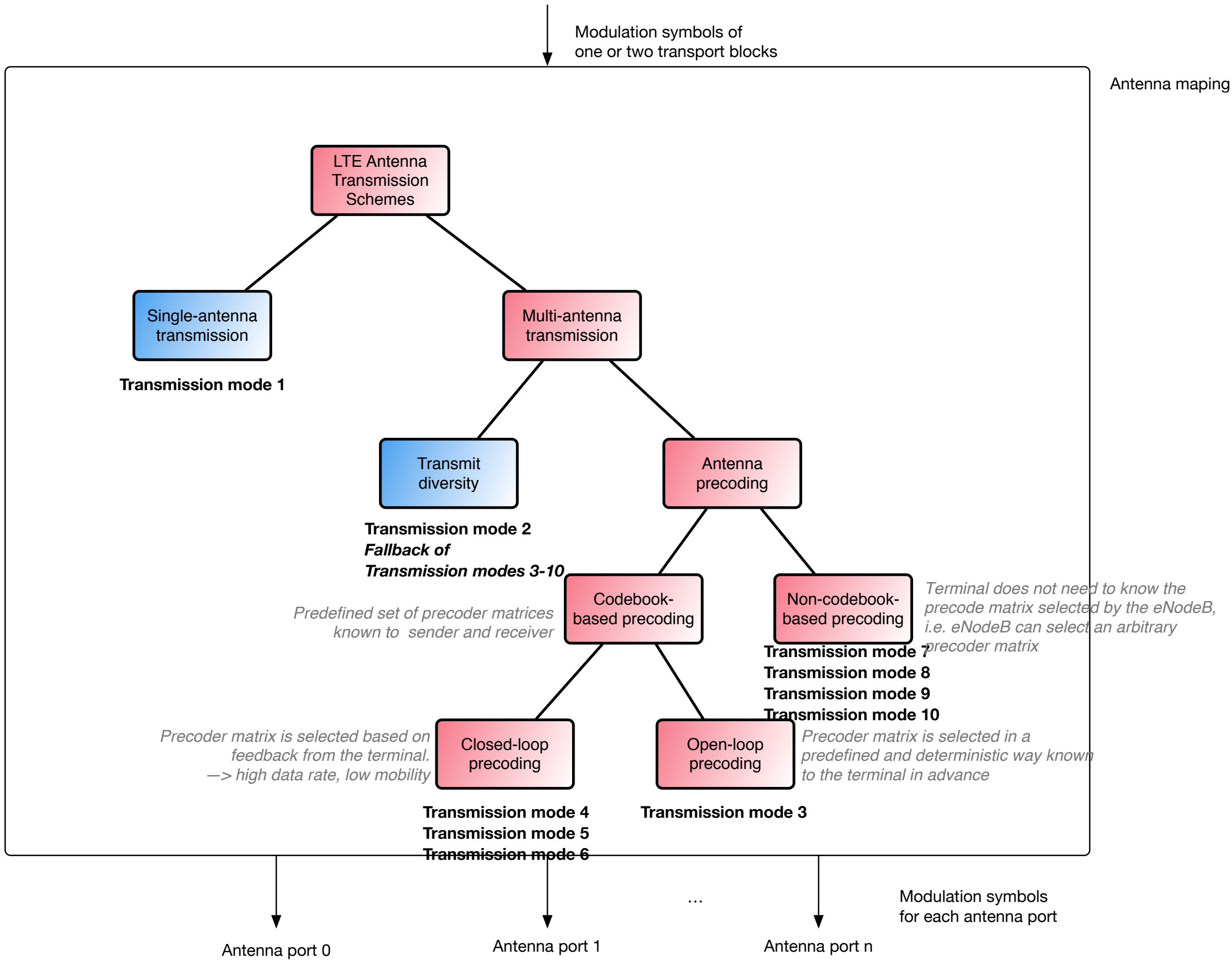
LTE DL-SCH transmission modes and corresponding multi-antenna transmission schemes

*For DL-SCH transmission, a terminal is configured in one of the **transmission modes** 1-10. Each transmission mode implies a certain **multi-antenna transmission scheme.** Below, the different multi-antenna transmission schemes are indicated as boxes, and the transmission modes by which they are implied are written underneath.*



- **Transmission mode 1:** Single-antenna transmission.
- **Transmission mode 2:** Transmit diversity.
- **Transmission mode 3:** Open-loop codebook-based precoding in the case of more than one layer, transmit diversity in the case of rank-one transmission. spatial multiplexing
- **Transmission mode 4:** Closed-loop codebook-based precoding. spatial multiplexing
- **Transmission mode 5:** Multi-user-MIMO version of transmission mode 4.
- **Transmission mode 6:** Special case of closed-loop codebook-based precoding limited to single-layer transmission.
- **Transmission mode 7:** Non-codebook-based precoding supporting single-layer PDSCH transmission.
- **Transmission mode 8:** Non-codebook-based precoding supporting up to two layers (introduced in LTE release 9). Rely on demodulation reference signals (DM-RS) for channel estimation. Multi-user-MIMO
- **Transmission mode 9:** Non-codebook-based precoding supporting up to eight layers (extension of transmission mode 8, introduced in LTE release 10). Rely on demodulation reference signals (DM-RS) for channel estimation. Multi-user-MIMO
- **Transmission mode 10:** Extension of transmission mode 9 for enhanced support of different means of downlink multi-point coordination and transmission, also referred to as CoMP (introduced in LTE release 11)