Error Handling and Checksum in the Transport Layer

Error handling involves detecting and correcting problems that occur during data transmission, such as lost, duplicated, or corrupted segments. The TCP protocol provides reliable delivery by using acknowledgments (ACKs) and retransmissions. If a segment is not acknowledged within a specific time, TCP automatically retransmits it to ensure proper delivery. It also ensures that data arrives in the correct order and without duplication. The UDP protocol, on the other hand, does not perform retransmissions or ordering—it only provides basic error detection.

The checksum is used by both TCP and UDP to detect transmission errors. Before sending data, the sender calculates a checksum value from the segment's contents and includes it in the header. The receiver recalculates the checksum upon arrival; if the values do not match, it means the data was corrupted during transmission. TCP then requests retransmission, while UDP simply discards the corrupted segment.

In summary, TCP provides reliable and ordered data delivery through error handling and retransmission mechanisms, while UDP offers faster but unreliable communication with only basic error detection.