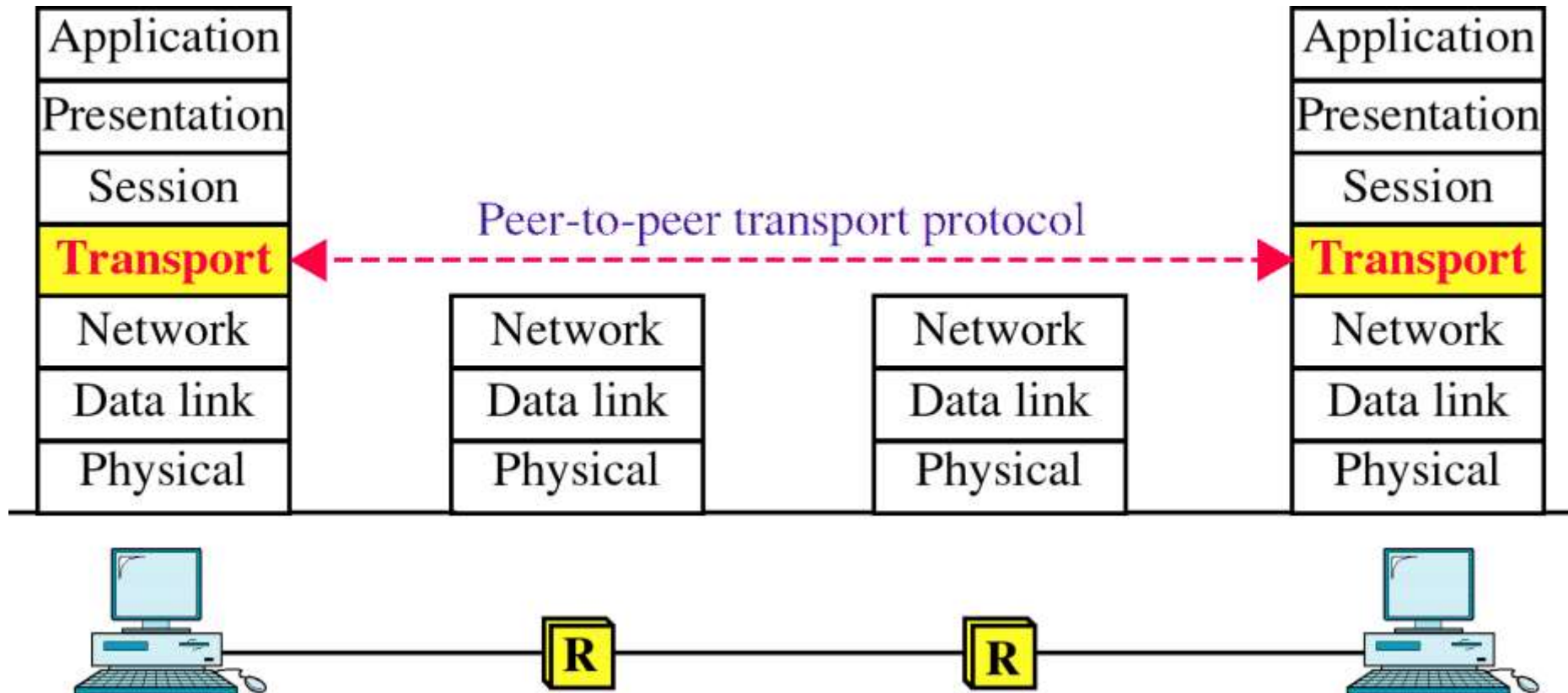




# TRANSPORT LAYER





# TRANSPORT LAYER

The transport layer is responsible for process-to-process delivery—the delivery of a packet, part of a message, from one process to another. Two processes communicate in a client/server relationship,

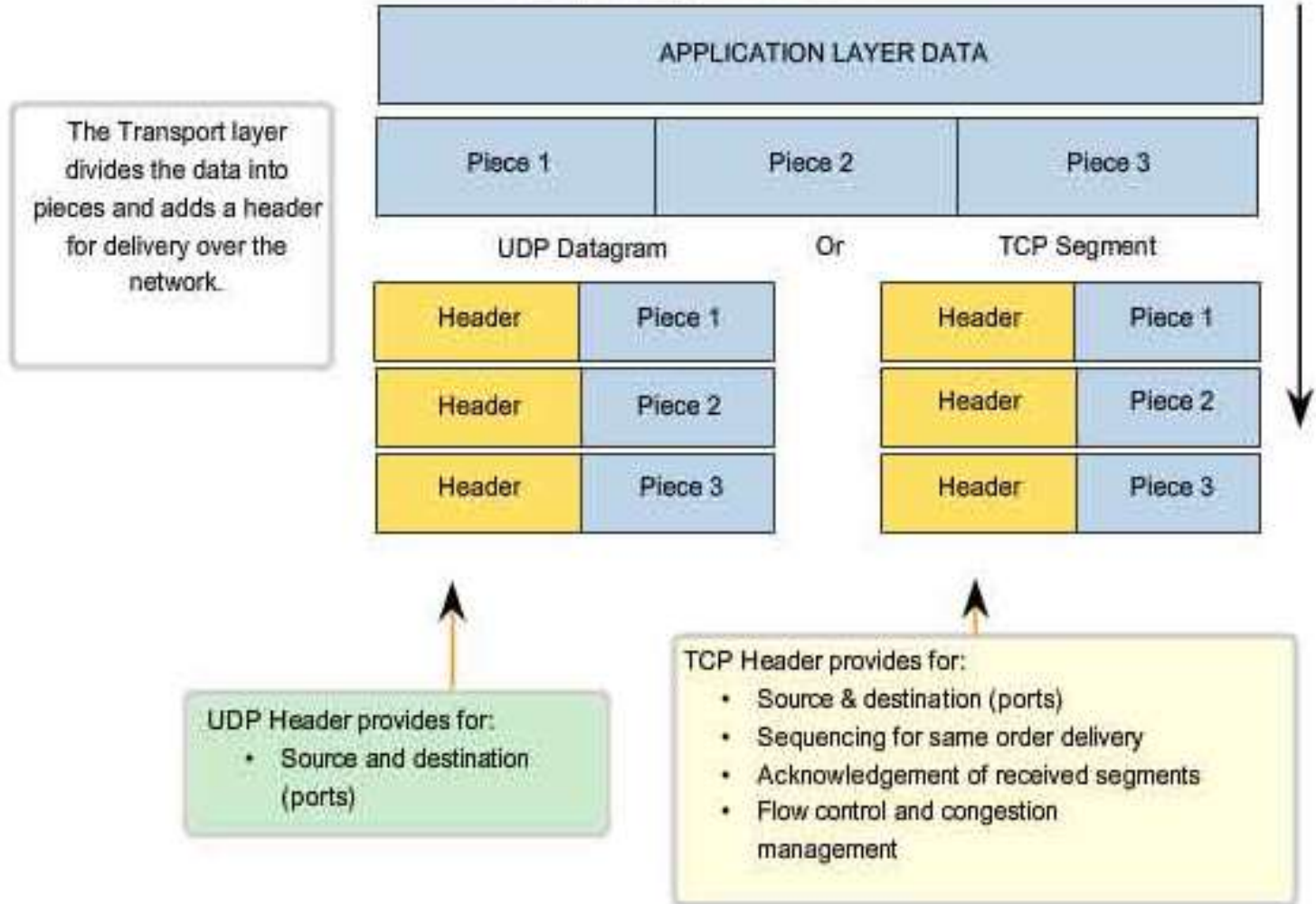
**In Client/Server communication, four entities must be defined:**

- Sending Node:
  - Local Host IP
  - Local Process Port number
- Receiving Node:
  - Remote host IP
  - Remote Process ID Port number



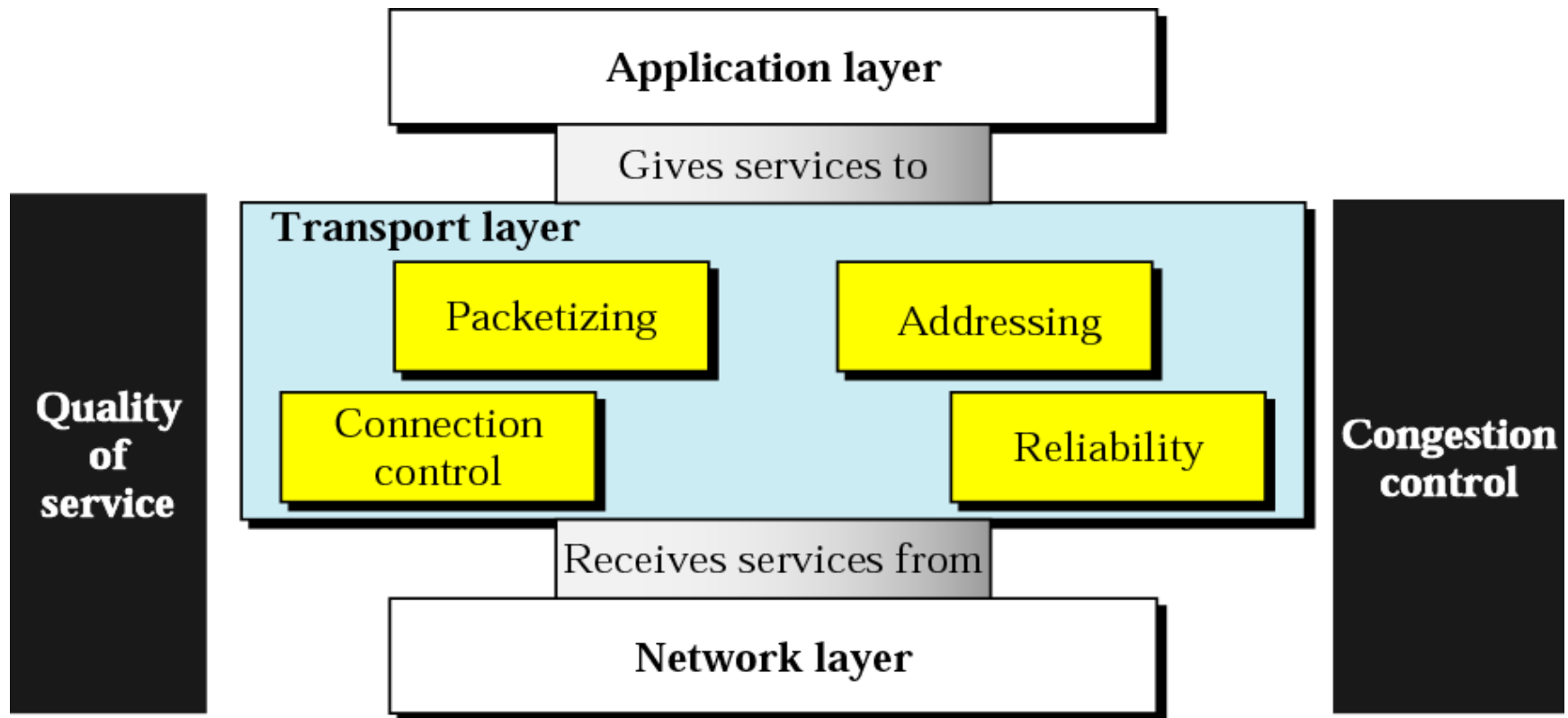
# TRANSPORT LAYER

## Transport Layer Functions



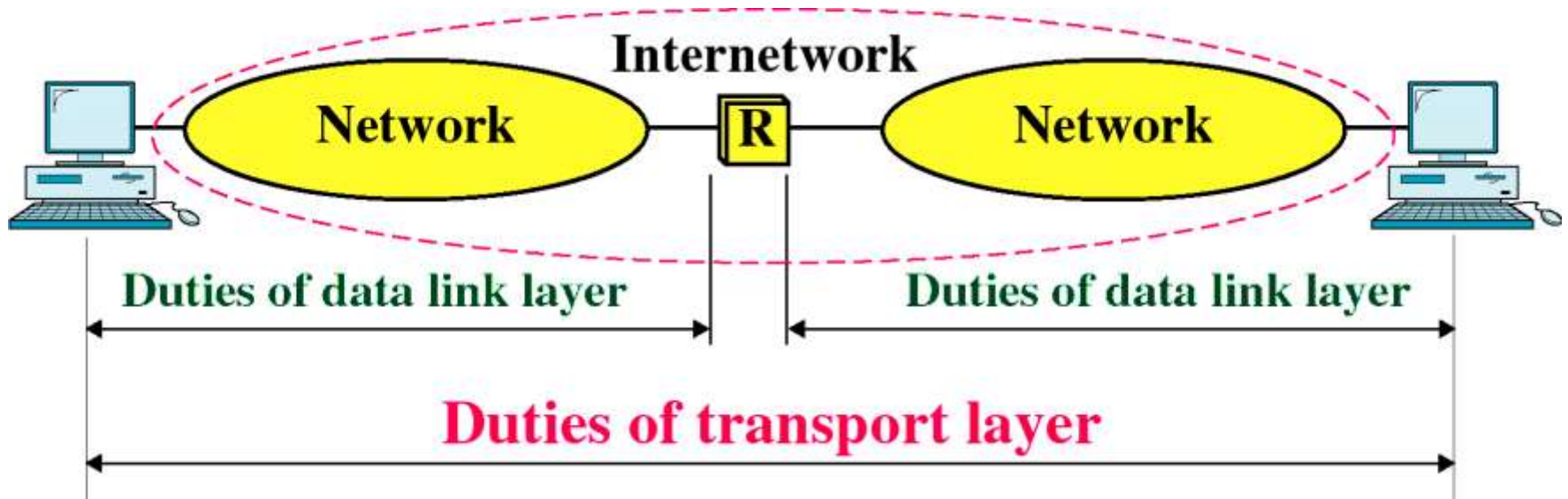


# Functions of transport layer





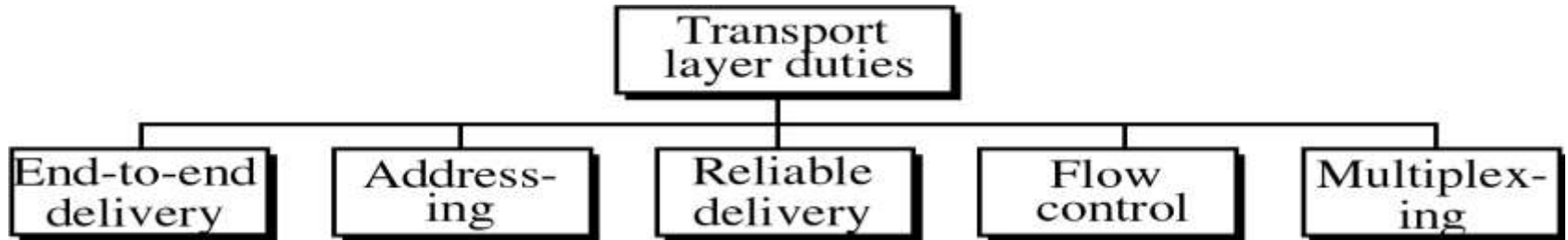
# Main Difference between data link layer and transport layer



Data Link Layer	Transport Layer
Provides services within a single network	Provides services across internetwork
Controls physical layer	Controls all three lower layers



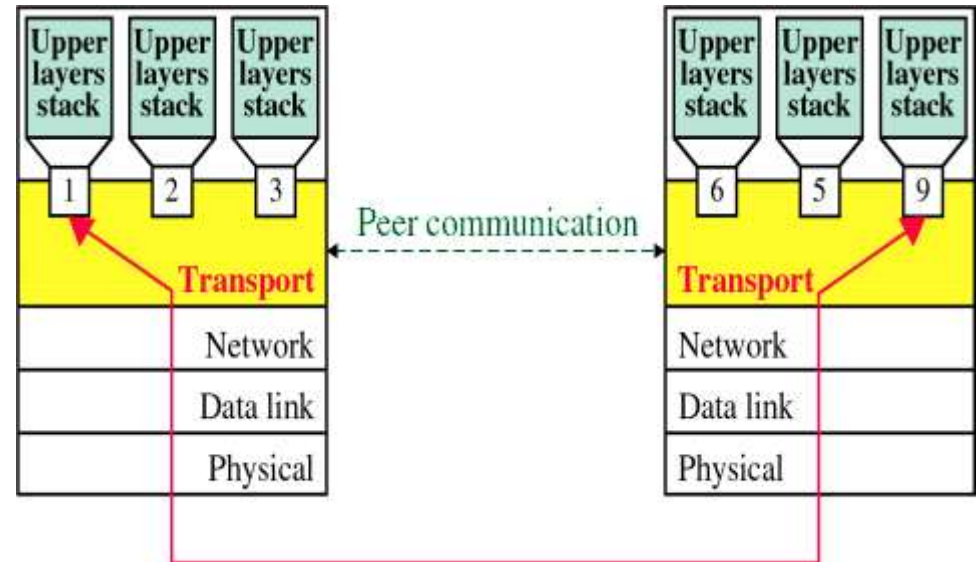
# Transport layer duties



1. **End to End Delivery:** Does not see any relationship between those packets. Ensure that the entire message arrives intact.

## 2. Addressing:

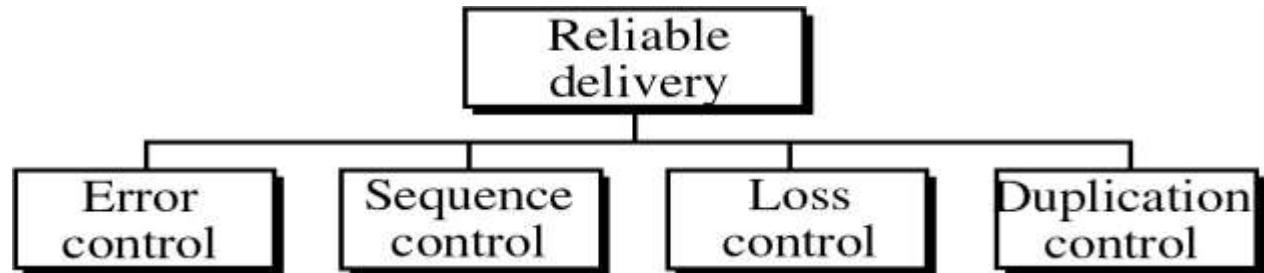
- a. DLL Protocols need to know address of computers within a network.
- b. NTL Protocols need to know address of computers within internet
- c. TPL protocols need to know which upper layer protocols are communicating





# Transport layer duties

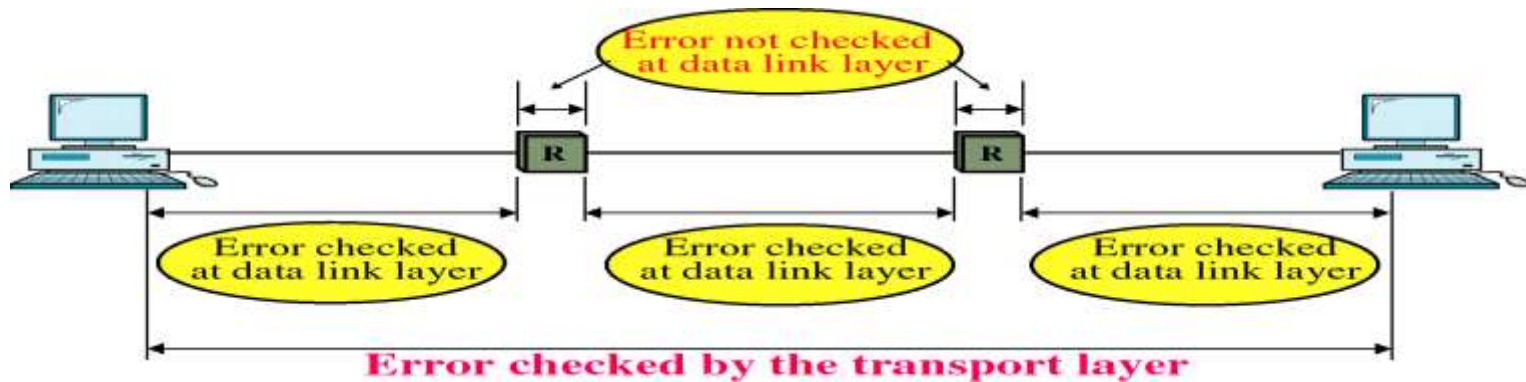
## 2. Reliable Delivery: Four aspects.



### 1. Error Control : Algorithm used for checking errors from end to end is Checksum.

DLL: Handles error in node to node

TPL: Handles error in end to end





# Transport layer duties

## 2. Sequence Control:

1. **Responsible at sender side:** Ensure that data units received from the upper layer.
2. **Responsible at receiver side:** Ensure that the various pieces are correctly reassembled.

## 3. Segmentation and concatenation:

1. **Segmentation:** Dividing too long data unit into smaller usable blocks
2. **Concatenation:** Size of data unit belonging to a single session are so small then combine them into a single data unit.
4. **Sequence Numbers:** Add at the end of the segment. The number indicates the order for reassemble.

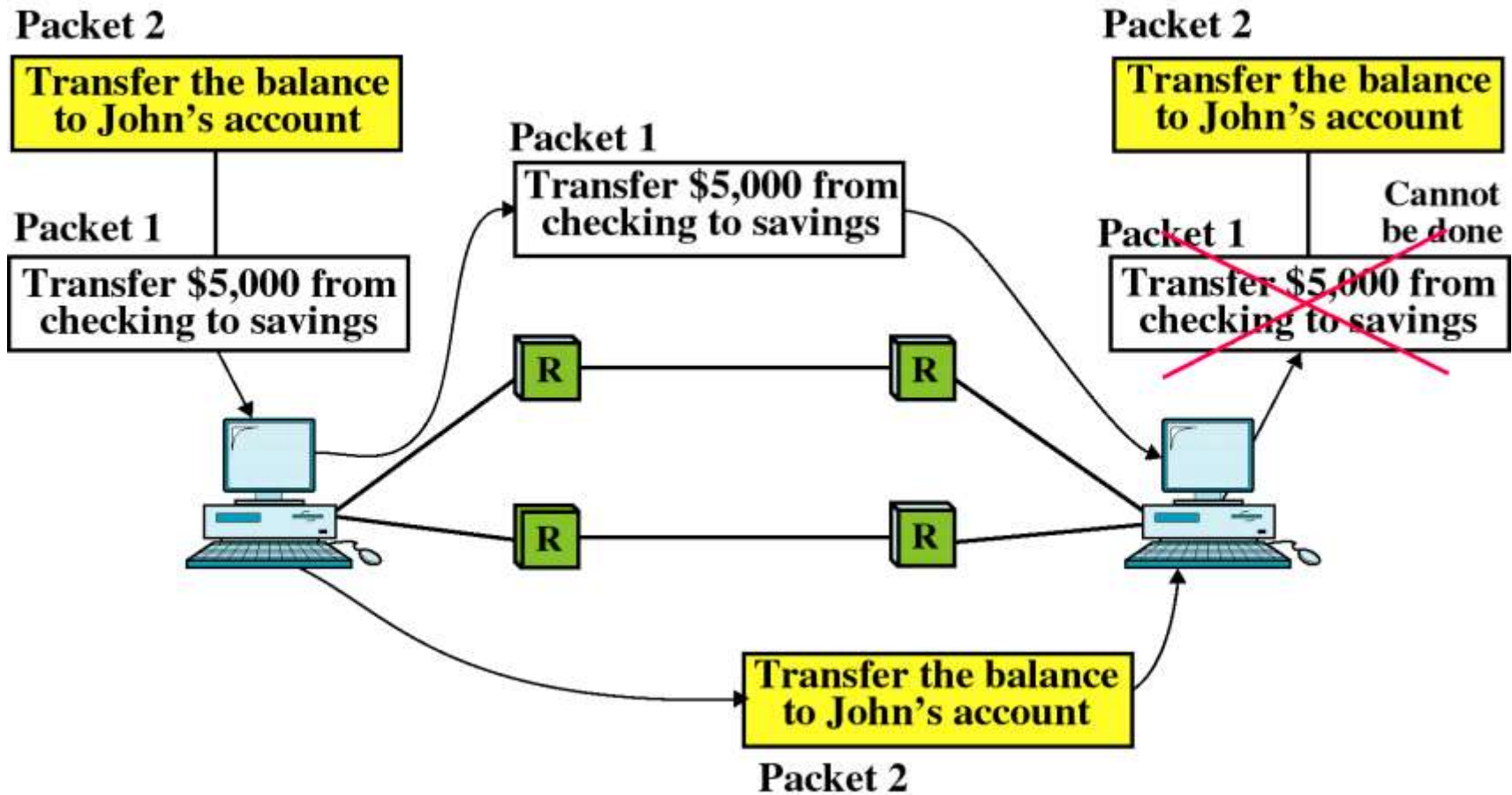
## 3. Loss Control:

Sequence Number allow the receiver's transport layer protocol to identify any missing segments and request redelivery.



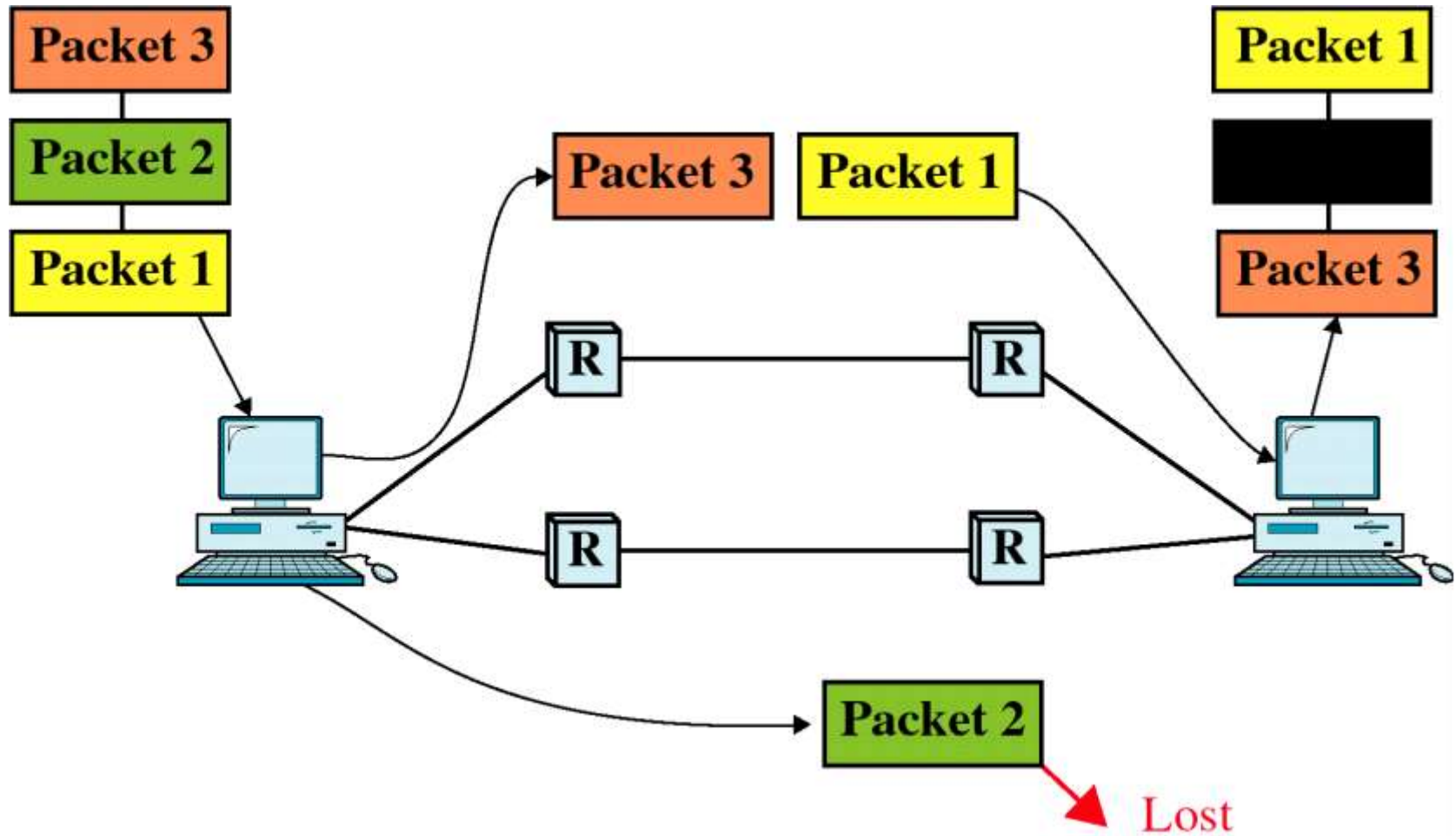


# Sequence Control





# Loss Control

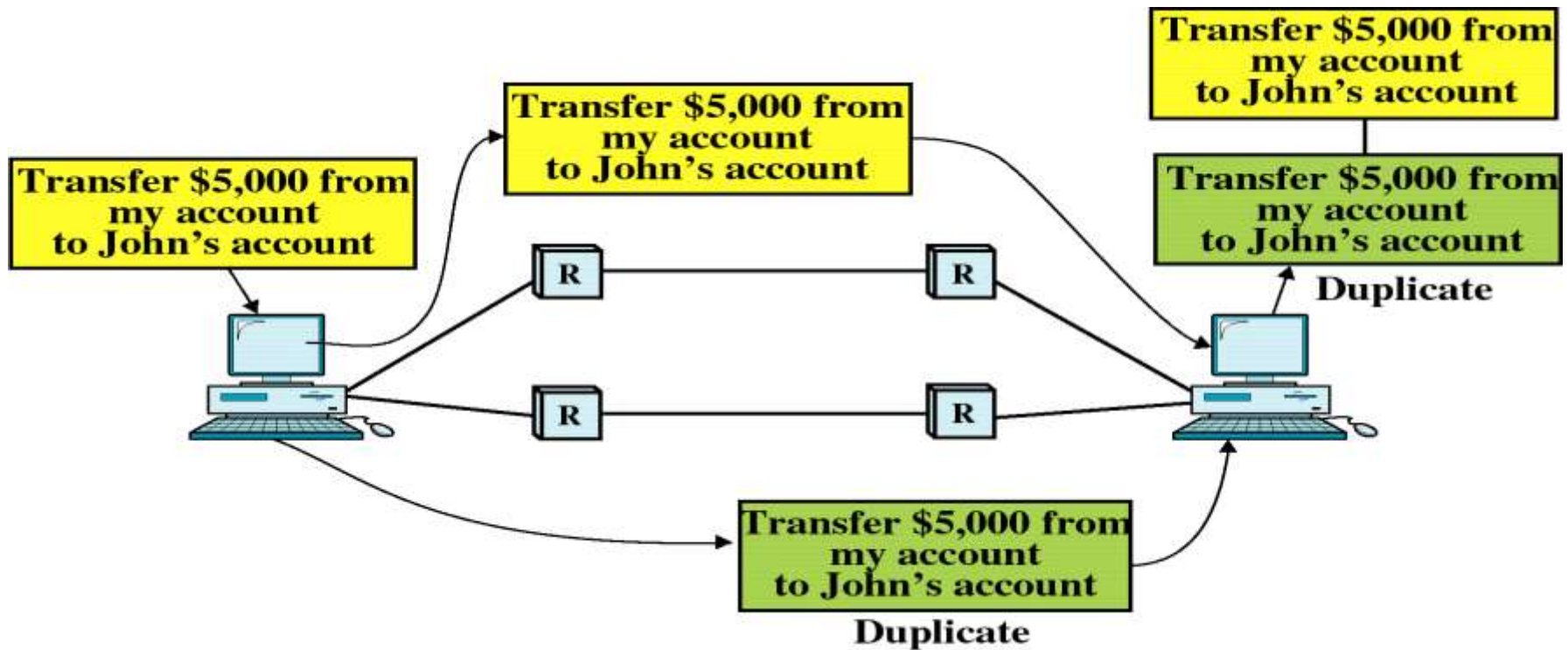




# Transport layer duties

**4. Duplicate Control:** No pieces of data arrive at the receiving system duplicated.

1. Identification of lost packets, sequence numbers allow the receiver to identify and discard duplicate segments.





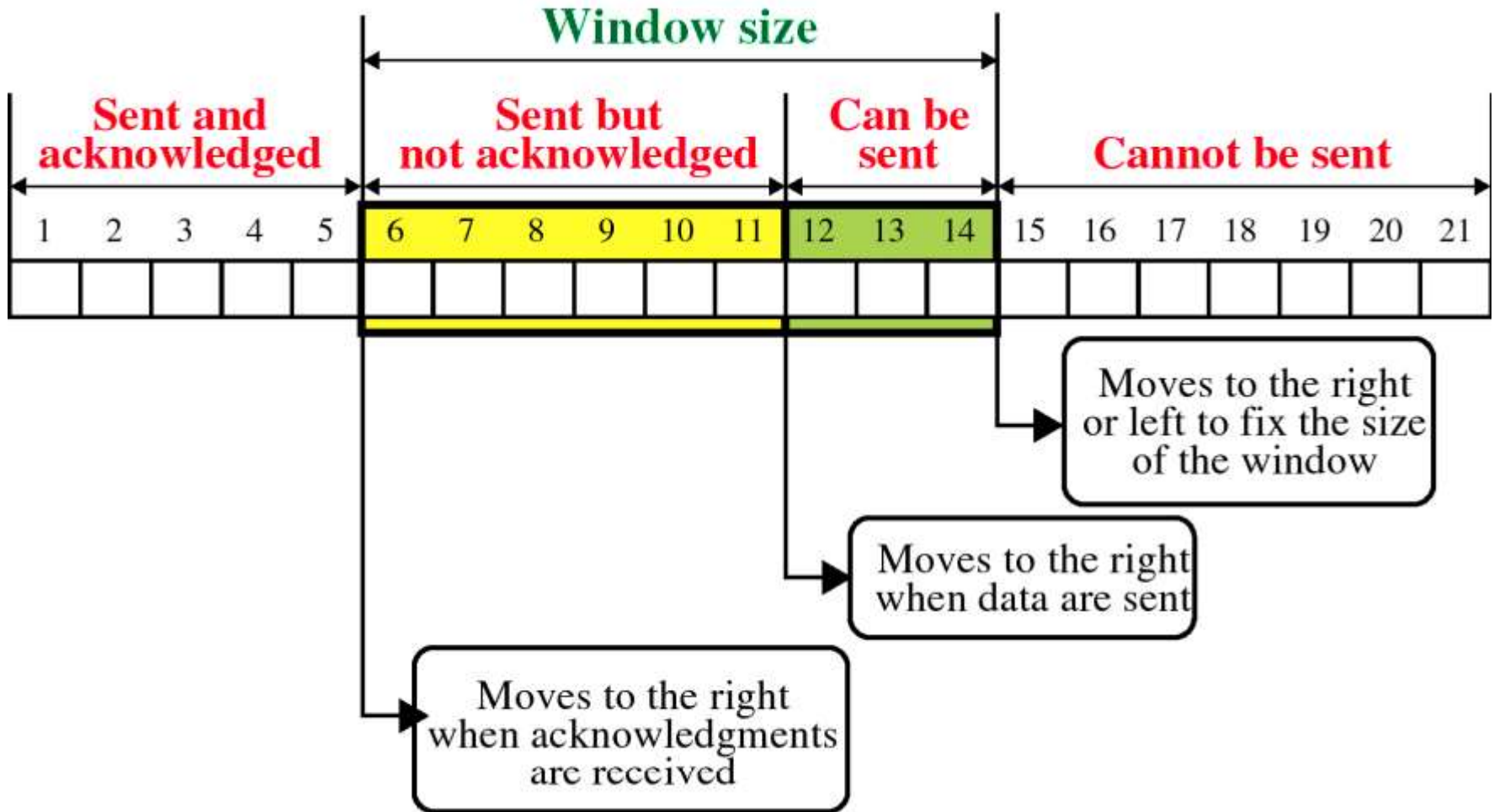
# Transport layer duties

## 4. Flow control:

1. Perform end to end
2. Uses a sliding window protocol for flow control.
3. Byte oriented rather than frame oriented
4. Some points:
  1. The sender does not have to send a full window's worth of data
  2. An ack can expand the size of the window
  3. The size of the window can be increased or decreased by the receiver
  4. The receiver can ack at anytime.



# Transport layer duties





# Transport layer duties

## 5. Multiplexing: To improve the transmission efficiency

1. Two ways:

- a. **Upward:** Multiple transport layer connections use the same network connection (Cost effective)
- b. **Downward:** One transport layer connection uses multiple network connections. (improve throughput)

