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Data Communication CS601 Lecture No 27

Lecture Prepared By

Muhammad Abid Ali

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CS601 Lecture No 27 Topic 156 to 160

DATA-LINK LAYER PROTOCOLS

- **Traditionally four protocols have been defined for the data-link layer to deal with flow and error control:**

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- ✓ **Simple Protocol**
- ✓ **Stop-and-Wait Protocol**
- ✓ **Go-Back-N Protocol**
- ✓ **Selective-Repeat Protocol**
- ✓ **Last two protocols have almost disappeared completely**

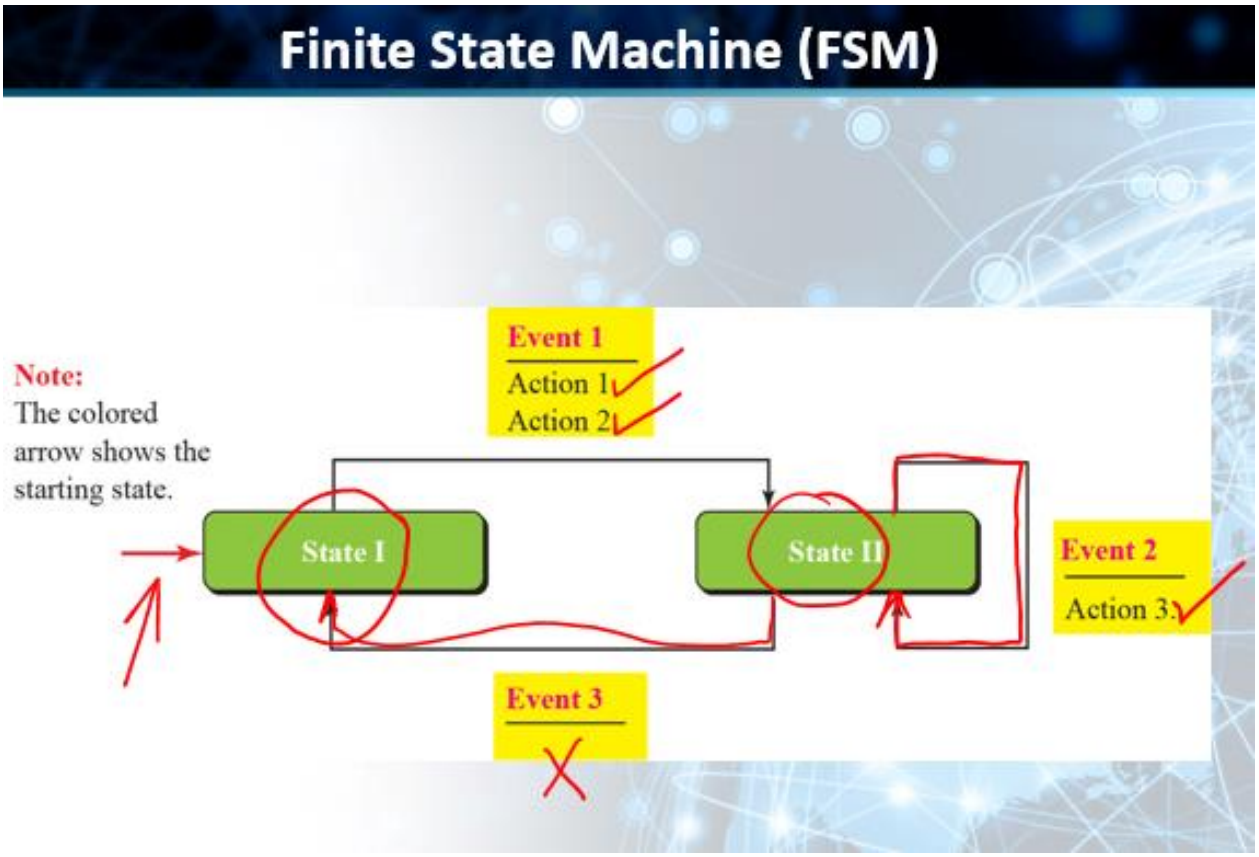
Finite State Machine (FSM)

- **A machine with a finite number of states**
- **Machines stays in one of the states until an event occurs**
- **Each event is associated with 2 reactions:**
  - ✓ **List of actions to be performed**
  - ✓ **Determining the next state**

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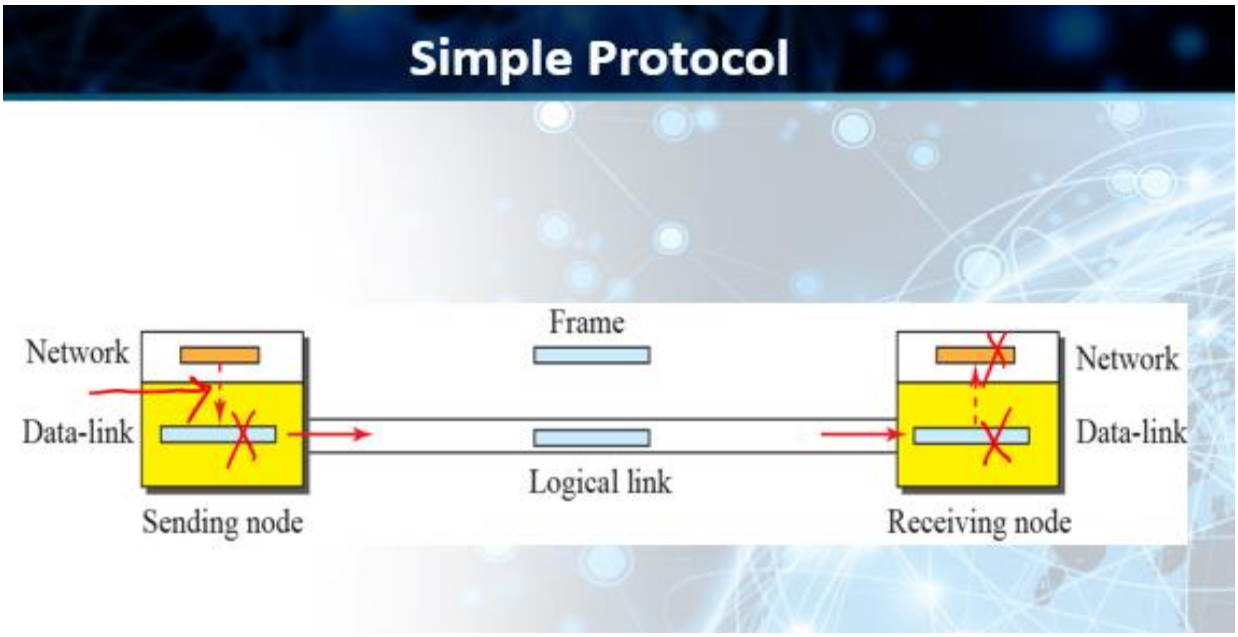
Simple Protocol

- **Simple protocol has neither flow nor error control**
- **Assumption: The receiver can immediately handle any frame it receives**
- **The receiver can never be overwhelmed with incoming frames**

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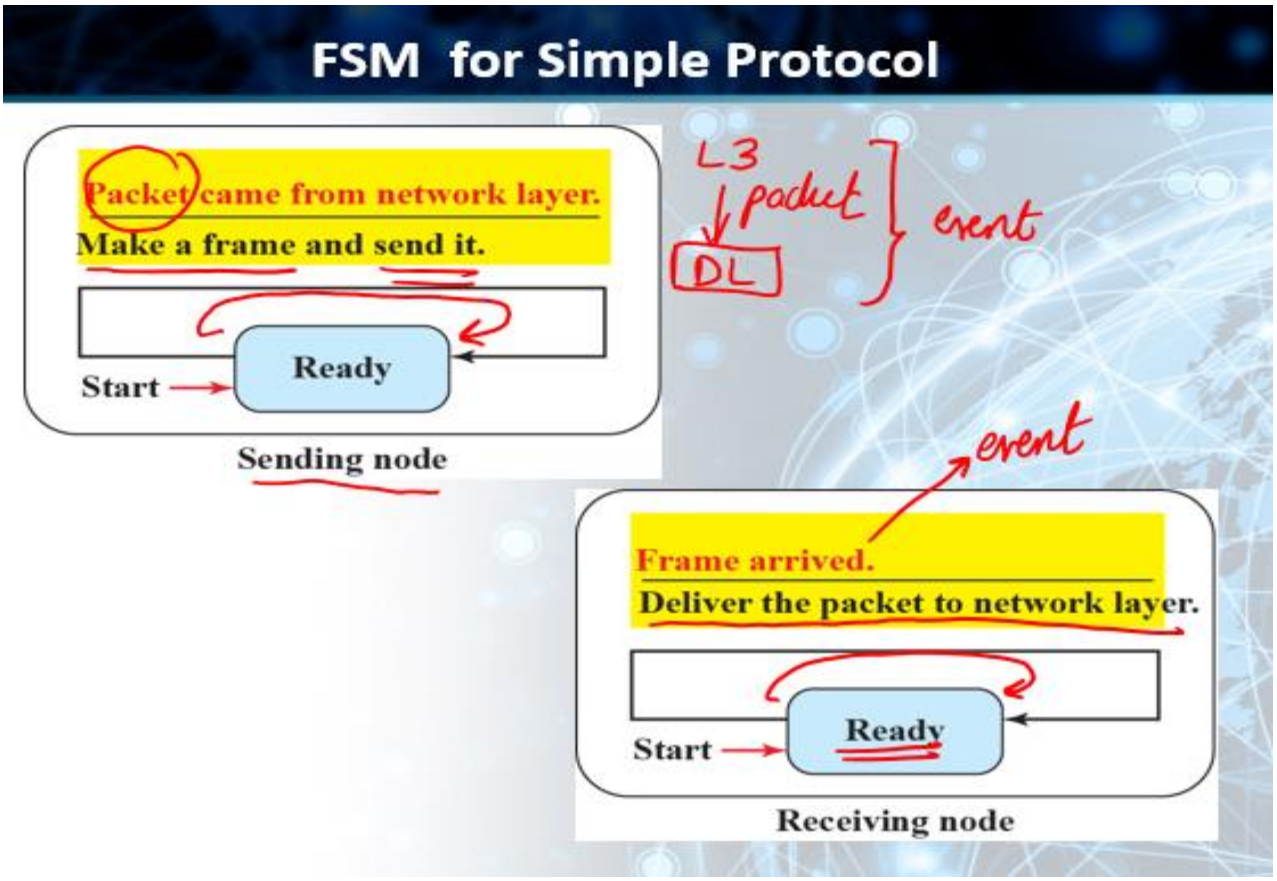
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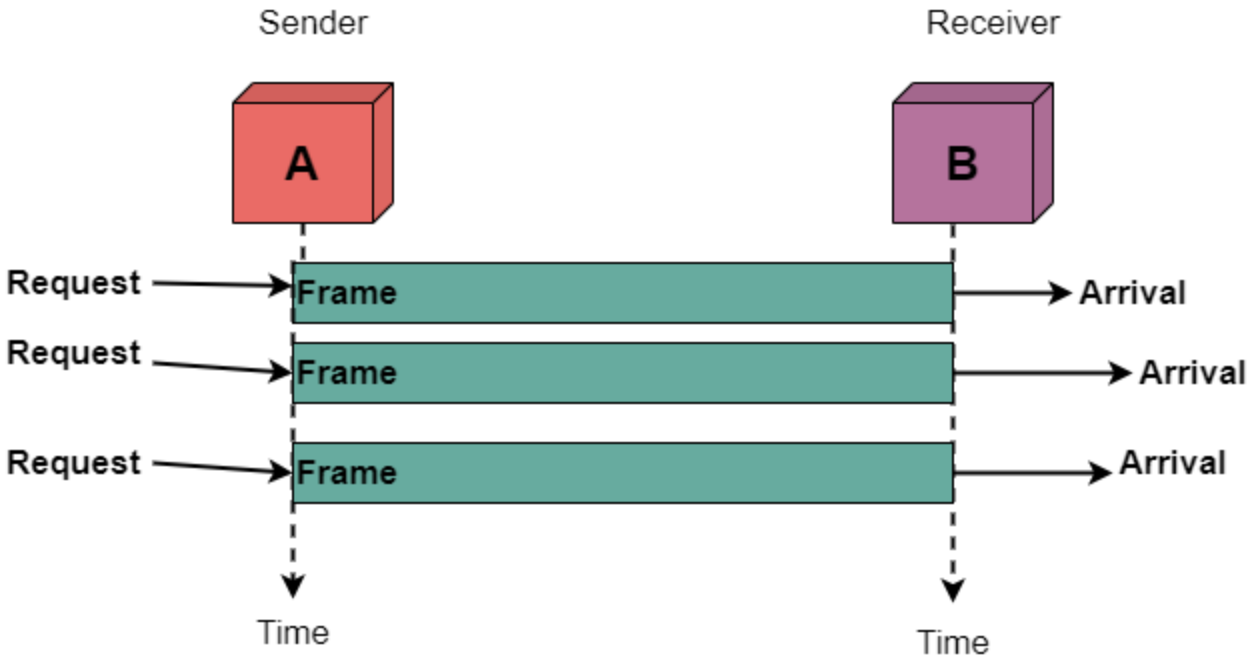
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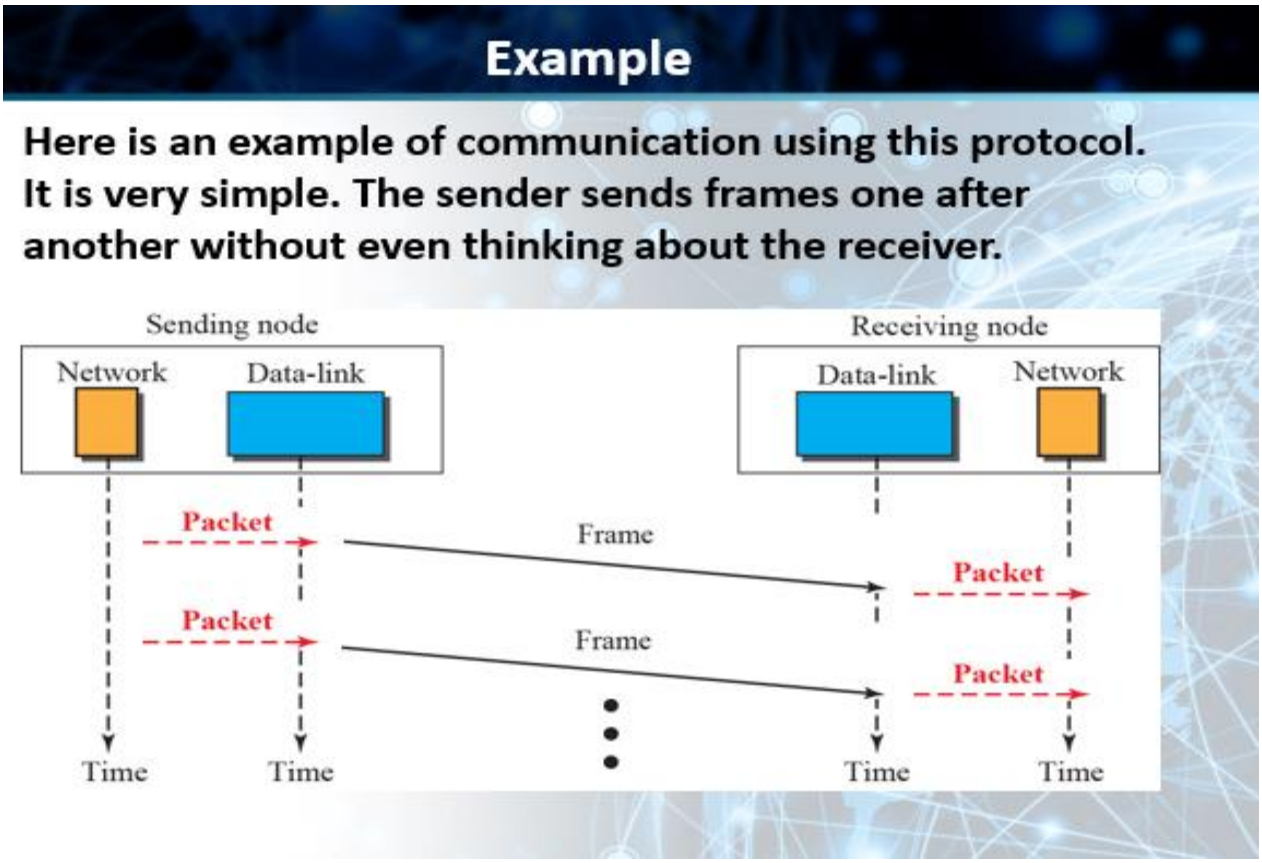
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Stop-and-Wait Protocol

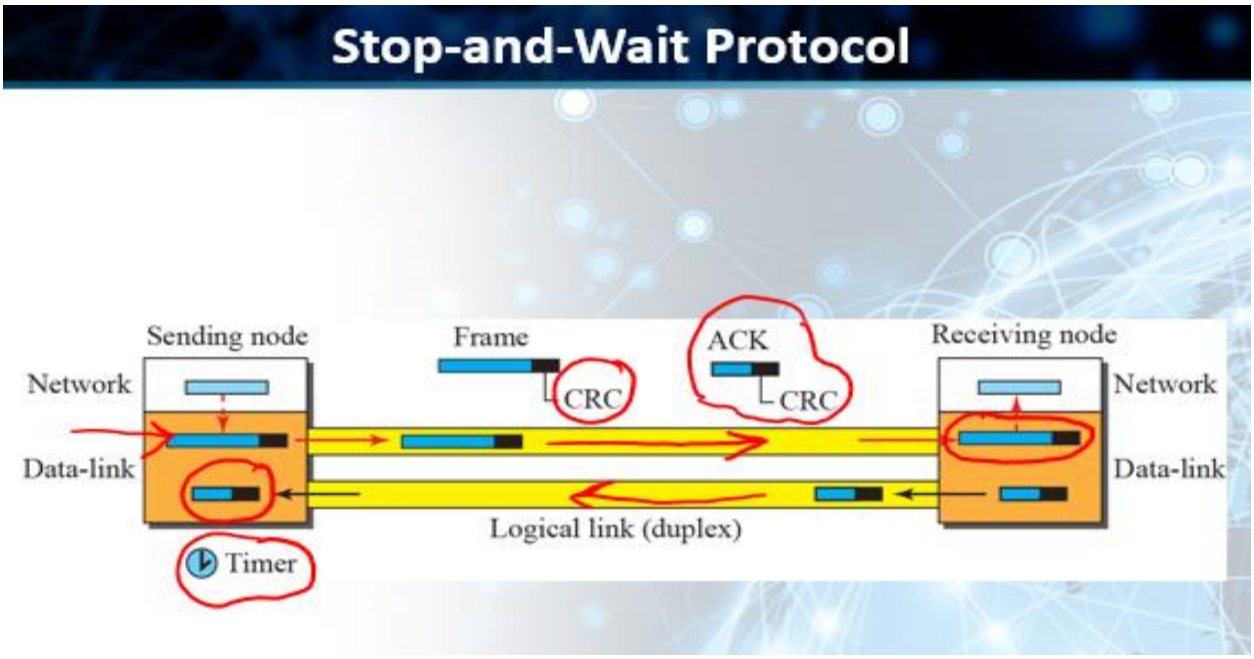
- **Stop-and-Wait protocol uses both flow and error control**
- **The sender sends one frame at a time and waits for an acknowledgment before sending the next one**
- **To detect corrupted frames, we add a CRC code**

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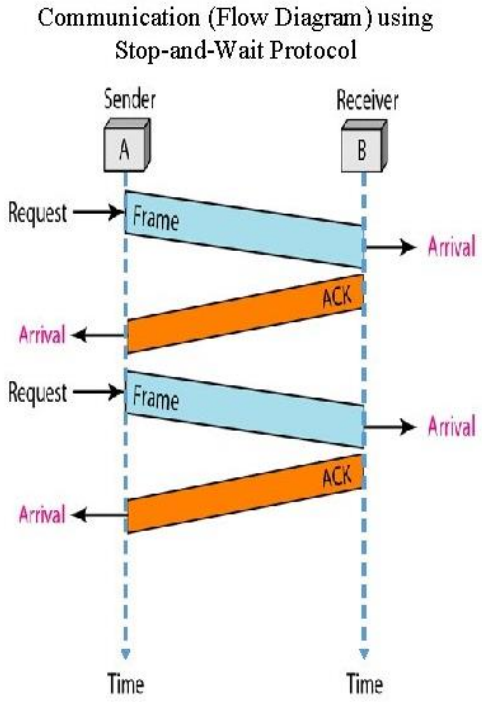
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Stop-and-Wait Protocol

At any time, there is either one ***data frame*** on the forward channel or one ***ACK frame*** on the reverse channel.

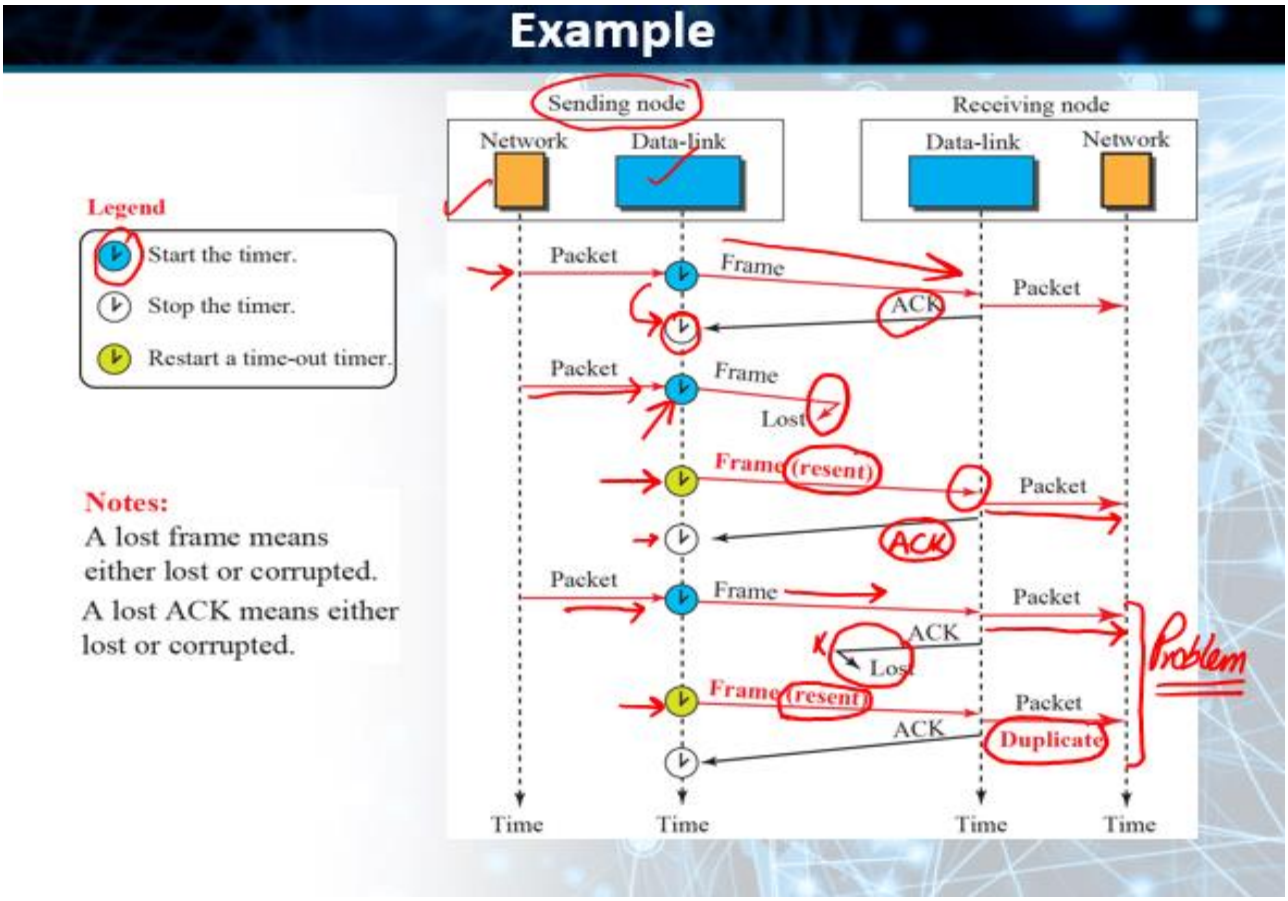
We therefore need a **half-duplex link**.



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Piggybacking

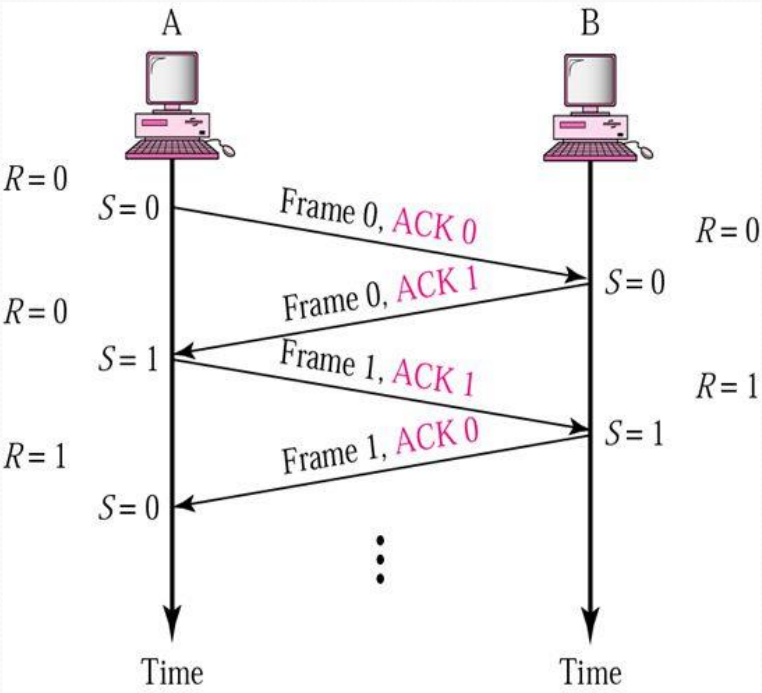
- **Both Simple and Stop-and-wait protocols are designed for unidirectional communication**
- **Data flows in one direction and ACK travels in the other**
- **To make the system efficient, the data in one direction is piggybacked with the acknowledgment in the other direction**

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Piggybacking

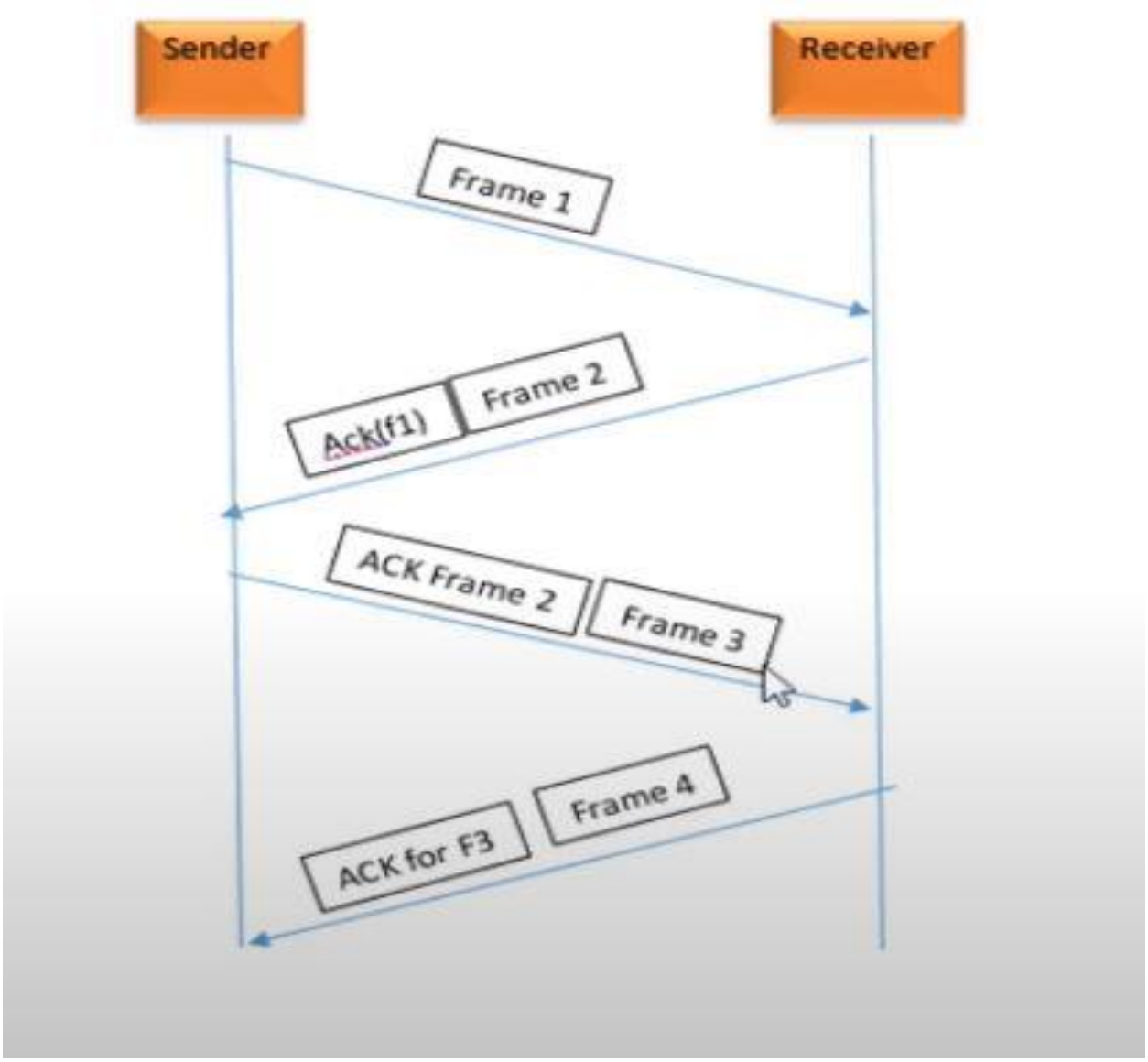


- A method to combine a data frame with ACK.
- Station A and B both have data to send.
- Instead of sending separately, station A sends a data frame that includes an ACK.
- Station B does the same thing.
- Piggybacking saves bandwidth.

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High-level Data Link Control (HDLC)

- **Bit -oriented protocol for communication over point-to-point and multipoint links**
- **It implements Stop-and-Wait protocol**
- **Most of the concepts defined in this protocol is the basis for other protocols such as PPP, Ethernet, or wireless LANs**

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Configurations & Transfer Modes in HDLC

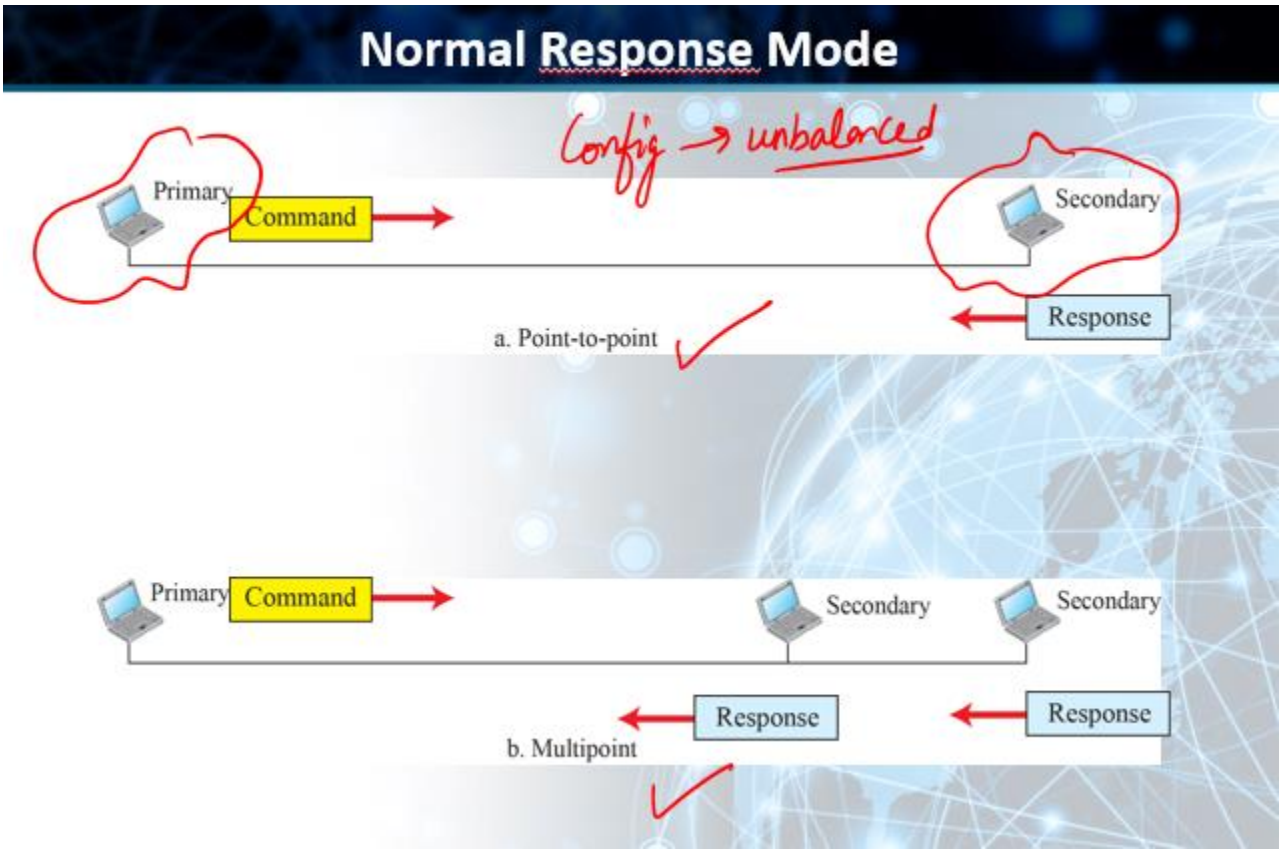
HDLC provides two common transfer modes that can be used in different configurations:

Normal Response Mode (NRM) &

Asynchronous Balanced Mode (ABM

Normal Response Mode (NRM) &

Normal Response Mode (NRM) is **an unbalanced configuration in which only the primary terminal may initiate data transfer**. The secondary terminals transmit data only in response to commands from the primary terminal. The primary terminal polls each secondary terminal to give it an opportunity to transmit any data it has.



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Asynchronous Balanced Mode (ABM

Asynchronous Balanced Mode (ABM) is a balanced configuration in which either station may initialize, supervise, recover from errors, and send frames at any time. There is no master/slave relationship.

