Stop-and-Wait ARQ Technique for RepairingFrame and Acknowledgment Transmission

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Abstract *- In sending data, a transmission will experience a damage or an error in the delivery process. Corrupted data will not be used for their intended purpose. Stop-and-Wait methods of Automatic Repeat Request is a method that is applied to correct errors in the process of sending the frame at the time of transmission. Data transmission is always done between the sending computer and the receiving computer. This method ensures that information is not lost due to packet drops and that the received packets in the correct order. This is the simplest type of method Automatic Repeat Request. Stop-and-Wait method will automatically fix corrupted data occurs in the transmission process. This method works by calculating the waiting time and timeout on both computers. If the data packets successfully sent and the recipient receives the data properly, then it will send an acknowledgment to the sender. It states that the transmission was not a failure or none of the bits sent change from 0 to 1 or vice verse. Timeout function is to record how long the computer wait if there is incongruity at the time of delivery. After a specified time limit runs out, either framed or acknowledgment will be sent again to correct the mistake.*

Keywords*–ARQ, Stop-and-Wait, Transmisi Data*

I. INTRODUCTION

Errors in data transmission often occur in the world of computers that have been distributed [4]. Errors sometimes occur due to disconnection of communication due to several factors. Some of them are the extinction of the electric current, the weak force between the network and the delivery can also occur on other technical factors. This influence can hinder the data at the time of delivery. Data transmission consists of frames and acknowledgments which are successfully sent. However, some bits is damaged or lost when the transmission progress[2].

The method is often done to control errors in the data delivery in the Automatic Repeat Request [5]. In this method, there is called the frame and acknowledgment. A frame is a data packet split into small data set while the acknowledgment is a confirmation from the receiving computer that the data packet is already well accepted, accepted with broken or even not at all acceptable. If the data received is not in accordance with the procedure, the recipient's computer will give a rebuttal that the packet should be sent back. Information is known by the sender's computer by way of non-receipt of acknowledgment from the receiving computer that the data sent was received perfectly. As settlement sending computer will attempt to retransmit the data in the form of pieces of a frame to the recipient's computer. This method is called Automatic Repeat Request the method of automatic data transmission repair damaged or missing. There are several methods that are owned by ARQ. This research will be conducted testing on one of the ARQ method is a method Stop-and-Wait.

II. THEORIES

A. *Data Link*

Because of the possibility of errors can occur in the transmission, as well as the receiver of data need to set the rate of the data it receives, it is necessary to create a control layer on any communication device that provides functions such as flow control, error detection and error control. The control layer is called a data link control protocol [6]. Some of the requirements and objectives of effective data communication between two transmitting and receiving stations are connected directly, such as:

a. Frame Synchronization

Block large amounts of data will be broken down by a source into blocks of smaller called frames. Beginning and end of each frame must be evident. This is done because:

- The size of the receiver buffer is limited.
- The block of data in large quantities can lead to the transmission becomes longer, resulting in possible occurrence of errors is greater, thus requiring an overall frame retransmissions. With a smaller frame, the error can be detected sooner, and the data must be retransmitted also less.

- On a shared media, such as LANs, usually undesirable one station occupies the media for a long time, because it can cause long delays in station-station another sender.

b. Flow Control

Sender station may not send frames at a faster rate than the rate in the receiver station receives the frames.

c. Error Handling

Bit errors caused by the transmission system should be improved

d. Addressing

Multipoint paths, such as Local Area Network (LAN), the identity of the two stations that communicate must be clearly defined.

e. Similar Path Controlling

Usually not expected to have a separate communication line physically to control information. Therefore, the receiver must be able to distinguish the control information from the data that is being transmitted.

f. Path Management

Starters, maintenance, and termination data exchange require coordination and cooperation among station. Therefore we need a management procedure for this exchange.

B. Flow Control

Flow Control is a technique to ensure that the transmitting entity does not overwhelm the entity receiving the data. The entity receiving the usually allocate a buffer of data with a maximum length for transfer. When data is received, the receiver must perform some specific processing activities before distributing the data to software which has a higher-level [1]. When there is no flow control, receiver buffer will overflow while processing the old data. Stop-and-Wait flow control is the simplest form of flow control. The process works as follows: Entities source transmits frame. After receiving frame purpose entities, the entities of interest will be sent a reply that was received by the frame and ready to receive the next frame. The sources must wait for an acknowledgment before sending the next frame. Interest can stop the flow of data in ways not give a reply.

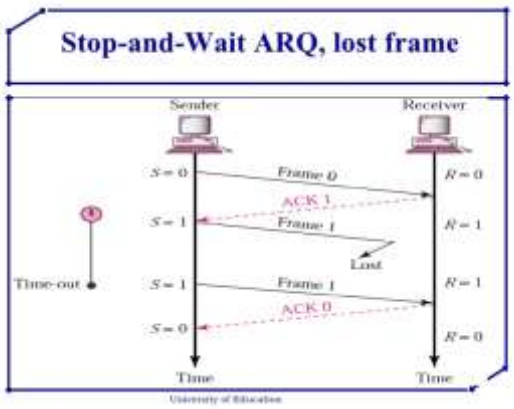

Fig. 1 Stop-and-Wait flow control

Figure 1 shows the flow control method Stop-and-Wait. The process of sending a sequence of computer sender to a receiver via several stages of frame delivery and acknowledgment acceptance.

This procedure works well, but the delivery of frames in large numbers and in a situation where the bit length of the track is greater than the length of the frame, it will be inefficient severe. This is due because there is only one frame that can be sent at one time. Bottom line, for a very high data rate, and for a great distance between sender and receiver then by applying the Stop-and-Wait flow control which enabled the use of inefficient paths.

C. Error Control

Error control is associated with a mechanism to detect and correct errors in the transmission frame. Data is sent as a sequence of frames, the frames arrive by the same command when sent, and each frame that is transmitted change and a variable number of delays before reaching the receiver [1]. There might be two types of errors, such as:

a. Lost Frame

Frame failed to reach the other side. For example, noise may damage the frame up to the level where the receiver does not realize that the frame has been transmitted.

b. Damage frame

A frame is acknowledged has arrived, but some bits have errors. The composition has changed during the transmission.

The most common technique for error control based on some or all of the following elements:

a. Fault detection.

b. Positive reply.

It is to restore a positive reply to an error-free frame is received.

c. Retransmission after the time is up.

Thesources retransmit frames unanswered after a certain time.

d. Negative reply and retransmission

It is to return a negative reply to the error frame. The sources retransmit the frame again.

D. Clock Tick

Clock Tick often called the cycle. Tick is the smallest unit of time recognized by the computer [1]. The faster the clock ticks or cycles, the more CPU instructions that can be executed in one second. Tick clock speed expressed in megahertz or gigahertz. Each instruction to be executed by a computer requires some clock ticks, but sometimes some of the instructions can be executed in one clock tick on a fast computer. In the simulation program, tick a special time unit used as a process or mechanism iterations between simulations on the computer [1]. Clock Tick often did to declare a timeout limit of a process [2].

E. Stop-and-Wait

Stop-and-Wait ARQ has a mechanism that stops if there is a frame, then the receiver computer will wait until the deadline specified [3]. The source sends a single frame and waits for a reply. No data is sent until there is an answer from the destination has arrived at the source computer. There are two types of errors that can occur, such as:

a. A frame that arrives at its destination is experiencing damage or missing.

When the receiver detects the presence of damage to the frame, the receiver will send a negative reply to the damaged frame and the transmitter will transmit the frame. For the case of missing frames in the middle of the transmission, the source computer equipped with a timer. Once the frame is transmitted, the source computer is waiting for a reply. If no reply is received until the time specified timer expires, the source computer will send back the same frame.

b. Damage to a positive reply.

As an illustration, station A sends a frame These frames are well received by station B, which response with a reply. ACK damaged during a stopover and are not recognized by A, which therefore out of line time and again sends the same frame. Duplicate this frame arrived and accepted by B. Thus, B receives two copies of the same frame as if they were a different frame. To resolve this problem, frames alternately labeled 0 or 1, and a positive reply in the form ACK0 and ACK1. By the rules of the sliding window, ACK0 reply frame receipt numbered 1 and indicated that the receiver is ready to receive the frame numbered 0.

c. Damage to the negative.

The transmitter sends the same frame (the same as the case of missing frames).

The major advantage Stop-and-Wait is its simplicity, while its main drawback is the mechanism that runs inefficiently. Therefore, the sliding window flow control techniques can be adapted to obtain more efficient use of the path again, as implemented in the method of go-back-n ARQ and selective-reject ARQ [1].

The following figure illustrates how the process of Stop-and-Wait takes place step by step.

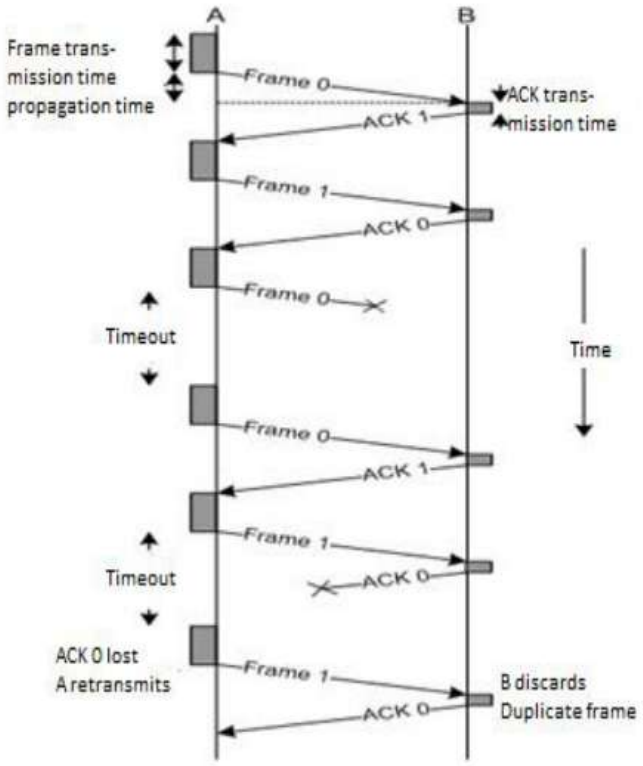

Fig. 2 Stop-and-Wait process

III. EVALUATION

The process of sending the Stop-and-Wait is a frame per frame. The following figure will explain how the process of sending the frame is held computers.

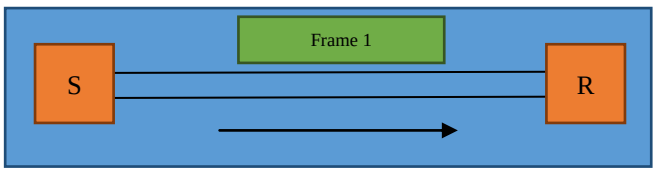

Fig. 3 ComputerT send the first frame (F0)

Fig. 4 ComputerR send first acknowledgment (ACK1)

In Figure 3 the sender's computer to perform the delivery Frame 1 (F0) to the recipient's computer. The process of sending data from T to R has a few ticks. If no timeouts, the R computer sends an acknowledgment that the frame has been received well. Computers R will send ACK1 to T (Figure 4). Likewise, the computer will send the next frame T if ACK1 well received.

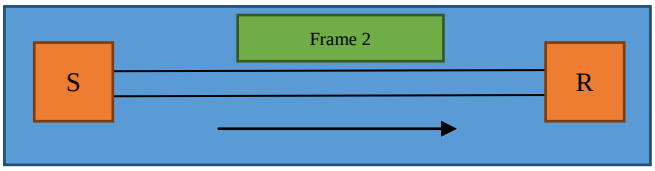

Fig. 5 ComputerR sendthe second frame (F1)

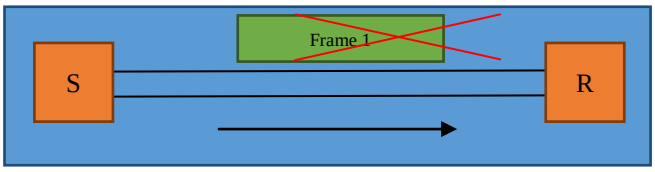

Fig. 6 The first frame is gone or missing

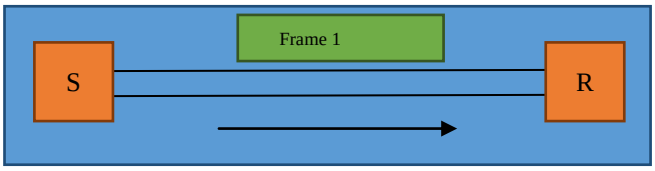

Fig. 7 Retransmitting of the first frame

Figure 5 to 7 states work process Stop-and-Wait if having problems at the time of delivery. These constraints can be seen in Figure 6. This can be either damaged or missing frames. In Figure 5, Frame 2 (F1) is sent by computer R to T but in the middle of the shipping process, the frames are damaged or lost (Figure 6). Timeout function to record the extent to which the computer T await acknowledgment of computer R. If the computer T does not get it within a certain time, then computer T will send back Frame 2 (F1) to computer R.

This process is repeated until the computer T will probably obtain acknowledgment that the packet frame sent well received by Computer R.

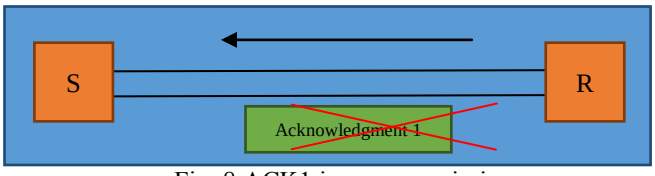

Fig. 8 ACK1 is gone or missing

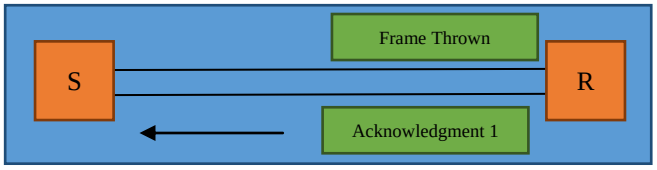

Fig. 9 Computer R is retransmitting the ACK1

In Figure 8 and 9, it can be seen the process of sending back an ACK is damaged or lost in the shipping process from Computer R to T. Timeout will record whether the time has crossed the line or not. If Computer T did not send next frame then Computer R ensure ACK sent by it was not well received by Computer T, so that the Computer R will send back the ACK.

This process will be repeated until all the frames that are in the queue resolved. Stop-and-Wait is a method of error checking and simultaneously repair the frame and acknowledgment of damaged or lost during data transmission.

IV. Conclusion

The Stop-and-Wait method is an excellent technique to apply in checking errors in data transmission with a small frame shape. Stop-and-Wait flow control function to transmit data by the number of frames were broken up into smaller frames. By sending a frame per frame, the delivery process will be faster. If a larger frame sent damaged, it would take a long time to resend the data frame and the acknowledgment.

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