

Practical-4

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Problem Statement:

Write a program to implement sliding window mechanisms using

1. Stop and Wait ARQ
2. Go Back N ARQ
3. Selective Repeat ARQ

Code:

1. Stop and Wait ARQ

```
#include<iostream>
#include<cstdlib>
#include<ctime>
using namespace std;

// Simulate frame transmission and return true if the frame is received, false otherwise.
bool transmitFrame()
{
    // Simulate frame transmission and random acknowledgment (50% chance of success)
    return rand() % 2 == 0;
}

int main()
{
    srand(time(0)); // Seed the random number generator
    int totalFrames;
    cout<<"\n\n\n\t\t===== STOP AND WAIT ARQ =====\n\n\n\n";
    cout << "--> Enter the total number of frames to simulate: ";
    cin >> totalFrames;
    int frameNumber = 0;
    cout << "\n==> Simulating Stop-and-Wait ARQ:\n\n";
    while (frameNumber < totalFrames)
    {
        cout << "\nSender sends frame " << frameNumber << endl;
        bool received = transmitFrame();
        if (received)
        {
            cout << "Receiver acknowledges frame " << frameNumber << endl;
            cout<<"_____";
            _____;
            frameNumber++; // Move to the next frame
        }
        else
```

```

    {
        cout << "Receiver does not acknowledge frame " << frameNumber << ",
retransmitting...\n";
    }
    cout << endl;
}
cout << "\n\n\n\t\t !!! All frames have been sent and acknowledged. !!!\n\n\n";
return 0;
}

```

OUTPUT:

```

===== STOP AND WAIT ARQ =====

--> Enter the total number of frames to simulate: 5
==> Simulating Stop-and-Wait ARQ:

Sender sends frame 0
Receiver does not acknowledge frame 0, retransmitting...

Sender sends frame 0
Receiver does not acknowledge frame 0, retransmitting...

Sender sends frame 0
Receiver acknowledges frame 0

-----

Sender sends frame 1
Receiver acknowledges frame 1

-----

Sender sends frame 2
Receiver acknowledges frame 2

-----

Sender sends frame 3
Receiver does not acknowledge frame 3, retransmitting...

Sender sends frame 3
Receiver does not acknowledge frame 3, retransmitting...

Sender sends frame 3
Receiver acknowledges frame 3

-----

Sender sends frame 4
Receiver acknowledges frame 4

-----

!!! All frames have been sent and acknowledged. !!!

PS D:\MIT\SEM 5\CN\Lab\4\output>

```

2. Go Back N ARQ

```

#include <bits/stdc++.h>
#include <ctime>
#define ll long long int
using namespace std;
void transmission(ll &i, ll &N, ll &tf, ll &tt)
{
    while (i <= tf)
    {
        int z = 0;
        for (int k = i; k < i + N && k <= tf; k++)

```

```

    {
        cout << "Sending Frame " << k << "..." << endl;
        tt++;
    }
    for (int k = i; k < i + N && k <= tf; k++)
    {
        int f = rand() % 2;
        if (!f)
        {
            cout << "\nAcknowledgment for Frame " << k << "... \n"
                << endl;
            z++;
        }
        else
        {
            cout << "\nTimeout!! \n--> Frame Number : " << k << " Not Received" << endl;
            cout << "*** Retransmitting Window... \n"
                << endl;
            break;
        }
    }
    cout << "\n";
    i = i + z;
}

int main()
{
    ll tf, N, tt = 0;
    srand(time(NULL));
    cout << "\n\n\t\t ===== GO BACK N ARQ ===== \n\n\n";
    cout << "--> Enter the Total number of frames : ";
    cin >> tf;
    cout << "\n --> Enter the Window Size : ";
    cin >> N;
    ll i = 1;
    transmission(i, N, tf, tt);
    cout << "\n\n\t Total number of frames which were sent and resent are : " << tt << endl;
    return 0;
}

```

OUTPUT:

```
PS D:\MIT\SEM 5\ON\Lab\4> cd 'd:\MIT\SEM 5\ON\Lab\4\output'
PS D:\MIT\SEM 5\ON\Lab\4\output> & .\Go Back N ARQ.exe

===== GO BACK N ARQ =====

--> Enter the Total number of frames : 5
--> Enter the Window Size : 2
Sending Frame 1...
Sending Frame 2...

Timeout!!
--> Frame Number : 1 Not Received
** Retransmitting Window...

Sending Frame 1...
Sending Frame 2...

Acknowledgment for Frame 1...

Timeout!!
--> Frame Number : 2 Not Received
** Retransmitting Window...

Sending Frame 2...
Sending Frame 3...

Acknowledgment for Frame 2...

Timeout!!
--> Frame Number : 3 Not Received
** Retransmitting Window...

Sending Frame 3...
Sending Frame 4...

Acknowledgment for Frame 3...

Timeout!!
--> Frame Number : 4 Not Received
** Retransmitting Window...

Sending Frame 4...
Sending Frame 5...

Acknowledgment for Frame 4...

Timeout!!
--> Frame Number : 5 Not Received
** Retransmitting Window...

Sending Frame 5...

Acknowledgment for Frame 5...

Total number of frames which were sent and resent are : 12
PS D:\MIT\SEM 5\ON\Lab\4\output>
```

```
Sending Frame 2...
Sending Frame 3...

Acknowledgment for Frame 2...

Timeout!!
--> Frame Number : 3 Not Received
** Retransmitting Window...

Sending Frame 3...
Sending Frame 4...

Acknowledgment for Frame 3...

Timeout!!
--> Frame Number : 4 Not Received
** Retransmitting Window...

Sending Frame 4...
Sending Frame 5...

Acknowledgment for Frame 4...

Timeout!!
--> Frame Number : 5 Not Received
** Retransmitting Window...

Sending Frame 5...

Timeout!!
--> Frame Number : 5 Not Received
** Retransmitting Window...

Sending Frame 5...

Acknowledgment for Frame 5...

Total number of frames which were sent and resent are : 12
PS D:\MIT\SEM 5\ON\Lab\4\output>
```

3. Selective Repeat ARQ

```
#include <iostream>
#include <vector>
#include <cstdlib>
#include <ctime>
using namespace std;

// Define the maximum window size and the total number of frames
const int MAX_WINDOW_SIZE = 4;
const int TOTAL_FRAMES = 10;
int main()
{
    int windowSize;
    int totalFramesSent = 0;
    cout << "\n\n\n\t\t ===== SELECTIVE REPEAT ARQ =====\n\n\n";
    cout << "--> Enter window size: ";
    cin >> windowSize;
    vector<bool> acknowledged(TOTAL_FRAMES, false);
    srand(time(0)); // Seed the random number generator
    cout << "\n--> Simulating Selective Repeat ARQ:\n\n";
    while (totalFramesSent < TOTAL_FRAMES)
    {
        cout << "Sender's Window: ";
        // Send frames within the current window
        for (int i = totalFramesSent; i < min(totalFramesSent + windowSize,
TOTAL_FRAMES); i++)
        {
            if (!acknowledged[i])
            {
                cout << i << " ";
                // Simulate frame transmission and random acknowledgment
                if (rand() % 2 == 0)
                {
                    acknowledged[i] = true;
                    cout << "(Sent) ";
                }
            }
        }
        cout << "\nReceiver's Window: ";
        // Simulate receiver's acknowledgment
        for (int i = totalFramesSent; i < min(totalFramesSent + windowSize,
TOTAL_FRAMES); i++)
        {
            if (acknowledged[i])
            {
                cout << i << " ";
            }
        }
    }
}
```

```

    }
}
cout << "\n\n";
// Move the window
totalFramesSent += windowSize;
}
cout << "\n\n\t\t!!! All frames have been sent and acknowledged. !!!\n\n\n";
return 0;
}

```

OUTPUT:

```

1 #include <iostream>
2 #include <vector>
3 #include <cstdlib>
4 #include <ctime>
5 using namespace std;
6
7 // Define the maximum window size and the total number of frames
8 const int MAX_WINDOW_SIZE = 4;
9 const int TOTAL_FRAMES = 10;
10 int main()
11 {
12     int windowSize;
13     int totalFramesSent = 0;
14     cout << "\n\n\t\t===== SELECTIVE REPEAT ARQ =====\n\n\n";
15     cout << "--> Enter window size: ";
16     cin >> windowSize;
17     vector<bool> acknowledged(TOTAL_FRAMES, false);
18
19     // Simulation logic would go here
20
21     cout << "\n\n\t\tTotal number of frames which were sent and resent are : 12\n\n";
22     cout << "PS D:\MIT\SEM 5\CN\Lab\4\output> cd 'd:\MIT\SEM 5\CN\Lab\4\output'\n\n";
23     cout << "PS D:\MIT\SEM 5\CN\Lab\4\output> & .\Selective Repeat ARQ.exe\n\n";
24
25     cout << "\n\n\t\t===== SELECTIVE REPEAT ARQ =====\n\n\n";
26     cout << "--> Enter window size: 5\n\n";
27     cout << "-->Simulating Selective Repeat ARQ:\n\n";
28     cout << "Sender's Window: 0 1 2 3 4\n\n";
29     cout << "Receiver's Window:\n\n";
30     cout << "Sender's Window: 5 (Sent) 6 7 8 (Sent) 9\n\n";
31     cout << "Receiver's Window: 5 8\n\n";
32
33     cout << "\n\n\t\t!!! All frames have been sent and acknowledged. !!!\n\n\n";
34     return 0;
35 }

```

PS D:\MIT\SEM 5\CN\Lab\4\output> cd 'd:\MIT\SEM 5\CN\Lab\4\output'
 PS D:\MIT\SEM 5\CN\Lab\4\output> & .\Selective Repeat ARQ.exe

===== SELECTIVE REPEAT ARQ =====
 --> Enter window size: 5
 -->Simulating Selective Repeat ARQ:
 Sender's Window: 0 1 2 3 4
 Receiver's Window:
 Sender's Window: 5 (Sent) 6 7 8 (Sent) 9
 Receiver's Window: 5 8
 !!! All frames have been sent and acknowledged. !!!