

422116-WEEK2



MY Details

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SECTION : A

LAB-2 (09-01-2025)

1. Construct a C-program for Client-Server applications using inter-process communication mechanisms using:

a) FIFO / Named Pipes

Client-fifo.c

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <fcntl.h>

#define FIFO_NAME "myfifo"
#define BUFFER_SIZE 256

int main() {
    char buffer[BUFFER_SIZE];

    int fd = open(FIFO_NAME, O_WRONLY);
    if (fd == -1) {
```

```

        perror("open");
        exit(EXIT_FAILURE);
    }

    printf("Client: Type your messages (type 'exit' to quit):\n");
    while (1) {

        fgets(buffer, sizeof(buffer), stdin);
        buffer[strcspn(buffer, "\n")] = '\0';

        if (write(fd, buffer, strlen(buffer)) == -1) {
            perror("write");
            exit(EXIT_FAILURE);
        }

        if (strcmp(buffer, "exit") == 0) {
            printf("Client exiting...\n");
            break;
        }
    }

    close(fd);
    return 0;
}

```

server-fifo.c

```

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <fcntl.h>
#include <sys/stat.h>
#include <sys/types.h>

```

```

#define FIFO_NAME "myfifo"
#define BUFFER_SIZE 256

int main()
{
    char buffer[BUFFER_SIZE];
    if (mkfifo(FIFO_NAME, 0666) == -1)
    {
        perror("mkfifo");
        exit(EXIT_FAILURE);
    }

    printf("Server: Waiting for clients...\n");

    int fd = open(FIFO_NAME, O_RDONLY);
    if (fd == -1)
    {
        perror("open");
        exit(EXIT_FAILURE);
    }

    while (1)
    {
        ssize_t bytes_read = read(fd, buffer, sizeof(buffer)
- 1);
        if (bytes_read > 0)
        {
            buffer[bytes_read] = '\0';
            printf("Server received: %s\n", buffer);

            if (strcmp(buffer, "exit") == 0)
            {
                printf("Server shutting down...\n");
                break;
            }
        }
    }
}

```

```

    }
}
}

close(fd);
unlink(FIFO_NAME);
return 0;
}

```

```

tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ mkdir -p ~/cn_lab/week2_fifo
tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ cp -r /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo/* ~/cn_lab/week2_fifo/
tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ cd ~/cn_lab/week2_fifo
tharun@BOOK-E8B01UE3PL: ~/cn_lab/week2_fifo$ ./fifo--server
Server: Waiting for clients...
Server received: hi
Server received: this side is client
Server received: ig you are server
hi
Server received: okay now i see only i can send mssgs
Server received: okay bye
Server received: exit
Server shutting down...
tharun@BOOK-E8B01UE3PL: ~/cn_lab/week2_fifo$ hi
Command 'hi' not found, but can be installed with:
sudo snap install hi
tharun@BOOK-E8B01UE3PL: ~/cn_lab/week2_fifo$

```

```

tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ ./fifo--client
open: No such file or directory
tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ mkdir -p ~/cn_lab/week2_fifo
tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ cp -r /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo/* ~/cn_lab/week2_fifo/
cp: cannot create regular file '/home/tharun/cn_lab/week2_fifo/fifo--server': Text file busy
tharun@BOOK-E8B01UE3PL: /mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/computer networks/CN LAB/week2_09_01_2025/fifo$ cd ~/cn_lab/week2_fifo
tharun@BOOK-E8B01UE3PL: ~/cn_lab/week2_fifo$ ./fifo--client
Client: Type your messages (type 'exit' to quit):
hi
this side is client
ig you are server
okay now i see only i can send mssgs
okay bye
exit
Client exiting...
tharun@BOOK-E8B01UE3PL: ~/cn_lab/week2_fifo$

```

b) Message queues

client

```

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/ipc.h>
#include <sys/msg.h>
#include <sys/stat.h>
#include <sys/types.h>

#define KEY 1234
#define BUFFER_SIZE 256

struct message {
    long type;

```

```

    char text[BUFFER_SIZE];
};

int main() {
    struct message msg;
    int msgid;

    // Connect to the message queue
    msgid = msgget(KEY, 0666);
    if (msgid == -1) {
        perror("msgget");
        exit(EXIT_FAILURE);
    }

    printf("Client: Connected to message queue. Type your mes
sages (type 'exit' to quit):\n");

    while (1) {

        printf("> ");
        fgets(msg.text, sizeof(msg.text), stdin);
        msg.text[strcspn(msg.text, "\n")] = '\0';

        msg.type = 1;

        if (msgsnd(msgid, &msg, sizeof(msg.text), 0) == -1) {
            perror("msgsnd");
            exit(EXIT_FAILURE);
        }

        if (strcmp(msg.text, "exit") == 0) {
            printf("Client exiting...\n");
            break;
        }
    }
}

```

```

    return 0;
}

```

server

```

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/ipc.h>
#include <sys/msg.h>

#define KEY 1234
#define BUFFER_SIZE 256

struct message {
    long type;
    char text[BUFFER_SIZE];
};

int main() {
    struct message msg;
    int msgid;

    msgid = msgget(KEY, 0666 | IPC_CREAT);
    if (msgid == -1) {
        perror("msgget");
        exit(EXIT_FAILURE);
    }
    printf("Server: Message queue created. Waiting for messages...\n");

    while (1) {

        if (msgrcv(msgid, &msg, sizeof(msg.text), 0, 0) == -

```

```

1) {

    perror("msgrcv");
    exit(EXIT_FAILURE);
}

printf("Server received: %s\n", msg.text);

if (strcmp(msg.text, "exit") == 0) {
    printf("Server shutting down...\n");
    break;
}

}

if (msgctl(msgid, IPC_RMID, NULL) == -1) {
    perror("msgctl");
    exit(EXIT_FAILURE);
}

return 0;
}

```

```

tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB$ cd week2_09_01_2025/message_queue/
tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/message_queue$ ./server_msgq
Server: Message queue created. Waiting for messages...
Server received: hellogesg
Server received: hi i am client
Server received: okay you are getting----i used message queues here
Server received: okay bye for now i will explore how to dooo 2 way chattig like w
hatspp tmr
Server received: exit
Server shutting down...
tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/message_queue$

tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB$ cd week2_09_01_2025/
tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025$ cd message_queue/
tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/message_queue$ ./client_msgq
Client: Connected to message queue. Type your messages (type 'exit' to quit):
> hellogesg
> hi i am client
> okay you are getting----i used message queues here
> okay bye for now i will explore how to dooo 2 way chattig like whatsapp tmr
> exit
Client exiting...
tharun@BOOK-E0B01UE3PL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/message_queue$

```

c) Shared memory

client

```

#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/shm.h>
#include <string.h>
#include <errno.h>

int main() {
    int shmid;
    void *shared_memory;

    shmid = shmget((key_t)2345, 1024, 0666);
    if (shmid == -1) {
        perror("shmget failed");
        exit(EXIT_FAILURE);
    }

    shared_memory = shmat(shmid, NULL, 0);
    if (shared_memory == (void *)-1) {
        perror("shmat failed");
        exit(EXIT_FAILURE);
    }

    printf("Data read from shared memory is: %s\n", (char *)s
hared_memory);

    return 0;
}

```

server

```

#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>

```



```

#include <sys/shm.h>
#include <string.h>
#include <errno.h>

int main() {
    int shmid;
    void *shared_memory;
    char buff[100];

    shmid = shmget((key_t)2345, 1024, 0666 | IPC_CREAT);
    if (shmid == -1) {
        perror("shmget failed");
        exit(EXIT_FAILURE);
    }

    shared_memory = shmat(shmid, NULL, 0);
    if (shared_memory == (void *)-1) {
        perror("shmat failed");
        exit(EXIT_FAILURE);
    }

    if (read(0, buff, 100) == -1) {
        perror("read failed");
        exit(EXIT_FAILURE);
    }

    strcpy(shared_memory, buff);

    return 0;
}

```

```

tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB$ cd week2_09_01_2025/shared_mem/
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$ ./client
Data read from shared memory is:
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$ ./client
Data read from shared memory is: hello tharun

tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$

tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB$ cd week2_09_01_2025/shared_mem/
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$ ls
client.c server.c sharedmem.md sm-code.md
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$ gcc client.c -o client
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$ gcc server.c -o server
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$ ./server
hello tharun
tharun@BOOK-E080IUEJPL:/mnt/c/Users/Tharun/Desktop/B-tech(22-26)/3rd yr/Sem6-/com
puter networks/CN LAB/week2_09_01_2025/shared_mem$

```

2. Construct a Program for Checksum

```

#include <bits/stdc++.h>

using namespace std;

string binaryAddition(string a, string b)
{
    int n = a.length();
    string res = "";
    int carry = 0;
    for (int i = n - 1; i >= 0; --i)
    {
        // we are starting from end co
z we do add from right to left
        int bit1 = a[i] - '0'; // 0001001001---here 1 is take
n at 1st
        int bit2 = b[i] - '0'; // 0001101001---here 1 is take
n at 1st then move to before on in R-L
        int sum = bit1 + bit2 + carry;
        res = to_string(sum % 2) + res;
        carry = sum / 2;
    }
    if (carry) // at last we might get carry ----if get it wi
ll be 1 so we add it to the result
    {
        for (int i = res.length() - 1; i >= 0 && carry; --i)

```

```

        {
            if (res[i] == '0')
            {
                res[i] = '1';
                carry = 0;
            }
            else
            {
                res[i] = '0';
            }
        }
    }
    return res;
}

```

string calculateChecksum(vector<string> dataSegments, int bitSize) // here as per example--4, 8

```

{
    string sum = string(bitSize, '0'); // 00000000
    for (const auto &segment : dataSegments)
    {
        sum = binaryAddition(sum, segment); // we go from left to right ---> like one seg to next segment
    }
}

```

// here we are doing 1's complement of the sum----sum which is calculated above from all binary additions of all segments

```

    for (char &bit : sum) // inversion case
    {
        bit = (bit == '0') ? '1' : '0';
    }
    return sum;
}

```

bool verifyChecksum(vector<string> dataSegments, int bitSize)

```

// i added that checksum direct to dataSegments at the end
{
    string sum = string(bitSize, '0');
    for (const auto &segment : dataSegments)
    {
        sum = binaryAddition(sum, segment);
    }

    for (char bit : sum) // here we get 11111111 as sum of all
    segments and checksum if it is valid
    {
        if (bit == '0')
            return false; // even if any bit is not 0 then info
        or data got is not valid
    }
    return true;
}

int main()
{
    vector<string> dataSegments = {"10011001", "11100010", "0
0100100", "10000100"};
    int bitSize = 8;

    string checksum = calculateChecksum(dataSegments, bitSize);
    cout << "Checksum: " << checksum << endl;

    dataSegments.push_back(checksum);

    // if (verifyChecksum(dataSegments, bitSize))
    // {
    //     cout << "Data is valid (Checksum verified successfully)." << endl;
    // }

```

```

        // else
        // {
        //     cout << "Data is invalid (Checksum verification fa
        iled)." << endl;
        // }

        // for checking --invalid case

        vector<string> dataSegments2 = {"10011001", "11100010",
        "00100100", "10000101"};
        dataSegments2.push_back(checksum);

        if (verifyChecksum(dataSegments2, bitSize))
        {
            cout << "Data is valid (Checksum verified successfull
            y)." << endl;
        }
        else
        {
            cout << "Data is invalid (Checksum verification faile
            d)." << endl;
        }

        return 0;
    }
}

```

```

cd "c:\Users\Tharun\Desktop\B-tech(22-26)\3rd yr\Sem6-\computer networks\CN LAB\week2_09_01_2025\checksum\" ; if ($?) { g++ checksum.cpp -o checksum } ; if
($?) { .\checksum }
Checksum: 11011010
Data is invalid (Checksum verification failed).
checksum>

```

```

cd "c:\Users\Tharun\Desktop\B-tech(22-26)\3rd yr\Sem6-\computer networks\CN LAB\week2_09_01_2025\checksum\" ; if ($?) { g++ checksum.cpp -o checksum } ; if
($?) { .\checksum }
Checksum: 11011010
Data is valid (Checksum verified successfully).
checksum>

```