# U18CO018
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## Subject: CN
## Assignment: 4

Implement the following datalink layer framing methods:
     1) Bit stuffing
     2) Character stuffing

## Bit-Stuffing.cpp

```cpp
#include <bits/stdc++.h>
using namespace std;
int main(){
    string a,b;
    cout<<"Enter Input Frame: ";
    cin>>a;
    //stuffing
    int n=a.size(),id1=0,zero=0,one=0;
    for(int i=0;i<n;i++){
        if(a[i] == '0') {
            zero = 1; one = 0;
        } else if(zero != 0) {
                one++;
        }
        b+=a[i];
        if(zero == 1 && one == 5) {
            zero = 0; one = 0;
            b+='0';
        }
    }
    cout<<"before stuffing Frame length: "<<n<<endl;
    cout<<"After stuffing Frame length: "<<b.size()<<endl;
    cout<<"After stuffing Frame: "<<b<<endl;
    //unstuffing
    a=""; n=b.size();
    zero = 0,one = 0;
    for(int i = 0;i<n;i++) {
        if(b[i] == '0') {
            zero = 1; one = 0;
        } else if(zero != 0) {
```

```
                one++;
            }
        a+=b[i];
        if(zero == 1 && one == 5) {
            zero = 0; one = 0;
            i++;
        }
    }
    cout<<"After unstuffing Frame length: "<<a.size()<<endl;
    cout<<"After unstuffing Frame: "<<a<<endl;
    return 0;
}
```

## Output 1:-



```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing>cd "d:\xampp\htdocs\Assignments\CN\Data Link
cpp -o Bit-Stuffing && "d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing\"Bit-Stuffing
Enter Input Frame: 110101111101011111101011111110
before stuffing Frame length: 30
After stuffing Frame length: 33
After stuffing Frame: 110101111100101111101010111110110
After unstuffing Frame length: 30
After unstuffing Frame: 110101111101011111101011111110

d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing>
```

## Output 2:-



```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL                                                        1: Cod

d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing>cd "d:\xampp\htdocs\Assignments\CN\Data Link Bit & Cha
cpp -o Bit-Stuffing && "d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing\"Bit-Stuffing
Enter Input Frame: 0111101111101100
before stuffing Frame length: 16
After stuffing Frame length: 17
After stuffing Frame: 01111011111001100
After unstuffing Frame length: 16
After unstuffing Frame: 0111101111101100

d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing>
```

## Character-Stuffing.cpp

```cpp
#include <bits/stdc++.h>
using namespace std;
int main(){
    cout<<"Enter Input Frame: ";
    string s,res="";
    cin>>s;
    //stuffing '-' special char and Ed = '$'
    int n=s.size();
    for(int i=0;i<n;i++){
        if(s[i]=='$' || s[i]=='-'){
            res+='-';
        }
        res+=s[i];
    }
    cout<<"before stuffing Frame length: "<<n<<endl;
    cout<<"After stuffing Frame length: "<<res.size()<<endl;
    cout<<"After stuffing Frame: "<<res<<endl;
    //unstuffing
    s="";
    n=res.size();
    for(int i=0;i<n;i++){
        if(res[i]=='-') i++;
        if(i<n)
            s+=res[i];
    }
    cout<<"After unstuffing Frame length: "<<s.size()<<endl;
    cout<<"After unstuffing Frame: "<<s<<endl;
    return 0;
}
```

## Output 1:-

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing>cd "d:\xampp\htdocs\Assignments\CN
ffing.cpp -o Character-Stuffing && "d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffin
Enter Input Frame: $ABSADF$-$$-
before stuffing Frame length: 12
After stuffing Frame length: 18
After stuffing Frame: -$ABSADF-$---$-$--
After unstuffing Frame length: 12
After unstuffing Frame: $ABSADF$-$$-
```

**Output 2:-**

```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL


d:\xampp\htdocs\Assignments\CN\Data Link Bit & Character stuffing>cd "d:\xampp
ffing.cpp -o Character-Stuffing && "d:\xampp\htdocs\Assignments\CN\Data Link B
Enter Input Frame: -$A$$
before stuffing Frame length: 5
After stuffing Frame length: 9
After stuffing Frame: ---$A-$-$
After unstuffing Frame length: 5
After unstuffing Frame: -$A$$
```