Programming with C and C++

CSC-101 (Lecture 27)

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Self Referential Structure

```c
#include <stdio.h>
#include <stdlib.h>

struct Node {
    int data;
    struct Node* next;
};

void display(struct Node* temp)
{
    while (temp) {
    printf(" %d ", temp->data);
    temp= temp->next;
    }
}

```

https://ideone.com/8vguyR

Self Referential Structure

```
17  void main()
18  {
19      // assign each node a null value to avoid any refrence error
20      struct Node* head =NULL;
21      struct Node* second_node = NULL;
22      struct Node* third_node = NULL;
23
24      // defining three nodes
25      head = (struct Node*)malloc(sizeof(struct Node));
26      second_node = (struct Node*)malloc(sizeof(struct Node));
27      third_node = (struct Node*)malloc(sizeof(struct Node));
28
29      head->data = 1000; // assign data in first node
30      head->next = second_node; // Link first node with second
31
32      second_node->data = 2000; // assign data to second node
33      second_node->next = third_node;
```

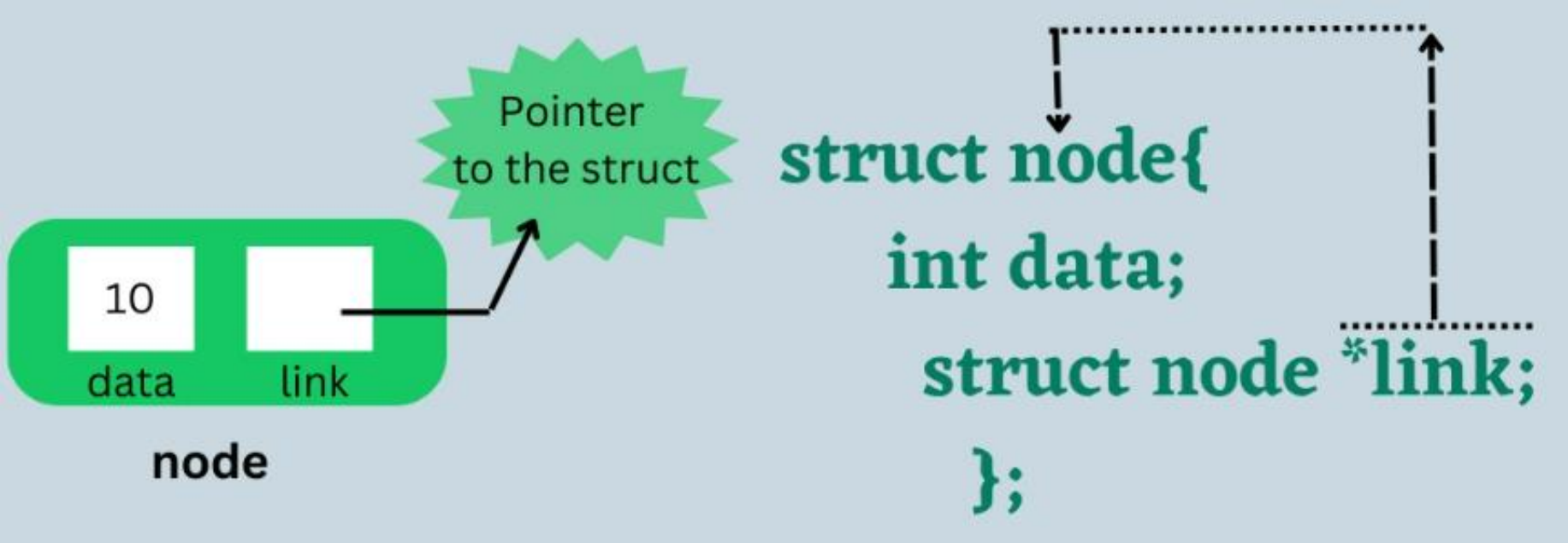
Self Referential Structure

```
34
35      third_node->data = 3000; // assign data to third node
36      third_node->next = NULL;
37
38      // calling the function to display value
39      display(head);
40
41      free(head);
42      free(second_node);
43      free(third_node);
44  }
45
```

stdout

```
1000   2000   3000
```

Self Referential Structure



- This is called **Linked List**

Problems

1. Define a structure representing a date with attributes day, month, and year. Write a function to compare two dates and determine which one is greater.
2. Create a program that stores a database of students using structures. Each structure should represent a student with attributes like name, age, and grades. Implement functions to find the average grade and display students with a grade above a certain value.
3. Create an address book program using pointers to structures. Each structure should represent a contact with attributes like name, phone number, and email. Implement functions to add a contact, display all contacts, and search for a contact by name.

Unions in C

- A union is a special data type available in C that allows to store different data types in the same memory location.
- We can define a union with many members, but only one member can contain a value at any given time.
- Unions provide an efficient way of using the same memory location for multiple-purpose.

```
union [union tag] {
    member definition;
    member definition;
    ...
    member definition;
} [one or more union variables];
```

Example

```
union Data {
    int i;
    float f;
    char str[20];
} data;
```

Size of union variable

https://ideone.com/CUksUC

```c
#include <stdio.h>
#include <string.h>

union Data {
   int i;
   float f;
   char str[20];
};

int main( ) {

   union Data data;

   printf( "Memory size occupied by data : %d\n", sizeof(data));

   return 0;
}
```

stdout

```
Memory size occupied by data : 20
```

Accessing Union Members

```
1   #include <stdio.h>
2   #include <string.h>
3
4   union Data {
5       int i;
6       float f;
7       char str[40];
8   };
9
10  int main( ) {
11
12      union Data data;
13
```

https://ideone.com/PKWjJ4

Union

```
14      data.i = 110;
15      data.f = 16.65;
16      strcpy( data.str, "Programming With C and C++");
17
18      printf( "data.i : %d\n", data.i);
19      printf( "data.f : %f\n", data.f);
20      printf( "data.str : %s\n", data.str);
21
22      return 0;
23  }
24
```

stdout

```
data.i : 1735357008
data.f : 113075428283777112919244 8.000000
data.str : Programming With C and C++
```

Union

```c
#include <stdio.h>
#include <string.h>

union Data {
    int i;
    float f;
    char str[40];
};

```

https://ideone.com/eEcz1T

Union

```
10  int main( ) {
11
12      union Data data;
13
14      data.i = 110;
15      printf( "data.i : %d\n", data.i);
16      data.f = 16.65;
17      printf( "data.f : %f\n", data.f);
18      strcpy( data.str, "Programming With C and C++");
19      printf( "data.str : %s\n", data.str);
20
21      return 0;
22  }
23
```

stdout

```
data.i : 110
data.f : 16.650000
data.str : Programming With C and C++
```

C++

- C++
  - Designed by Bjarne Stroustrup
  - First appeared in 1983; 40 years ago
  - Procedural and Object Oriented!

Simple cpp program

https://ideone.com/o75DIV

```cpp
#include <iostream>
using namespace std;

int main() {
    // your code goes here
    cout << "Welcome to CPP part in CSC-101";
    return 0;
}

```

stdout

```
Welcome to CPP part in CSC-101
```

Simple cpp program

https://ideone.com/2M8AyR

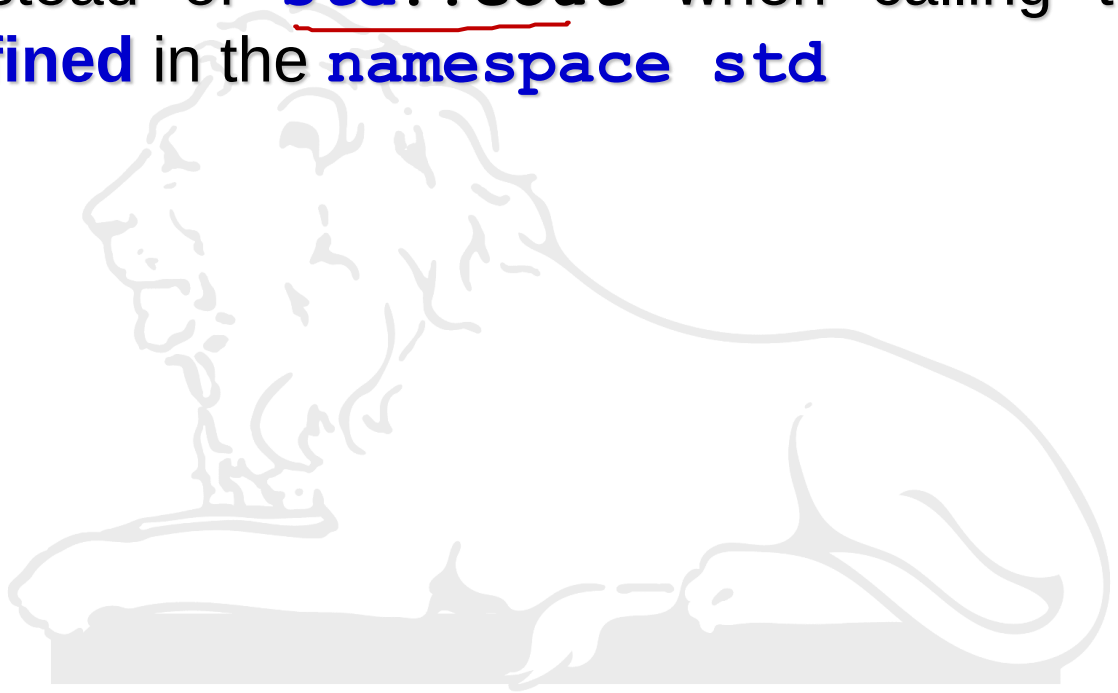
```cpp
#include <iostream>

int main() {
    // your code goes here
    std::cout << "Welcome to CPP part in CSC-101";
    return 0;
}

```

stdout

```
Welcome to CPP part in CSC-101
```

using namespace std

- A symbol may be for instance a function, class or a variable. E.g. if you add `using namespace std;` you can write just `cout` instead of `std::cout` when calling the operator `cout` **defined** in the `namespace std`



In Terminal

HelloWorld.cpp

```cpp
#include <iostream>
using namespace std;

int main() {
	// your code goes here
	cout << "Welcome to CPP part in CSC-101"
<<endl;
	return 0;
}
```

```
~$ g++ HelloWorld.cpp
~$ ./a.out
Welcome to CPP part in CSC-101
~$
```

Sample CPP code

https://ideone.com/5hi8xD

```cpp
#include <iostream>

using namespace std;

int main() {
    int num1, num2;
    cout << "Enter the first number: "<<endl;
    cin >> num1;
    cout << "Enter the second number: "<<endl;
    cin >> num2;

    int sum = num1 + num2;
    cout<<"Sum of "<<num1<<" and "<<num2<<" is: "<<sum<<endl;

    return 0;
}
```

```
Success #stdin #stdout 0.01s 5424KB
Enter the first number:
Enter the second number:
Sum of 10 and 5 is: 15
```

Thank You!