STRUCTURE

&

UNION

Data Types

C programming language which has the ability to divide the data into different types. The type of a variable determine the what kind of values it may take on. The various data types are

- Simple Data type

  → Integer, Real, Void, Char

- Structured Data type

  →Array, Strings

- User Defined Data type

  →Enum, Structures, Unions

Structure Data Type

A structure is a user defined data type that groups logically related data items of different data types into a single unit. All the elements of a structure are stored at contiguous memory locations. A variable of structure type can store multiple data items of different data types under the one name. As the data of employee in company that is name, Employee ID, salary, address, phone number is stored in structure data type.

Defining of Structure

A structure has to defined, before it can used. The syntax of defining a structure is

struct <struct_name>

{

<data_type> <variable_name>;

<data_type> <variable_name>;

……..

<data_type> <variable_name>;

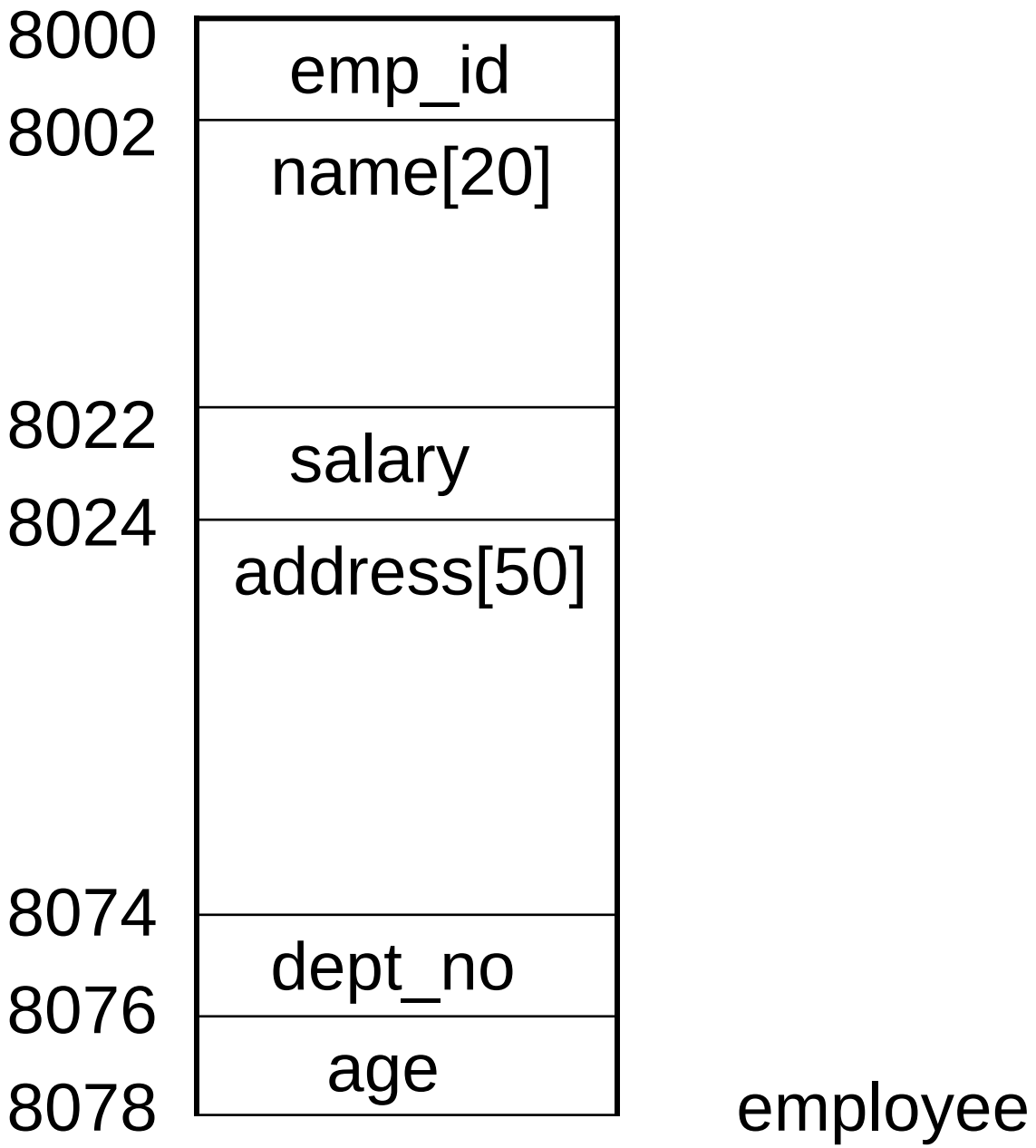
};

Example of Structure

The structure of Employee is declared as

```
struct employee
{
int  emp_id;
char name[20];
float salary;
char address[50];
int dept_no;
int age;
};
```

Memory Space Allocation



Declaring a Structure Variable

A structure has to declared, after the body of structure has defined. The syntax of declaring a structure is

struct <struct_name> <variable_name>;

The example to declare the variable for defined structure “employee”

struct employee e1;

Here e1 variable contains 6 members that are defined in structure.

Initializing a Structure Members

The members of individual structure variable is initialize one by one or in a single statement. The example to initialize a structure variable is

1) struct employee e1 = {1, “Hemant”,12000, “3 vikas colony new delhi”,10, 35);

2) e1.emp_id=1; e1.dept_no=1
   e1.name=“Hemant”; e1.age=35;
   e1.salary=12000;
   e1.address=“3 vikas colony new delhi”;

Accessing a Structure Members

The structure members cannot be directly accessed in the expression. They are accessed by using the name of structure variable followed by a dot and then the name of member variable. The method used to access the structure variables are e1.emp_id, e1.name, e1.salary, e1.address, e1.dept_no, e1.age. The data with in the structure is stored and printed by this method using scanf and printf statement in c program.

Structure Assignment

The value of one structure variable is assigned to another variable of same type using assignment statement. If the e1 and e2 are structure variables of type employee then the statement

e1 = e2;

assign value of structure variable e2 to e1. The value of each member of e2 is assigned to corresponding members of e1.

Program to implement the Structure

```
#include <stdio.h>
#include <conio.h>
struct employee
{
int  emp_id;
char name[20];
float salary;
char address[50];
int dept_no;
int age;
};
```

Program to implement the Structure

```
void main ( )
  { struct employee e1,e2;
    printf (“Enter the employee id of employee”);
    scanf(“%d”,&e1.emp_id);
    printf (“Enter the name of employee”);
    scanf(“%s”,e1.name);
    printf (“Enter the salary of employee”);
    scanf(“%f”,&e1.salary);
    printf (“Enter the address of employee”);
    scanf(“%s”,e1.address);
    printf (“Enter the department of employee”);
    scanf(“%d”,&e1.dept_no);
    printf (“Enter the age of employee”);
```

Program to implement the Structure

```
scanf("%d",&e1.age);
printf ("Enter the employee id of employee");
scanf("%d",&e2.emp_id);
printf ("Enter the name of employee");
scanf("%s",e2.name);
printf ("Enter the salary of employee");
scanf("%f",&e2.salary);
printf ("Enter the address of employee");
scanf("%s",e2.address);
printf ("Enter the department of employee");
scanf("%d",&e2.dept_no);
printf ("Enter the age of employee");
scanf("%d",&e2.age);
```

Program to implement the Structure

```
printf (“The employee id of employee is : %d”,
            e1.emp_id);
printf (“The name of employee is : %s”,
            e1.name);
printf (“The salary of employee is : %f”,
            e1.salary);
printf (“The address of employee is : %s”,
            e1.address);
printf (“The department of employee is : %d”,
            e1.dept_no);
printf (“The age of employee is : %d”,
            e1.age);
```

Program to implement the Structure

```
printf (“The employee id of employee is : %d”,
            e2.emp_id);
printf (“The name of employee is : %s”,
            e2.name);
printf (“The salary of employee is : %f”,
            e2.salary);
printf (“The address of employee is : %s”,
            e2.address);
printf (“The department of employee is : %d”,
            e2.dept_no);
printf (“The age of employee is : %d”,e2.age);
getch();
}
```

Output of Program

Enter the employee id of employee 1
Enter the name of employee Rahul
Enter the salary of employee 15000
Enter the address of employee 4,villa area, Delhi
Enter the department of employee 3
Enter the age of employee 35
Enter the employee id of employee 2
Enter the name of employee Rajeev
Enter the salary of employee 14500
Enter the address of employee flat 56H, Mumbai
Enter the department of employee 5
Enter the age of employee 30

Output of Program

The employee id of employee is : 1
The name of employee is : Rahul
The salary of employee is : 15000
The address of employee is : 4, villa area, Delhi
The department of employee is : 3
The age of employee is : 35
The employee id of employee is : 2
The name of employee is : Rajeev
The salary of employee is : 14500
The address of employee is : flat 56H, Mumbai
The department of employee is : 5
The age of employee is : 30

Array of Structure

C language allows to create an array of variables of structure. The array of structure is used to store the large number of similar records. For example to store the record of 100 employees then array of structure is used. The method to define and access the array element of array of structure is similar to other array. The syntax to define the array of structure is

Struct <struct_name> <var_name> <array_name> [<value>];

For Example:-

Struct employee e1[100];

Program to implement the Array of Structure

```
#include <stdio.h>
#include <conio.h>
struct employee
{
int  emp_id;
char name[20];
float salary;
char address[50];
int dept_no;
int age;
};
```

Program to implement the Array of Structure

```
void main ( )
  {
    struct employee e[100];
    int i;
    for (i=0; i<100; i++)
    {
    printf (“Enter the employee id of employee”);
    scanf (“%d”,&e[i].emp_id);
    printf (“Enter the name of employee”);
    scanf (“%s”,e[i].name);
    printf (“Enter the salary of employee”);
    scanf (“%f”,&e[i].salary);
```

Program to implement the Array of Structure

```
printf (“Enter the address of employee”);
scanf (“%s”, e[i].address);
printf (“Enter the department of employee”);
scanf (“%d”,&e[i].dept_no);
printf (“Enter the age of employee”);
scanf (“%d”,&e[i].age);
}
for (i=1; i<=100; i++)
{
printf (“The employee id of employee is : %d”,
            e[i].emp_id);
printf (“The name of employee is: %s”,e[i].name);
```

Program to implement the Array of Structure

```
    printf ("The salary of employee is: %f",
                e[i].salary);
    printf ("The address of employee is : %s",
                e[i].address);
    printf ("The department of employee is : %d",
                e[i].dept_no);
    printf ("The age of employee is : %d", e[i].age);
    }
getch();
}
```

Passing Structure to Function

The structure variable can be passed to a function as a parameter. The program to pass a structure variable to a function.

```
#include <stdio.h>
#include <conio.h>
struct employee
{
int  emp_id;
char name[20];
float salary;
};
```

Passing Structure to Function

```
void main ( )
  {
    struct employee e1;
    printf (“Enter the employee id of employee”);
    scanf(“%d”,&e1.emp_id);
    printf (“Enter the name of employee”);
    scanf(“%s”,e1.name);
    printf (“Enter the salary of employee”);
    scanf(“%f”,&e1.salary);
    printdata (struct employee e1);
    getch();
  }
```

Passing Structure to Function

```
void printdata( struct employee emp)
 {
    printf (“\nThe employee id of employee is :
                %d”, emp.emp_id);
    printf (“\nThe name of employee is : %s”,
                emp.name);
    printf (“\nThe salary of employee is : %f”,
                emp.salary);
  }
```

Union Data Type

A union is a user defined data type like structure. The union groups logically related variables into a single unit. The union data type allocate the space equal to space need to hold the largest data member of union. The union allows different types of variable to share same space in memory. There is no other difference between structure and union than internal difference. The method to declare, use and access the union is same as structure.

Defining of Union

A union has to defined, before it can used. The syntax of defining a structure is

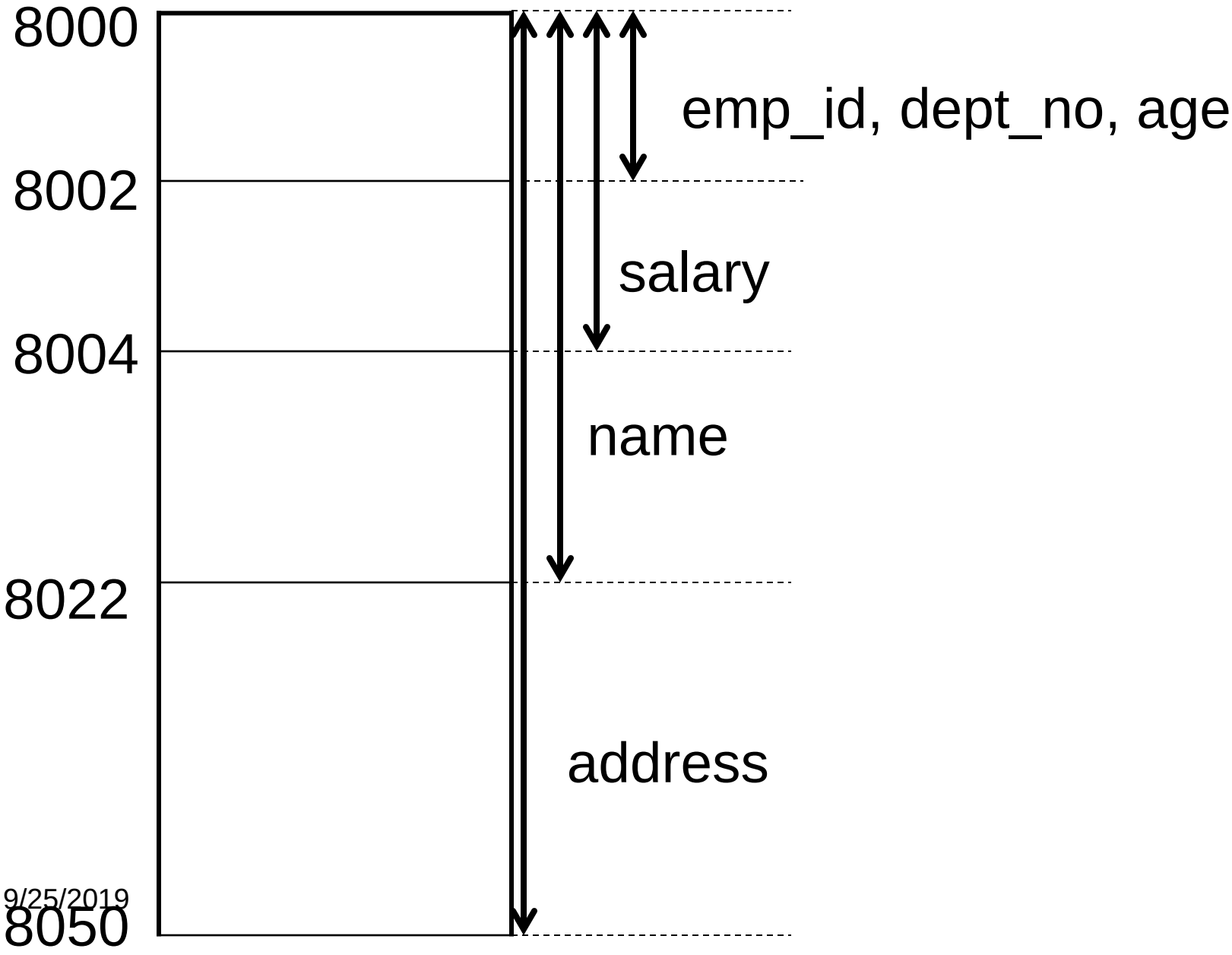
```
union <union_name>
{
  <data_type> <variable_name>;
  <data_type> <variable_name>;
   ……..
  <data_type> <variable_name>;
};
```

Example of Union

The union of Employee is declared as

```
union employee
{
int  emp_id;
char name[20];
float salary;
char address[50];
int dept_no;
int age;
};
```

Memory Space Allocation



Difference between Structures & Union

Structure	Union
1.The keyword struct is used to define a structure	1. The keyword union is used to define a union.
2. When a variable is associated with a structure, the compiler allocates the memory for each member. The size of structure is greater than or equal to the sum of sizes of its members. The smaller members may end with unused slack bytes.	2. When a variable is associated with a union, the compiler allocates the memory by considering the size of the largest memory. So, size of union is equal to the size of largest member.
3. Each member within a structure is assigned unique storage area of location.	3. Memory allocated is shared by individual members of union.
4. The address of each member will be in ascending order This indicates that memory for each member will start at different offset values.	4. The address is same for all the members of a union. This indicates that every member begins at the same offset value.
5 Altering the value of a member will not affect other members of the structure.	5. Altering the value of any of the member will alter other member values.
6. Individual member can be accessed at a time	6. Only one member can be accessed at a time.
7. Several members of a structure can initialize at once.	7. Only the first member of a union can be initialized.

Summary

- A structure is a user defined data type that groups logically related data items of different data types into a single unit.
- The elements of a structure are stored at contiguous memory locations.
- The value of one structure variable is assigned to another variable of same type using assignment statement.
- An array of variables of structure is created.
- A variable of structure type is defined as a member of other structure type called nested structure.