NWEN 241
Systems Programming

Week 5 Tutorial

Union vs Structure

	Structure	Union
Declaration syntax	Same	
Storage allocation	Allocates storage for all members separately	• Allocates common storage for all its members • Space is allocated to hold the biggest member
Access	All members can be accessed at the same time	Only one member can be “active” at any given time

Union Application

- Data structure for a record which can contain at least 2 types, but only one type is active at any given time

- Using struct:

- Using union:

Pointer Application 3: Dynamic Memory Allocation

1. Calculate how much memory you want to allocate
   - Number of elements
   - Size of each element
2. Request for memory using either `malloc()` or `calloc()`
   - Assign return value to an appropriate pointer
   - Check if request is granted by checking return value
3. Use memory as intended
4. Release memory by using `free()`

Valgrind

- Valgrind is an open-source tool for detecting memory management and threading bugs
- Available in CO246 lab computers and ECS servers

- Steps to using Valgrind:
  - Compile program with –g option
    - Example: `gcc -g buggy.c –o buggy`
  - Run with valgrind:
    - Example: `valgrind --leak-check=yes ./buggy`

Linked List Example

- Ask user to input arbitrary string
- Convert string to a singly-linked list, with each node containing a character
- User Input:

```
Smeagol
```

- Linked List: