Declaration Qualifiers

Last updated 8/6/22

Declaration Qualifiers

- Declaration – Full Structure
  - This applies to variables and functions
  - Declarations consist of 4 elements
    - Storage Class
    - Type Qualifier
    - Type Specifier
    - Declarator
  - Format
    - (Storage_Class) (Type_Qualifier) Type_Specifier Declarator;

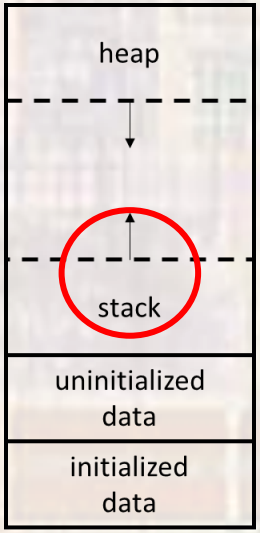
      int foo;
      - () indicates optional

Declaration Qualifiers

- Declaration – Storage Class
  - The storage class determines the duration of a variable's existence – it's scope
  - Storage class dictates where the variable is stored in data memory
  - Storage class determines where the variable can be seen
    - no linkage – only visible in the current block {}
    - internal linkage – visible in the current file
    - external linkage – visible in more than one file
  - 4 storage classes
    - Auto
    - Static
    - Extern
    - Register

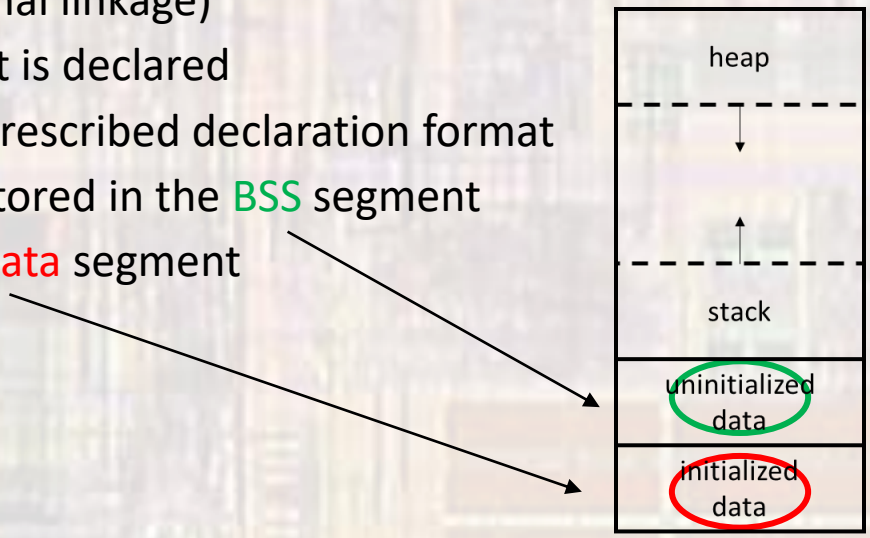
Declaration Qualifiers

- Declaration – Storage Class
  - Auto
    - Default value if not specified
    - Variable exists until the end of the block {} (scope) in which it was declared
      - Once the block is completed – the variable no longer exists
    - Only visible in the current file (no linkage)
    - Stored in the Stack
    - Auto is typically omitted since it is the default
    - auto int foo;
    - int foo;



Declaration Qualifiers

- Declaration – Storage Class
  - Static
    - Variable exists in the block {} in which it was declared for the duration of the program
      - Commonly used in functions to retain the variable's value between calls (e.g. a counter) – (no linkage)
      - Global variables are static -
      - Only visible in the current file (internal linkage)
      - Can be initialized at the same time it is declared
        - One of two exceptions to our prescribed declaration format
      - If un-initialized or initialized to 0 – stored in the BSS segment
      - If initialized (not 0) – stored in the Data segment
      - static int foo = 5;
      - static int boo;

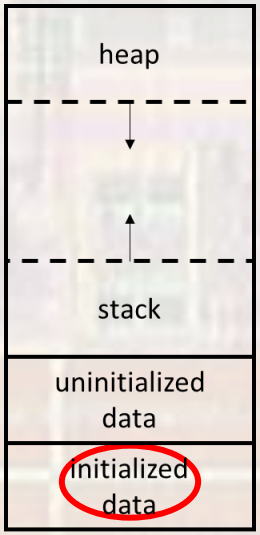


Declaration Qualifiers

- Declaration – Storage Class
  - Extern
    - Variable visible in more than one file (external linkage)
      - Used when multiple files need access to a single variable
      - Defined in 1 file, declared as extern in any files that want to access it
      - Has a Static duration
      - Stored in the Data segment
      - If it needs to be initialized, it should be done at the same time it is defined – ensures all files see the initialization

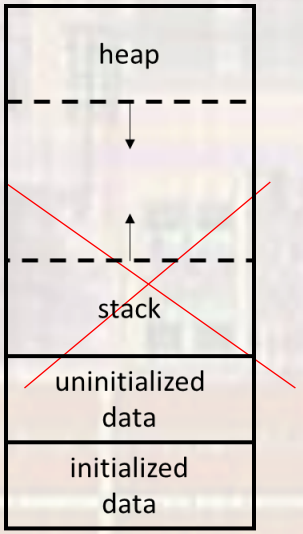
File 1	File 2,3,…
int foo;	extern int foo;
int loo = 3;	extern int loo;
inf boo[10]	extern int boo[]

note – no size here



Declaration Qualifiers

- Declaration – Storage Class
  - Register
    - Variable stored in a CPU register
      - Allows fast access
      - Only defined with-in a block {}
      - Only visible in the current block (no linkage)
      - Not used often due to high quality compilers used today
      - The compiler can ignore this request
      - register int foo;



Declaration Qualifiers

- Data Memory