FUNCTIONS AND VARIABLE SCOPE

Each function defines a new, unique scope

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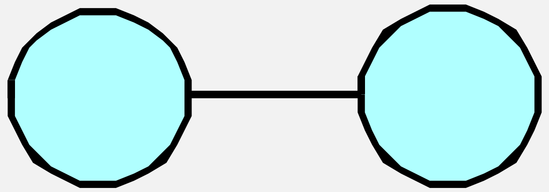
SCOPE

- Scope is the location in a program where an identifier is visible or accessible
- Named scopes
  - Global
  - Class
  - Local
  - Block / control statement
- Scope resolution takes place from the tightest to the widest

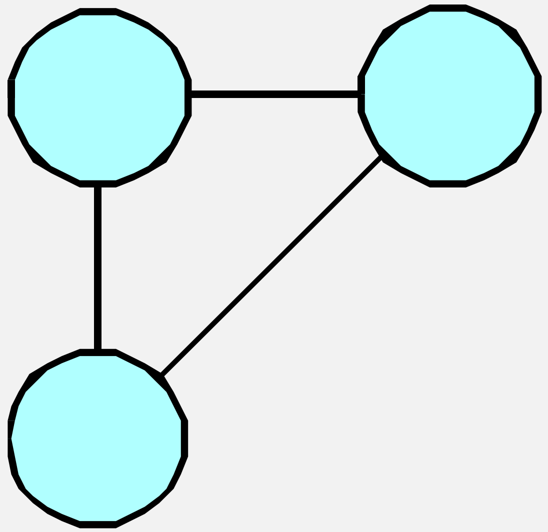
GLOBAL VARIABLES AND FUNCTION COUPLING

- Functions that only operate on parameter values can be tested independently
- Functions that share data through global variables are coupled and must be tested together
- The level of complexity increases rapidly as each new coupled function is added
- The complexity of coupled functions limit the size of programs

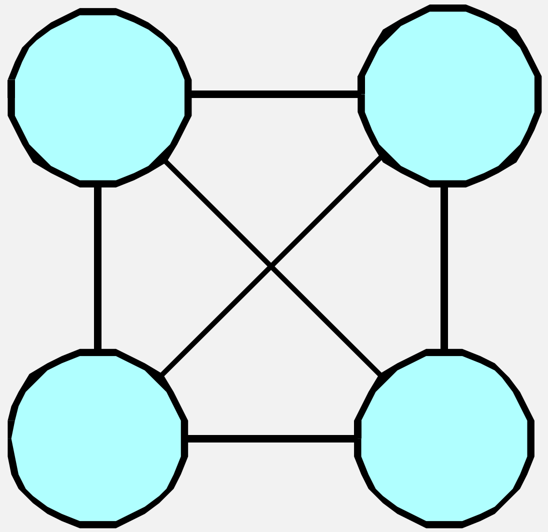
VISUALIZING THE COMPLEXITY OF COUPLED FUNCTIONS



VISUALIZING THE COMPLEXITY OF COUPLED FUNCTIONS



VISUALIZING THE COMPLEXITY OF COUPLED FUNCTIONS



CLASS SCOPE

- One of the many advantages of the object-oriented programming model is that it provides an intermediate scope (between global and local)
  - Some functions can see or access class scope variables or data
  - Class scope variables are hidden from most of the program
  - Covered in greater detail later

LOCAL VARIABLES

- Variables defined inside of a function; includes function parameters

```
double average(...)
{
    double sum = 0;
        .
        .
        .
}
```

```
int to_seconds(int hrs,
        int mins, int secs)
{
    int h = hrs * 3600;
    int m = mins * 60;
    return  h + m + secs;
}
```

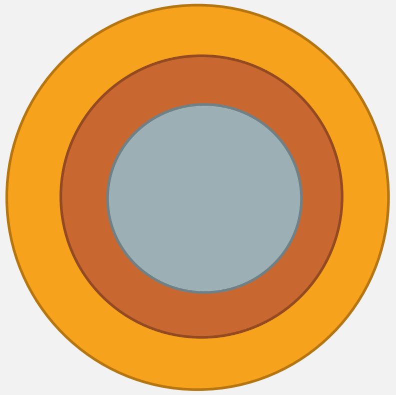
BLOCK SCOPE

The scope of the for-loop loop control variable is restricted to the for-loop

```
double average()
{
        double  sum = 0;
        int     count = 0;

        while (...)
        {
                int data;

                cin >> data;
                sum += data;
                count++;
        }

        return sum / count;
}
```

SCOPE RESOLUTION

- The compiler searches for variables from the tightest to the widest scope



```
int         nlines = 10;
int         counter = 100;      // global

void  function( )
{
            int counter = 200;  // local
            cout << "nlines " << nlines <<
                        "counter " << counter;
}
```

STATIC VARIABLES

```
double average()
{
        double  sum = 0;
        int     count = 0;
                . . .
        return sum / count;
}
```

```
double random()
{
        static  double      x = 0;

        x = x * (x + 1) % 2147483648L;
        return  x;
}
```

EXTERN VARIABLES

file1.cpp

```
int counter = 100;

void increment()
{
        counter++;
}
```

file2.cpp

```
extern int counter;

int report()
{
        return counter;
}
```