CSC340:
User-defined Data Types in C++

Main Topics:
1. **Struct (covered previously)**
2. **Enumerations**
3. **Union**
4. **Classes (to be covered next)**

Readings:
1. **Search "union" and "enumeration" on http://www.cplusplus.com**

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Enumerations

- **Often used to represent sets of constants**
- **Two forms:**
  - enum class (strong-typed and strongly recommended)
    enum class Color {red, blue, green};
    enum class Traffic_light {red, yellow, green};
  - enum: implicitly converts each value to an integer
    enum Color {red, blue, green};
    int color1 = green; //color1 will get value 2

More about enum classes

enum class Color {red, blue, green};

enum class Traffic_light {red, yellow, green};

- **Strong typed**

Color color1 = Color::red; //correct

Color x = red; //illegal, which red?

Color y = Traffic_light::red; //illegal

Traffic_light light = Traffic_light::red; //correct

int i = Color::red; //illegal

Color z = 2; //illegal

- **By default, enum class only has assignment, initialization, and comparions. We can overload meaningful operators though.**

```
Traffic_light & operator( Traffic_light & t){
    switch (t) {
            case Traffic_light::green: retrun t=Traffic_light::yellow;
            case Traffic_light::yellow: retrun t=Traffic_light::red;
            case Traffic_light::red: retrun t=Traffic_light::green;  }
}
```


3

Union

- **Union is a struct where all members are allocated at the same address so that the union only occupies as much space as its largest member**

- **Example**

```
enum Type {str, num};
struct Entry{
      char *name;
      Type t;
      char *s; //use if t==str
      int I;      //use if t==num
};
```

```
union Value{
      char *s;
      int i;
};
Struct Entry{
      char *name;
      Type t;
      Value v; //use v.s if t==str
                  //use v.i if t==num
};
```

- **Caution:** maintaining the correspondence between the type field and the type held in a union can be error prone.
- **Solution:** encapsulation and information hiding

4

Summary

- When to use enumerations?
- What are the two types of enumerations?
- When to use unions?
- What is the benefit and risk of using unions?