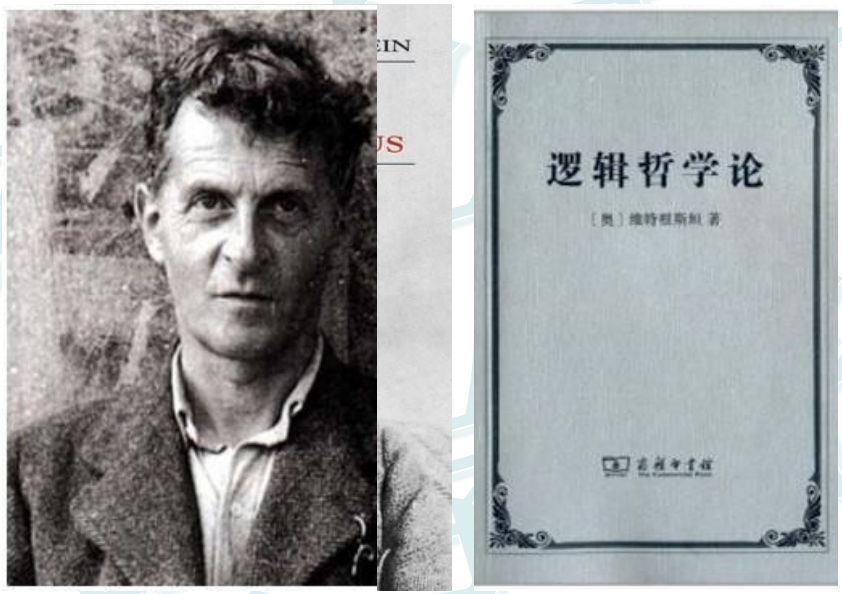
C/C++程序设计案例实战
——种类繁多的手机世界

华中农业大学信息学院　李小霞

面向对象的由来



案例分析

买手机

品牌：iphone8
主频：2376MHz
容量：64G
大小：5.7寸
…

静态的特征

对象

打电话
发短信
4G上网
…

动态的行为


TIM
下午5:49
35%
日历
照片
相机
地图
时钟
天气
Wallet
备忘录
提醒事项
iTunes Store
App Store
iBooks
设置
附加程序
信息
FaceTime
邮件
电话
Safari
微信

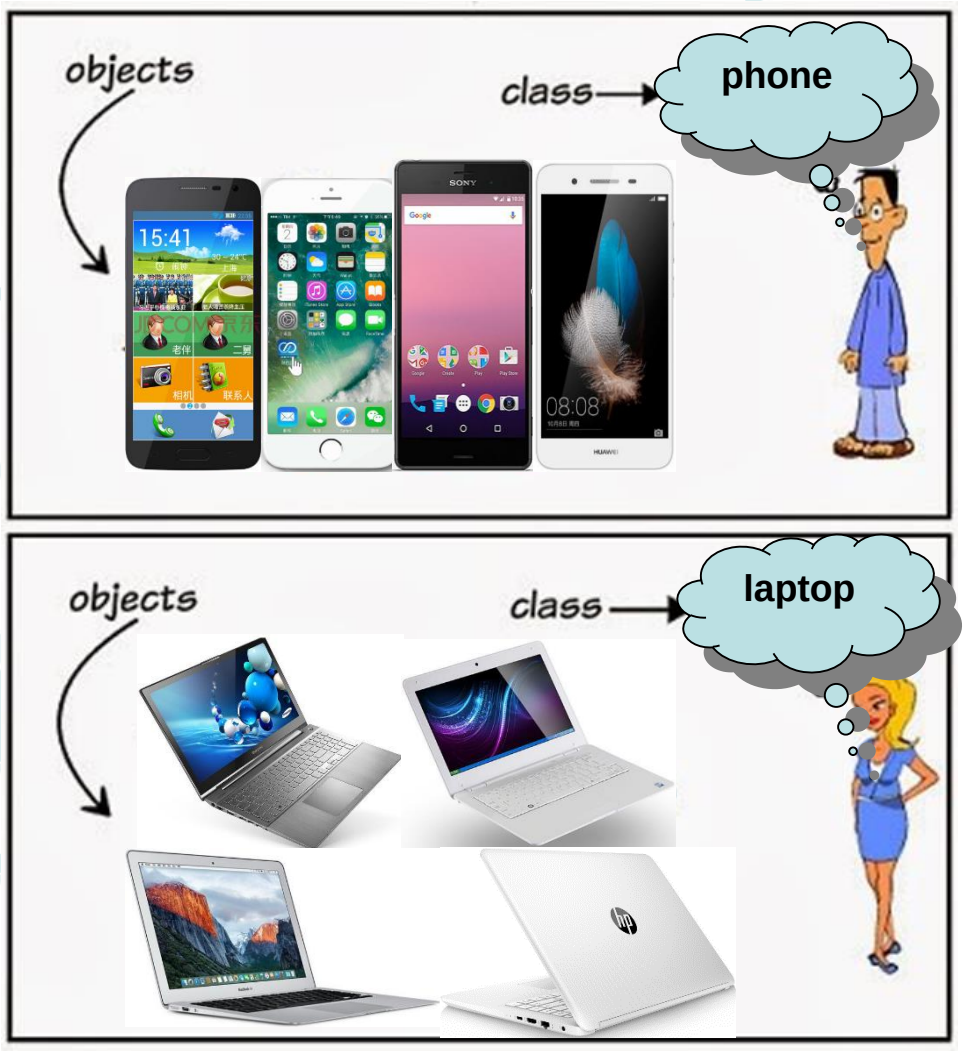

08:08
10月8日 周四
HUAWEI


SAMSUNG
12:03
12:03
8 月 29日，星期三
滑动屏幕以解锁


01:10
10月20日 星期二

……


对象
对象
对象
对象
08:08
10月8日 周四
HUAWEI
12:03
8 月 29日，星期三
滑动屏幕以解锁
01:10
10月20日 星期二
.....
类

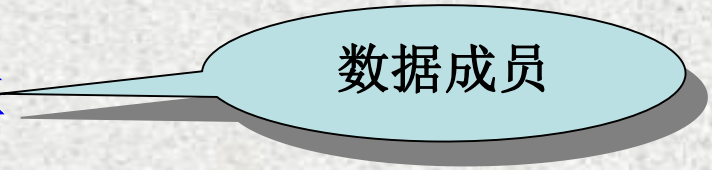

objects
class
phone
15:41
08:08
objects
class
laptop

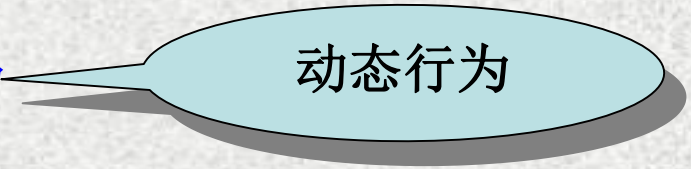
类的创建

```
class 类名
{

}
```

类的创建

```
class 类名
{
    静态属性
    动态行为

}
```





类的创建

```
class  类名                    class   Phone
{                              {

   静态属性

   动态行为


}                              }
```

类的创建

```
class  类名
{
   静态属性

   动态行为

}
```

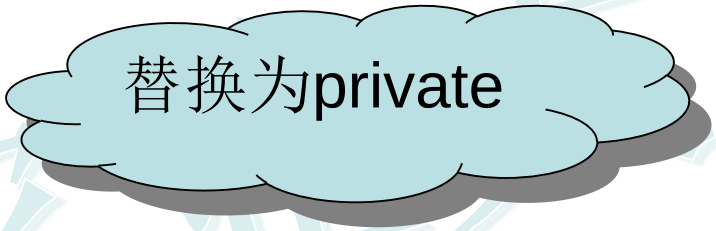
```
class   Phone
{
    string  brand;
    float   cpu;
    int     mem;
    float   size;

    void   call(){...}
    void   sendMessage(){...}
    void   surfInternet (){...}
}
```

案例——代码实现

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 public:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15    void surfInternet()
16    {cout<<brand<<"is surfing internet"<<endl;}
17 }
```

案例——代码实现

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 public:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15    void surfInternet()
16    {cout<<brand<<"is surfing internet"<<endl;}
17 }
```



案例——代码实现

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 private:
7    char brand[20];
8    float cpu;
9    int memo;
10   float size;
11 public:
11   void call()
12   {cout<<brand<<"is calling"<<endl;}
13   void sendMessage()
14   {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15   void surfInternet()
16   {cout<<brand<<"is surfing internet"<<endl;}
17 }
```

案例——代码实现

```
1  #include<iostream>
2  #include<cstring>
3  using namespace std;
4  class Phone
5  {
6  private:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11 public:
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15    void surfInternet()
16    {cout<<brand<<"is surfing internet"<<endl;}
17 }
```

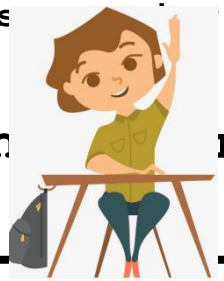
```
18 int main()
19 {
20    Phone ph1;
21    ph1.call();
22    ph1.sendMessage();
23    ph1.surfInternet();
22    return 0;
23 }
```

案例——代码实现

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 private:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11 public:
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending mess                cpu"<<cpu<<"HZ"<<endl;}
15    void surfInternet()
16    {cout<<brand<<"is surfin
17 }
```

```
18 int main()
19 {
20    Phone ph1;
21    ph1.call();
22    ph1.sendMessage();
23    ph1.surfInternet();
22    return 0;
23 }
```

```
is calling
is sending message using cpu 6.00581e-039HZ
is surfing internet
```



如何初始化数据成员？

方法1：通过定义类的对象，以对象访问其数据成员的方式，进行初始化

```
1
2
3 using namespace std;
4 class Phone
5 {
6 public:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;
15    void surfInternet()
16    {cout<<brand<<"is surfing internet"<<endl;}
17 }
```

```
18 int main()
19 {
20    Phone ph1;
21    strcpy(ph1.brand,"iphone8");
22    ph1.cpu=2376;
23    ph1.memo=64;
24    ph1.size=5.7;
25    ph1.call();
26    ph1.sendMessage();
27    ph1.surfInternet();
28    return 0;}
```

```
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
```

修改数据成员为私有

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 private:
7    char brand[20];
8    float cpu;
9    int memo;
10   float size;
11 public:
11   void call()
12   {cout<<brand<<"is calling"<<endl;}
13   void sendMessage()
14   {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15   void surfInternet()
16   {cout<<brand<<"is surfing internet"<<endl;}
17 }
```

出现错误提示

```
18 int main()
19 {
20    Phone ph1;
21    strcpy(ph1.brand,“iphone8”);
22    ph1.cpu=2376;
23    ph1.memo=64;
24    ph1.size=5.7;
25    ph1.call();
26    ph1.sendMessage();
27    ph1.surfInternet();
28    return 0;
29 }
```

```
C:\Users\Admin...          In function 'int main()':
C:\Users\Admin... 6        error: 'std::string Phone::brand' is private
C:\Users\Admin... 21       error: within this context
C:\Users\Admin... 7        error: 'float Phone::cpu' is private
C:\Users\Admin... 22       error: within this context
C:\Users\Admin... 8        error: 'int Phone::memo' is private
C:\Users\Admin... 23       error: within this context
C:\Users\Admin... 9        error: 'float Phone::size' is private
C:\Users\Admin... 24       error: within this context
```

案例进阶——初始化数据成员

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 private:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11 public:
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15    void surfInternet()
16    {cout<<brand<<"is surfing internet"<<endl;}
17    void init()
18    {cin>>brand>>cpu>>memo>>size;}
19 }
```

方法2：通过定义成员函数进行初始化

```
18 int main()
19 {
20    Phone ph1;
21    ph1.init();
22    ph1.call();
23    ph1.sendMessage();
24    ph1.surfInternet();
25    return 0;
26 }
```


```
iphone8 2367 64 5.7
iphone8 is calling
iphone8 is sending message using cpu 2367HZ
iphone8 is surfing internet
```

```
18 int main()
19 {
20    Phone ph1;
21    ph1.call();
22    ph1.sendMessage();
23    ph1.surfInternet();
24    return 0;
25 }
```

代码太多，我忘了
调用初始化函数

```
is calling
is sending message using cpu 6.00581e-039HZ
is surfing internet
```

x=0;

能不能像变量赋初值那样
对数据成员进行初始化？

案例进阶——构造函数

```
1 #include<iostream>
2 #include<cstring>
3 using namespace std;
4 class Phone
5 {
6 private:
7     char brand[20];
8     float cpu;
9     int memo;
10    float size;
11 public:
11    void call()
12    {cout<<brand<<"is calling"<<endl;}
13    void sendMessage()
14    {cout<<brand<<"is sending message using cpu"<<cpu<<"HZ"<<endl;}
15    void surfInternet()
16    {cout<<brand<<"is surfing internet"<<endl;}
17    Phone(char b[],float c,int m,float s)
18    {strcpy(brand,b); cpu=c; memo=m; size=s;}
19 }
```

构造函数：
函数名与类名相同；
无返回值；
实例化对象时，会被自动调用

自动调用构造函数，
为数据成员赋初值

```
18 int main()
19 {
20    Phone ph1("iphone8",2376,64,5.7);
21    ph1.call();
22    ph1.sendMessage();
23    ph1.surfInternet();
24    return 0;
25 }
```

```
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
```

y=x;

能否用已存在的对象
去初始化另一个对象？

案例进阶——复制构造函数

自动调用默认复制构造函数，初始化另一对象

```
18 int main()
19 {
20    Phone ph1("iphone8",2376,64,5.7);
21    Phone ph2(ph1);
22    cout<<"ph1"<<endl;
23    ph1.call();
24    ph1.sendMessage();
25    ph1.surfInternet();
26    cout<<"ph2"<<endl;
27    ph2.call();
28    ph2.sendMessage();
29    ph2.surfInternet();
30    return 0;
31 }
```

```
ph1:
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
ph2:
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
```

案例进阶——复制构造函数

```
18 int main()
19 {
20    Phone ph1("iphone8",2376,64,5.7);
21    Phone ph2=ph1;
22    cout<<"ph1"<<endl;
23    ph1.call();
24    ph1.sendMessage();
25    ph1.surfInternet();
26    cout<<"ph2"<<endl;
27    ph2.call();
28    ph2.sendMessage();
29    ph2.surfInternet();
30    return 0;
31 }
```

```
ph1:
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
ph2:
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
```

案例进阶——复制构造函数

```
1 #include<iostream>
2 #include<string>
3 using namespace std;
4 class Phone
5 {
6 private:
7     string brand;
8     float cpu;
9     int memo;
10    float size;
11 public:
12    ……
11     Phone(const Phone &ph)
12    {    strcpy(brand,ph.brand);
13         strcat(brand,"plus");
14         cpu=ph.cpu+14;
15         memo=ph.memo;
16         size=ph.size-0.2;   }
17  }
```

案例进阶——复制构造函数

```
18 int main()
19 {
20    Phone ph1("iphone8",2376,64,5.7);
21    Phone ph2=ph1;
22    cout<<"ph1"<<endl;
23    ph1.call();
24    ph1.sendMessage();
25    ph1.surfInternet();
26    cout<<"ph2"<<endl;
27    ph2.call();
28    ph2.sendMessage();
29    ph2.surfInternet();
30    return 0;
31 }
```

```
ph1:
iphone8 is calling
iphone8 is sending message using cpu 2376HZ
iphone8 is surfing internet
ph2:
iphone8plus is calling
iphone8plus is sending message using cpu 2390HZ
iphone8plus is surfing internet
```

小结

类的定义

对象实例化

构造函数

复制构造函数

小结

类的定义

对象实例化

构造函数

复制构造函数

延申

请调研超市用品，并将其按照食品、日用品、生鲜、文化玩具、家电等进行分类，请编写代码实现。