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编译环境 给C语言带来的困扰

——C语言技术公开课第一讲

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主要内容

- 编译环境
- 大小端模式
- 由贪吃法深入
- 结构体内存对齐



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编译环境

➤ Visual C++

微软公司的C++开发工具，具有集成开发环境，可提供编辑C语言，C++以及C++/CLI等编程语言。

➤ GCC

GNU Compiler Collection, GNU编译器集合。

.....

我们就介绍
这两种常使
用编译环境



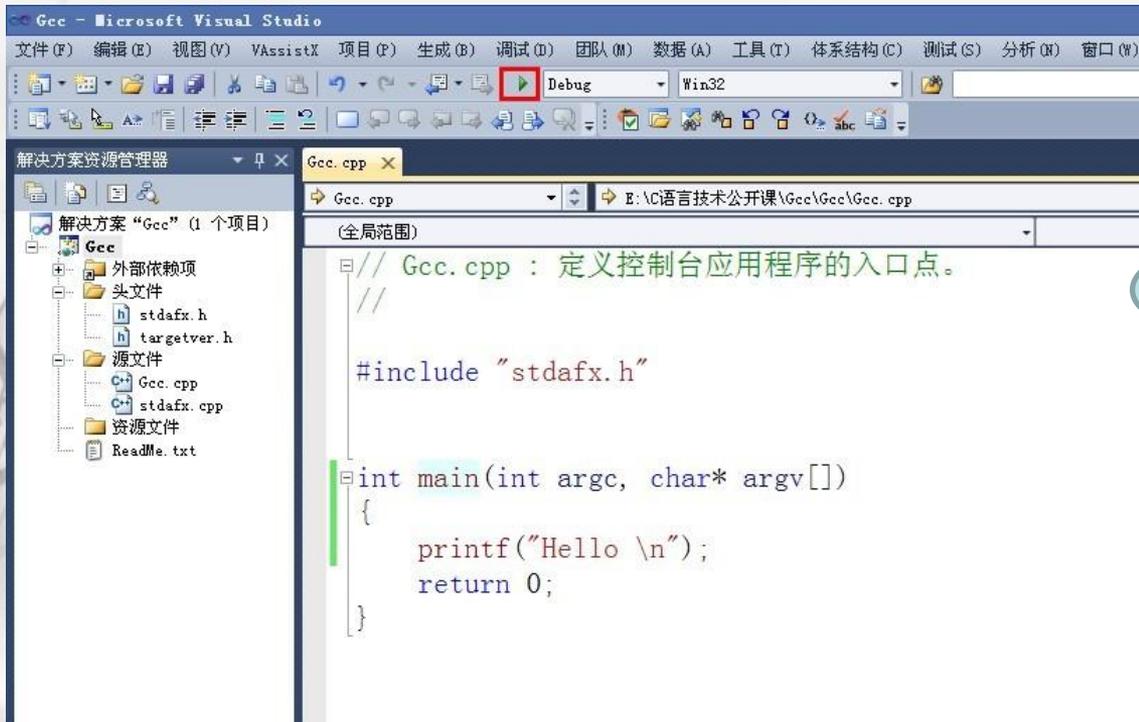
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Visual C++



Ctrl+F5

GCC

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ gcc hello.c -o hello
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ls
hello hello.c
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ./hello
Hello
```

预编译

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ gcc -E hello.c -o hello.i
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ls
hello.c hello.i
```

编译

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ gcc -S hello.i -o hello.s
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ls
hello.c hello.i hello.s
```

汇编

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ gcc -c hello.s -o hello.o
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ls
hello.c hello.i hello.o hello.s
```

链接

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ gcc hello.o -o hello
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ls
hello hello.c hello.i hello.o hello.s
zhuzhaoqi@zhuzhaoqi-desktop:~/c/Gcc$ ./hello
Hello
```

大小端模式

```
#include "stdafx.h"

int main(int argc, char* argv[])
{
    int iNumber = 0x12345678;
    unsigned char *pcNumber = (unsigned char *)(&iNumber);

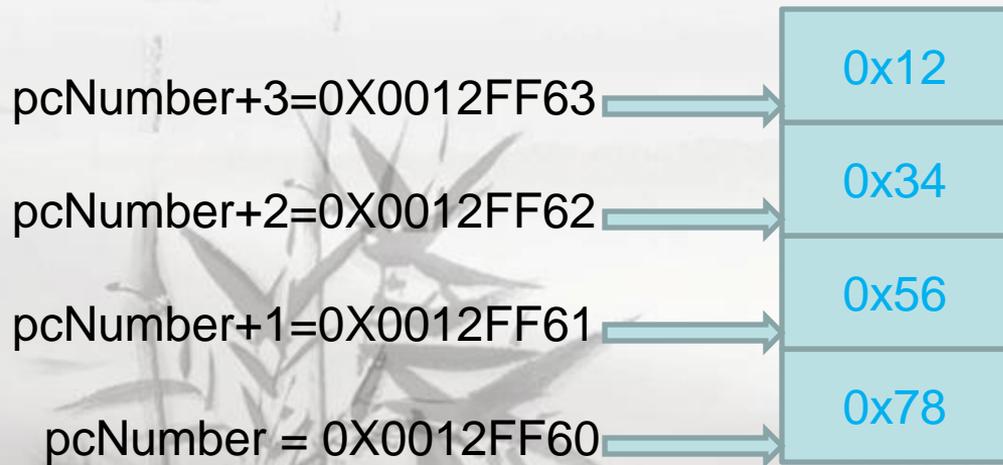
    printf("pcNumber = %#x \n", pcNumber);
    printf("*pcNumber = %#x \n", *pcNumber);
    return 0;
}
```

0x12

PK

0x78

小端模式



```
pcNumber + 3 = 0X12FF63  
*(pcNumber + 3) = 0X12
```

```
pcNumber + 2 = 0X12FF62  
*(pcNumber + 2) = 0X34
```

```
pcNumber + 1 = 0X12FF61  
*(pcNumber + 1) = 0X56
```

```
pcNumber = 0X12FF60  
*pcNumber = 0X78
```

低地址存放数据低位，高地址存放数据高位。

大端模式

低地址存放数据高位，高地址存放数据低位。

$$\text{uiNumber} = 65536 - 10000 = 55536 = 0XD8F0$$

0X0012FF71



0XF0

0X0012FF70

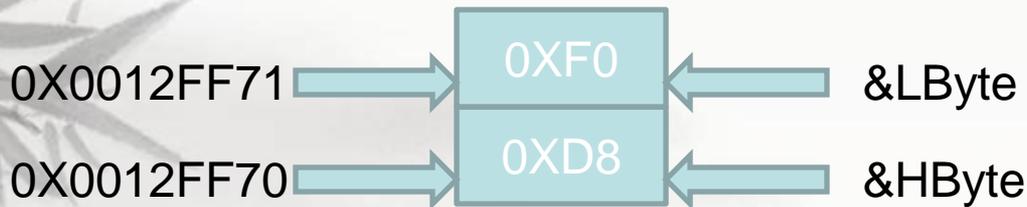


0XD8

keil C51

大端模式的应用

```
union {  
    unsigned int uiNumber;  
    struct {  
        unsigned char HByte;  
        unsigned char LByte;  
    } BYTE;  
} TIME;
```



uiNumber = 0XD8F0

```
TIME.uiNumber = 65536 - 10000;  
TH0 = TIME.BYTE.HByte;  
TL0 = TIME.BYTE.LByte;
```

贪吃法

```
int main(int argc, char* argv[])  
{  
    unsigned int i = 1;  
    unsigned int uiNumber;  
  
    uiNumber = i+++i;  
    printf("uiNumber = %d \n", uiNumber);  
  
    return 0;  
}
```

(i++)+i

PK

i+(++i)



Visual C++ VS GCC

```
int main(int argc, char* argv[])  
{  
    unsigned int i = 1;  
    unsigned int uiNumber;  
  
    uiNumber = i+++i+++i++;  
    printf("uiNumber = %d \n", uiNumber);  
  
    return 0;  
}
```

```
uiNumber = 3  
请按任意键继续. . .
```



```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ gcc eat.c -o eat  
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ ls  
eat  eat.c  
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ ./eat  
uiNumber = 3
```

Visual C++ VS GCC

```
int main(int argc, char* argv[])  
{  
    unsigned int i = 1;  
    unsigned int uiNumber;  
  
    uiNumber = (++i)+(++i)+(++i);  
    printf("uiNumber = %d \n", uiNumber);  
  
    return 0;  
}
```

```
uiNumber = 12  
请按任意键继续. . .
```

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ gcc eat.c -o eat  
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ ./eat  
uiNumber = 10
```



Visual C++ VS GCC

```
int main(int argc, char* argv[])  
{  
    unsigned int i = 1;  
    unsigned int uiNumber;  
  
    uiNumber = (++i)+(++i)+(++i)+(++i);  
    printf("uiNumber = %d \n", uiNumber);  
  
    return 0;  
}
```

```
uiNumber = 20  
请按任意键继续. . .
```



```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ gcc eat.c -o eat  
zhuzhaoqi@zhuzhaoqi-desktop:~/c/eat$ ./eat  
uiNumber = 15
```

结构体内存对齐

```
typedef struct STUDENT {  
    char cName[10];  
    int iAge;  
    char cSex;  
    double dScore;  
} student;  
  
int main(int argc, char* argv[])  
{  
    student sZhu;  
    printf("sizeof(sZhu) = %d \n", sizeof(sZhu));  
    return 0;  
}
```

$$10 + 4 + 1 + 8 = 23 \quad ?$$



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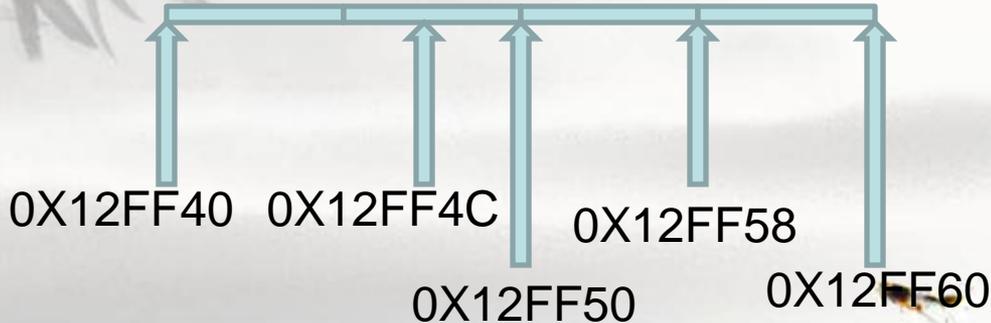
Windows

```
sizeof(sZhu) = 32
```

```
请按任意键继续. . .
```

```
printf("&(sZhu.cName) = %#X \n", &(sZhu.cName));  
printf("&(sZhu.iAge) = %#X \n", &(sZhu.iAge));  
printf("&(sZhu.cSex) = %#X \n", &(sZhu.cSex));  
printf("&(sZhu.dScore) = %#X \n", &(sZhu.dScore));  
printf("&sZhu + 1 = %#X \n", &sZhu + 1);
```

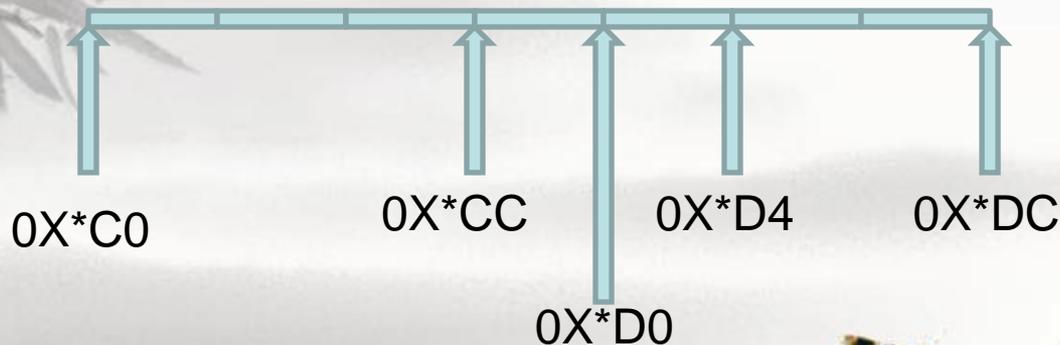
```
&(sZhu.cName) = 0X12FF40  
&(sZhu.iAge) = 0X12FF4C  
&(sZhu.cSex) = 0X12FF50  
&(sZhu.dScore) = 0X12FF58  
&sZhu + 1 = 0X12FF60  
请按任意键继续. . .
```



Linux

```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/struct$ ./struct  
sizeof(sZhu) = 28
```

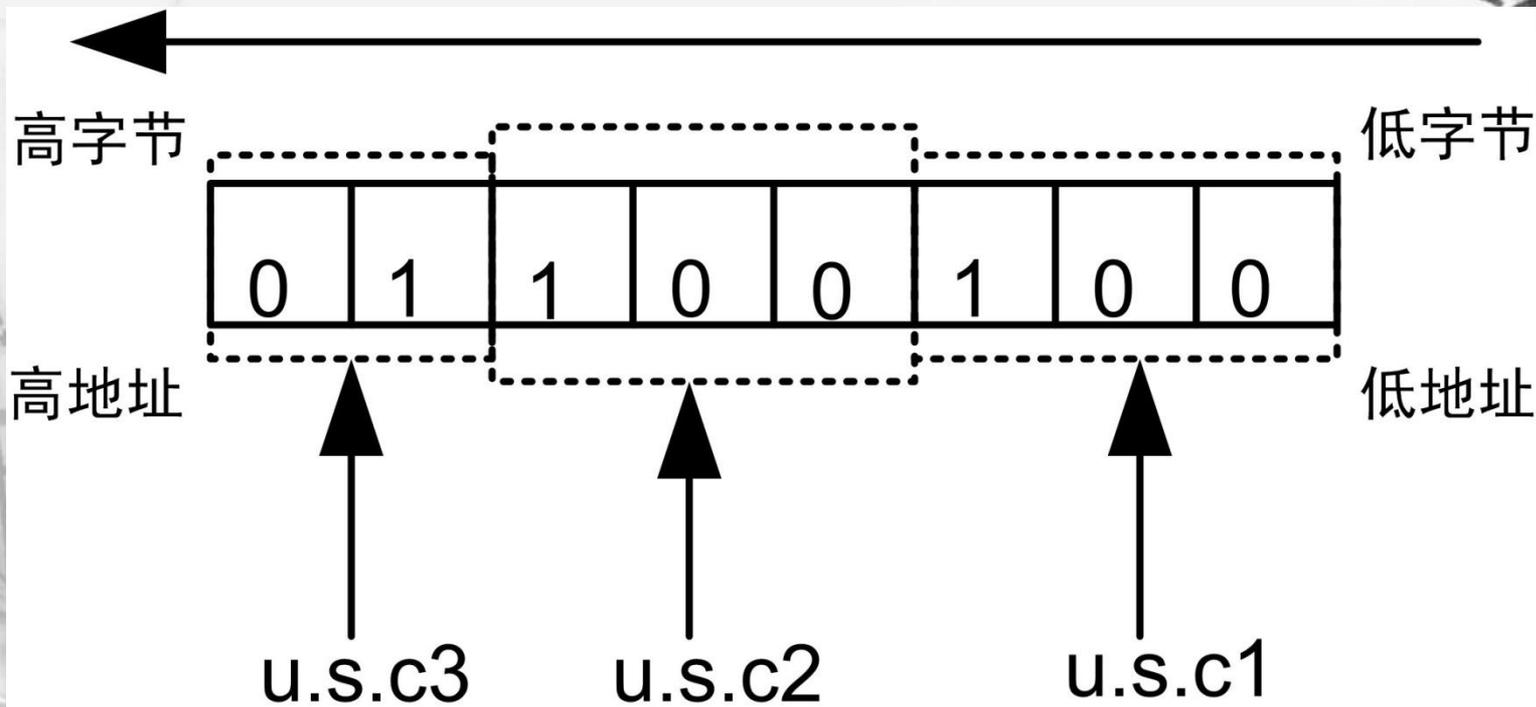
```
zhuzhaoqi@zhuzhaoqi-desktop:~/c/struct$ ./struct  
sizeof(sZhu) = 28  
&(sZhu.cName) = 0xBF8EB2C0  
&(sZhu.iAge) = 0xBF8EB2CC  
&(sZhu.cSex) = 0xBF8EB2D0  
&(sZhu.dScore) = 0xBF8EB2D4  
&sZhu + 1 = 0xBF8EB2DC
```



思考题

```
union {  
    struct {  
        unsigned char c1:3;  
        unsigned char c2:3;  
        unsigned char c3:2;  
    }s;  
    unsigned char c;  
}u;  
  
int main(int argc, char *argv[])  
{  
    u.c = 100;  
    printf("u.s.c1 = %d\n", u.s.c1);  
    printf("u.s.c2 = %d\n", u.s.c2);  
    printf("u.s.c3 = %d\n", u.s.c3);  
    return 0;  
}
```

解析





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- 《攻破C语言笔试与机试难点》C语言资料、应届生应聘资料下载
<http://pan.baidu.com/share/link?shareid=3562495290&uk=3996269986>
- 嵌入式Linux实用教程、配套视频、Linux相关资料下载地址
<http://pan.baidu.com/share/link?shareid=3562495290&uk=3996269986>
- 嵌入式Linux实用教程QQ群：①：284013595、②：271641475
- 视频配套OK6410开发板、AM335X开发板、210开发板、STM32开发板淘宝店（明志电子科技），网址：<http://mzkeji.taobao.com>



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