



AMD PROCESSOR RECOGNITION

Code Sample

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AMD Processor Recognition Code Sample

This document contains a code sample that uses the CPUID instruction to identify the processor and its features. The code was compiled with the Borland C++ compiler v4.5.

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DEFINES Header File (defines.h file)

```
// defines.h : HEADER FILES
#ifndef _H_DEFINES
#define _H_DEFINES
class cpuid {

public:
    int chkcpubit(void);
    int chkcpuid(void);
    void std_vendor_id_str (void);
    void std_cpu_signature(void);
    void ext_vendor_id_str (void);
    void ext_cpu_signature(void);
    void ext_cpu_name_str(void);
    void ext_cpu_cache_info(void);
};
#endif
```

CHKCPUBIT Module (ckcpubit.cpp file)

```

#include "DEFINES.H"

//chkcpubit checks the processor ID bit (bit 21) in the EFLAGS register.
//The program aborts if the processor does not implement the CPUID instruction.

int cpuid::chkcpubit(void)
{
    asm {
        .486
        pushfd                //Save eflags
        pop    eax
        test   eax,0x00200000  //Check ID bit (bit 21)
        jz    set_21           //Bit 21 is not set, so jump to set_21
        and   eax,0xffdf0000   //Clear bit 21
        push  eax              //Save new value in register
        popfd                //Store new value in flags
        pushfd
        pop    eax
        test   eax,0x00200000  //Check ID bit
        jz    cpu_id_ok        //If bit 21 is clear, jump to cpu_id_ok
        jmp   err              //If bit 21 is set, CPUID inst is not
                                //supported
    set_21:
    asm {
        or    eax,0x00200000   //Set bit 21
        push  eax              //Store new value
        popfd                //Store new value in EFLAGS
        pushfd
        pop    eax
        test   eax,0x00200000  //If bit 21 is on
        jnz   cpu_id_ok        //then jump to cpu_id_ok
    }
    err:
    asm {
        mov   eax,0xffffffff   //CPUID instruction is not supported
        jmp   exit             //so exit
    }
    cpu_id_ok:
                                //Support CPUID instruction
    asm mov eax,0              //Return 0
    exit:
    if(_EAX == 0xffffffff){
        return (-1);
    }
    if (_EAX == 0x0) {
        return (0);
    }
}

```

CHKCPUID Module (chkcpuid.cpp file)

```
#include "DEFINES.H"
#include <iomanip.h>
#include <iostream.h>
#include <conio.h>
#include <stdlib.h>
#include <string.h>

//chkcpuid identifies the processor name string.

int cpuid::chkcpuid()
{
    char idstr[13];                //Vendor string variable

    asm {
        mov    eax,0x0            //EAX = 0
        db    0x0F,0xA2         //CPUID opcode
    }

    //Store the 12 character ASCII string
    idstr[0] = _BL;
    idstr[1] = _BH;
    asm {
        ror    ebx,0x10
    }
    idstr[2] = _BL;
    idstr[3] = _BH;
    idstr[4] = _DL;
    idstr[5] = _DH;
    asm {
        ror    edx,0x10
    }
    idstr[6] = _DL;
    idstr[7] = _DH;
    idstr[8] = _CL;
    idstr[9] = _CH;
    asm {
        ror    ecx,0x10
    }
    idstr[10] = _CL;
    idstr[11] = _CH;
    idstr[12] = '\0';
    if ( strcmp(idstr, "AuthenticAMD") != 0 )
        return (0);
    else
        return (1);
}
```

STD_VENDOR_ID_STR Module (cpuidstr.cpp file)

```
#include "DEFINES.H"
#include <iomanip.h>
#include <iostream.h>
#include <conio.h>
#include <stdlib.h>
#include <string.h>

//std_vendor_id_str finds the largest function value recognized by
//AMD processors. It also identifies AMD as the vendor of the CPU
//by returning "AuthenticAMD" in idstr. If another vendor's identification
//is returned, the program aborts.

void cpuid::std_vendor_id_str()
{
    char idstr[13];                //Vendor string variable
    int largest_func = 0;         //Largest function variable
    unsigned long  reg_eax,       //Register variable
                  reg_ebx,
                  reg_ecx,
                  reg_edx;

    asm {
        mov    eax,0x0           //EAX = 0
        db    0x0F,0xA2         //CPUID opcode
    }
    reg_eax = _EAX;              //Store the vendor indentification string
    reg_ebx = _EBX;
    reg_edx = _EDX;
    reg_ecx = _ECX;
    largest_func = _EAX;         //The largest function value
    idstr[0] = _BL;              //Get the 12-character ASCII string
    idstr[1] = _BH;              //that identifies AMD as the vendor
    asm {                          //of the CPU.
        ror  ebx,0x10
    }
    idstr[2] = _BL;
    idstr[3] = _BH;
    idstr[4] = _DL;
    idstr[5] = _DH;
    asm {
        ror  edx,0x10           //Get the leftmost bit
    }
    idstr[6] = _DL;
    idstr[7] = _DH;
    idstr[8] = _CL;
    idstr[9] = _CH;
    asm {
        ror  ecx,0x10
    }
    idstr[10] = _CL;
```



```

idstr[11] = _CH;
idstr[12] = '\\0';
cout.setf(ios::uppercase);
cout << "\\nFuction 0 (EAX = 0)" << endl;
cout << "=====\\n";
cout << "\\n\\n";
cout << "EAX == " << setw(8) << setfill('0') << hex << reg_eax;
cout << "    EBX == " << setw(8) << hex << reg_ebx;
cout << "    EDX == " << setw(8) << hex << reg_edx;
cout << "    ECX == " << setw(8) << hex << reg_ecx;
cout << "\\n\\n";
cout << "    Largest Function Input Value : " << largest_func;
cout << "\\n\\n";
cout << "    Vendor Identification String : " << idstr;
cout.unsetf(ios::uppercase);
if ( strcmp(idstr, "AuthenticAMD") != 0 )    //If this not AMD then abort
{
    cout << "\\n\\n\\n\\n";
    cout << "    This is not an AMD processor." << "\\n\\n";
    exit(1);
}
cout << "\\n\\n\\n                Press any key for more." << "\\n\\n";
getch();
}

```

STD_CPU_SIGNATURE Module (cpuname.cpp file)

```
#include "DEFINES.H"
#include <iostream.h>
#include <iomanip.h>
#include <stdlib.h>
#include <conio.h>

//std_cpu_signature identifies the specific CPU by providing information
//regarding the type, instruction family, model, stepping revision, and the
//feature flags. The feature flags indicate the presence of specific features.

void cpuid :: std_cpu_signature (void)
{
    int signature = 0;           //CPU signature variable
    int stepping_id = 0;        //CPU stepping id variable
    int model = 0;              //CPU model variable
    int inst_family = 0;        //CPU instruction family variable
    unsigned int reg_ax = 0 ;   //AX register
    unsigned long reg_eax,reg_edx, test_reg;//EAX, EDX, and test register variables
    unsigned long print_eax,print_ebx,print_ecx,print_edx; //Display variables
    int maxbit = 18;            //Control loop variable
    int bits ;

    asm {
        mov EAX,1                //EAX = 1 or function 1
        db 0x0F, 0xA2            //CPUID opcode
    }
    //Display the value of the registers
    print_eax = _EAX;
    print_ebx = _EBX;
    print_ecx = _ECX;
    print_edx = _EDX;

    reg_edx = _EDX;              //Store the standard feature flags
    reg_ax = _AX;
    asm mov BX, reg_ax
    asm and BL,0x0F                //Mask the rightmost 4 bits
    stepping_id = _BL;            //to get the CPU stepping id

    asm mov BX, reg_ax
    asm and BL,0xF0                //Mask the leftmost 4 bits
    asm ror BL,4                    //to get the CPU model
    model = _BL;

    asm mov BX, reg_ax              //Get the CPU instruction family
    asm and BH, 0x0F
    inst_family = _BH;

    asm and EAX,0xFFFFF000        //Get the bits[31:12]
    asm ror EAX,12
```

```

reg_eax = _EAX;

asm mov BX, reg_ax           //Get the CPU signature
asm and BX,0x0FF0
signature = _BX;

clrscr();
cout.setf(ios::uppercase);
cout << "Function 1 (EAX = 1)" << endl;
cout << "===== ";
cout << "\n\n";
cout << "EAX == " << setw(8) << hex << print_eax;
cout << "  EBX == " << setw(8) << hex << print_ebx;
cout << "  ECX == " << setw(8) << hex << print_ecx;
cout << "  EDX == " << setw(8) << hex << print_edx;
cout.unsetf(ios::uppercase);
cout << "\n\n";
cout << "    EAX[3:0] == " << setw(1) << hex << stepping_id << endl;
cout << "    EAX[7:4] == " << setw(1) << hex << model << endl;
cout << "    EAX[11:8] == " << setw(1) << hex << inst_family << endl;
cout << "    EAX[31:12] == " << setw(5) << hex << reg_eax << endl;
cout << "\n\n";
cout << "    Processor Signature : ";
if (signature == 0x0500)
    cout << "AMD-K5 (Model 0) " << endl;
else if (signature == 0x0510)
    cout << "AMD-K5 (Model 1) " << endl;
    else if (signature == 0x0560)
        cout << " AMD-K6 " << endl;
        else if (signature == 0x0400)
            cout << "Am486 and Am5x86 " << endl;
cout << "\n\n          Press any key for more." << "\n\n";
getch();

clrscr();
cout << "\n";
cout << "    Feature Flags : " << "\n\n";
cout << "    EDX == ";
cout.setf(ios::uppercase);
cout << setw(8) << hex << reg_edx << "\n\n";
cout.unsetf(ios::uppercase);

//Get the standard feature flags
for ( bits = 0; bits < maxbit; bits++){
    switch (bits) {
        case 0 : test_reg = reg_edx;
            if((test_reg & 0x00000001)== 0x00000001){//Test bit 0
                cout.width(13);
                cout.setf(ios::left);
                cout << "EDX[0] = 1b ";
                cout.unsetf(ios::left);
            }
    }
}

```

```
        cout << " (bit 0==1 indicates FPU present)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[0] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 0==1 indicates FPU present)" << endl;
    }
    test_reg = reg_edx;
    break;
case 1 : if ((test_reg & 0x00000002 )==0x00000002){ //Test bit 1
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 2 : if ((test_reg & 0x00000004 )==0x00000004){ //Test bit 2
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions )"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 3 : if ((test_reg & 0x00000008 )==0x00000008){ //Test bit 3
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[3] = 1b ";
```

```

        cout.unsetf(ios::left);
        cout << " (bit 3==1 indicates Page Size Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[3] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 3==1 indicates Page Size Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 4 : if ((test_reg & 0x00000010 )==0x00000010){    //Test bit 4
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[4] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 4==1 indicates Time Stamp Counter)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[4] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 4==1 indicates Time Stamp Counter )"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 5 : if ((test_reg & 0x00000020 )==0x00000020){    //Test bit 5
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[5] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 5==1 indicates K86 Model-Specific “;
        cout <<"Registers)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[5] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 5==1 indicates K86 Model-Specific “;
        cout <<"Registers)" << endl;
    }
    test_reg = reg_edx;
    break;
case 6 : if ((test_reg & 0x00000040 )==0x00000040){    //Test bit 6

```

```
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[6] = 0b";
        cout.unsetf(ios::left);
        cout << "  Reserved" << endl;
    }
    test_reg = reg_edx;
    break;
case 7 : if ((test_reg & 0x00000080 )==0x00000080){ //Test bit 7
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[7] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 7==1 indicates Support of Machine";
        cout << " Check Exception)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[7] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 7==1 indicates Support of Machine";
        cout << " Check Exception)" << endl;
    }
    test_reg = reg_edx;
    break;
case 8 : if ((test_reg & 0x00000100 )==0x00000100){ //Test bit 8
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[8] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 8==1 indicates Support of CMPXCHG8B";
        cout << " Extensions)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[8] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 8==1 indicates Support of CMPXCHG8B";
        cout << " Extensions)" << endl;
    }
    test_reg = reg_edx;
    break;
```

```

case 9 : if ((test_reg & 0x00000200 )==0x00000200){ //Test bit 9
        if (signature == 0x0500){
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 1b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of Global";
            cout << " Paging Extension)"<< endl;
        }
        else {
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 1b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of APIC "
                << endl;
        }
    }
    else {
        if (signature == 0x0500){
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 0b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of Global";
            cout << " Paging Extensions)"<< endl;
        }
        else {
            cout.width(13);
            cout.setf(ios::left);
            cout << "EDX[9] = 0b ";
            cout.unsetf(ios::left);
            cout << " (bit 9==1 indicates Support of APIC "
                << endl;
        }
    }
    test_reg = reg_edx;
    break;
case 10 : if ((test_reg & 0x00000C00 )==0x00000000){ //Test bits 10:11
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[10:11] = ";
        cout.unsetf(ios::left);
        cout << " Reserved"<< endl;
    }
    test_reg = reg_edx;
    break;
case 11 : if ((test_reg & 0x00001000 )==0x00001000){ //Test bit 12
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[12] = 1b";

```

```

        cout.unsetf(ios::left);
        cout << " (bit 12==1 indicates Memory Type Range ";
        cout << "Registers)" << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[12] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 12==1 indicates Memory Type Range ";
        cout << "Registers)" << endl;
    }
    test_reg = reg_edx;
    break;
case 12 : if ((test_reg & 0x00002000 )==0x00002000){ //Test bit 13
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[13] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 13==1 indicates Global Paging Extension)"
        << endl;
}
else {
    if (signature == 0x0500){
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 0b";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 13==1 indicates Global Paging ";
        cout << "Extension)" << endl;
    }
}
    test_reg = reg_edx;
    break;
case 13 : if ((test_reg & 0x00004000 )==0x00000000){ //Test bit 14
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[14] = 0b ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
    test_reg = reg_edx;
    break;

```



```
case 14 : if ((test_reg & 0x00008000 )==0x00008000){ //Test bit 15
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 15==1 indicates Conditional Move ";
    cout <<"Instruction)" << endl;
}
else {
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 15==1 indicates Conditional Move ";
    cout <<"Instruction)" << endl;
}
test_reg = reg_edx;
break;
case 15 : if ((test_reg & 0x007F0000 )==0x00000000){ //Test bits 16:22
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[16:22] = ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
test_reg = reg_edx;
break;
case 16 : if ((test_reg & 0x00800000 )==0x00800000){ //Test bit 23
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[23] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 23==1 indicates Support of Multimedia"
        << " Extensions)" << endl;
}
else {
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[23] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 23==1 indicates Support of Multimedia"
        << " Extensions)" << endl;
}
test_reg = reg_edx;
break;
```

```
        case 17: if ((test_reg & 0xFF000000) == 0x00000000){ //Test bits 24:31
                  cout.width(12);
                  cout.setf(ios::left);
                  cout << "EDX[24:31] = ";
                  cout.unsetf(ios::left);
                  cout << " Reserved" << endl;
                }
            }
        }
    cout << "\n                Press any key for more. " << endl;
    getch();
}
```

EXT_VENDOR_ID_STR Module (extidstr.cpp file)

```

#include "DEFINES.H"
#include <iomanip.h>
#include <iostream.h>
#include <conio.h>
#include <stdlib.h>
#include <string.h>

//ext_vendor_id_str finds the largest extended function value
//recognized by AMD processors.

void cpuid::ext_vendor_id_str()
{
    unsigned long reg_eax,           //Register variables
                  reg_ebx,
                  reg_ecx,
                  reg_edx,
                  largest_func;     //Largest function variable

    asm {
        mov     eax,0x80000000        //EAX = 8000_0000h
        db     0x0F,0xA2            //CPUID opcode
    }
    largest_func = _EAX;             //The largest function value
    reg_ebx = _EBX;
    reg_edx = _EDX;
    reg_ecx = _ECX;
    clrscr();
    cout.setf(ios::uppercase);
    cout << "\nFuction 8000_0000h (EAX = 80000000)" << endl;
    cout << "===== ";
    cout << "\n\n";
    cout << "      EAX == " << setw(8) << hex << largest_func << endl;;
    cout << "      EBX == " << setw(8) << hex << reg_ebx << endl;
    cout << "      EDX == " << setw(8) << hex << reg_edx << endl;
    cout << "      ECX == " << setw(8) << hex << reg_ecx << endl;
    cout << "\n\n";
    cout.unsetf(ios::uppercase);
    cout << "      Largest Extended Function Input Value : " << largest_func;
    cout << "\n\n";
    cout << "      EBX, EDX, ECX : Reserved " << "\n\n";
    cout << "                        Press any key for more." << endl;
    cout << "\n\n\n\n";
    getch();
}

```

EXT_CPU_SIGNATURE Module (extname.cpp file)

```

#include "DEFINES.H"
#include <iostream.h>
#include <iomanip.h>
#include <stdlib.h>
#include <conio.h>

//ext_cpu_signature identifies the specific CPU by providing information
//regarding the type, instruction family, model, stepping revision, and
//feature flags. The feature flags indicate the presence of specific
//features.

void cpuid :: ext_cpu_signature (void)
{
    int signature = 0;                //Signature variable
    int stepping_id = 0;              //Steeping id variable
    int model = 0;                    //Model variable
    int inst_family = 0;              //Instruction family variable
    unsigned int reg_ax = 0 ;         //AX register
    unsigned long reg_eax,reg_edx,test_reg, //Register variables
        print_eax,print_ebx,print_ecx,print_edx;//Display variables
    int maxbit = 18;                  //Control loop
    int bits ;                         //Case statement
    asm {
        mov EAX,0x80000001             //EAX = 8000_0001h
        db 0x0F, 0xA2                 //CPUID opcode
    }
    print_eax = _EAX;
    print_ebx = _EBX;
    print_ecx = _ECX;
    print_edx = _EDX;
    reg_edx = _EDX;                    //Store the extended feature flags
    reg_ax = _AX;
    asm mov BX, reg_ax
    asm and BL,0x0F                     //Mask the rightmost 4 bits
    stepping_id = _BL;                  //to get the CPU stepping id
    asm mov BX, reg_ax
    asm and BL,0xF0                     //Mask the leftmost 4 bits
    model = _BL;                       //to get the CPU model id
    asm mov BX, reg_ax
    asm and BH, 0x0F
    inst_family = _BH;
    asm and EAX,0xFFFFF000             //Get bits 31-12
    asm ror EAX,12
    reg_eax = _EAX;
    asm mov BX, reg_ax                 //Get the CPU signature
    asm and BX,0x0FF0
    signature = _BX;
    clrscr();
    cout.setf(ios::uppercase);
}

```

```

cout << "Function 8000_0001h (EAX = 80000001)" << endl;
cout << "===== ";
cout << "\n";
cout << "EAX == " << setw(8) << hex << print_eax << "    EBX == " << setw(8)
    << hex << print_ebx << "    ECX == " << setw(8) << hex << print_ecx
    << "    EDX == " << setw(8) << hex << print_edx << "\n\n";
cout << "    EAX[3:0] == " << setw(1) << hex << stepping_id << endl;
cout << "    EAX[7:4] == " << setw(1) << hex << model << endl;
cout << "    EAX[11:8] == " << setw(1) << hex << inst_family << endl;
cout << "    EAX[31:12] == " << setw(5) << hex << reg_eax << endl;
cout.unsetf(ios::uppercase);

cout << "\n";
cout << "    AMD Processor Signature : ";

if (signature == 0x0660)
    cout << " AMD-K6 " << endl;
else {
    if (signature == 0x0510)
        cout << " AMD-K5 (Model 1) " << endl;
    else cout << " Undefined " << endl;
}

cout << "\n";
cout << "    Feature Flags : " << "\n\n";
cout << "    EDX == ";
cout.setf(ios::uppercase);
cout << setw(8) << hex << reg_edx << "\n\n";
cout.unsetf(ios::uppercase);
cout << "                Press any key for more. " << endl;
cout << "\n\n";
getch();
clrscr();
//Get the feature flags
for ( bits = 0; bits <= maxbit; bits++){
    switch (bits) {
        case 0 : test_reg = reg_edx;
            if((test_reg & 0x00000001)== 0x00000001){//Test bit 0
                cout.width(13);
                cout.setf(ios::left);
                cout << "EDX[0] = 1b ";
                cout.unsetf(ios::left);
                cout << " (bit 0==1 indicates FPU present)" << endl;
            }
            else {
                cout.width(13);
                cout.setf(ios::left);
                cout << "EDX[0] = 0b ";
                cout.unsetf(ios::left);
                cout << " (bit 0==1 indicates FPU present)" << endl;
            }
    }
}

```

```
        test_reg = reg_edx;
        break;
    case 1 : if ((test_reg & 0x00000002 )==0x00000002){ //Test bit 1
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[1] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 1==1 indicates Virtual Mode Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
    case 2 : if ((test_reg & 0x00000004 )==0x00000004){ //Test bit 2
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[2] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 2==1 indicates Debugging Extensions )"
            << endl;
    }
    test_reg = reg_edx;
    break;
    case 3 : if ((test_reg & 0x00000008 )==0x00000008){ //Test bit 3
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[3] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 3==1 indicates Page Size Extensions)"
            << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[3] = 0b ";
        cout.unsetf(ios::left);
    }
}
```

```

        cout << " (bit 3==1 indicates Page Size Extensions)"
            << endl;
    }
    test_reg = reg_edx;
    break;
case 4 : if ((test_reg & 0x00000010 )==0x00000010){    //Test bit 4
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[4] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 4==1 indicates Time Stamp Counter)"
        << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[4] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 4==1 indicates Time Stamp Counter )"
        << endl;
}
    test_reg = reg_edx;
    break;
case 5 : if ((test_reg & 0x00000020 )==0x00000020){    //Test bit 5
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[5] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 5==1 indicates K86 Model-Specific"
        << " Registers)" << endl;
}
else {
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[5] = 0b ";
    cout.unsetf(ios::left);
    cout << " (bit 5==1 indicates K86 Model-Specific"
        << " Registers)" << endl;
}
    test_reg = reg_edx;
    break;
case 6 : if((test_reg & 0x00000040) == 0x00000000){    //Test bit 6
    cout.width(13);
    cout.setf(ios::left);
    cout << "EDX[6] = 0b ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
    test_reg = reg_edx;
    break;
case 7 : if ((test_reg & 0x00000080 )==0x00000080){    //Test bit 7

```

```

        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[7] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 7==1 indicates Support of Machine";
        cout << " Check Exception)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[7] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 7==1 indicates Support of Machine";
        cout << " Check Exception)" << endl;
    }
    test_reg = reg_edx;
    break;
case 8 : if ((test_reg & 0x00000100 )==0x00000100){//Test bit 8
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[8] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 8==1 indicates Support of CMPXCHG8B "
            << "instruction)" << endl;
    }
    else {
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[8] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 8==1 indicates Support of CMPXCHG8B";
        cout << " instruction)" << endl;
    }
    test_reg = reg_edx;
    break;
case 9 : if ((test_reg & 0x00000200 )==0x00000000){//Test bit 9
        cout.width(13);
        cout.setf(ios::left);
        cout << "EDX[9] = 0b ";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    test_reg = reg_edx;
    break;
case 10 :if ((test_reg & 0x00000400 )==0x00000400){//Test bit 10
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[10] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 10==1 indicates Support of SYSCALL";
        cout << " and SYSRET Extension)"<< endl;

```



```

    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[10] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 10==1 indicates Support of SYSCALL";
        cout << " and SYSRET Extensions)" << endl;
    }
    test_reg = reg_edx;
    break;
case 11 :if ((test_reg & 0x00001800 )==0x00000000){ //Test bit 11
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[11:12] = ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
    test_reg = reg_edx;
    break;
case 12 :if ((test_reg & 0x00002000 )==0x00002000){ //Test bit 12
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[13] = 1b ";
    cout.unsetf(ios::left);
    cout << " (bit 13==1 indicates Support of Global Paging "
        << "Extensions)" << endl;
}
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[13] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 13==1 indicates Support of Global Paging "
            << "Extensions) " << endl;
    }
    test_reg = reg_edx;
    break;
case 13 :if ((test_reg & 0x00004000 )==0x00000000){//Test bit 13
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[14] = ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
    test_reg = reg_edx;
    break;
case 14 :if ((test_reg & 0x00008000 )==0x00008000){//Test bit 14
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[15] = 1b ";

```

```
        cout.unsetf(ios::left);
        cout << " (bit 15==1 indicates Support of Integer "
              << "Conditional Move" << endl;
        cout << "          Instructions)" << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[15] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 15==1 indicates Support of Integer"
              << " Conditional Move" << endl;
        cout << "          Instructions)" << endl;
    }
    test_reg = reg_edx;
    break;
case 15 :if ((test_reg & 0x00010000) == 0x00010000){//Test bit 15
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[16] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 16==1 indicates Support of Floating-Point"
              << " Conditional Move" << endl;
        cout << "          Instructions) " << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[16] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 16==1 indicates Support of Floating-Point"
              << " Conditional Move" << endl;
        cout << "          Instructions) " << endl;
    }
    test_reg = reg_edx;
    break;
case 16 :if ((test_reg & 0x007E0000) == 0x00000000) {//Test bit 16
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[17:22] = ";
        cout.unsetf(ios::left);
        cout << " Reserved" << endl;
    }
    test_reg = reg_edx;
    break;
case 17 :if ((test_reg & 0x00800000) == 0x00800000){//Test bit 17
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[23] = 1b ";
        cout.unsetf(ios::left);
        cout << " (bit 23==1 indicates Support of Multimedia"
```

```
        << " Extensions) " << endl;
    }
    else {
        cout.width(12);
        cout.setf(ios::left);
        cout << "EDX[23] = 0b ";
        cout.unsetf(ios::left);
        cout << " (bit 16==1 indicates Support of Multimedia"
            << " Extensions) " << endl;
    }
    test_reg = reg_edx;
    break;
case 18 :if ((test_reg & 0xFF000000) == 0x00000000) { //Test bit 18
    cout.width(12);
    cout.setf(ios::left);
    cout << "EDX[24:31] = ";
    cout.unsetf(ios::left);
    cout << " Reserved" << endl;
}
}
}
cout << "                Press any key for more. " << endl;
getch();
}
```

EXT_CPU_NAME_STR Module (extstr.cpp file)

```

#include "defines.h"
#include <iostream.h>
#include <iomanip.h>
#include <conio.h>

//ext_cpu_name_str displays the processor name string (up to 48 characters).
//The processor name string is the name of the AMD processor.

void cpuid :: ext_cpu_name_str(void)
{
    unsigned long reg_eax, reg_ebx, reg_ecx, reg_edx;    //Register variables
    char idstr[48];    //Processor name string variable
    int func;    //Case statement variable
    int maxfunc = 2;    //Control loop variable
    clrscr();
    cout << "Function 8000_0002, 8000_0003, 8000_0004 (EAX = 80000002/3/4)" << endl;
    cout << "=====
";
    cout << "\n\n";
    for (func = 0; func <= maxfunc; func++){
        switch (func){
            case 0 : cout << "          Input: EAX = 80000002 " << endl;
                    cout << "          EAX = ";
                    cout.setf(ios::uppercase);
                    asm mov eax, 0x80000002 //EAX=80000002
                    asm db 0x0F, 0xA2    //CPUID opcode
                    reg_eax = _EAX;    //Store the processor name string
                    reg_ebx = _EBX;
                    reg_edx = _EDX;
                    reg_ecx = _ECX;
                    cout << setw(8) << hex << reg_eax << endl;
                    cout << "          EBX = " << setw(8) << hex
                        << reg_ebx << endl;
                    cout << "          ECX = "
                        << setw(8) << hex << reg_ecx << endl;
                    cout << "          EDX = " << setw(8) << hex
                        << reg_edx << endl;
                    _EAX = reg_eax;
                    _EBX = reg_ebx;
                    _ECX = reg_ecx;
                    _EDX = reg_edx;
                    //Get the first 12 characters of the processor name string
                    idstr[0] = _AL;
                    idstr[1] = _AH;
                    asm  ror eax,0x10
                    idstr[2] = _AL;
                    idstr[3] = _AH;
                    idstr[4] = _BL;
                    idstr[5] = _BH;
                    asm ror ebx,0x10

```

```

        idstr[6] = _BL;
        idstr[7] = _BH;
        idstr[8] = _CL;
        idstr[9] = _CH;
        asm ror ecx,0x10
        idstr[10] = _CL;
        idstr[11] = _CH;
        idstr[12] = _DL;
        idstr[13] = _DH;
        asm ror edx, 0x10;
        idstr[14] = _DL;
        idstr[15] = _DH;
        //idstr[16] = '\0';
        break;
case 1 : cout << "          Input: EAX = 80000003 " << endl;
        cout << "          EAX = ";
        asm mov eax, 0x80000003 //EAX = 8000_0003
        asm db 0x0F, 0xA2 //CPUID opcode
        reg_eax = _EAX;
        reg_ebx = _EBX;
        reg_edx = _EDX;
        reg_ecx = _ECX;
        cout << setw(8) << hex << reg_eax << endl
             << "          EBX = " << setw(8) << hex
             << reg_ebx << endl << "          ECX = "
             << setw(8) << hex << reg_ecx << endl
             << "          EDX = " << setw(8) << hex
             << reg_edx << endl;
        _EAX = reg_eax;
        _EBX = reg_ebx;
        _ECX = reg_ecx;
        _EDX = reg_edx;
        //Get the second 12 characters of the processor name string
        idstr[16] = _AL;
        idstr[17] = _AH;
        asm ror eax,0x10
        idstr[18] = _AL;
        idstr[19] = _AH;
        idstr[20] = _BL;
        idstr[21] = _BH;
        asm ror ebx,0x10
        idstr[22] = _BL;
        idstr[23] = _BH;
        idstr[24] = _CL;
        idstr[25] = _CH;
        asm ror ecx,0x10
        idstr[26] = _CL;
        idstr[27] = _CH;
        idstr[28] = _DL;
        idstr[29] = _DH;
        asm ror edx, 0x10;

```

```

        idstr[30] = _DL;
        idstr[31] = _DH;
        break;
    case 2 : cout << "          Input: EAX = 80000004 " << endl;
            cout << "          EAX = ";
            asm mov eax, 0x80000004 //EAX = 8000_00004
            asm db 0x0F, 0xA2 //CPUID opcode
            reg_eax = _EAX;
            reg_ebx = _EBX;
            reg_edx = _EDX;
            reg_ecx = _ECX;
            cout << setw(8) << hex << reg_eax << endl
                << "          EBX = " << setw(8) << hex
                << reg_ebx << endl << "          ECX = "
                << setw(8) << hex << reg_ecx << endl
                << "          EDX = " << setw(8) << hex
                << reg_edx << endl;
            cout.unsetf(ios::uppercase);
            _EAX = reg_eax;
            _EBX = reg_ebx;
            _ECX = reg_ecx;
            _EDX = reg_edx;
            //Get the rest of the processor name string
            idstr[32] = _AL;
            idstr[33] = _AH;
            asm ror eax,0x10
            idstr[34] = _AL;
            idstr[35] = _AH;
            idstr[36] = _BL;
            idstr[37] = _BH;
            asm ror ebx,0x10
            idstr[38] = _BL;
            idstr[39] = _BH;
            idstr[40] = _CL;
            idstr[41] = _CH;
            asm ror ecx,0x10
            idstr[42] = _CL;
            idstr[43] = _CH;
            idstr[44] = _DL;
            idstr[45] = _DH;
            asm ror edx, 0x10;
            idstr[46] = _DL;
            idstr[47] = _DH;
            idstr[48] = '\0';
            break;
        }
    }
    cout << "\n Processor Name String : " << idstr;
    cout << "\n\n          Press any key for more."<<"\n\n";
    getch();
}

```

EXT_CPU_CACHE_INFO Module (extcache.cpp file)

```

#include "defines.h"
#include <iostream.h>
#include <iomanip.h>
#include <conio.h>

//ext_cpu_cache_info provides information about the instruction TLB,
//data TLB, L1 instruction cache, and L1 data cache.

void cpuid::ext_cpu_cache_info(void)
{
    unsigned long reg_eax, reg_ebx, reg_ecx, reg_edx, test_reg; //Register variables
    unsigned long  bits7_0, bits15_8, bits23_16, bits31_24;    //TLB and data cache
                                                           //variables and L1
                                                           //instruction cache info

    clrscr();
    cout << "Function 8000_0005 (EAX = 80000005)" << endl;
    cout << "===== " << "\n\n";
    cout << " Processor Cache Information : " << "\n\n";
    asm mov eax,0x80000005 //EAX = 8000_0005h
    asm db 0x0F, 0xA2 //CPUID opcode
    reg_eax = _EAX; //Store the EAX register
    reg_ebx = _EBX; //Store data and instruction TLB
    reg_edx = _EDX; //Store the L1 data cache
    reg_ecx = _ECX; //Store the L1 instruction cache
    cout.setf(ios::uppercase);
    cout << " EAX == " << setw(8) << hex << reg_eax << " EBX == "
        << setw(8) << hex << reg_ebx << " ECX == " << setw(8)
        << hex << reg_ecx << " EDX == " << setw(8) << hex
        << reg_edx << "\n\n";

    test_reg = reg_ebx; //Data and instruction TLB
    bits7_0 = (test_reg & 0x000000ff); //Instruction TLB entries
    test_reg = reg_ebx;
    bits15_8 = (test_reg & 0x0000ff00); //Associativity of inst TLB
    bits15_8 >>= 8;
    test_reg = reg_ebx;
    bits23_16 = (test_reg & 0x00ff0000); //Data TLB entries
    bits23_16 >>= 16;
    test_reg = reg_ebx;
    bits31_24 = (test_reg & 0xff000000); //Associativity of data TLB
    bits31_24 >>= 24;
    cout<<"\n\n";
    cout<<"
    <<endl;
    cout<<" | | Data TLB | Instruction TLB |"
    << endl;
    cout<<"
    << endl;
    cout<<" | |Associativity| #Entries |Associativity| #Entries |"

```

```

    << endl;
cout<<"
----- "
    << endl;
cout<<"
|          |Bits 31-24 |Bits 23-16 | Bits 15-8  | Bits 7-0 |"
    << endl;
cout<<"
----- "
    << endl;
cout<<"
| EBX      |          " << setw(2) << hex << bits31_24
<<"      |          " << setw(2)<< hex << bits23_16 <<"      |          "
<< setw(2) << dec
<< bits15_8 << "      |          " << setw(2) << hex << bits7_0 << "      |"
    << endl;
cout<<"
----- "
    << endl;
cout<<"
    Note: " << endl;
cout<<"
    Full associativity is indicated by a value of 0FFh."
    <<"\n\n";
cout<< "
                                Press any key for more." <<"\n\n\n";
getch();
test_reg = reg_ecx;
bits7_0 = (test_reg & 0x000000ff);           //Line size of L1 data cache
test_reg = reg_ecx;
bits15_8 = (test_reg & 0x0000ff00);         //Lines per tag of L1 data cache
bits15_8 >>= 8;
test_reg = reg_ecx;
bits23_16 = (test_reg & 0x00ff0000);       //Associativity
bits23_16 >>= 16;
test_reg = reg_ecx;
bits31_24 = (test_reg & 0xff000000); //Size
bits31_24 >>= 24;
clrscr();
cout<< "\n\n\n";
cout<<"
----- "
    <<endl;
cout<<"
|          |          L1   Data   Cache          |"
    << endl;
cout<<"
----- "
    << endl;
cout<<"
|          |   Size   |Associa - | Lines per |Line Size |"
    << endl;
cout<<"
|          | (Kbytes) |tivity   |   Tag   | (bytes) |"
    << endl;
cout<<"
----- "
    << endl;
cout<<"
|          |Bits 31-24 |Bits 23-16 | Bits 15-8  | Bits 7-0 |"
    << endl;
cout<<"
----- "
    << endl;
cout<<"
| ECX      |          " << setw(2) << hex << bits31_24
<<"      |          " << setw(2)<< hex << bits23_16 <<"      |          "
<< setw(2) << dec

```



```

        << bits15_8 << "      |      " << setw(2) << hex << bits7_0 << "      |"
        << endl;
cout<<"
-----"
<< endl;
cout<<"      Note: " << endl;
cout<<"      Full associativity is indicated by a value of 0FFh."
<<"\n\n";
cout<<"      Press any key for more." << endl;
getch();
test_reg = reg_edx;
bits7_0 = (test_reg & 0x000000ff);      //Line size of L1 instruction cache
test_reg = reg_edx;
bits15_8 = (test_reg & 0x0000ff00);      //Lines per tag of L1 instruction cache
bits15_8 >>= 8;
test_reg = reg_edx;
bits23_16 = (test_reg & 0x00ff0000);      //Associativity
bits23_16 >>= 16;
test_reg = reg_edx;
bits31_24 = (test_reg & 0xff000000);      //Size
bits31_24 >>= 24;
clrscr();
cout<<"\n\n";
cout<<"
-----"
<<endl;
cout<<"      |      |      L1 Instruction Cache      |"
<< endl;
cout<<"
-----"
<< endl;
cout<<"      |      |      Size      |Associa - | Lines per |Line Size |"
<< endl;
cout<<"      |      |      (Kbytes) |tivity      |      Tag      |      (bytes) |"
<< endl;
cout<<"
-----"
<< endl;
cout<<"      |      |Bits 31-24 |Bits 23-16 | Bits 15-8 | Bits 7-0 |"
<< endl;
cout<<"
-----"
<< endl;
cout<<"      | EDX      |      " << setw(2) << hex << bits31_24
<<"      |      " << setw(2)<< hex << bits23_16 <<"      |      "
<< setw(2) << dec
<< bits15_8 << "      |      " << setw(2) << hex << bits7_0 << "      |"
<< endl;
cout<<"
-----"
<< endl;
cout<<"      Note: " << endl;
cout<<"      Full associativity is indicated by a value of 0FFh."
<<endl;
cout<<"\n\n";
cout.unsetf(ios::uppercase);
}

```

CPUID Module (cpuid.cpp file)

```
#pragma inline
#include <fstream.h>
#include <iomanip.h>
#include <iostream.h>
#include <stdlib.h>
#include <string.h>
#include <conio.h>
#include <dos.h>
#include "DEFINES.H"

cpuid k86; //Object of cpuid class
int main(void)
{
    int maxnum; //Case statement variable
    int result = 0; //Return value variable
    int func = 3; //Control loop variable

    result = k86.chkcpubit(); //Check ID bit in EFLAGS
    if(result == -1) {
        clrscr();
        cout << "\n\n";
        cout << " CPUID instruction is not supported by this processor.";
        cout << "\n\n";
        exit(1);
    }
    else {
        result = k86.chkcpuid(); //Check vendor id string
        if(result == 1) {
            clrscr();
            cout << "\n\n";
            cout << "AMD-K86 CPU supporting CPUID is in place.";
            cout << "\n\n";
        }
        else {
            clrscr();
            cout << "\n\n";
            cout << "CPU supporting CPUID is in place.";
            cout << "\n\n";
        }
    }
}
//These are the standard functions
k86.std_vendor_id_str();
k86.std_cpu_signature();

//These are the extended functions
for (maxnum=0; maxnum<=func; maxnum++) {
    switch (maxnum) {
        case 0 : k86.ext_vendor_id_str(); //Vendor Identification String
                break;
```

```
        case 1 : k86.ext_cpu_signature(); //Processor Signature
                break;
        case 2 : k86.ext_cpu_name_str(); //Processor Name String
                break;
        case 3 : k86.ext_cpu_cache_info();//Processor Cache Information
                break;
    }
}
return 0;
}
```

