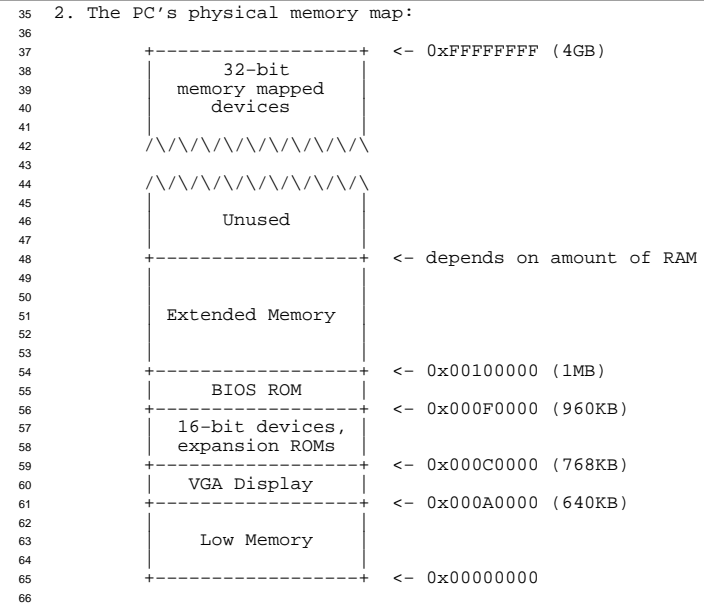


```

1 Handout for CS 372H
2 Lecture 2
3 21 January 2010
4
5 Some stuff to accompany lecture: pseudocode, memory layout, gcc calling
6 convention example....
7
8 [Credit to Frans Kaashoek, Robert Morris, and Nickolai Zeldovich.]
9
10 1. using the IN and OUT instructions
11
12     writing a byte to the parallel port (e.g., a line printer):
13
14     #define DATA_PORT    0x378
15     #define STATUS_PORT  0x379
16     #define BUSY 0x80
17     #define CONTROL_PORT 0x37A
18     #define STROBE 0x01
19
20     void
21     lpt_putc(int c)
22     {
23         /* wait for printer to consume previous byte */
24         while((inb(STATUS_PORT) & BUSY) == 0)
25             ;
26
27         /* put the byte on the parallel lines */
28         outb(DATA_PORT, c);
29
30         /* tell the printer to look at the data */
31         outb(CONTROL_PORT, STROBE);
32         outb(CONTROL_PORT, 0);
33     }
34

```



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67 3. Example
68
69 Here is the C code:
70 int main(void) { return f(8)+1; }
71 int f(int x) { return g(x); }
72 int g(int x) { return x+3; }
73
74 The assembly code:
75
76 _main:
77     prologue
78
79     pushl %ebp
80     movl %esp, %ebp
81
82     body
83     pushl $8
84     call _f
85     addl $1, %eax
86
87     epilogue
88     movl %ebp, %esp
89     popl %ebp
90     ret
91
92 _f:
93     prologue
94
95     pushl %ebp
96     movl %esp, %ebp
97
98     body
99     pushl 8(%esp)
100    call _g
101
102    epilogue
103    movl %ebp, %esp
104    popl %ebp
105    ret
106
107 <small version of _g>:
108 movl 4(%esp), %eax
109 addl $3, %eax
110 ret
111
112 <longer version of _g>:
113     prologue
114     pushl %ebp
115     movl %esp, %ebp
116
117     save %ebx
118     pushl %ebx
119
120     body
121     movl 8(%ebp), %ebx
122     addl $3, %ebx
123     movl %ebx, %eax
124
125     restore %ebx
126     popl %ebx
127
128     epilogue
129     movl %ebp, %esp
130     popl %ebp
131     ret
132

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133 4. pseudocode for Bochs CPU simulation
134
135 for (;;) {
136     read_instruction();
137     switch (decode_instruction_opcode()) {
138     case OPCODE_ADD:
139         int src = decode_src_reg();
140         int dst = decode_dst_reg();
141         regs[dst] = regs[dst] + regs[src];
142         break;
143     case OPCODE_SUB:
144         int src = decode_src_reg();
145         int dst = decode_dst_reg();
146         regs[dst] = regs[dst] - regs[src];
147         break;
148     ...
149     }
150     eip += instruction_length;
151 }
152
153 5. simulate PC's physical memory map
154
155 #define KB      1024
156 #define MB      1024*1024
157
158 #define LOW_MEMORY  640*KB
159 #define EXT_MEMORY  10*MB
160
161 uint8_t low_mem[LOW_MEMORY];
162 uint8_t ext_mem[EXT_MEMORY];
163 uint8_t bios_rom[64*KB];
164
165 uint8_t read_byte(uint32_t phys_addr) {
166     if (phys_addr < LOW_MEMORY)
167         return low_mem[phys_addr];
168     else if (phys_addr >= 960*KB && phys_addr < 1*MB)
169         return bios_rom[phys_addr - 960*KB];
170     else if (phys_addr >= 1*MB && phys_addr < 1*MB+EXT_MEMORY) {
171         return ext_mem[phys_addr-1*MB];
172     }
173     else ...
174 }
175
176 void write_byte(uint32_t phys_addr, uint8_t val) {
177     if (phys_addr < LOW_MEMORY)
178         low_mem[phys_addr] = val;
179     else if (phys_addr >= 960*KB && phys_addr < 1*MB)
180         /* ignore attempted write to ROM! */
181     else if (phys_addr >= 1*MB && phys_addr < 1*MB+EXT_MEMORY) {
182         ext_mem[phys_addr-1*MB] = val;
183     }
184     else ...
185 }

```