

143A: Principles of Operating Systems

Lecture 3: PC Hardware

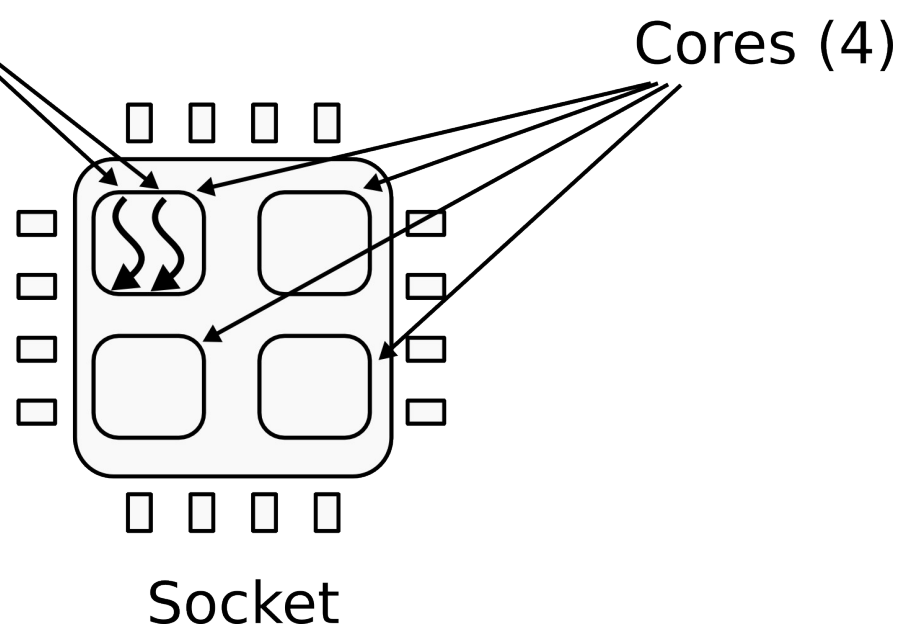
Anton Burtsev
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CPU

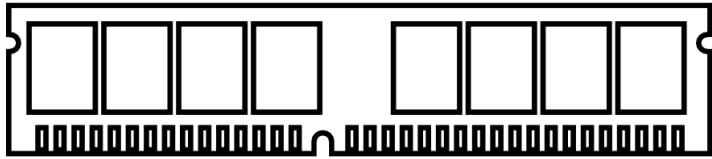
- 1 CPU socket
 - 4 cores
 - 2 logical (HT) threads each



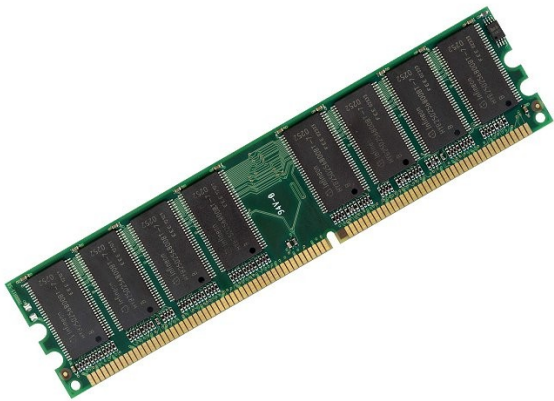
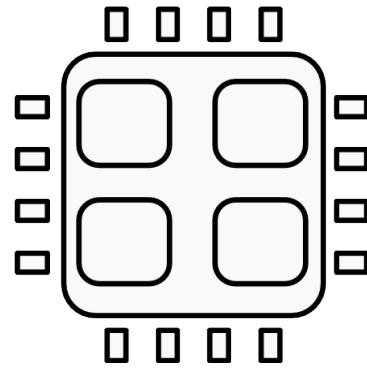
Hyper-Threading
(logical threads)



Memory



Memory
Bus



Memory abstraction

$\text{WRITE}(addr, value) \rightarrow \emptyset$

Store *value* in the storage cell identified by *addr*.

$\text{READ}(addr) \rightarrow value$

Return the *value* argument to the most recent WRITE call referencing *addr*.

- x86 assembly examples:

`mov eax, [ebx]` ; Move 4 bytes in memory at the address contained in EBX into EAX

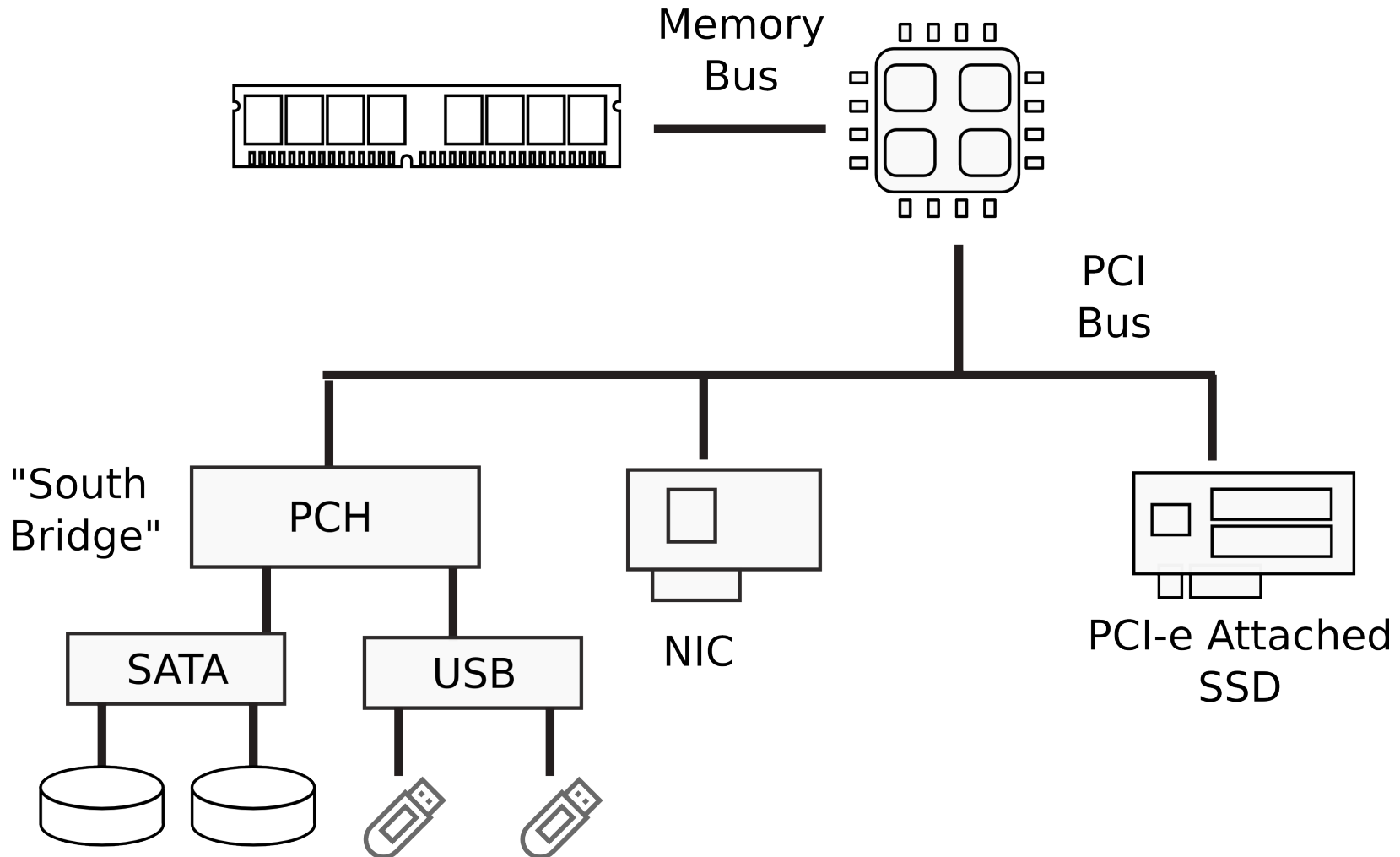
`mov [var], ebx` ; Move the contents of EBX into the 4 bytes at memory address var.

`mov eax, [esi-4]` ; Move 4 bytes at memory address ESI + (-4) into EAX

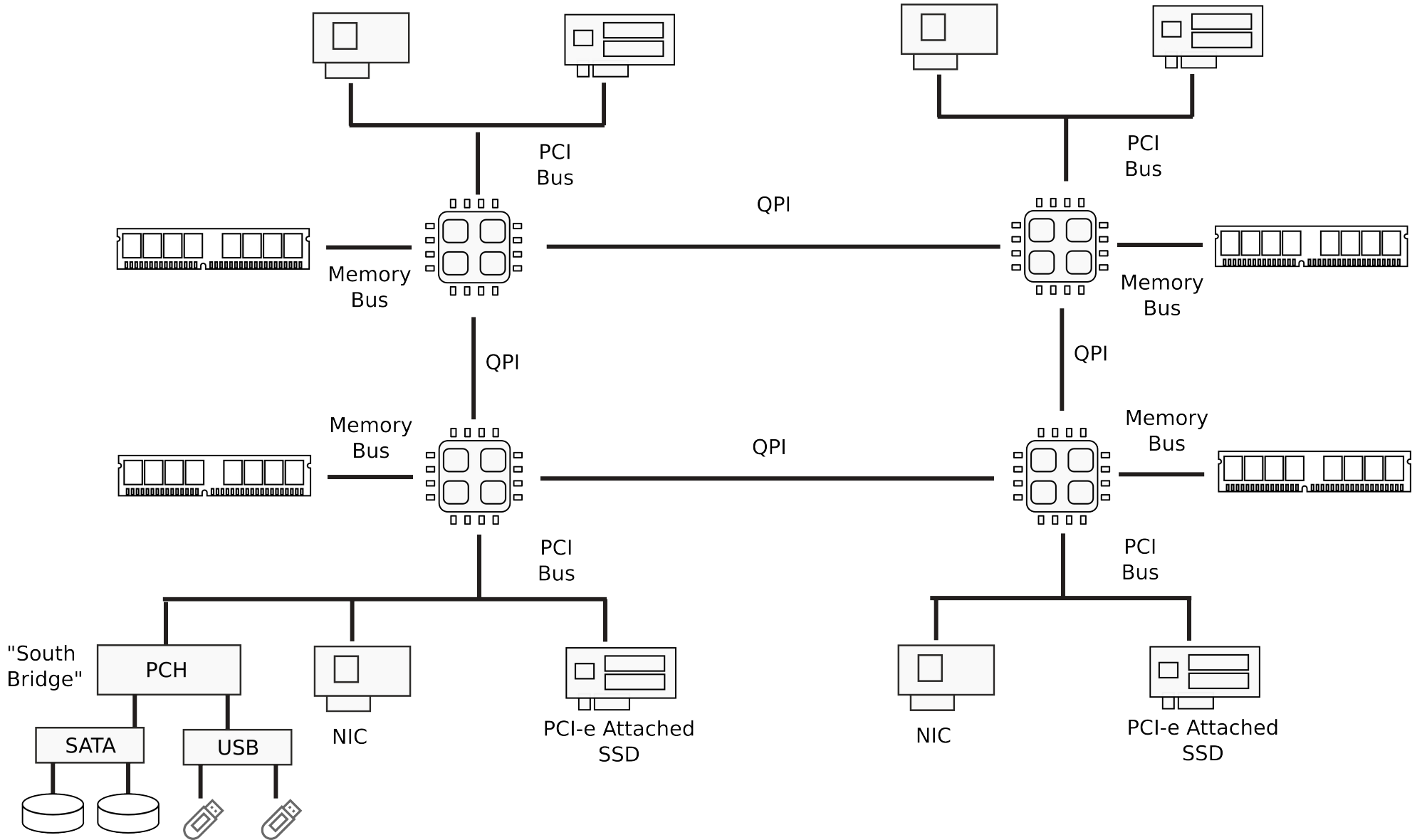
`mov [esi+eax], cl` ; Move the contents of CL into the byte at address ESI+EAX

`mov edx, [esi+4*ebx]` ; Move the 4 bytes of data at address ESI+4*EBX into EDX

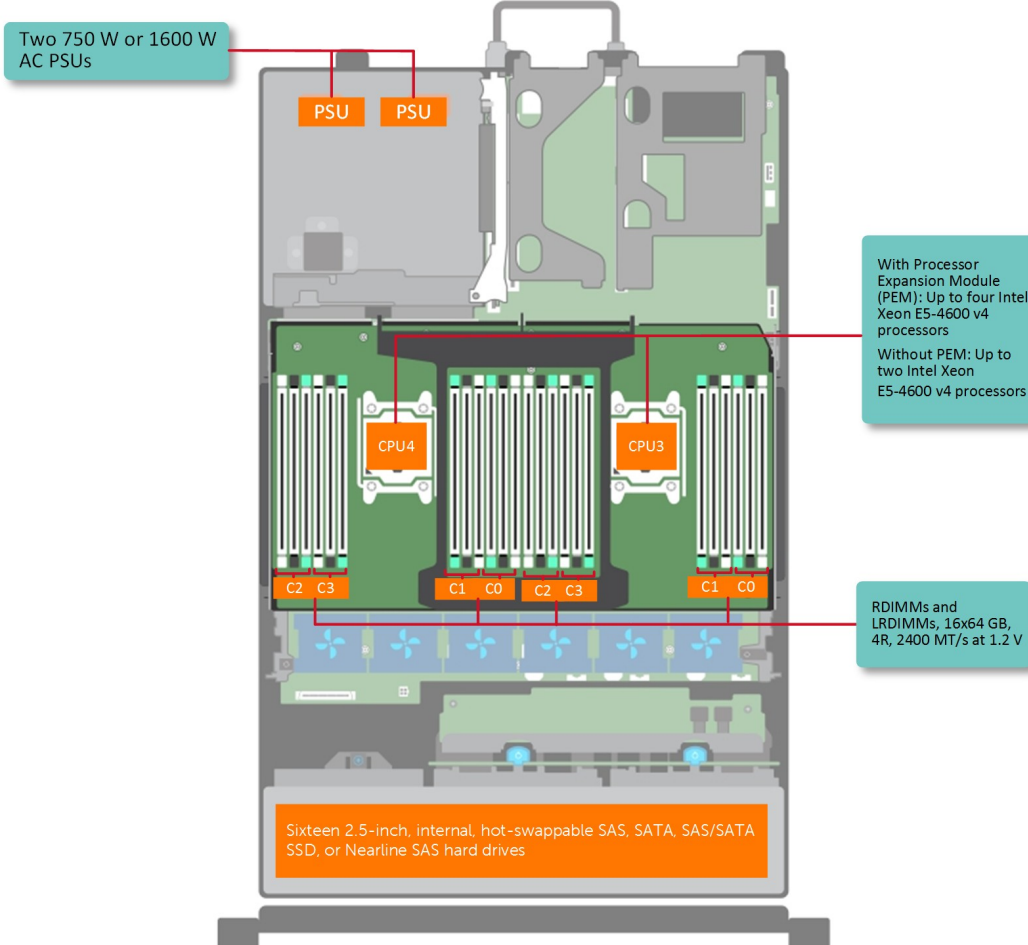
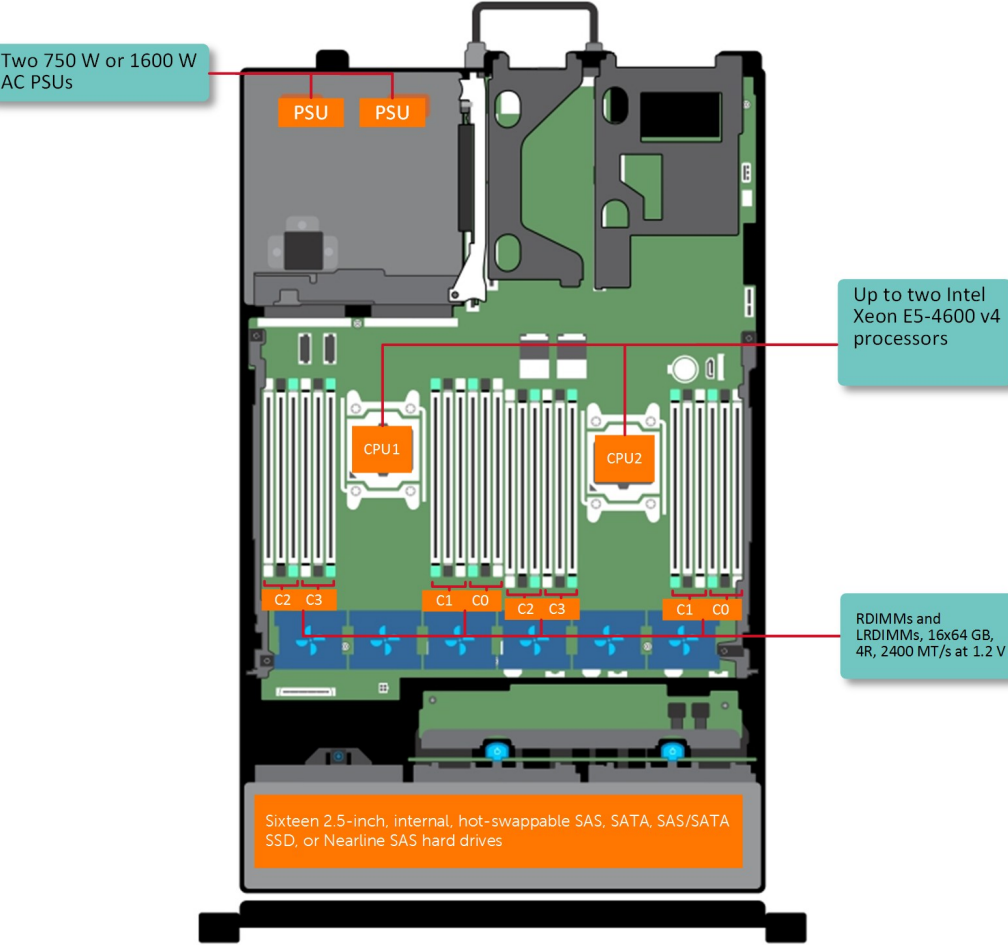
I/O Devices



Multi-socket machines



Dell R830 4-socket server



Dell Poweredge R830 System Server with 2 sockets on the main floor and 2 sockets on the expansion



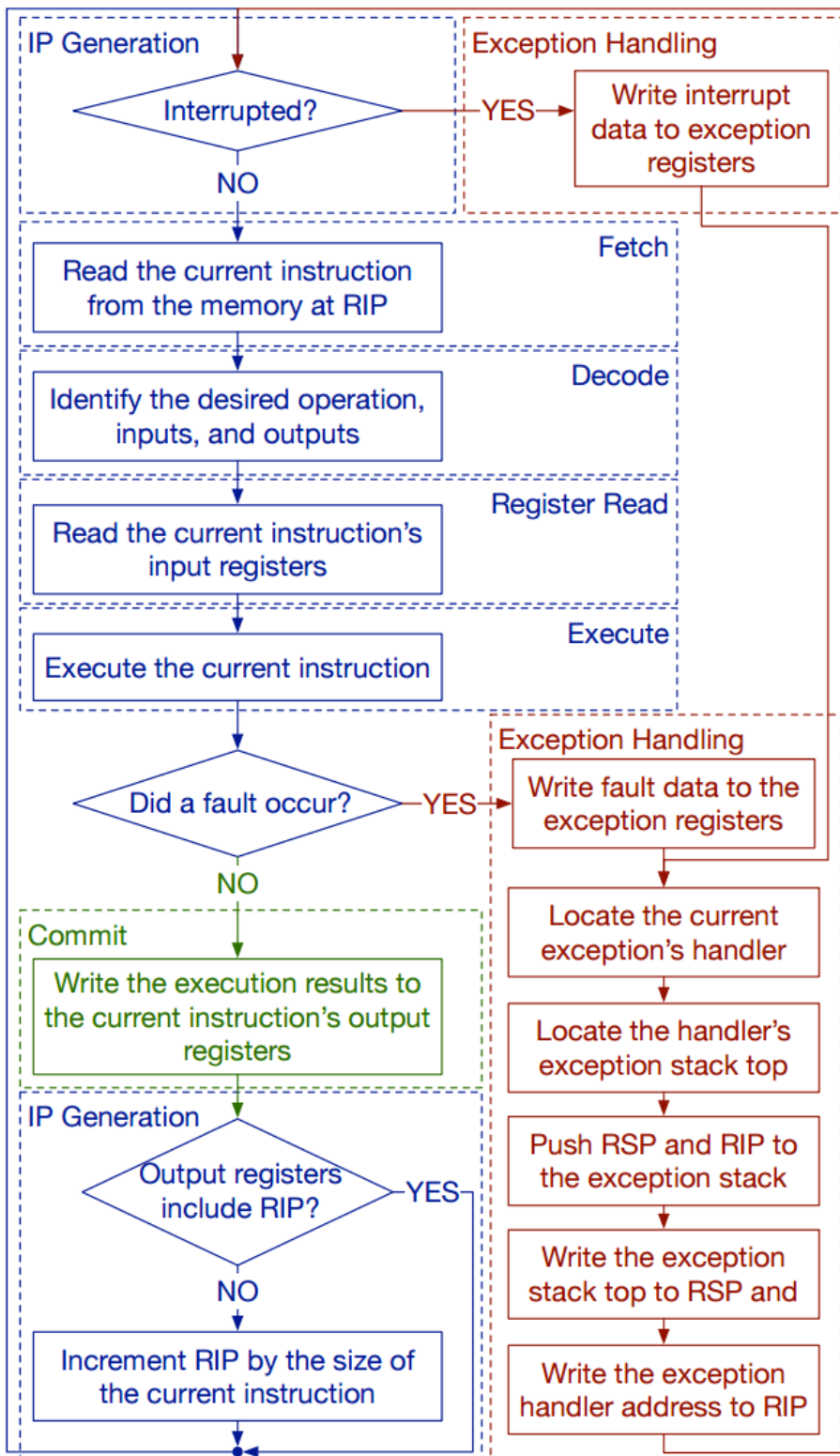
http://www.dell.com/support/manuals/us/en/19/poweredge-r830/r830_om/supported-configurations-for-the-poweredge-r830-system?guid=guid-01303b2b-f884-4435-b4e2-57bec2ce225a&lang=en-us

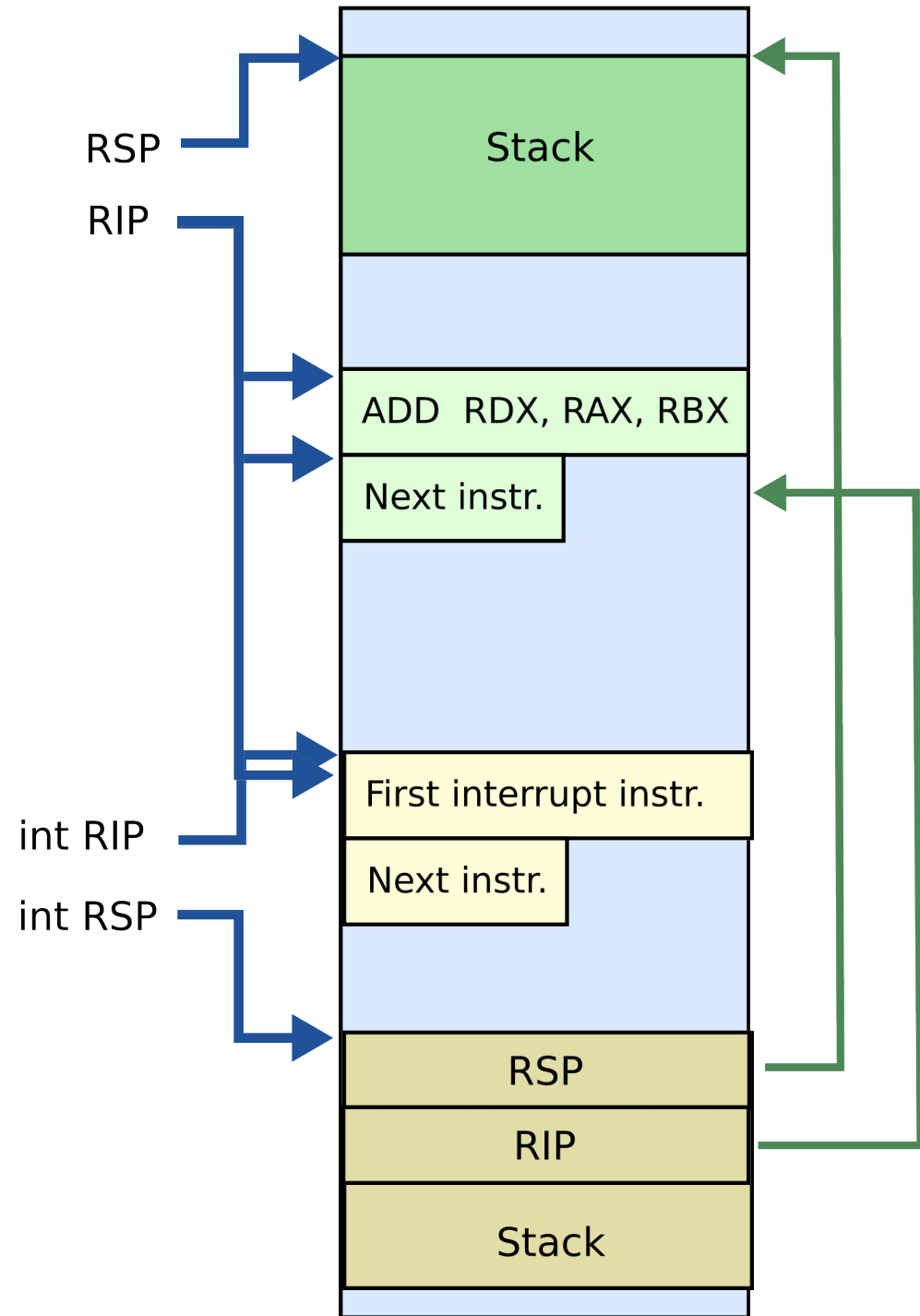
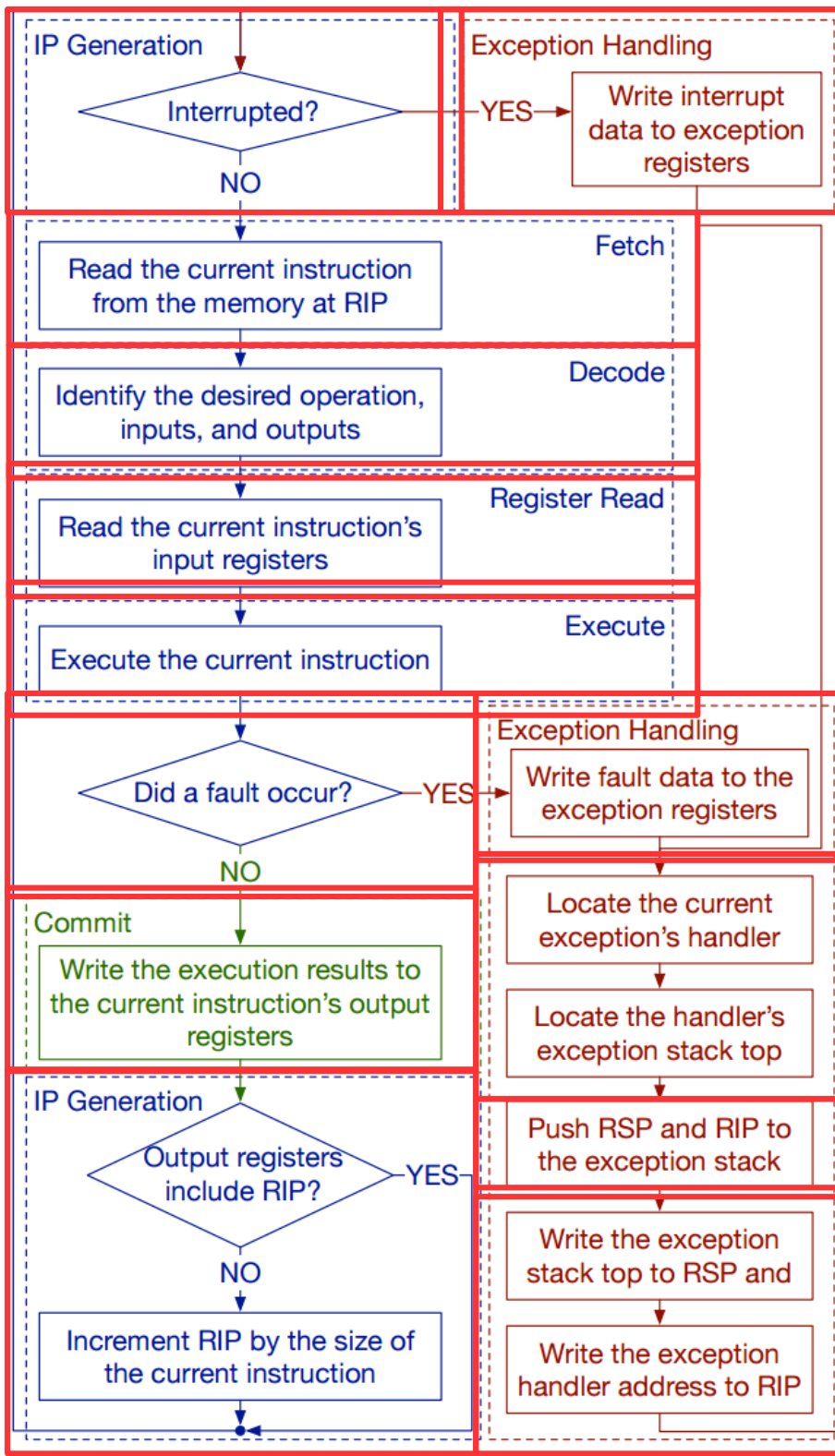
CPU execution loop

- CPU repeatedly reads instructions from memory
- Executes them
- Example

```
ADD EDX, EAX, EBX
```

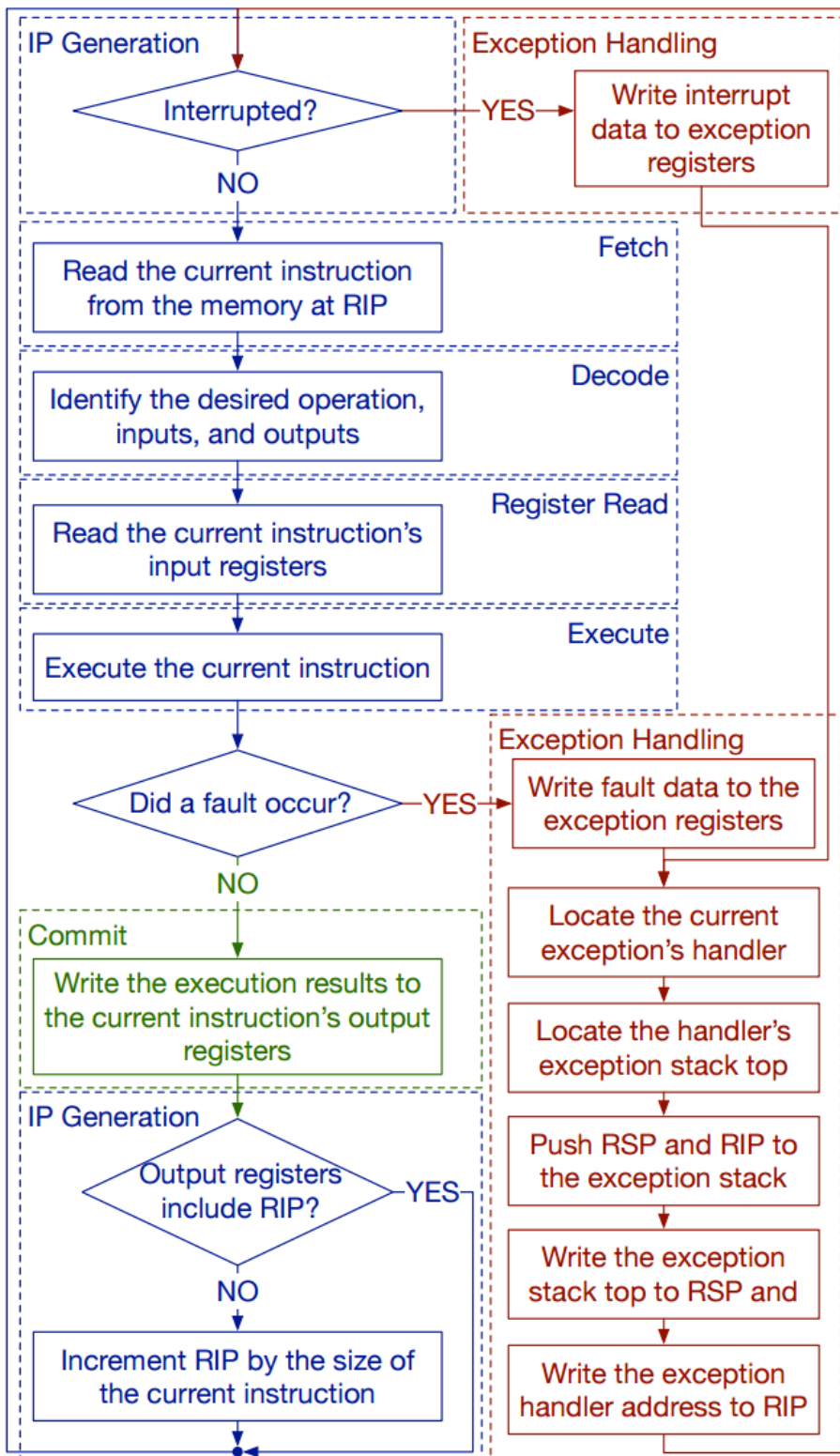
```
// EDX = EAX + EBX
```





CPU execution loop

- Fault
 - Instruction's preconditions are not met
- Examples
 - Division by zero
 - Page not mapped



Memory hierarchy (PowerPoint)

Questions?