



Protection Rings in Pentium

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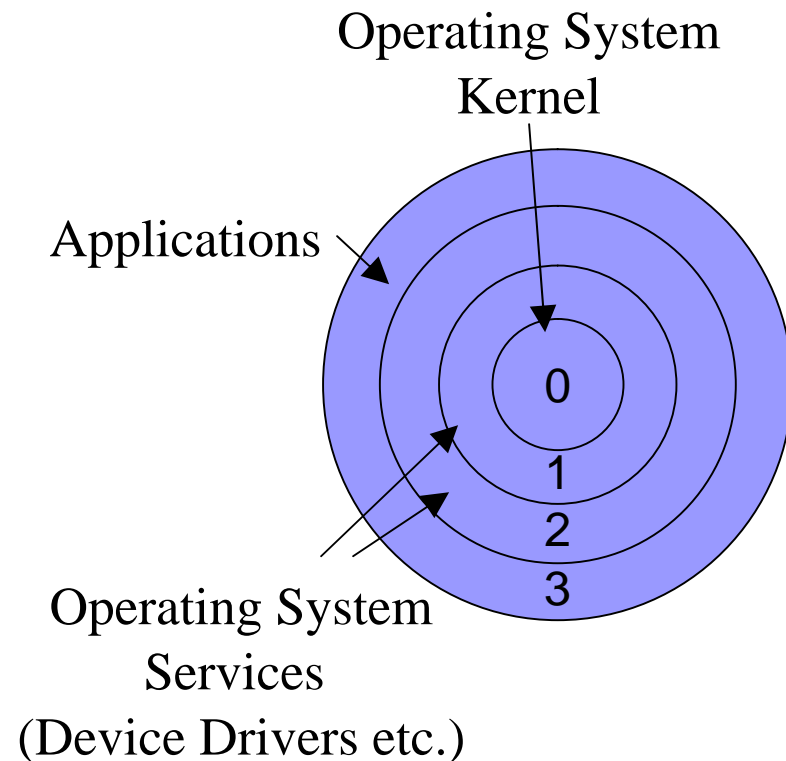


Protection Rings

- Protection necessary for reliable multitasking.
- ability to limit the amt of interference between programs
- Protection violation results in a General Protection exception
- 2 bits in processor define CPL (current PL)

Protection Rings

- User's programs and data are assigned level 3; if they fail, cannot cripple the entire system
- MINIX uses all 4 rings, OS/2 uses 3, while Linux, BSD and WinNT use 2 rings





Segment Descriptors and Gates

- Define a segment (data or code) or a Gate
- Have Base, Limit, Protection Level (DPL)
- Table of valid descriptors per process
- Gate is a pointer to a procedure entry
- Gate defines the lowest PL that can enter through it



Restricting access

- Restricting access to Data
 - $DPL(\text{segment}) \leq CPL$
- Restricting access to Code
 - JMP only to same PL
 - CALL to same PL or through Gate which allows CPL
- Privileged/Sensitive Instructions
 - Loading the GDT/LDT/IDT registers
 - Instructions performing I/O



References

- 386 DX Microprocessor Programmer's Reference Manual – Intel, p 6-1,6-16
- Microprocessor and Microcomputer-based System Design, Mohamed Rafiquzzaman, p388-394
- IA-32 Intel Architecture Software Developer's Manual. Volume 1: Basic Architecture (online)