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An Architectural Approach to Preventing Code Injection Attacks

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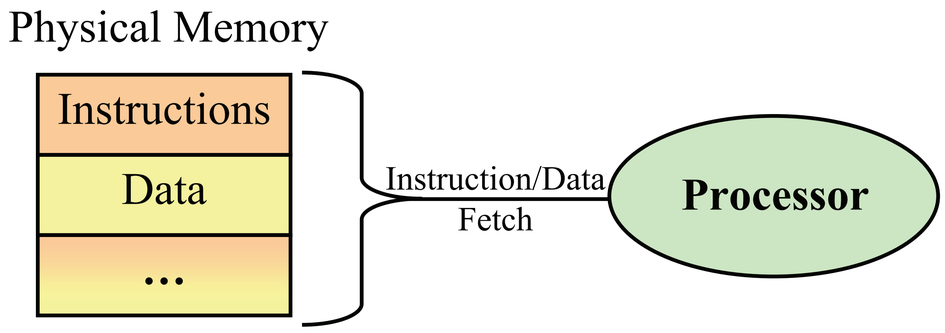
Problem #1

Most computers are inherently vulnerable to code injection attacks

- Their v*on Neumann* memory architecture allows data to be executed as code
- Attackers can inject malicious code using data sources (files, the network, etc.) and execute it

von Neumann Architecture

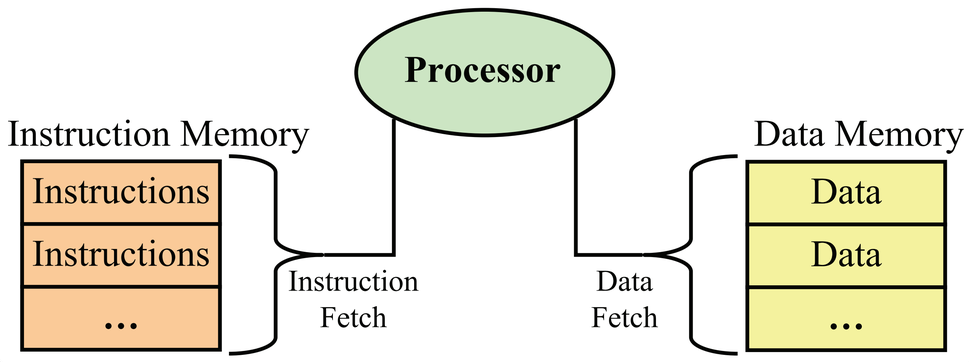


Solution #1

Use a *Harvard* memory architecture

- Completely separates instructions and data
- The processor cannot even load data as instructions
- Code injected as data can never be run

Harvard Architecture



Problem #2

No one will follow Solution #1

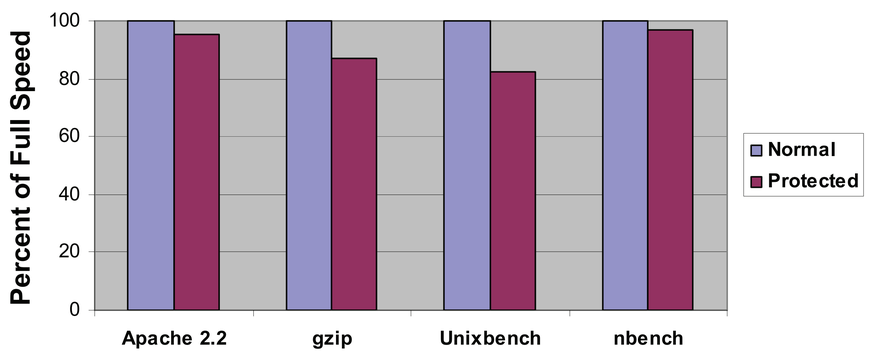
- Intel/AMD/IBM all use von Neumann architectures
- Grad students don't have much clout with those three
- This fundamental change would take a long time

Solution #2

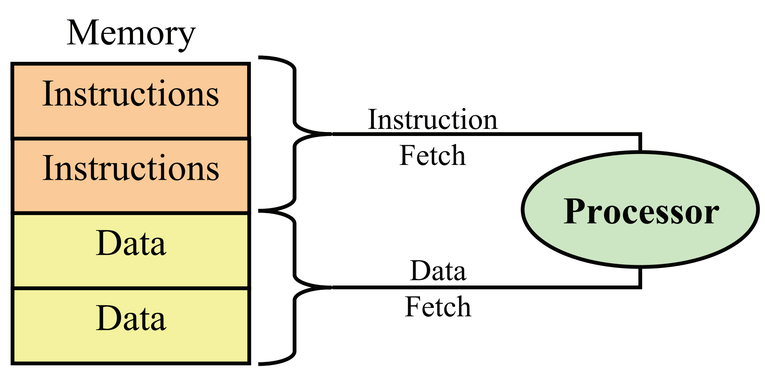
Create a virtual Harvard architecture

- Exploit tricks in the Intel processor related to memory management
- Have the operating system build the architecture on a per process basis
- Implement it in Linux 2.6.13
- *Test it against a suite of attacks* (All thwarted)

Performance Graph



Virtual Harvard Architecture



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