Linux Network Latency

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Problem Definition

- Fast Gun in the West
- Start: request received
- End: response sent
- Protocol: UDP
- Processing must reach user-space

Anatomy

- Hardware interrupt

    - 360ns

- NAPI poll

    - 1190ns

- Enter network stack

    - 1510ns

- Task wakeup

Anatomy

- Task wakeup
  - 9720ns
- sendmsg(2)
  - 2260ns
- Exit network stack
  - 560ns
- PCI write

Anatomy

- Idle + Sched + app   9720ns
- Driver   2100ns
- Network stack   3770ns
- Total   15590ns

Idle Loop

- Interrupt received
- **Prepare to resume execution**
    - ACPI
    - cpuidle
    - NO HZ
- Enter scheduler
- Switch to target process

Network stack

- SELinux netfilter hooks

- Timestamping

    - Packet socket (DHCP)

    - NTP

- IP stack

Driver

- Interrupt mitigation
- PCI reads/writes
- Packet management

To Do

- Reduce idle loop latency.
- Fix DHCP client.
- Optimise IP stack.
- Optimise driver.

Questions