Muti-Hypervisor Virtual Machines

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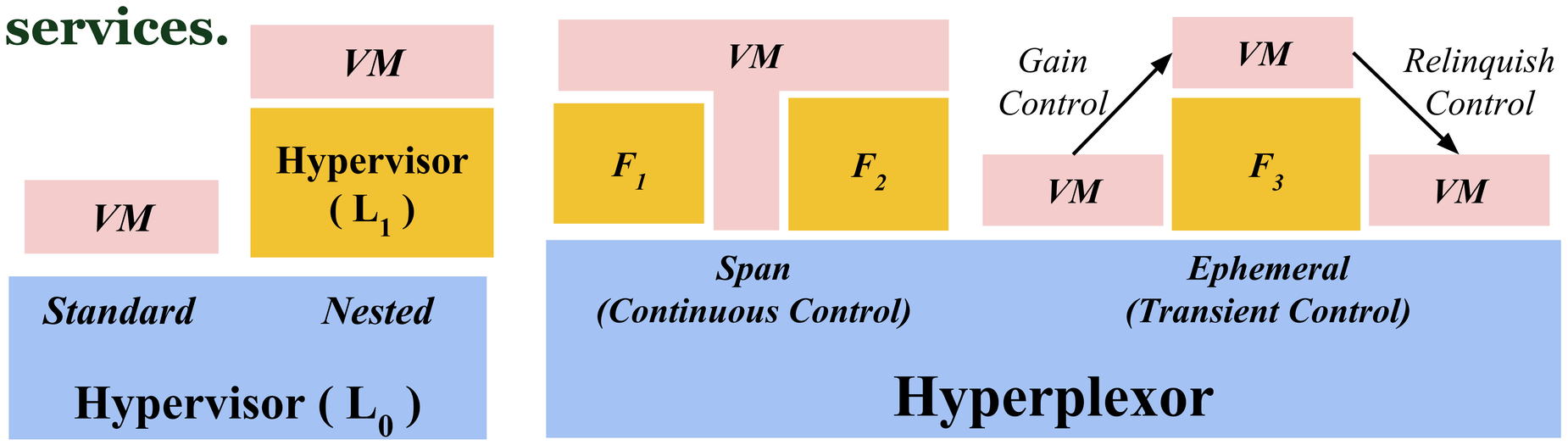
Hypervisors are Getting Too Big

Problem: Too many services.

- VM Introspection
- Intrusion Detection
- High Availability
- Live Migration
- Live Patching
- File systems etc.

Solution: Break Them Up

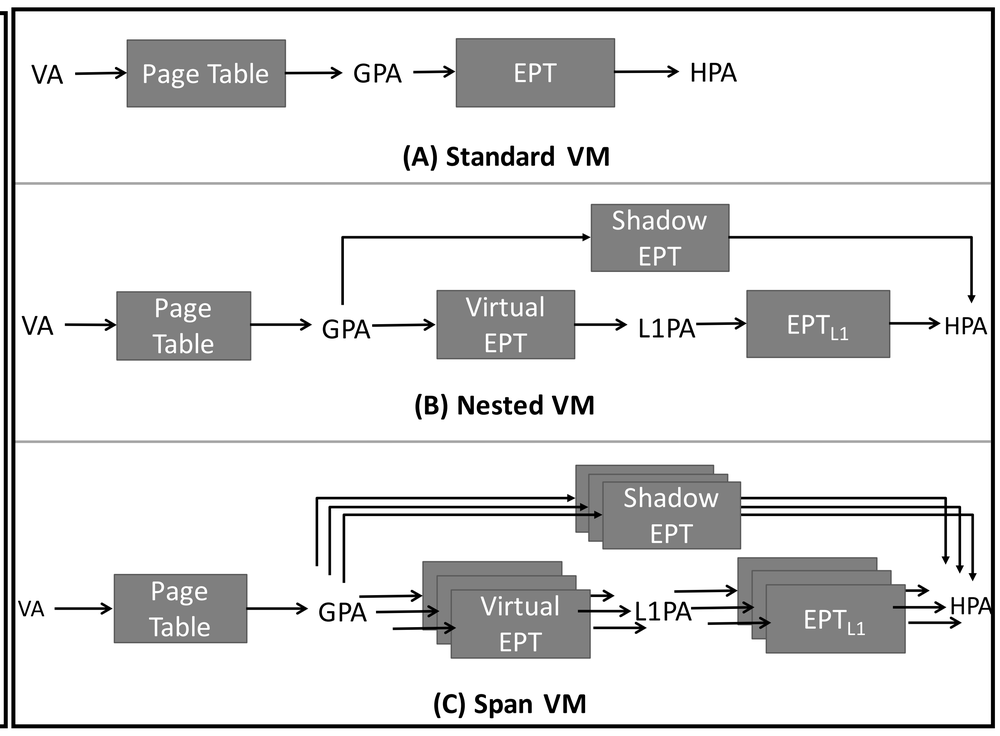


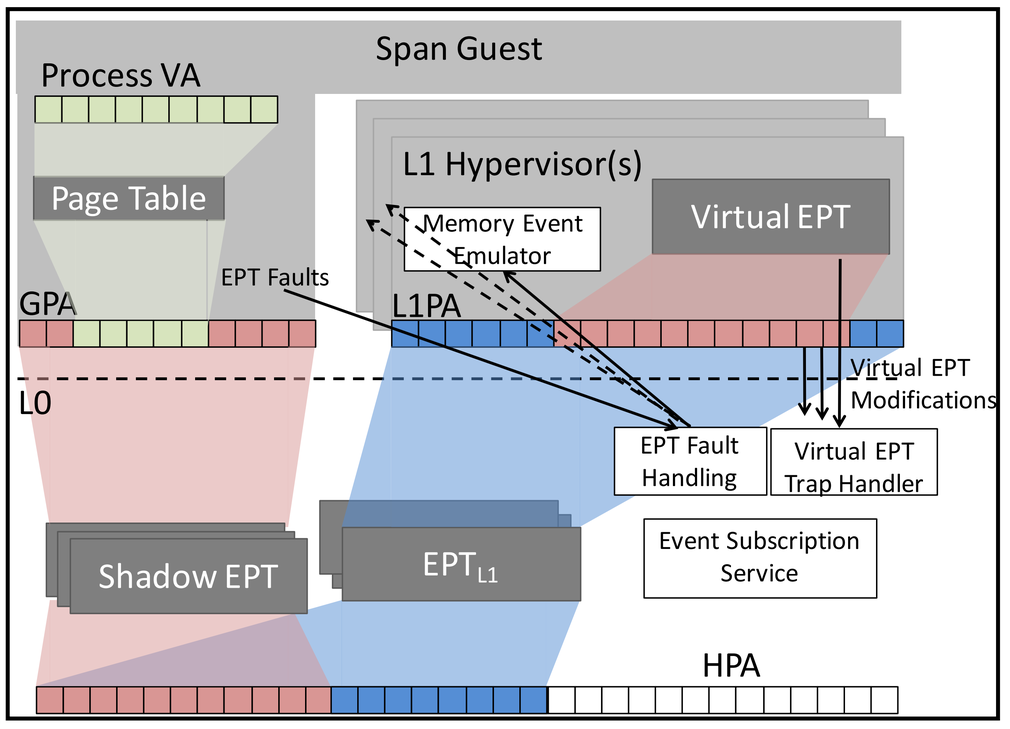
Featurevisors (F) : 3rd-party "Hypervisors" that provide add-on services.

Hyperplexor : Base L0 hypervisor that multiplexes hardware for L1.

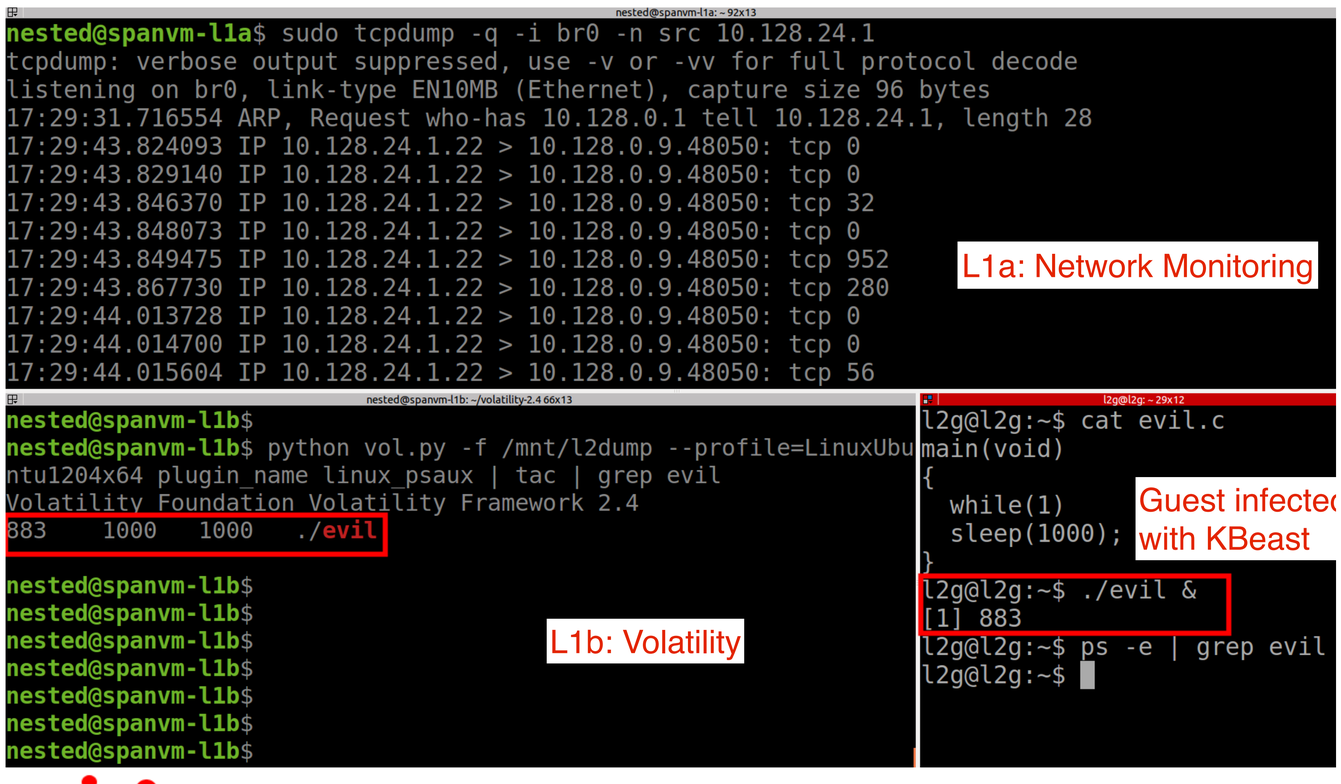
Challenge: Transparent Control of Guest By Multiple Hypervisors

- **Guest Memory**
  - Shared
- **Virtual I/O Devices**
  - Distributed.
- **VCPUs**
  - One hypervisor.





Demonstration



Performance

- On modified KVM/QEMU platform
- Common benchmarks
  - Kernbench, iperf, Quicksort
  - 0–15% overhead vs. standard VMs
- Ephemeral Virtualization
  - 80ms average switching times.
- Page-fault servicing: 3.6—4.2µs
- Interrupt redirection: 13—41µs

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