When Virtual Is Better Than Real

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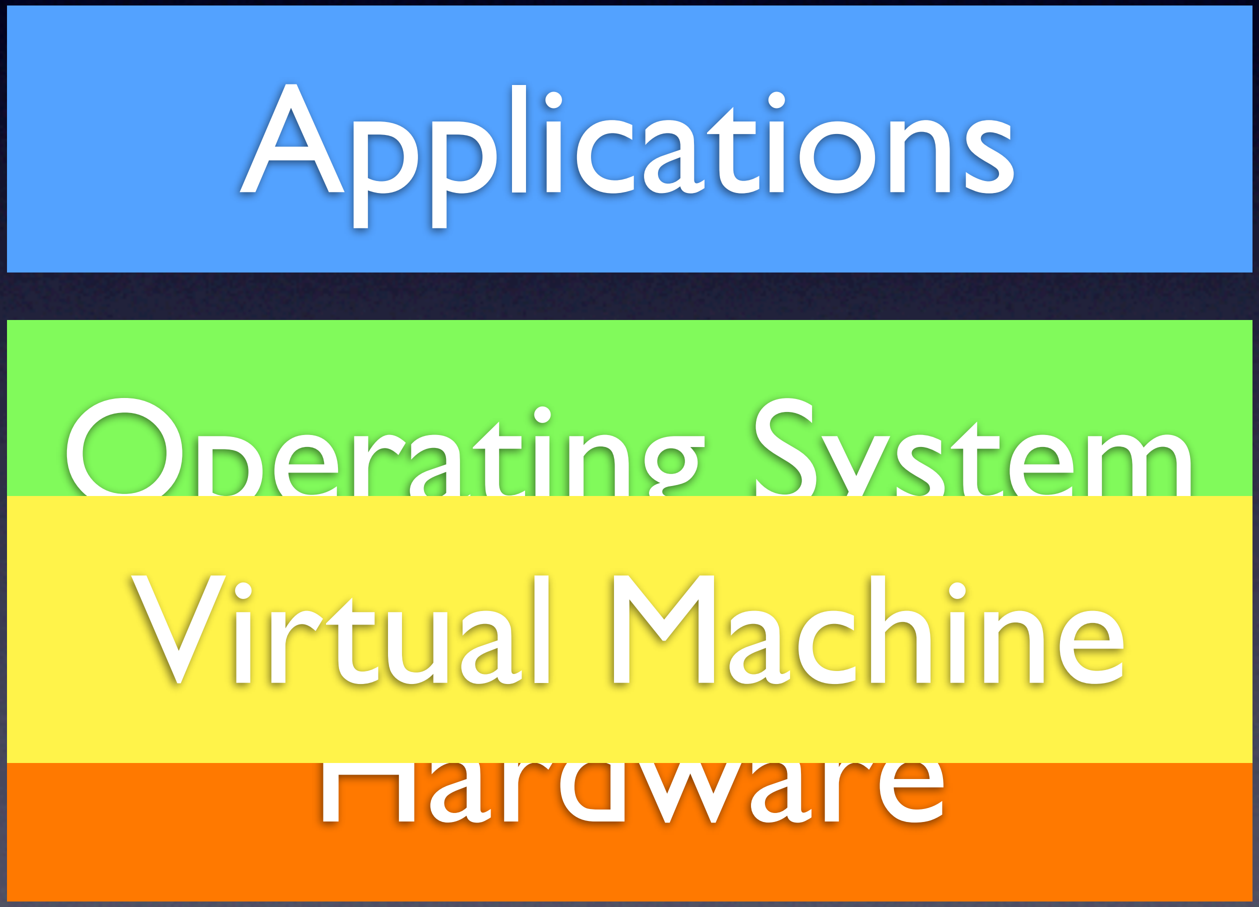
Position



Advantages

- provide services below the most code running on the system
- need not trust the OS
- useful for enhancing security and mobility
- functionally equivalent to modifying the physical machine, but way easier
- fast connection to „another computer“

Challenges

- virtualization and its overhead
- semantic gap, consistency problems
- leaky abstraction
    - real-time guarantees within the OS?
    - direct hardware access (think GPUs)

Secure Logging

- logging in OS: easily turned off by attacker
- paper proposes checkpointing approach
  - replay attacks to analyze them
- reduce data to log by trusting other machines
  - seems only applicable for the datacenter

Intrusion Detection

- detect and prevent attacks by observing the OS from the outside
- cannot detect today’s web-based attacks
- adds another attack vector

Migration

- motivated as a non-server use-case here
    - virtual machines travel with the user
- trust issue with encrypted data
- What about the data on the disk?
- What’s wrong with notebooks?

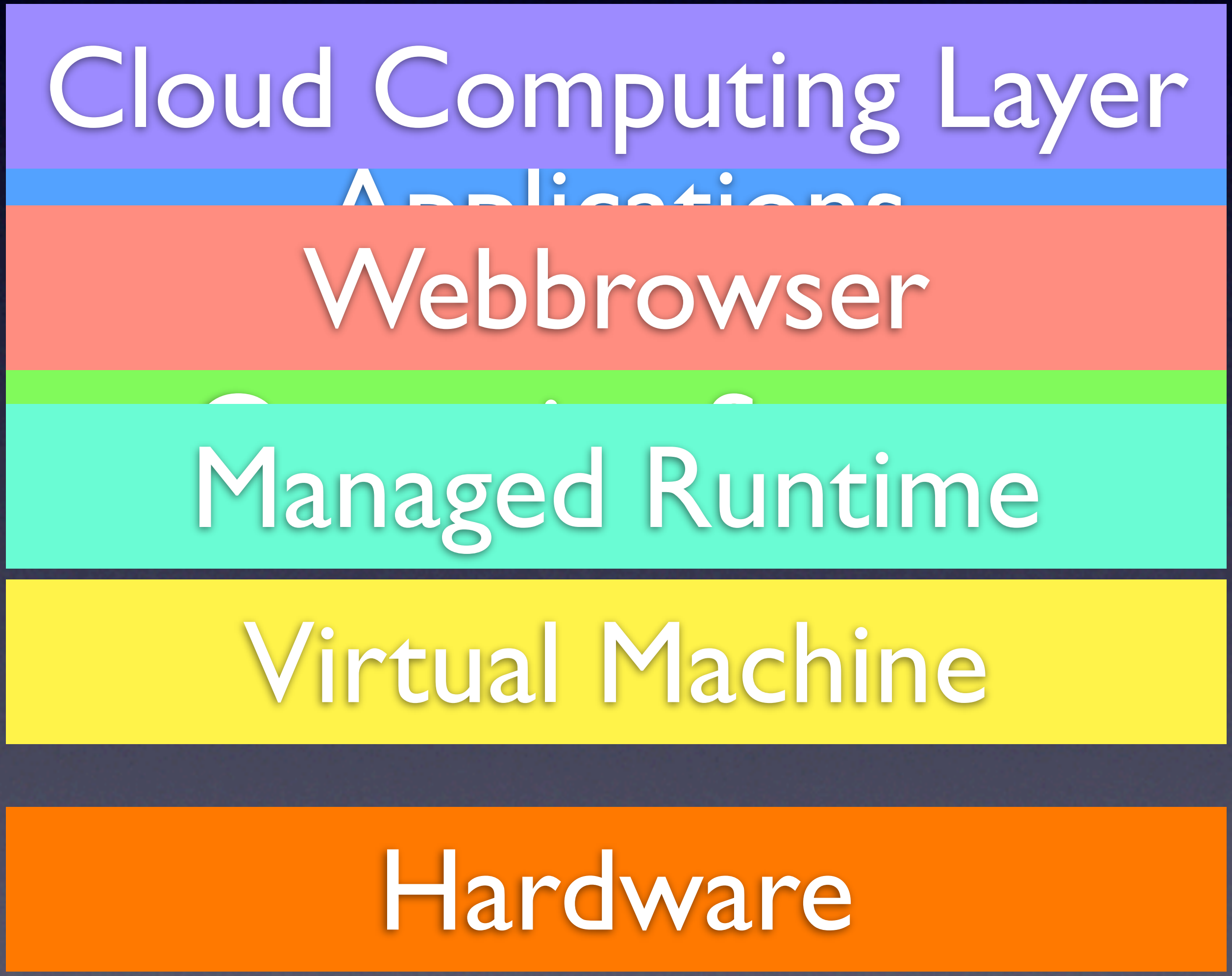
Alternative

- implement such services in the OS
- it has all the required knowledge
- it is just one level of abstraction away from the hardware
- can use all features offered by the hardware
- minimal design

Security

- 7.11.2008: Bug in VMware’s CPU emulation grants elevated privileges
- 31.10.2008: VMware patches ESX server to close security holes
- 6.10.2008: VMware patches various vulnerabilities
- 19.9.2008: security update for VMware ESX

Be Afraid



Cloud Computing Layer

Applications

Webbrowser

Managed Runtime

Virtual Machine

Hardware

What I do believe in

- virtualization as an application on top of the OS
- hosted VMM architecture
- running the occasional windows app
- nice for developers
- virtualization only as needed

What I do not believe in

- virtualization to solve problems of the OS
- virtualization purely for isolation
  - that's what OSes and address spaces were invented for
- virtualization as an additional layer for everything
  - brings more complexity

Discussion

- Is the recent hype of virtualization primarily an artifact of the flaws in Windows?
- Will the trend of adding layers ultimately make the systems unmanageable?
- Or should we give up on transparency?
- Will VMMs inherit today's OS problems? (monolithic, insecure, hard to restructure)
- Name one use-case that requires pervasive virtualization on mobile phones.