

Servers have evolved...

- New form factors
 - Higher density
 - Standard architectures
 - Multicore/multithreaded
- Advances in operating systems
- Virtualization
 - Thrustworthiness/security
 - Clustering



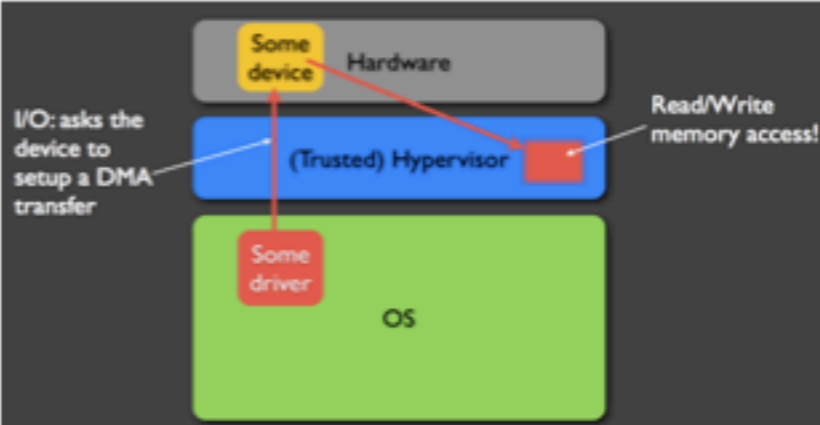
Need for new programming models, SW Architectures, Services

Virtualization problems

- Security: extended attack surface
- Virtualization-based malware
- Must trust hypervisor

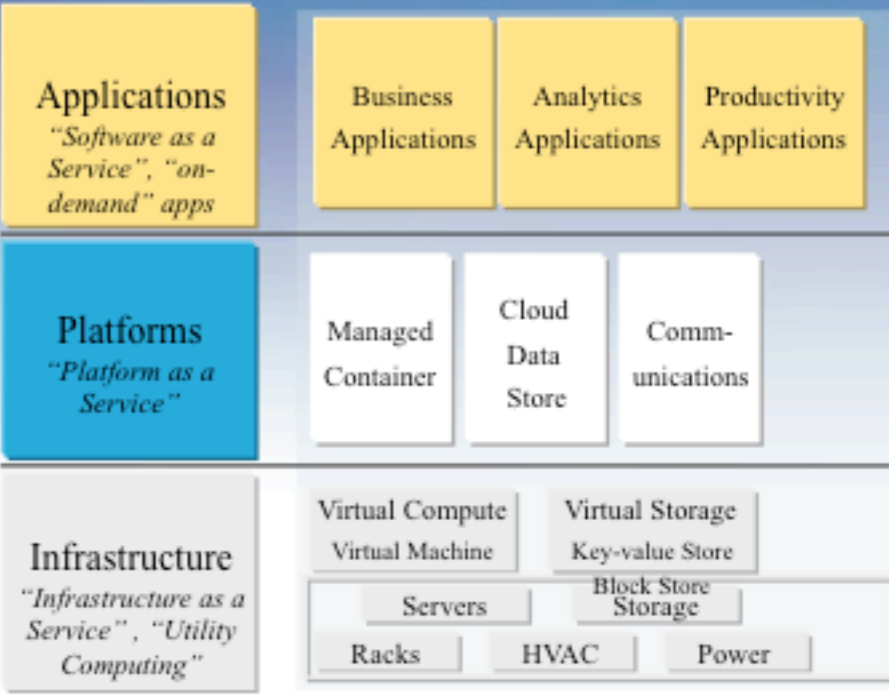


Intel VT-x, AMD Pacifica

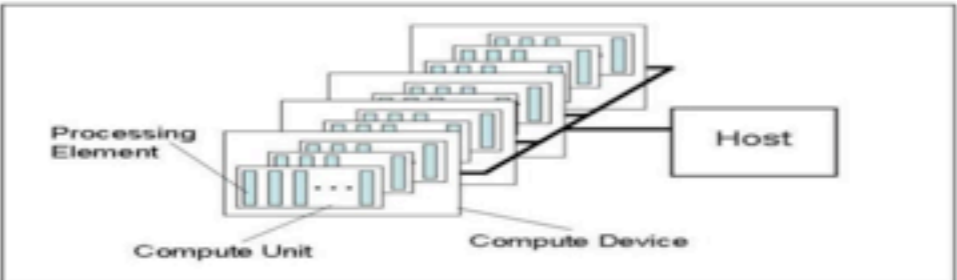


Cloud Computing – the three layers

- Challenges to the Cloud
- Has to abstract underlying hardware
 - Be elastic in scaling to demand
 - Pay per use basis



OpenCL: New Programming Models



- One Host + one or more Compute Devices
 - Each Compute Device is composed of one or more Compute Units
 - Each Compute Unit is further divided into one or more Processing Elements