

A Peer to Peer, Local Area Disaggreated System



Michael Wei, George Porter, Steven Swanson UC San Diego

Today, we design computer systems as closely coupled physical aggregates:

- Computers consist of a procesor with memory and I/O in a physcial enclosure
- 4 Aggregation leads to fixed-ratio provisioning which results in underutilization

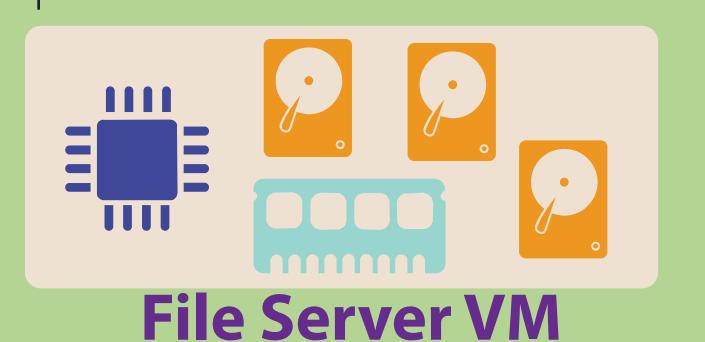
Disaggreation decouples resources from their physical constraints.

In disaggregated systems, applications directly drive resource utilization, increasing efficiency.

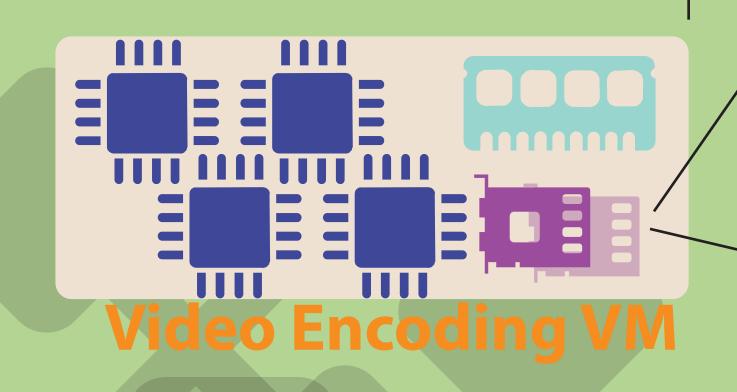
However, disaggregated components need to communicate, leading to increased network load.



Disaggreated applications run in virtual machines which are composed of physical resources



Memcache VM



VMs can use CPU, memory and specialized I/O resources spanning physical servers.

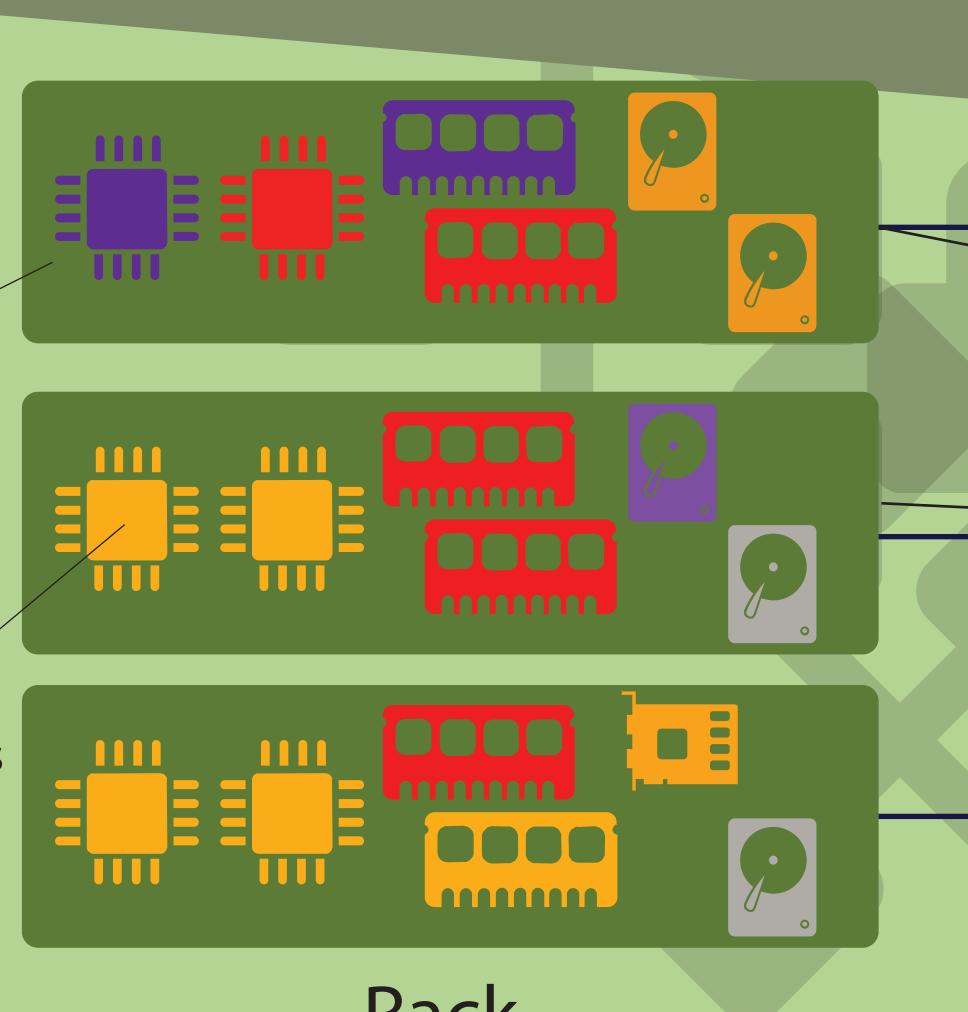
Allocation does not need to be necessarily static, applications can demand more resources when necessary.

Virtual

Physical

VMs are mapped across physical machines, which may have different resources available.

Thread migration and other techniques are used to keep resources local whenever possible.



is managed by the global hypervisor.

compute.

Network traffic and I/O traffic share the same physical network, eliminating the need for additional cabling.

A distributed hypervisor manages

Our specialized network card enables hosts to

share and use remote I/O devices, memory and

A local hypervisor ensures VM isolation and

global resource allocation and security.

A circuit switched network manages resource scheduling, ensuring that resources get dedicated channels for low-latency communication.

Pools of specialized resources, like GPUs and FPGAs can also be pooled and accessed by disaggregated VMs when necessary.

Rack



Compared to other disaggregation solutions, our design uses the existing network and servers, allowing the use of commodity parts to realize a disaggregated system.