CSE 291: Operating Systems in Datacenters

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Agenda for Today

- Disaggregation overview
- LegoOS discussion
- The future of disaggregation
Disaggregation
What is disaggregation?

- Disaggregated datacenter
  - Resources directly connect to the network in “resource blades”
  - No notion of a “server” anymore
- Offers better resource utilization, easier upgrades, etc.

“Network Requirements for Resource Disaggregation” [OSDI ‘16]
What makes disaggregation challenging?

- Traditional datacenter networks have much lower throughput and higher latency than server interconnects

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Throughput: 65 GB/s = 520 Gbps
Latency: 50-100 ns

Throughput: 100 Gbps
Latency: a few μs
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“Network Requirements for Resource Disaggregation” [OSDI ‘16]
Hardware for Disaggregation

- Many announcements of disaggregated hardware:
  - SeaMicro
  - Intel Rack Scale Architecture, 2013
  - HP The Machine, announced in 2014
  - UC Berkeley Firebox, 2014

RIP HPE's The Machine product, 2014-2016: We hardly knew ye

Remains of lab experiment, including ReRAM, will be scattered into future gear

AMD kills off SeaMicro server business

Dense server subsidiary shut down after AMD posts a bigger-than-expected loss

But... no widespread adoption yet
Disaggregation-Related Research Questions

- What kind of network is required?
  - “Network Requirements for Resource Disaggregation” [OSDI ‘16]
  - “Pond: CXL-Based Memory Pooling Systems for Cloud Platforms” [ASPLOS ‘23]

- Transparent or not?
  - “AIFM: High-Performance, Application-Integrated Far Memory” [OSDI ‘20]

- How to share disaggregated resources?
  - “MIND: In-Network Memory Management for Disaggregated Data Centers” [SOSP ‘21]
LegoOS Discussion