Experiences With RAMCloud Applications
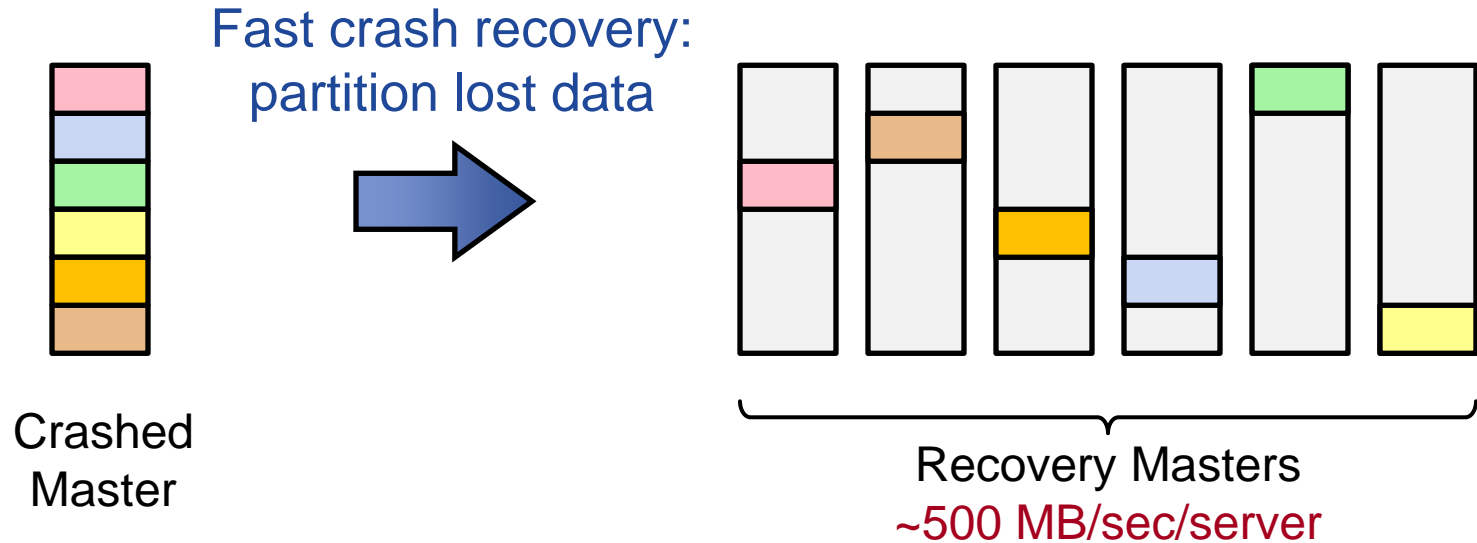
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Overview

- **January 2014: RAMCloud 1.0 (first practical version)**

- **Application experiments so far:**
  - Stanford: natural language processing, graph algorithms
  - Open Networking Laboratory: ONOS (operating system for software defined networks)
  - CERN: high energy physics (visiting scientist, summer 2014)
  - Huawei: real-time device management

- **Challenges**
  - Low-latency networking not yet commonplace
  - RAMCloud not cost-effective at small scale
 - RAMCloud is too slow (!!)

Scale and Recovery

Fast crash recovery:
partition lost data

Crashed
Master

Recovery Masters
~500 MB/sec/server

| Cluster Size	Server Capacity	Cluster Capacity	Recovery Time
101 servers	50 GB	5 TB	1 sec
201 servers	100 GB	20 TB	1 sec
6 servers	100 GB	600 GB	40 sec
6 servers	2.5 GB	15 GB	1 sec
11 servers	5 GB	55 GB	1 sec

Small clusters can't have
both fast recovery and
large capacity/server

Fast But Not Fastest

Choice #1:
5-10 µs remote access
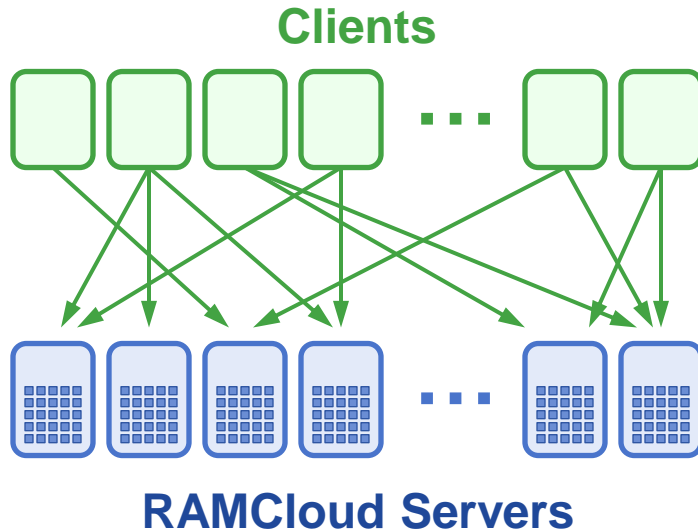
Choice #2:
50-100ns local access

Clients

RAMCloud Servers
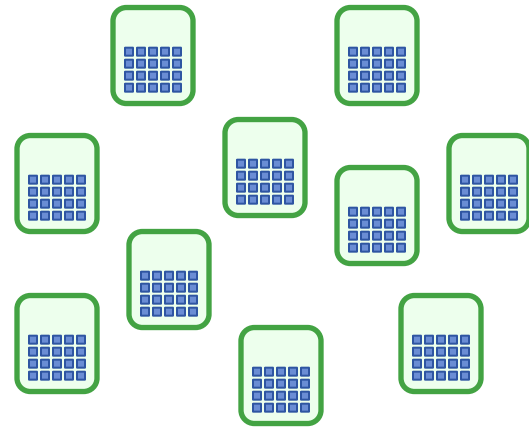
- **Choice #2 is 100x faster than RAMCloud**
  - And, can store data in application-specific fashion
  - But, data must partition
  - What about persistence?

Conclusion

- **Technology transfer is a numbers game:**
  - Odds of success with any one group or project are low
  - Must try many experiments to find the right fit

- **Our goals:**
  - Learn something from every test case
  - Keep improving RAMCloud

- **Application issues suggest new research opportunities**