Aegean: Replication in the cloud era
(or: How to replicate non-standalone services)

COMPUTER SCIENCE & ENGINEERING
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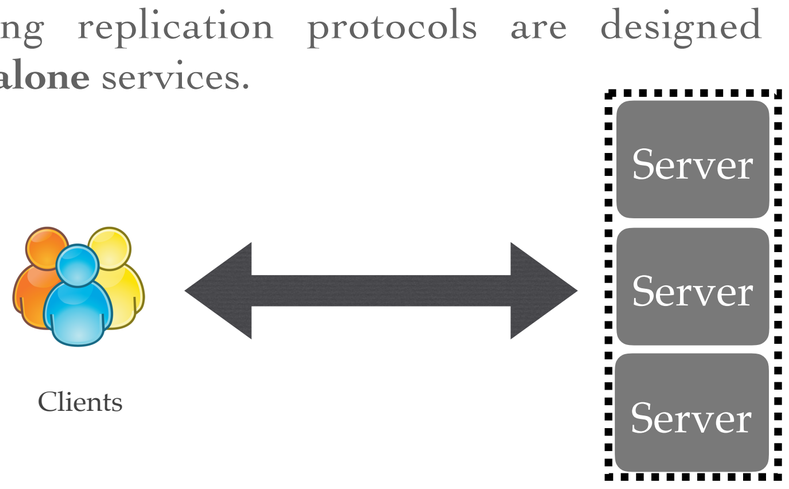
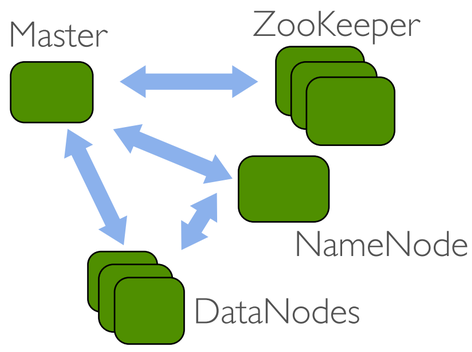
1. Beyond Client-Server Model

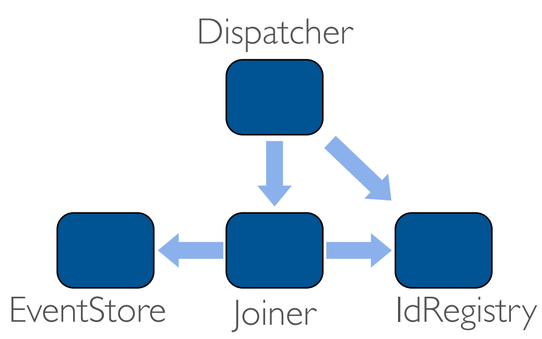
Existing replication protocols are designed to replicate **standalone** services.



Today's services are frequently **not** standalone; they **interact** with other services:

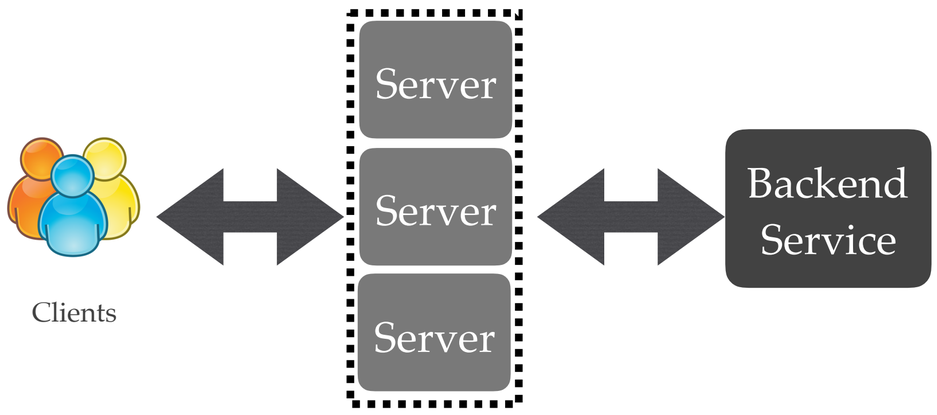


HBase



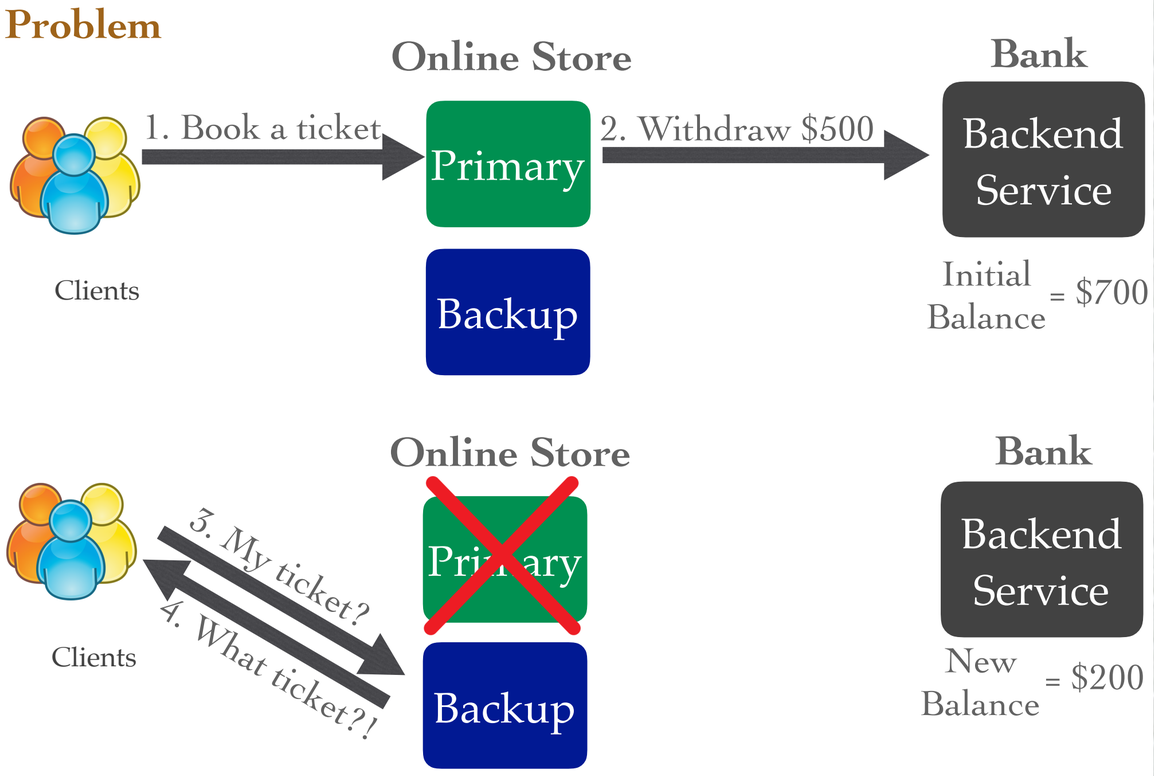
Google's Photon

In this multi-service environment, interactions with other services can **break correctness** and **hurt performance** of replication protocols.



2. Service Interactions Violate Correctness

Problem



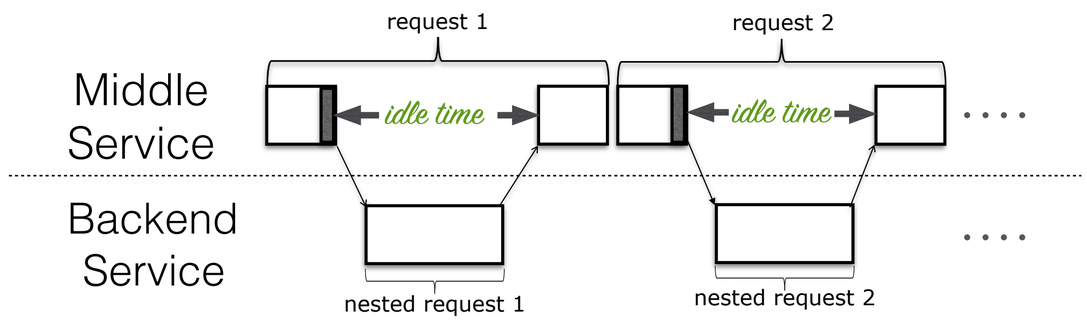
Solution

Use speculation **within** a service, but **resolve** it before making any output commit to another service

3. Service Interactions Hurt Performance

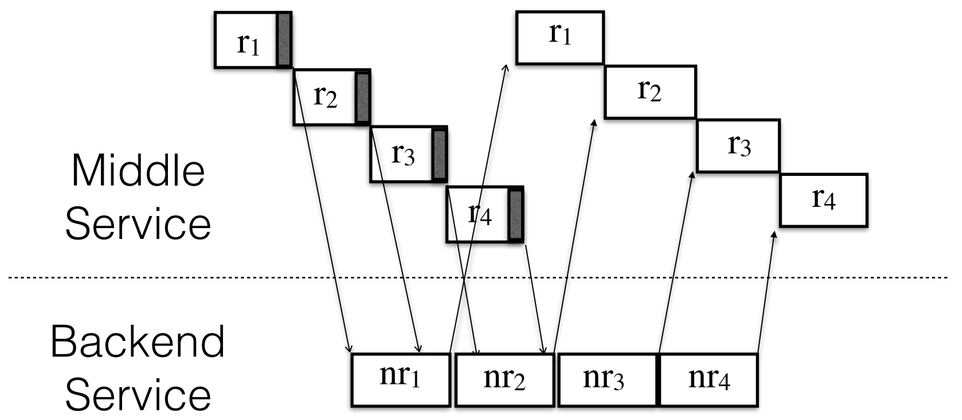
Problem

Replication protocols like Paxos are bound by **sequential execution**. In a multi-service environment, this forces the middle service to remain **idle** for long periods of time.



Solution

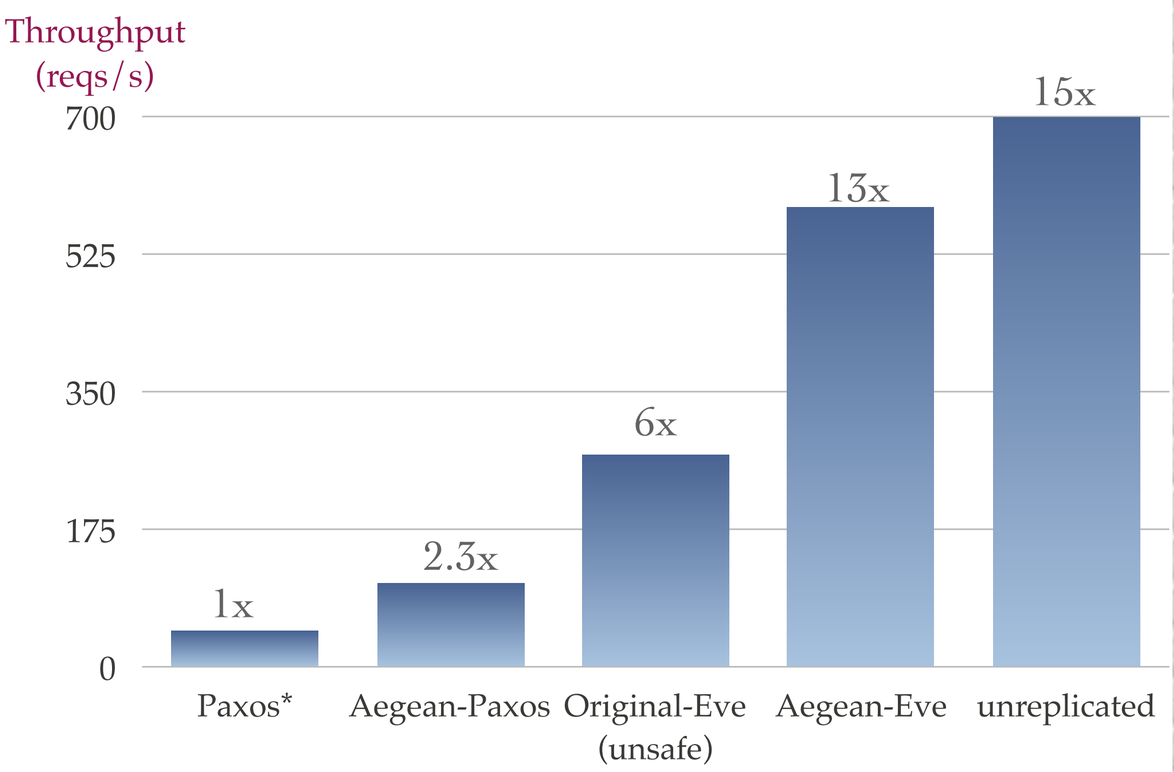
Instead of sequential execution, use more efficient deterministic schedules: ***Request Pipelining***.



In fact, the same approach applies beyond Paxos-like sequential protocols to multithreaded protocols like Eve.

4. Aegean Improves Throughput by 13x

Throughput of TPC-W benchmark



- **Request pipelining** gives us **2x** throughput over Paxos*.
- **Supporting multithreading** gives us another **6x**.