# An Analysis of Facebook Photo Caching



Qi Huang


Ken Birman


Robbert van Renesse


Wyatt Lloyd

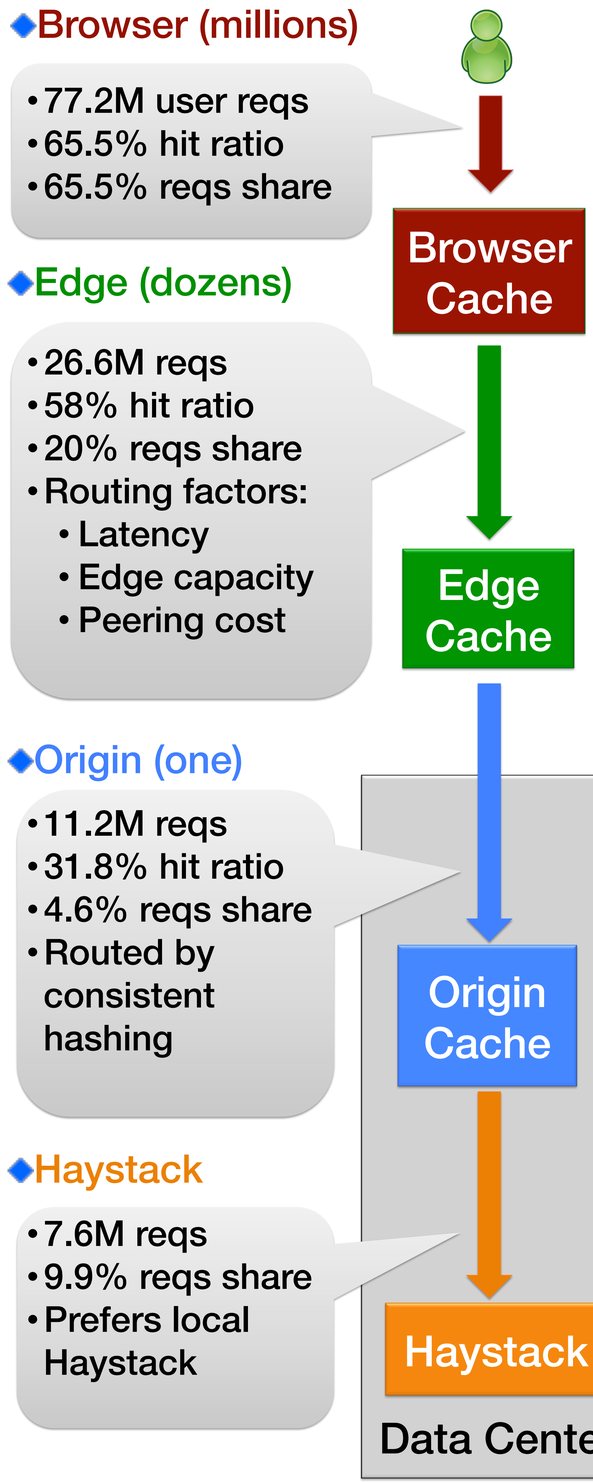

Sanjeev Kumar


Harry C. Li


## Instrumented Stack

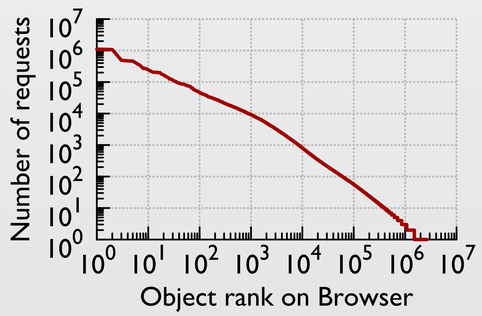
### Deep and Distributed

1. 4 layers of cache and storage.
2. ~12M user IPs, ~20 Point-of-Presence, 4 Datacenters.

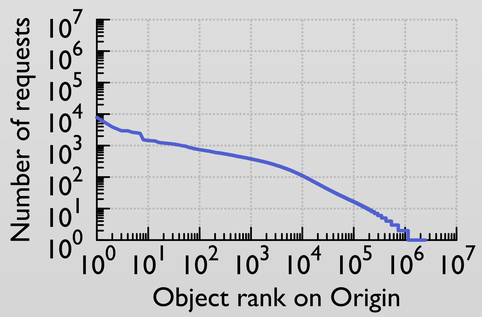



## Workload

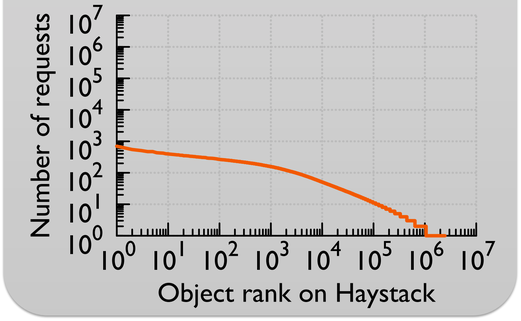
At top layers, req popularity follows a power-law dist., but curve flattens as reqs tunnels deeper.








Haystack sees a Stretched Exponential dist.

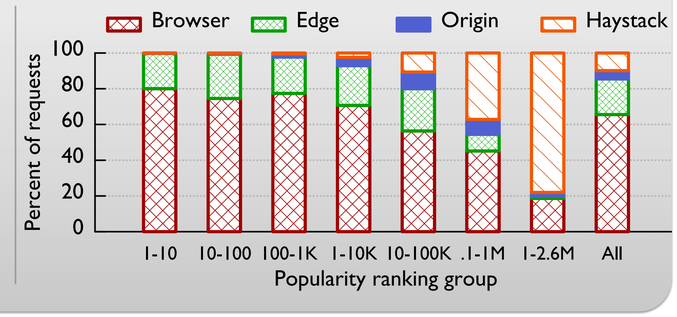



## Cache Performance

### Traffic Share by Photo Popularity

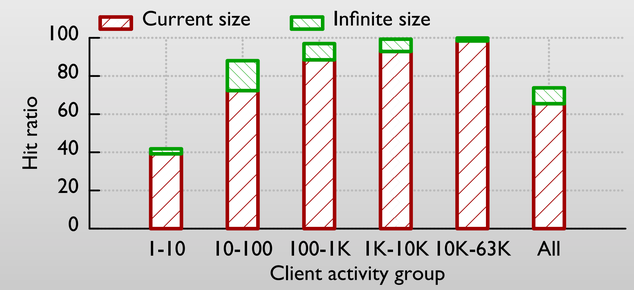
Cache traffic share drop for less popular items.

1. Top 1K photos attract 25% traffic.
2. Cache serves 99.93% reqs for them.
3. Haystack handles the tail.



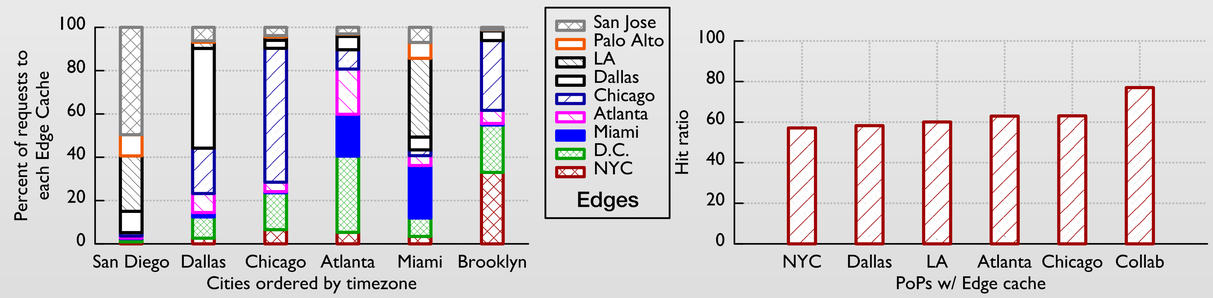

### Browser Caching

1. Clients with <10 reqs send 37% traffic.
2. Active clients have higher hit ratio.
3. Increasing cache size helps.

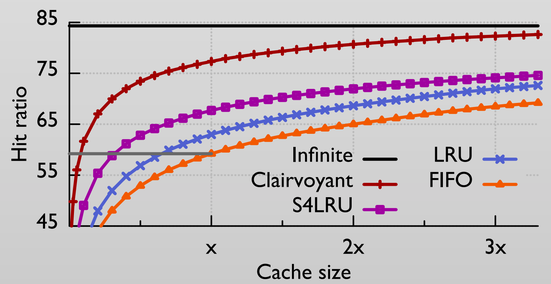



### Edge Caching & Origin Caching

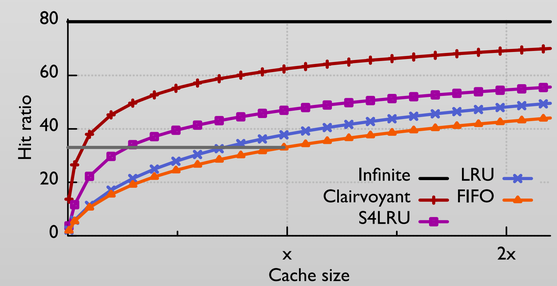
1. Request from clients are often routed to remote Edges.
2. Collaborative Edges (collab bar) increases hit ratio by 17%.




3. S4LRU increases hit ratio significantly both at Edge and Origin.




San Jose Edge




Origin