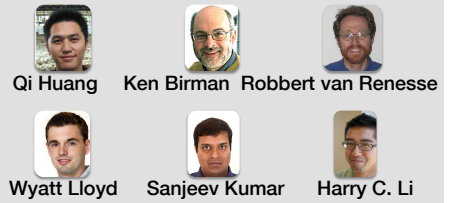




# An Analysis of Facebook Photo Caching



## Instrumented Stack

### Deep and Distributed

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

#### Browser (millions)

- 77.2M user reqs
- 65.5% hit ratio
- 65.5% reqs share



Browser Cache

#### Edge (dozens)

- 26.6M reqs
- 58% hit ratio
- 20% reqs share
- Routing factors:
  - Latency
  - Edge capacity
  - Peering cost

Edge Cache

#### Origin (one)

- 11.2M reqs
- 31.8% hit ratio
- 4.6% reqs share
- Routed by consistent hashing

Origin Cache

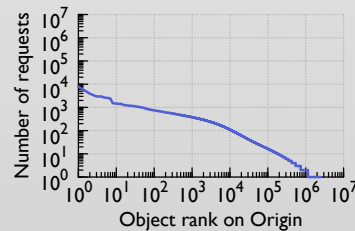
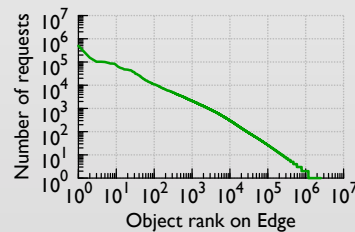
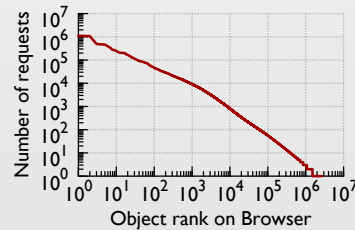
#### Haystack

- 7.6M reqs
- 9.9% reqs share
- Prefers local Haystack

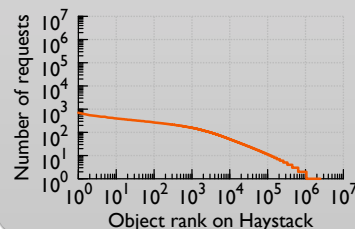
Haystack  
Data Center

## Workload

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



Haystack sees a Stretched Exponential dist.

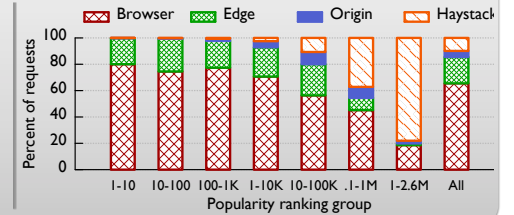


## Cache Performance

### Traffic Share by Photo Popularity

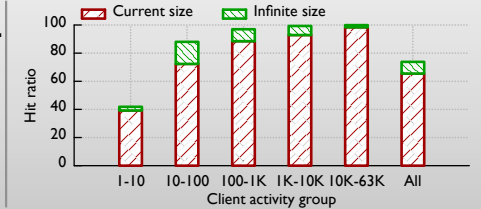
Cache traffic share drop for less popular items.

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



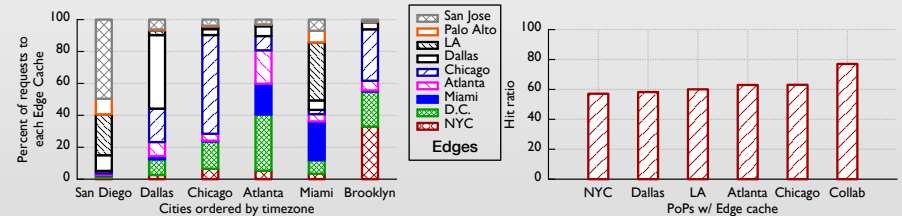
### Browser Caching

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



### Edge Caching & Origin Caching

- Request from clients are often routed to remote Edges.
- Collaborative Edges (collab bar) increases hit ratio by 18%.



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

