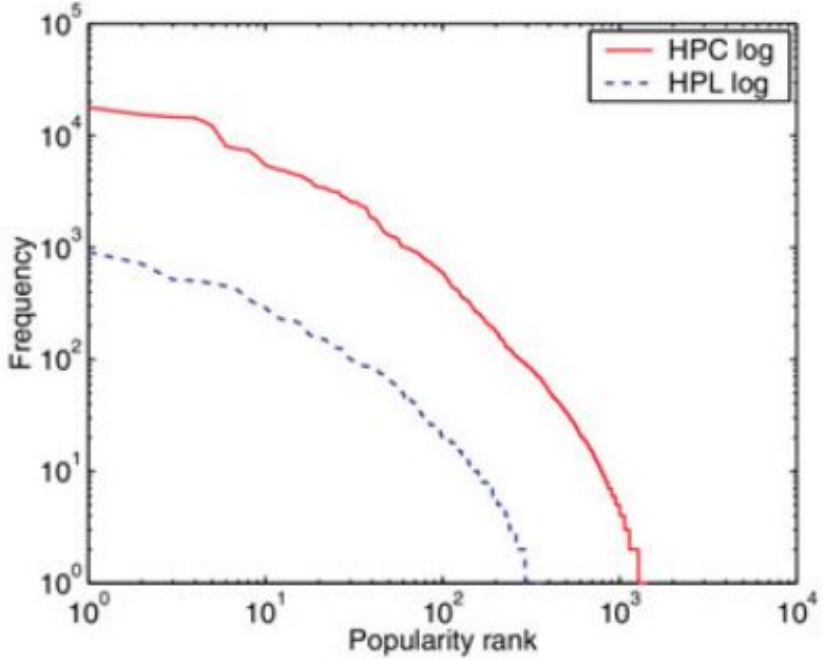
Edge-Caching

Realistic Requests patterns for experiments

Realistic Request Patterns

User requests are directly influenced by content popularity.



Realistic Request Patterns

A probabilistic model based on real data has been discussed before:

Modeling the Content Popularity Evolution in Video-on-Demand Systems: Attila Kőrösi1, Balázs Székely and Miklós Máté

Investigation on the Content Popularity Distribution under K-Transformation in Streaming Applications: Zongkai Yang, Tai Wang, Xu Du, Wei Liu and Jiang Yu

Web Caching and Zipf-like Distributions: Evidence and Implications: Lee Breslau, Pei Cao, Li Fan, Graham Phillips, Scott Shenker.

Realistic Request Patterns

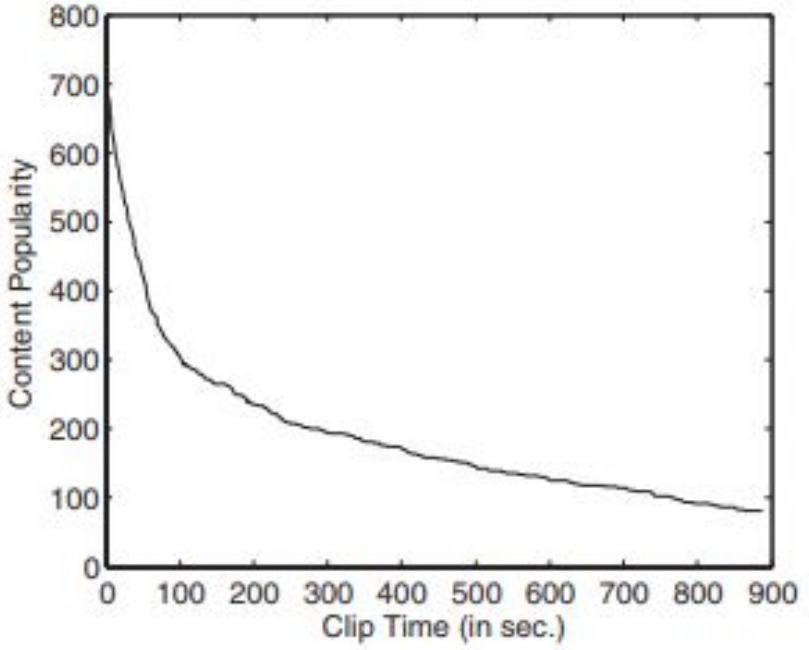
A popularity model based on Zipf-like distribution.

- The access frequency (usually the parameter used to define popularity) of the r-th most popular file is proportional to $1/r^{\alpha}$.

- If the frequencies of files and the corresponding popularity ranks are plotted on a log-log scale, a Zipf-like distribution can be fitted by a straight line.

Realistic Request Patterns

- Content-Popularity, in general, decreases time-duration, which can be implemented in the form of size.



Realistic Request Patterns

Probabilistic Model (simple) for content popularity:

- Let N be the total number of web pages in the universe.
- Let P(i) be the conditional probability that, given the arrival of a page request, the arriving request is made for page i.
- Let all pages be ranked in order of popularity, s.t page file i is i^{th} most popular page (rank).
- P(i), defined for i = 1,2,. . . , N, has a "cut-off" Zipf-like distribution given by:

$$P(i) = \Omega / i^{\alpha} , \quad \text{where } \Omega = \left({}^{N}\Sigma_{i=1} \; 1/ i^{\alpha}\right)^{-1}$$

Mathematical Model

Rough. More parameters and constraints will be introduced.

- I : set of all files available on content-servers.
  - File f_i ; size : $|f_i|$
- One Main Base Station has L locations
- Each Location ‘l’ has N_l small cell base stations, interconnected.
- All small cell base stations are identical in all aspects:
  - Storage : s
  - Transmission capacity : t
- r_{li} : number of requests made at a location for f_i

Thank You