

# PnC: Predict and Cache in Content Centric Networks

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**Objective:** Content placement in content centric networks (CCN) that offer high hit rate with minimal replacements in order to achieve high operational efficiency.

**Solution:** Predict and Cache (PnC) policy for proactively caching relevant contents close to users for future access requests.

## How Does it Work?

### Offline phase

#### Learning potential demand /router

Build a model for ranking contents per user<sup>1</sup>e.g.

- a) Estimate demand of user  $u$  for content  $j$ ,  $r_{uj}$
- b) Rank contents per user (get top  $K$  content list  $T_u$ )

Utility score for content  $j$  @router  $k$

$$d_{jk} = \sum_{u \in Router_k} 1(j \in T_u) r_{uj}$$

### Online phase

#### Placement/replacement algorithm

Input: content  $j$  arrives at router  $k$

Output: cache content  $j$  or not

- 1: **if** cache is not full, **then** cache  $j$
- 2: **else**
- 3:     look-up utility score for  $j$
- 4:     **if**  $d_{jk} > d_{\min} = \min_{i \in Router_k} d_{ik}$  **then**
- 5:         cache content  $j$
- 6:         drop content with  $d_{\min}$
- 7:     **else**
- 8:         do not cache  $j$
- 9:     **end if**
- 10: **end if**

## Evaluation

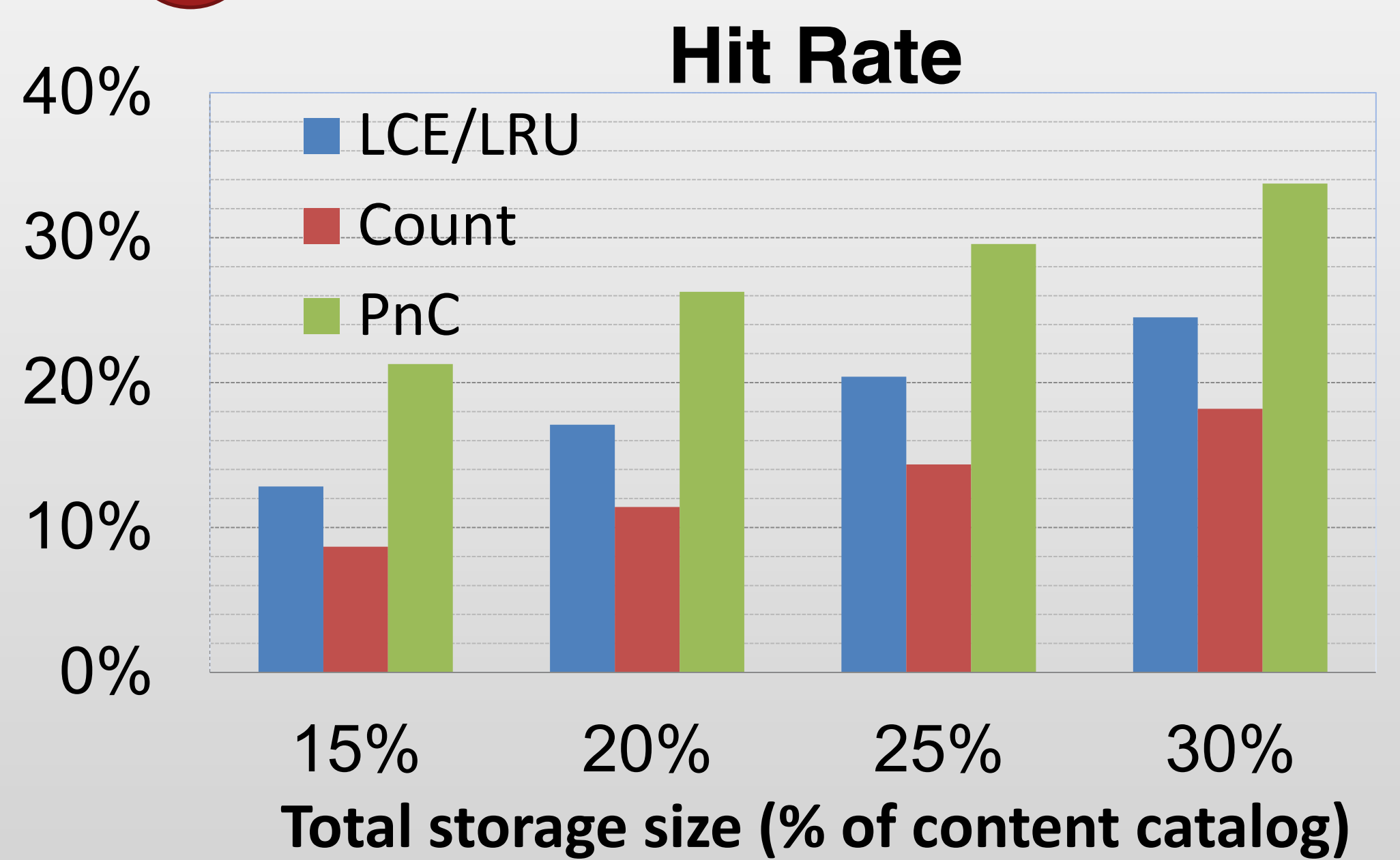
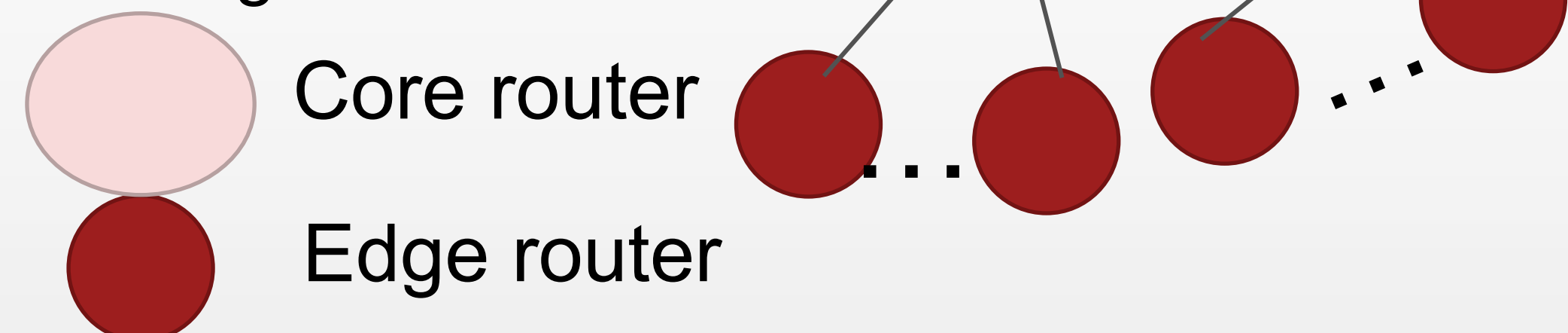
MovieLens data<sup>2</sup>

- 943 end hosts
- 1682 contents

Topology

(simulated in ndnSim):

- 3 core routers
- 10 edge routers/core



### Replacement rate

Storage	15%	20%	25%	30%
LCE/LRU	2.45	2.37	2.31	2.23
Count	0.077	0.110	0.119	0.142
PnC	0.064	0.091	0.101	0.120

Count: online placement w/o prediction ( $d_{jk}$ =#times  $j$  accessed before)  
LCE: leave copy everywhere

## Conclusion

PnC achieves a balance between content caching and replacements by estimating potential likelihood of content popularity.

For future work, we plan to extend this policy with some coordination among routers. We also intend to study PnC in ICN architectures employing name resolution systems.

<sup>1</sup> Y. Hu, Y. Koren, C. Volinsky, Collaborative filtering for implicit feedback datasets, in ICDM 2008, pp 263 -272, Dec. 2008

<sup>2</sup> <http://grouplens.org/datasets/movielens/>  
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