Consumer Driven Information Freshness Approach for Content Centric Networking

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ICN for IoT

- IoT is increasingly focusing on data and information rather than on point-to-point communications.

- By bringing naming into the network layer, the ICN approach is considered to be a viable solution to the challenges imposed by the predicted IoT scenarios.

- In-network storage for caching is considered to be a common key advantage to all ICN approaches.

Naming IoT Content

- In IoT scenarios, new information is constantly being generated and consumers are mainly interested in the latest information.

- The use of sequence numbers for naming data to be sensed does not seem to be a valid approach.

- Using a unique name will generate information under the same name, although the data values will be different.
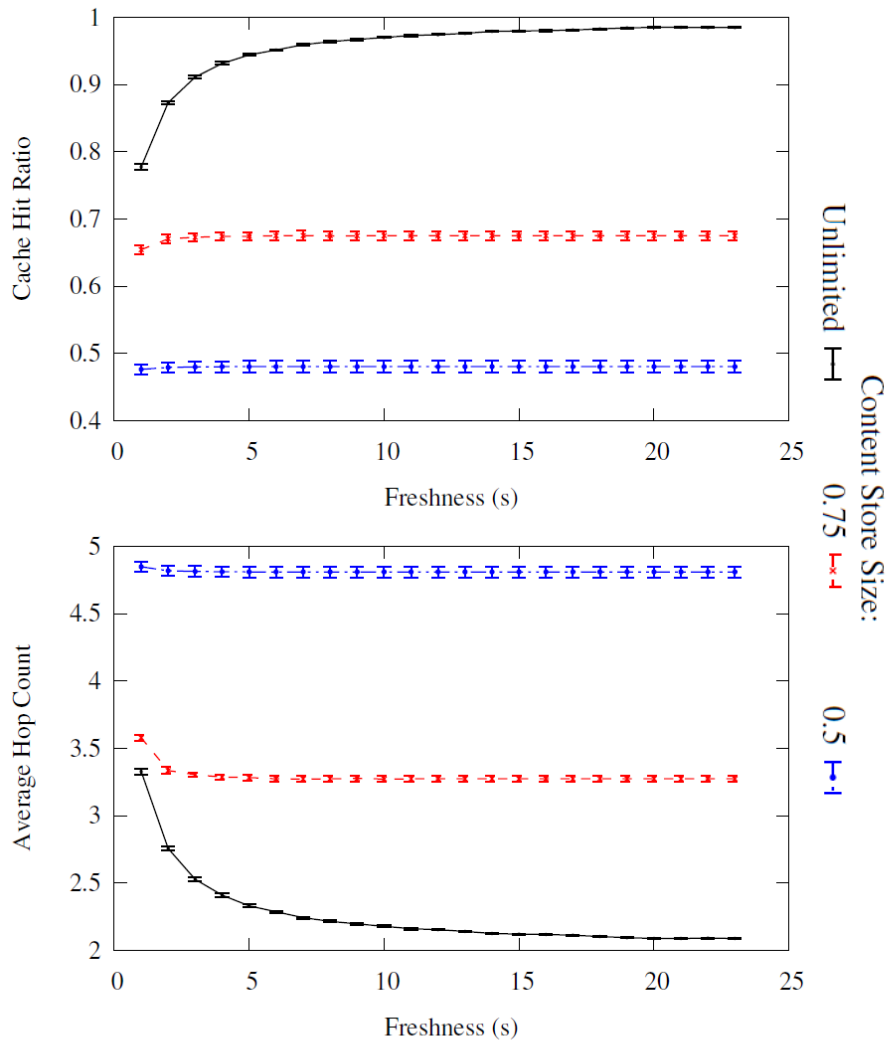
Information Freshness

- There is a need for controlling the freshness of the stored information and mechanisms for removing/replacing old content must be provided (e.g, FreshnessSeconds field included in CCN Content Objects).

- The absence of such mechanism will forbid consumers from getting new content unless in accordance with the cache replacement policies implemented at the routers.

- The precision of the information received could be very decisive for the adequate development of the consumer application.

Impact of Freshness in the Received Information
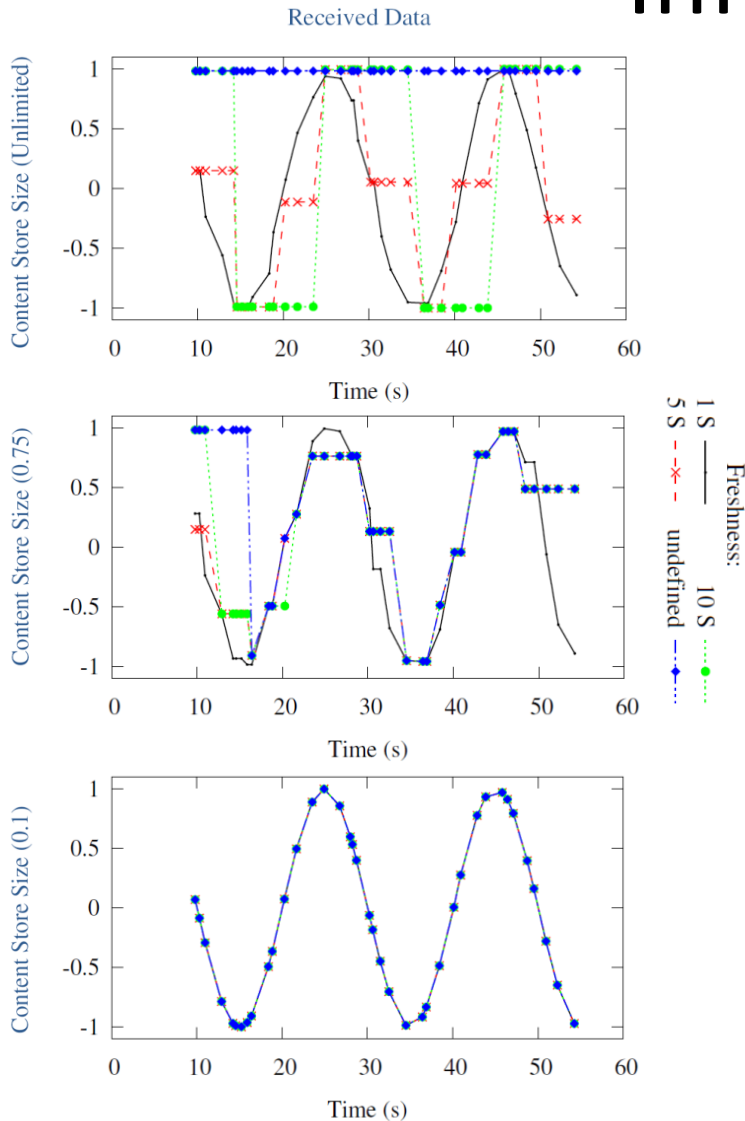
- The adequate selection of the time that a particular content will be allowed to be held on the caches (FreshnessSeconds) positively impacts reliability of data received by the consumers.

- The benefits of the FreshnessSeconds gets reduced as the Content Stores size is more limited.

# Impact of Freshness and Content Store size in the Caching Performance

- More strict freshness requirements limit the benefits that in-network caching may bring.

- The benefits of in-network caching get also reduced as the Content Stores size decreases.

Information Freshness Controlled by the Producers

- Different consuming applications may involve different freshness requirements for the information generated by the same producer.

- In order to satisfy all possible consumers requirements, the FreshnessSeconds should be set to the more strict (lowest) value even if the more strict applications will be active for short periods of time.

- Moreover it is not always possible to know beforehand the freshness that will be required by a certain consuming application.

Consumer Driven Freshness Mechanism
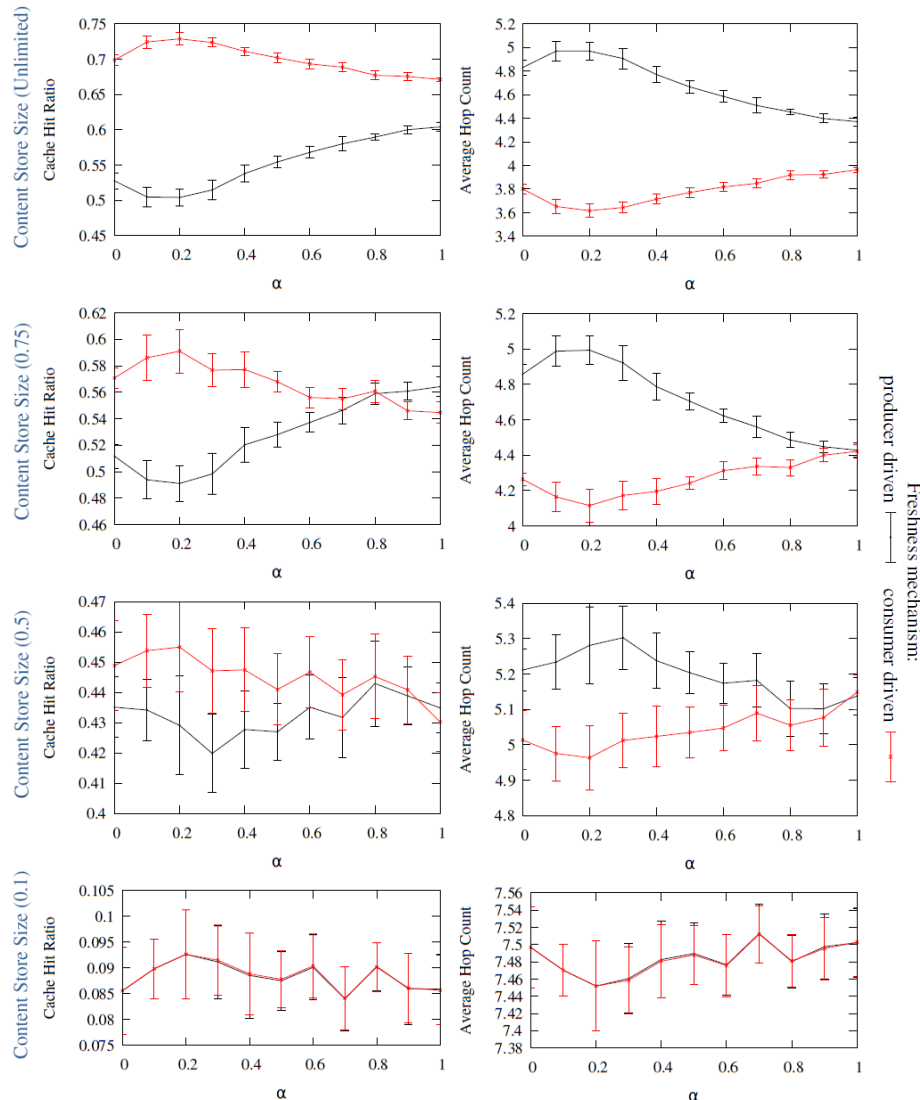
- We propose to let Consumers to express their freshness requirements and Producers to conveniently adjust the freshness values they provide.

- This approach showed to better leverage the in-network caching from ICN

- The impact is bigger when more strict applications are active for a smaller time.

Conclusions

- While ensuring the data quality in environments featuring consumers with different freshness requirements, the new proposed approach showed to be a viable solution to reduce the negative effects of the freshness on the network performance.

- The obtained results have indicated that, jointly with naming, freshness results as a key issue when applying ICN to IoT environments.

- More in:

  - José Quevedo, Daniel Corujo, Rui L. Aguiar, **"Consumer Driven Information Freshness Approach for Content Centric Networking"**, Proc. 2014 IEEE INFOCOM Workshop on Name-Oriented Mobility, Toronto, Canada, May 2014

THANK YOU!

Next Steps

- To extend this study to real sensors and to assess its significance not only for the network but also for the constrained device itself, mainly in terms of energy efficiency.

- To design and evaluate more complex algorithms for the freshness agreement procedure.

- To extend the scope of this work to different cache replacement and decision policies and to study their impact in the studied IoT scenarios.