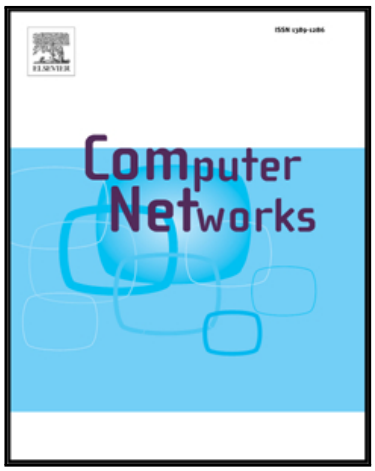

Fair throughput allocation in Information-Centric Networks

Thomas Bonald, Léonce Mekinda, Luca Muscariello

PII: S1389-1286(17)30219-0
DOI: 10.1016/j.comnet.2017.05.019
Reference: COMPNW 6213

To appear in: *Computer Networks*

Received date: 15 October 2016
Revised date: 5 March 2017
Accepted date: 18 May 2017

Please cite this article as: Thomas Bonald, Léonce Mekinda, Luca Muscariello, Fair throughput allocation in Information-Centric Networks, *Computer Networks* (2017), doi: 10.1016/j.comnet.2017.05.019

Fair throughput allocation in Information-Centric Networks

Thomas Bonald[a], Léonce Mekinda[b], Luca Muscariello[c]

[a]*TELECOM ParisTech, 23 Avenue d'Italie, 75013 Paris, France*
[b]*European XFEL, Holzkoppel 4, 22869 Schenefeld, Germany*
[c]*Cisco Systems, 11 Rue Camille Desmoulins, 92130 Issy-les-Moulineaux, France*

Abstract

Cache networks are the cornerstones of today's Internet, helping it to scale by an extensive use of Content Delivery Networks (CDN). Benefiting from CDN's successful insights, ubiquitous caching through Information-Centric Networks (ICN) is increasingly regarded as a premier future Internet architecture contestant. However, the use of in-network caches seems to cause an issue in the fairness of resource sharing among contents. Indeed, in legacy communication networks, link buffers were the principal resources to be shared. Under max-min flow-wise fair bandwidth sharing [14], content throughput was not tied to content popularity. Including caches in this ecosystem raises new issues since common cache management policies such as probabilistic Least Recently Used (p-LRU) or even more, Least Frequently Used (LFU), may seem detrimental to low popularity objects, even though they significantly decrease the overall link load [3]. In this paper, we demonstrate that globally achieving *LFU is a first stage of content-wise fairness*. Indeed, any investigated content-wise α-fair throughput allocation permanently stores the most popular contents in network caches by ensuring them a cache hit ratio of 1. As ICN caching traditionally pursues LFU objectives, content-wise fairness specifics remain only a matter of fair bandwidth sharing, keeping the cache management intact.

Keywords: ICN, Caching, Fairness, Network Performance Analysis.

1. Introduction

Today's Internet owes its scalability to caching. Indeed, most of Internet contents cross Content Delivery Networks and significant research is pushing for a better solution, Information-Centric Networks. In ICN, and more specifically, Named-Data Networking (NDN) and Content-Centric Networking (CCN) [9], two leading ICN architectures, content objects are identified by their unique name. At every node/router, content Data packets are requested via matching Interest packets, through egress interfaces. Interests and their satisfying Data counterparts follow rigorously the same path. This feature would not be possible without the Pending Interest Table (PIT) structure

Email addresses: thomas.bonald@telecom-paristech.fr (Thomas Bonald), leonce.mekinda@xfel.eu (Léonce Mekinda), lumuscar@cisco.com (Luca Muscariello)