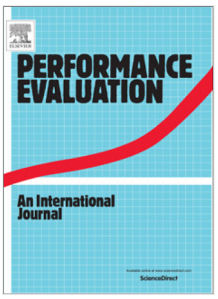
# Accepted Manuscript




On a class of push and pull strategies with single migrations and limited probe rate

Wouter Minnebo, Tim Hellemans, Benny Van Houdt

PII: S0166-5316(16)30070-0
DOI: http://dx.doi.org/10.1016/j.peva.2017.04.004
Reference: PEVA 1905

To appear in: *Performance Evaluation*

Received date : 22 June 2016
Revised date : 22 February 2017
Accepted date : 19 April 2017

Please cite this article as: W. Minnebo, et al., On a class of push and pull strategies with single migrations and limited probe rate, *Performance Evaluation* (2017), http://dx.doi.org/10.1016/j.peva.2017.04.004

# On a Class of Push and Pull Strategies with Single Migrations and Limited Probe Rate

Wouter Minnebo[a], Tim Hellemans[a], Benny Van Houdt[a,*]

[a] *Department of Mathematics and Computer Science, University of Antwerp - imec, Middelheimlaan 1, B-2020 Antwerp, Belgium*

**Abstract**

In this paper we introduce a general class of rate-based push and pull load balancing strategies, assuming there is no central dispatcher and nodes rely on probe messages for communication.

Under a pull strategy lightly loaded nodes send random probes in order to discover heavily loaded nodes, if such a node is found one task is transferred. Under a push strategy the heavily loaded nodes attempt to locate the lightly loaded nodes.

We show that by appropriately setting its parameters, rate-based strategies can be constructed that are equivalent with traditional or d-choices strategies.

Traditional strategies send a batch of $L_p$ probes at task arrival (push) or completion times (pull), whereas rate-based strategies send probes according to an interrupted Poisson process. Under the centralized/distributed d-choices strategy, $d$ or $d-1$ probes are sent in batch at arrival times and the task is transferred to the shortest queue discovered.

We derive expressions for the mean delay for all considered strategies assuming a homogeneous network with Poisson arrivals and exponential job durations under the infinite system model.

We compare the performance of all strategies given that the same overall probe rate is used. We find that a rate-based push variant outperforms d-choices in terms of mean delay, at the cost of being more complex. A simple pull strategy is superior for high loads.

*Keywords:* Performance analysis, Distributed computing, Processor scheduling, Load balancing

*Corresponding author

*Email addresses:* wouter.minnebo@uantwerpen.be (Wouter Minnebo), tim.hellemans@uantwerpen.be (Tim Hellemans), benny.vanhoudt@uantwerpen.be (Benny Van Houdt)