

Research Topic for the ParisTech/CSC PhD Program

Subfield: Computer science, networking

ParisTech School: Ecole Polytechnique

Title: Intelligent High Performance Computer Networks

Advisor(s):

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Short description of possible research topics for a PhD:

The development of cloud computing, “big data” era and streaming of high-resolution video over computer networks triggers the demand of high performance network infrastructure. This PhD project aims at proposing, designing and evaluating new intelligent network algorithms to meet the need of high performance networking. It includes, but not limited to:

- Design efficient and scalable multicast algorithms for high-load traffic (such as video stream).
- Propose flexible load balancing mechanisms to dynamically distribute the traffic and computational load among servers in data centers.
- Study pacing and synchronization methods to meet the requirement of real time traffic (such as live video streaming) processing.
- Implement the self-learning and intelligent algorithms and build prototypes on high performance network platform (such as NetFPGA <https://netfpga.org>) .

The topic areas mentioned above will be studied by building analytical models to understand theoretical boundaries. Network simulation tools will be used to evaluate protocol performance and simulate large scale scenarios. Real testbeds will be built to validate the correctness of the proposals.

Required background of the student: Computer networks, information theory, solid programming skills

A list of 5 (max.) representative publications of the group:

[1] Desmouceaux, Yoann; Pfister, Pierre; Tollet, Jérôme; Townsley, Mark W; Clausen, Thomas, 6LB: Scalable and Application-Aware Load Balancing with Segment Routing, IEEE/ACM Transactions on Networking, 26 (2), pp. 819-834, 2018, ISSN: 1063-6692.

[2] Desmouceaux, Yoann; Clausen, Thomas; Cordero, Juan Antonio; Townsley, Mark W, Reliable Multicast with B.I.E.R., IEEE/KICS Journal of Communications and Networks (JCN), 20 (2), pp. 182-197,

[3] Yoann Desmouceaux, Sonia Toubaline, Thomas Clausen, Flow-Aware Workload Migration in Data Centers, Journal of Network and Systems Management, October 2018, Volume 26, Issue 4, pp 1034–1057 |