An integer linear formulation for the file transfer scheduling problem

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Abstract

In this paper, we propose a new integer linear programming (ILP) formulation for solving a file transfer scheduling problem (FTSP), which is to minimize the overall time needed to transfer all files to their destinations for a given collection of various sized files in a computer network. Each computer in this network has a limited number of communication ports. The described problem is proved to be NP-hard in a general case. Our formulation enables solving the problem by standard ILP solvers like CPLEX or Gurobi. To prove the validity of the proposed ILP formulation, two new reformulations of FTSP are presented. The results obtained by CPLEX and Gurobi solvers, based on this formulation, are presented and discussed.

Keywords

Integer linear programming Scheduling File transfers Combinatorial optimization

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Mathematics Subject Classification (2000)

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References

Akbari MK, Nezhad MH, Kalantari M (2004) Neural network realization of file transfer scheduling. CSI J Comput Sci Eng 2(2, 4):19–29
Google Scholar (http://scholar.google.com/scholar_lookup?title=Neural%20network%20realization%20of%20file%20transfer%20scheduling&author=MK.%20Akbari&author=MH.%20Nezhad&author=M.%20Kalantari&journal=CSI%20J%20Comput%20Sci%20Eng&volume=2&issue=2%2C%204&pages=19-29&publication_year=2004)

Coffman EG, Garey MR, Johnson DS, Lapaugh AS (1985) Scheduling file transfers. SIAM J Comput 14(3):744–765
CrossRef (https://doi.org/10.1137/0214054)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Scheduling%20file%20transfers&author=EG.%20Coffman&author=MR.%20Garey&author=DS.%20Johnson&author=AS.%20Lapaugh&journal=SIAM%20J%20Comput&volume=14&issue=3&pages=744-765&publication_year=1985)

CPLEX solver (2013) IBM-ILOG company. http://www.ibm.com (http://www.ibm.com)

Dražić Z (2012) Variable neighbohood search for the file transfer scheduling problem. Serdica J Comput 3(6):333–348
Google Scholar (http://scholar.google.com/scholar_lookup?title=Variable%20neighbohood%20search%20for%20the%20file%20transfer%20scheduling%20problem&author=Z.%20Dra%C5%BEi%C4%87&journal=Serdica%20J%20Comput&volume=3&issue=6&pages=333-348&publication_year=2012)

Gouveia L, Moura P (2012) Enhancing discretized formulations: the knapsack reformulation and the star

Gurobi Optimization (2012) Gurobi optimizer reference manual. http://www.gurobi.com (http://www.gurobi.com)

Havill JT, Mao W (1997) Greedy on-line file transfer routing. In: Proceedings of IASTED international conference on parallel and distributed systems, pp 225–230
Google Scholar (https://scholar.google.com/scholar?q=Havill%20JT%2C%20Mao%20W%20%281997%29%20Greedy%20on-line%20file%20transfer%20routing.%20In%3A%20Proceedings%20of%20IASTED%20international%20conference%20on%20parallel%20and%20distributed%20systems%2C%20pp%20225%E2%80%93230)

Higuero D, Tirado JM, Isaila F, Carretero J (2012) Enhancing file transfer scheduling and server utilization in data distribution infrastructures. In: Proceedings of IEEE 20th international symposium on modeling, analysis and simulation of computer and telecommunication systems (MASCOTS), pp 431–438
Google Scholar (https://scholar.google.com/scholar?q=Higuero%20D%2C%20Tirado%20JM%2C%20Isaila%20F%2C%20Carretero%20J%20%282012%29%20Enhancing%20file%20transfer%20scheduling%20and%20server%20utilization%20in%20data%20distribution%20infrastructures.%20In%3A%20Proceedings%20of%20IEEE%2020th%20international%20symposium%20on%20modeling%2C%20analysis%20and%20simulation%20of%20computer%20and%20telecommunication%20systems%20%28MASCOTS%29%2C%20pp%20431%E2%80%93438)

Mao W (1993) Directed file transfer scheduling. In: Proceedings of the ACM 31st annual southeast conference, pp 199–203
Google Scholar (https://scholar.google.com/scholar?q=Mao%20W%20%281993%29%20Directed%20file%20transfer%20scheduling.%20In%3A%20Proceedings%20of%20the%20ACM%2031st%20annual%20southeast%20conference%2C%20pp%20199%E2%80%93203)

Nakano S, Zhou X, Nishizeki T (1995) Edge-coloring algorithms. Computer Science Today, pp 172–183
Google Scholar (https://scholar.google.com/scholar?q=Nakano%20S%2C%20Zhou%20X%2C%20Nishizeki%20T%20%281995%29%20Edge-coloring%20algorithms.%20Computer%20Science%20Today%2C%20pp%20172%E2%80%93183)

Sherali HD, Smith JC (2012) Dynamic Lagrangian dual and reduced RLT constructs for solving 01 mixed-integer programs. Top 20(1):173–189
CrossRef (https://doi.org/10.1007/s11750-011-0199-3)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Dynamic%20Lagrangian%20dual%20and%20reduced%20RLT%20constructs%20for%20solving%2001%20mixed-integer%20programs&author=HD.%20Sherali&author=JC.%20Smith&journal=Top&volume=20&issue=1&pages=173-189&publication_year=2012)

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