# Routing Calculation in Multimedia: A Procedure Based on a Bicriteria Model

Marta M. B. Pascoal[1], João C. N. Clímaco[2], and José M. F. Craveirinha [3]

[1] Departamento de Matemática – Centro de Informática e Sistemas
Polo I da Universidade de Coimbra, Apartado 3008, 3001-454 COIMBRA, Portugal
E-mail: *marta@mat.uc.pt*

[2] Faculdade de Economia da Universidade de Coimbra – INESC Coimbra
Avenida Dias da Silva, 165, 3004-512 COIMBRA, Portugal
E-mail: *jclimaco@inescc.pt*

[3] Departamento de Engenharia Electrotécnica e de Computadores – INESC Coimbra
Polo II da Universidade de Coimbra, Pinhal de Marrocos, 3030-290 COIMBRA, Portugal
E-mail: *jcrav@deec.uc.pt*

## Abstract:

The calculation of routes for node to node traffic flows in modern multimedia networks involves the selection of paths which seek to optimise certain metrics, while satisfying multiple constraints (designated as QoS requirements). In this communication a bi-objective routing model where the objective functions are the route cost (expressed in terms of the available bandwidth in the arcs) and the number of arcs of the paths, and the constraints are concerned with minimum bandwidth, maximum acceptable delay and the maximum acceptable delay jitter. The first objective function to be minimised reflects the costs of accepting a call of a given type of traffic flow in every arc of the path in terms of its impact on the other traffic flows. The second objective function is associated with the fact that the use of paths with the lowest number of links favours the maximisation of the total traffic network.

This model enables the exploration of compromise routing solutions taking into account the above referred to metrics. In a previous work an algorithmic approach was developed by the authors for this problem enabling an efficient calculation of the whole set of non-dominated solutions, even in networks with thousands of nodes. The application of this method to a video traffic routing problem in a significant number of large networks revealed that, although some correlation between the two metrics (objective functions) is expectable, there are various non-dominated paths for most traffic flows. This puts in evidence the necessity of establishing a procedure for selecting the path(s) to be actually used by the calls of each node to node traffic flow. This choice should take into account the allowed route calculation time, the possible addition of reservation levels for the objective functions and the consideration of flexibility in the strategy of selection of the "best" route (possibly also a second "best" route, for instance in the case of failure of the first choice route) in terms of the network working conditions. In this communication we will present and discuss approaches for dealing with this *desideratum*. Computational tests are included.