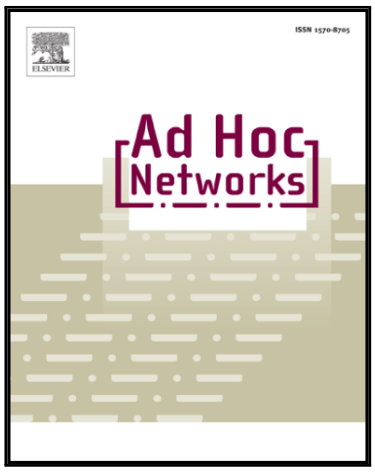

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Optimization of an integrated fronthaul/backhaul network under path and delay constraints

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Abstract

Cloud or Centralized Radio Access Networks (C-RANs) are expected to be widely deployed under 5G in order to support the anticipated increased traffic demands and reduce costs. Under C-RAN, the radio elements (e.g., eNB or gNB in 5G) are split into a basic radio part (Distributed Unit, DU), and a pool-able base band processing part (Central Unit, CU). This functional split results in high bandwidth and delay constrained traffic flows between DUs and CUs (referred to as fronthaul), calling for the deployment of a specialized network to accommodate them or for integrating them with the rest of the flows (referred to as backhaul) over the existing infrastructure. This work studies the next generation of transport networks, which aims at integrating fronthaul and backhaul traffic over the same transport stratum. An optimization framework for routing and resource placement is developed, taking into account delay, capacity and path constraints, maximizing the degree of DU deployment while minimizing the supporting CUs. The framework and the developed heuristics (to reduce the computational complexity) are validated and applied to both small and large- scale (production-level) networks. They can be useful to network operators for both network planning as well as network operation adjusting their (virtualized) infrastructure dynamically.

Keywords: 5G-Crosshaul, fronthaul, backhaul, optimization, delay

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