Proposition de recherche doctorale

Optimisations d Énergie et de la Charge pour les Reseaux a Petites Cellules

Mots clés :
- Directeur de thèse : Thrasyvoulos Spyropoulos
- Co-encadrant(s) :
- Unité de recherche : Laboratoire de recherche d'EURECOM
- Ecole doctorale : École Doctorale Informatique, Télécommunications, Électronique de Paris
- Domaine scientifique principal: Divers

Résumé du projet de recherche (Langue 1)

The project deals with future mobile networks, with dense small-cell and heterogeneous cell deployments, connected to the core network over heterogeneous backhaul technologies. The higher cell density, along with the fewer users per cell, lead to high utilization variability across cells, but also within a cell. This motivates powering down cells whenever they are not utilized or underutilized. The inputs to this problem will be the topology, loads, and QoS requirements (e.g SLA agreements). The effect on performance of partial or full power downs of cells, as well as loads shifted to neighboring cells will be predicted using advanced queueing models, that take into account startup delays and costs. Based on the above constraints and the performance predictions from our models, potential power savings will be identified subject to performance costs, and optimal network-wide powering policies will be derived. Furthermore, load variations over time and space, as well as the frequent load balancing and shifts between cells, (e.g. for energy optimization), will create the need for smart scheduling and load balancing algorithms. First, appropriate models to estimate the per-link and “end-to-end” delay will be proposed and evaluated. Second, as congestion will be a frequent phenomenon, simply isolating capacity for different classes (e.g. virtual paths) will be suboptimal. Instead, we will explore sophisticated multiplexing methods along every network link using smart priority queueing and scheduling (virtual priority queueing, size-based queueing, generalized processor sharing). Finally, access and backhaul have so far been only individually designed and therefore not optimized. In order to make the best out of the complex access and backhaul topologies foreseen for future networks, challenges on access and backhaul will be simultaneously tackled in this project.

Résumé du projet de recherche (Langue 2)

The project deals with future mobile networks, with dense small-cell and heterogeneous cell deployments, connected to the core network over heterogeneous backhaul technologies. The higher cell density, along with the fewer users per cell, lead to high utilization variability across cells, but also within a cell. This motivates powering down cells whenever they are not utilized or underutilized. The inputs to this problem will be the topology, loads, and QoS requirements (e.g SLA agreements). The effect on performance of partial or full power downs of cells, as well as loads shifted to neighboring cells will be predicted using advanced queueing models, that take into account startup delays and costs. Based on the above constraints and the performance predictions from our models, potential power savings will be identified subject to performance costs, and optimal network-wide powering policies will be derived. Furthermore, load variations over time and space, as well as the frequent load balancing and shifts between cells, (e.g. for energy optimization), will create the need for smart scheduling and load balancing algorithms. First, appropriate models to estimate the per-link and “end-to-end” delay will be proposed and evaluated. Second, as congestion will be a frequent phenomenon, simply isolating capacity for different classes (e.g. virtual paths) will be suboptimal. Instead, we will explore sophisticated multiplexing methods along every network link using smart priority queueing and scheduling (virtual priority queueing, size-based queueing, generalized processor sharing). Finally, access and backhaul have so far been only individually designed and therefore not optimized. In order to make the best out of the complex access and backhaul topologies foreseen for future networks, challenges on access and backhaul will be simultaneously tackled in this project.