Radio Resource Management in Heterogeneous Networks

Zakrzewska, Anna

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Radio Resource Management in Heterogeneous Networks

Anna Zakrzewska
azak@fotonik.dtu.dk

Network Heterogeneity

Advantages
- Flexible architecture, cost efficient deployment
- Better performance as a whole in comparison to a set of separated networks
- Increased network coverage and capacity
- High network reconfigurability (cell topology, user mobility, radio environment and traffic patterns)
- Ubiquity, connectivity anywhere, anytime from any kind of device
- Seamless switching between the Radio Access Networks (RATs) according to the user preferences, like service cost or network parameters

Challenges
- Multiple standards, highly diversified users and their resource demands
- High Quality of Service (QoS) for multimedia applications, especially during a handover
- Better utilization of scarce radio resources
- User mobility, seamless handover between the standards
- Access network detection and selection
- Reliable, fast and efficient signaling
- Authentication and accounting

Radio Resource Management

Functionalities
- Responsible for efficient utilization of the radio resources in a coordinated manner
- Ensures planned coverage for each service and required connection quality
- Optimizes the system usage
- Joint RRM systems designed to carry coordinated management of multistandard heterogeneous networks, functionalities depend on the level of coupling between different networks

Cell Selection

Classic Approach
- Connection to the cell offering the highest received power

Challenges and Example Solutions
- Small cells with low power nodes experience interference from a macrocell
  - Range Expansion and Inter-cell Interference Coordination (ICIC) schemes
- More factors should be taken into account while selecting a cell, e.g. QoS, required by a terminal $t$, its speed ($V_t$), cell type ($k_j$), handover constraints $h_i$ and user preference $p_i$
  - Better utility value definition
  - Integer Programming (IP) used to model and optimize the problem
  - Heuristics to solve it in the real-time

Benefits
- Better Quality of Experience (QoE) for the users
- Improved network load balancing (non uniform traffic distribution)