

Job Title : Self Organizing Networks (SON) : Improve and optimize the global performance of Radio Access Network using feedback control real-time Scheduling algorithm

Subject:

Wireless ecosystem consists of numerous coexisting Radio Access Networks (RANs). Each RAN (GERAN, UTRAN, EUTRAN) provide efficient and ubiquitous broadband wireless access with a wide variety of spectrum allocation to overcome multimedia applications. Multimedia applications require a QoS but the real QoS provide to the UE (User Equipment) is given by the Wireless Network in function of the charge of the Network, the condition of signal propagation, ...

To improve the network capacity, Operators can add Base Station (BTS, Node B, eNode B). Nevertheless, each Base Station has to be considered as an extension of the actual Mobile Network (PLMN) and so the added Base Station has to be monitored, controlled, configured and managed in function of the previous configured Network. Moreover each neighbor Base Station has to be re-configured to take into account the new Base Station.

In this challenging context, competing wireless operators are faced with the complicated task of running their networks while introducing new services and achieving goals in terms of customer satisfaction, benefit, market share, innovation, reputation etc.

In today's 2G/3G wireless networks, many parameters are manually configured: Planning, configuration, management are essential but actually only manual process exist to tune these network parameters in a time consuming manner [1].

The reasons for automation can be grouped into two categories

- Before New Installation of a Added Base Station
 - o ANR : Automatic Neighbor Relation : Manual processes in Network operation to deploy the BTS in a configured PLMN
 - Knowledge of neighbor cells (CID : Cell Identification)
 - Knowledge of the list of the frequency re-used to reduce Interference Co-Channel
 - PCI planning : Physical Layer Cell identifies to identify the e-node B by a PCI signature
 - o TAP : Tracking Area Planning
 - TA is used to facilitate Paging Procedure. A small TA improve Paging Procedure since the Paging call is broadcast in few cells but Mobile has to update more often is position.
- To improve the instantaneous Quality of the Mobile Network
 - o Load Balancing and QoS optimization
 - MLB : Mobility Load Balancing is develop to spread user traffic accros system radio resources in order to improve performance of the call
 - o Mobility Robustness/Handover Optimization
 - MRO : Mobility Robustness Optimization is used to dynamically modify parameters which concern Handover

Job Targets

The student has to list the radio-ressource targets which can be used to optimize certain Key Performance Indicators such as call drop, call blocking, handover failure, coverage, capacity (typically throughput), delay etc. These metrics can be of different temporal scales, layers, contexts and domains.

Minimization of human intervention in wireless network management is realized by a novel concept called as Self Organizing Networks (SONs) [2]. SONs are considered today as a driving technology that aims at improving spectral efficiency, simplifying management, and reducing the operational costs of next generation RANs. SON refers to a family of functionalities used in operating a network in a highly autonomous manner, encompassing self-configuration, self-optimization and self-healing [3]. Several SON functionalities will coexist in the network and act on several parameters algorithms. These actions are not necessarily independent and may be conflicting sometimes. Indeed, these autonomic functionalities should act in a coordinated manner to fulfil a common objective defined by the operator policy.

The student activity will investigate the parameters to improve ad'hoc network and fulfill the require QoS. The aim is then to define algorithm procedure (feedback control real time scheduling) to control and dynamically optimize the mobile network.

[1] Aib I., Boutaba R., "Business-driven optimization of policy-based management solutions", *Proc. 10th IFIP/IEEE Int. Symposium on Integrated Network Management*, pp.254-263, 2007

[2] 3GPP TR 36.902 "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Self-configuring and self-optimizing network (SON) use cases and solutions.

[3] "NGMN Recommendation on SON and O& M Requirements", *A requirement Specification by the MGMN Alliance*, Dec. 2008.

Location and administrative information

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