

**CHENNAI – PONDICHERRY**

**CLEVER: a Cooperative and Cross-Layer Approach to Video Streaming in HetNets**

**Abstract:**

We investigate the problem of providing a video streaming service to mobile users in an heterogeneous cellular network composed of micro e-NodeBs (\_eNBs) and macro e-NodeBs (MeNBs). More in detail, we target a cross-layer dynamic allocation of the bandwidth resources available over a set of \_eNBs and one MeNB, with the goal of reducing the delay per chunk experienced by users. After optimally formulating the problem of minimizing the chunk delay, we detail the Cross LayEr Video stReaming (CLEVER) algorithm, to practically tackle it. CLEVER makes allocation decisions on the basis of information retrieved from the application layer as well as from lower layers. Results, obtained over two representative case studies, show that CLEVER is able to limit the chunk delay, while also reducing the amount of bandwidth reserved for offloaded users on the MeNB, as well as the number of offloaded users. In addition, we show that CLEVER performs clearly better than two selected reference algorithms, while being very close to a best bound. Finally, we show that our solution is able to achieve high fairness indexes and good levels of Quality of Experience (QoE).

**Existing System:**

The foreseen increase in spectral efficiency, 5G networks will still be faced with the problem of spectrum crunch caused by the scarcity of radio frequency spectra allocated for cellular communications. To solve this issue, a number of proposals have envisaged the use of heterogeneous networks (HetNets). Such networks are composed of different tiers of cellular devices, with macro cells spread over the territory to provide basic connectivity, and small cells covering hot spot zones, i.e., areas where users (and traffic) tend to concentrate.

In this context, future HetNets will require flexible and dynamic use of all available resources. To meet 5G requirements in terms of bandwidth and delay, it is expected that small and macro cells will be jointly controlled. This in turn requires to coordinate the management of traffic processes and spectral resources across cells, including the need for flexible design of the control and user planes.

**Proposed System:**

We provide the optimal formulation of the problem of minimizing the total experienced delay of video segments streamed in a system architecture composed by a macro cell and a set of micro cells; we demonstrate that the problem falls in the class of NP-Hard ones.

We derive CLEVER, a cross-layer resource allocation algorithm, used by HetNets to offload a subset of users from a micro cell to the macro cell when the spectral resources available at the micro cell are insufficient. Decisions made by the CLEVER scheme are based on information retrieved from the applica tion layer (i.e., the video flow) as well as from status data obtained from lower layer (physical/data-link) entities.

We consider a general HetNet scenario as well as a layout that is based on a specific topological realization matching a real city.