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Green Networking and Network Programmability: a Paradigm for the Future Internet?

The Future Internet should support a very large number of heterogeneous user-led services, increased user mobility, machine-to-machine communications, and multimedia flows with a massive presence of video. In order to face the challenges posed by increased and differentiated user traffic, many Telecom operators believe that next-generation network devices and infrastructures should be more energy-efficient, scalable and flexible than those based on today's Information and Communications Technology (ICT). A possible promising solution to this problem seems to rely on extremely virtualised and "vertically" (across layers) optimized networks. At the same time, the interaction between the network and the computing infrastructure (datacentres and the cloud), where applications reside, needs to be redesigned and integrated. In the computing world, energy efficiency and flexible resource usage by means of virtualisation and programmability have long been pursued. In all network segments (access, metro/transport and core) a similar attitude, aiming at achieving energy consumption proportional to the traffic load is rapidly being adopted; however, the complex interactions between the energy consumed by virtualised servers, the server farms on which they execute, the datacentre networks that interconnect them, and the wider network from which users access services and data, require a holistic approach to energy efficiency. This approach should be capable of addressing many different critical aspects and basic strategies of current ICT and network technologies, with the ultimate overall goal of a rational usage of physical resources. In this perspective, energy efficiency (with respect to a non-optimised scenario) may be viewed as an indicator of the "health" of the overall computing and networking ecosystem. It reflects the extent of exploitation of computing, storage, and communications hardware capabilities to the degree needed to support the current workload generated by applications at the required Quality of Service/Experience (QoS/QoE) level. Thus, flexibility and programmability of the network itself and of all other physical resources come naturally onto the scene as instruments that allow optimal dynamic resource allocation strategies to be really implemented in practice. The talk will explore the state of the art in energy-efficiency in networking and datacentres, and the integration of green technologies in the framework of Software Defined Networking (SDN), as a sustainable path toward the Future Internet.