Description for the general public

In the next years, 5G will introduce hundreds of new services and applications, which will benefit from the advanced features of the 5G network. The new scenarios foreseen in 5G are: (1) Ultra Reliable Low Latency Communications (URLLC) including applications with strict requirements on latency and reliability for mission-critical communications, such as remote surgery, autonomous vehicles or the tactile Internet; (2) Enhanced Mobile Broadband (eMBB) which includes data-driven use cases requiring high data rates across a wide coverage area; and (3) Massive Machine Type Communications (mMTC) which support a very large number of devices in a small area that may only send data sporadically, such as Internet of Things use cases. The network slicing concept enables the creation of dedicated to each abovementioned scenario networks that are implemented in software and share single, virtualized infrastructure. To varying degrees, these scenarios will introduce novel, revolutionary applications and services for clients, especially for business customers, commonly called verticals.

The service management in 5G is being mattered of research, but so far special attention is put to URLLC services only. URLLC is anchored to the radio access infrastructure, and quality of service will be based on moving the service to the radio access. Nonetheless, efficient eMBB services management is more complex (since these services touch all the elements of the network, from cloud to radio and consider all potential transmission ways: p2p, fog network-based, etc.). So far, the management of eMBB services has been treated in a narrow sense without addressing the whole complexity of the service management.

This project is devoted to management of eMBB services and aims to introduce a new framework for adding context awareness to eMBB services. The framework will allow for service adaptation according to the end-user needs and context. Specifically, the adaptation of the service to the context will consist of executing one or more of the following actions:

Dynamic configuration of the end-to-end multi-path for multi-homing enabled terminals. Dynamically configured multi-path offers efficiency, flexibility, elasticity and performance for managing enhanced mobile broadband delivery according to user expected Quality of Experience when one provider is serving the content or even in the case of multi-provider delivery (this is the case of several set-top-boxes serving one content in a peer-to-peer mode).

Dynamic selection (on-the-fly) of servers, **including origin, caching, prefetching servers or peer-to-peer nodes.** Thanks to HTTP-based adaptive streaming protocols, multimedia streaming has achieved adaptation to the network, however in our approach, the multimedia streaming and other eMBB applications must adapt to the infrastructure as a whole. This means that the problem is not only a matter of the download bandwidth (a typical factor taken into account) but also it is about the selection of the origin of the content, content caching servers, as well as the links conforming the streaming path, which may be parallel (partially) disjoint paths.

Dynamic selection of network and service nodes involved in multi-path transmission based on the terminal and network preferences and constraints (context-awareness). The context awareness lies in including additional factors for dynamic service reconfigurations. For example, by identifying the location of the terminals, instead of using long-range links (LTE connection) the use of other short-range networking technologies like WiFi is envisioned. The use of such mechanisms will increase the quality of the transmission and/or reduce the energy consumption of the end-user terminal – a factor that also will be taken into account.

The framework that we will develop, is especially suited for the eMBB scenario, since (1) the eMBB applications run during a reasonably long time, during which the infrastructure conditions may change, and the adaptation of the transmission might be necessary; (2) the eMBB applications are sensitive to changes in many parts of the network infrastructure since the applications make use of the whole network: from clouds to the radio part. It stays in contrast to URLLC service which uses the' last mile' only; (3) the eMBB applications are in general quality-sensitive (e.g., multimedia applications).