Superfluidity: a super-fluid, cloud-native, converged edge system

Superfluidity

MAIN OBJECTIVES

Many shortcomings affect today's networks, and must be addressed if we expect successful 5G network deployments (overly long provisioning times; reliance on proprietary, hard-to-modify and cost-ineffective hardware devices and components; and the daunting complexity from awide range of heterogeneous access technologies). SUPERFLUIDITY tackles these challenges with a multi-pronged comprehensive strategy:

Flexibility, via an architectural decomposition of network components and network services into elementary, reusable primitives.
Simplicity, via a cloud-based architecture, getting rid of access-specific gateways and integrating heterogeneous JBOAs.
Agility, via virtualization of radio and network processing tasks.
Portability and viability, through platform-independent abstractions, permitting reuse of network functions across multiple heterogeneous hardware platforms.
High performance beyond the state of the art, via software acceleration, specialization and adaptation to hardware accelerators, while making these mechanisms transparent to network service designers so that they can focus on the development of novel services.

USE CASES (or APPLICATIONS)

SUPERFLUIDITY will enable the following sample of use cases: Minimum-Delay Cloud storage ; RAN As A Service ; Localized services ; Pooling ; Edge offloading ; Portable signal processing; On-the-fly Monitoring ; Virtualized CDN operators and many others: For instance, context-aware services that take advantage of location information, low-delay services such as augmented reality (e.g., Google glass) or SIRI, edge-based video analytics, and application-aware performance optimizations, as described in a recent ETSI white paper on Mobile-Edge Computing

TECHNICAL AND RESEARCH CHALLENGES

SUPERFLUIDITY plans to offer a converged solution to counter the complexity emerging from three forms of challenging heterogeneity: **Heterogeneous data traffic and end-points** make proper planning and prediction of loads incredibly hard.
Heterogeneity in services and processing needs: operators have largely recognized the need to transform the wireless access network from a bit pipe to a "smart" pipe. A network that is able to instantiate platform-agnostic software-based processing when and where needed, would open up seemingly endless possibilities.
Heterogeneity in access technologies and their scale. 5G networks should become access-agnostic: specific wireless or wired technology should be treated as "just a bunch of accesses" (JBOAs), and seamlessly exploited so as to offer an "always best served" model down to a per-application level of granularity (rather than users).

EXPECTED IMPACT

The 5G network will benefit from: 1. location-independence: network services deployable in heterogeneous networks; 2. time-independence: near instantaneous deployment and migration of services; 3. scale-independence: transparent service scalability; and 4. hardware-independence: development and deployment of services with high performance irrespective of the underlying hardware.
Through these properties, SUPERFLUIDITY will provide a converged cloud-based 5G concept that will enable innovative use cases in the mobile edge, empower new business models, and reduce investment and operational costs.

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