

# Preface

The original goal of IMT-2020 (5G) is to provide 1000 times traffic throughput compared to the current 4G system, to meet the rapid increase in mobile broadband data applications, especially for indoor and hotspot scenarios. Ultra-Dense Networks (UDN) has been promoted as the most promising technology direction to meet the very high area traffic capacity, e.g. 10 Mbps/m<sup>2</sup>. With the very high AP density, traditional cellular architecture is not efficient in UDN. In this book, a user-centric UDN (UUDN) concept is proposed based on the principle of de-cellular and user-centric.

The novel principle of “de-cellular” and “user-centric” is introduced to deal with the high requirement of UDN in 5G. The key characteristics of UUDN include four aspects: *Intelligent network knows user*, *Moving network follows user*, *Dynamic network serves user* and *Secured network protects user*.

Based on the challenge analysis of UUDN, we provide a novel UUDN network architecture. The new architecture is designed with the idea of localization, flatter, U/C separation, user-centric, intelligent and flexible networking. It introduces three kinds of decoupling: user plane and control plane decoupling from radio access, control and transmission decoupling from network, local service and network service decoupling.

Meanwhile, many key technologies are introduced to provide high QoE (quality of experience), high area spectrum efficiency, low costing and green communication. Four promising technology directions are discussed in detail, which include dynamic APs grouping (DAPGing) method, intelligent networking, advanced interference management and user-centric security. DAPGing is a promising technology, which can provide good user mobility experience and very high area throughput in very high AP density. Intelligent networking can decrease the CAPEX and OPEX of UUDN by self-configuration and self-optimization. Advanced interference management is critical to ensure the spectrum efficiency and cell edge user experience in ultra-dense and high inter-AP interference scenario. As a new network architecture with mobility management applications, security enhancement is also a critical issue for UUDN.

Simulation results of an example UUDN solution show that UUDN can achieve much higher spectrum efficiency and very good user mobility experience in typical UDN scenarios. Finally, future study directions of UUDN are analysed.

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