Wireless Network Optimization

The challenge	Current wireless network optimization is based on simple static optimizations of lower level functions. WNP provides a methodology to optimize Quality-of-Service levels in real time, responsive to end user needs. Such dynamic design increases the efficacy and efficiency of wireless networks. This technology provides for more efficient resource usage with greater user satisfaction on a personal level, and a corresponding positive impact on network operator revenue.
The solution	By utilizing user satisfaction feedback and machine-learning algorithms (as shown in Figs. 1 and 2), wireless network decisions are optimized for the user and available resources can be managed so that maximum user satisfaction is achieved with minimal resources.
Key Benefits	✓ Maximal user satisfaction can be achieved with a minimum amount of resources. ✓ Resources not being used for personal applications can be dynamically utilized for more time critical applications such as public safety and autonomous cars. ✓ Increased user satisfaction, as users do not have to pay for the provided extra bandwidth they do not need or use.
Development Stage	Concept validation completed, simulations validated.

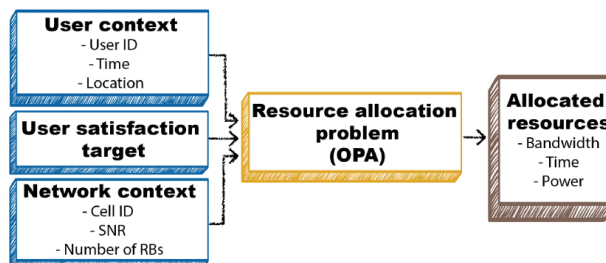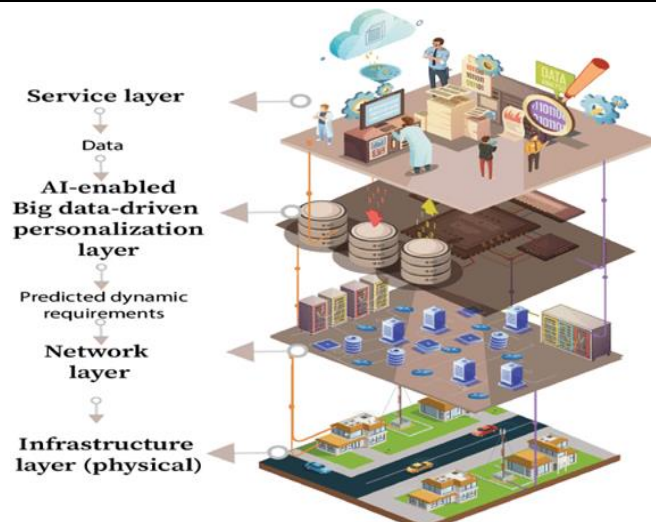**Figure 1:** Inputs and outputs of the Optimum Personalized Resource Allocation (OPA) problem for wireless networks

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Details	The Optimized Network provides: • A novel Zone-of-Tolerance model to quantify user satisfaction, and a framework to capture nonintrusive and real-time user feedback (Fig. 2), in wireless networks. • Multi-objective optimization to enable data-driven optimization of resources, revenue, and user satisfaction. • User feedback (i.e., satisfaction level) by utilizing machine learning and predictive analytics.
Research Team	Prof. Halim Yanikomeroglu (lead), R Alkurd, I Abualhaol
Patents	Patents pending in United States, Canada and Europe with international filing date of Aug. 29, 2019. See PCT publication, WO 2020/041883
Publications	R. Alkurd, I. Abualhaol, and H. Yanikomeroglu (2020), "Big data-driven and AI-based framework to enable personalization in wireless networks," IEEE Communications Magazine, vol. 58, no. 3, pp.18–24

Figure 2: Framework for Optimized Wireless Networks