



Next-Generation Edge Computing for Tactical Situational Awareness

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ABSTRACT

In dynamic and adversarial environments, the ability to process and act on mission-critical data in real time is essential. Extreme Edge Computing (XEC) is transforming Tactical Command & Control by shifting computational workloads from centralized data centers to the tactical edge – where data is generated, and decisions must be made instantly.

This talk explores how XEC leverages Extreme Edge Devices (XEDs) – including wearables, sensors, unmanned systems, and mobile command platforms – to process and analyze data at the edge, reducing reliance on fragile network links. By distributing intelligence across tech-equipped soldiers, command posts, forward operating bases, and mobile HQs, we enhance operational agility, resilience, and survivability.

Key topics include resource-constrained computing, dynamic task scheduling, federated learning, and reliable architectures to enable robust, autonomous decision-making in high-risk environments. The talk will discuss novel strategies for optimizing resource allocation, workload migration, and mission-aware processing, ensuring XEC systems can adapt to rapidly changing tactical conditions.

BIO



Dr. Hossam Hassanein is a leading researcher in the areas of broadband, wireless and mobile networks architecture, protocols, control and performance evaluation. His record spans more than 700 publications in journals, conferences and book chapters, in addition to numerous keynotes and plenary talks in flagship venues. Dr. Hassanein has received several recognition and best paper awards at top international conferences.

He is the founder and director of the Telecommunications Research Lab (TRL) at Queen's University School of Computing, with extensive international academic and industrial collaborations. He is the recipient of the 2016 IEEE Communications Society Communications Software Technical Achievement Award for outstanding contributions to routing and deployment planning algorithms in wireless sensor networks, and the 2020 IEEE IoT, Ad Hoc and Sensor Networks Technical Achievement and Recognition Award for significant contributions to technological advancement of the Internet of Things, ad hoc networks and sensing systems.

Dr. Hassanein is a fellow of the IEEE and is a former chair of the IEEE Communication Society Technical Committee on Ad hoc and Sensor Networks (TC AHSN). He is an IEEE Communications Society Distinguished Speaker (Distinguished Lecturer 2008-2010).