

5G (ENCQOR) Technology Development Challenge

Situation Aware Machine Type Communication

Challenge Launch Date	<ul style="list-style-type: none">• January 3, 2019
Challenge Deadline	<ul style="list-style-type: none">• January 31, 2019
Challenge Statement	<ul style="list-style-type: none">• The rapidly growing number of machine-type communication (MTC) devices from diverse industrial applications in 5G heterogeneous networks contributes significantly to the complexity of future ultra-dense 5G networks. Many of the future MTC applications will require an extremely large number of connected devices with diverse QoS requirements including high availability, reliability and security and low latency of the underlying 5G networks for supporting vertical industry applications. Furthermore, low latency and reliable operation are often the top priorities of many emerging applications (for instance, connected vehicles). In many industrial applications, failing to meet the QoS requirements can cause significant business loss or intolerable customer experiences. Operation of such 5G heterogeneous networks has inherently complex scenarios due to resource constraints and the diverse requirements of different users and processes, which are difficult to predict in advance during the network design and deployment stages. However, many hidden patterns and characteristics of the network traffic and user behavior could be exploited in assisting the operation of 5G networks, including use of intelligent real-time network traffic-awareness.
Project Partner	<ul style="list-style-type: none">• Ericsson Canada Inc.
Timeline	<ul style="list-style-type: none">• 1 year
Available funding	<ul style="list-style-type: none">• \$100K
Applicant Type	<ul style="list-style-type: none">• Ontario based College/University
Location	<ul style="list-style-type: none">• Work can be completed remotely.
Project Details	<p>The proposed MTC infrastructure solutions, including use of virtual small cell concepts will employ intelligent network adaptation with a high level of situation-awareness. Due to the varying load conditions, the network solution will need to adapt</p>

	<p>to varying traffic loads and employ situation-awareness metrics. For optimal performance, the proposed network solution should be able to adapt its structure with minimal latency according to varying load conditions. Proposed solutions will employ network orchestration approaches that enable intelligent user-centric network adaptation.</p> <p>The proposed solution will include multi-dimensional transmission schemes that can be adapted based on MTC device-centric requirements or different network operation objectives to optimize the network performance, including network area capacity, spectrum efficiency under congested network conditions, as well as network operational cost with low network traffic. The solutions using the proposed multi-dimensional transmission technologies will address dynamic interactions and cooperation among distributed transmitters and MTC user devices.</p>
<p>Project Goals/ Outcomes</p>	<ul style="list-style-type: none"> • Development of intelligent enabling methodologies for spectrum-aware MTC cooperation between 5G licensed/unlicensed bands through data offloading to increase the availabilities of spectral resources. • Interference minimization among co-existing MTC devices and cells in both licensed and unlicensed bands. Specifically, mutual interference among co-existing devices/cells in unlicensed and licensed band will be evaluated. • Intra-network and inter-network coordination solutions will be proposed as well as virtual cell communication protocols (licensed or unlicensed) that enable resource allocation with minimal latencies. • Network/user data collection including gathering of network, traffic, spatial and time distributions through mobile crowdsensing. • Proposed solutions for macro base station assisted of virtual cell formation
<p>Applicant Capabilities</p>	<p>The lead applicant and the supporting research team will have extensive research expertise in areas closely related to the proposed project, including an in-depth technical background in wireless communications, cellular networks as well as wireless network modeling and optimization. Expertise in spectrum and resource allocation, machine learning and mobility management will also be beneficial.</p>

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