

# Self Optimizing Fabric Research and Co-Creation- Academic

<b>Challenge Launch Date</b>	September 25, 2018
<b>Challenge Deadline</b>	<del>October 23, 2018 at 2PM EST</del> <b>Deadline extended to November 13, 2018 at 2PM EST</b>  Late submissions will not be accepted
<b>Challenge Statement</b>	The vision of the ENCQOR corridor is to connect Anchor partners, innovators and academia to an advanced 5G network spanning Ontario and Quebec. How can hardware and software solutions be deployed to develop a 'Self Optimizing Fabric' (SOF); a new paradigm to 'develop' and 'operate' ultra-lean adaptive systems and ensure cohesive delivery of service on the network.
<b>Project Partner</b>	Ciena
<b>Timeline</b>	2 year projects
<b>Available funding</b>	Up to \$150 000 per project  Multiple projects may be funded. Funding per project will be determined based on scope of work.
<b>Applicant Type</b>	Ontario based Academic Institutions  (Please note that there is a concurrent call for SME based projects. Ontario based SMEs should respond to the 'Self Optimizing Fabric Research and Co-Creation- SME' Challenge Statement to open an application.
<b>Location</b>	Academic Institution in Ontario with some travel to Ottawa to interface with project partners.
<b>Project Details</b>	This is a research and co-creation project that will develop, validate and implement key technologies essential to implementation of the Self Optimizing Fabric (SOF) component of the ENCQOR innovation corridor. This initiative will include multiple partners including Ciena, SME scale companies and Academics working together to develop a functional SOF prototype by leveraging the ENCQOR iPaaS network.

It is envisioned that these key technologies will be developed on bare-metal/white box substrates employing open source hardware and software components to the best degree possible.

This research co-creation project will be driven by the ENCQOR iPaaS Phase 2 roadmap.

**Background:**

Our vision for the ENCQOR innovation corridor is that of a distributed logical construct that stitches disparate resources hosted at the Innovation Hubs and Research Partner compute for a logically distributed data center that spans the length of the ENCQOR Innovation Corridor, enabling customizable dynamic network compositions for ENCQOR constituents participating in the Innovation Marketplace with seamless open access through the length of the corridor. With this approach, the underlying service delivery mechanisms are abstracted to such a level that the network becomes invisible to the ENCQOR User.

Three industries are simultaneously evolving their products and services and will change the ways that we connect to future networks:

The fifth generation of wireless access, commonly known as 5G, is anticipated to revolutionize the user experience with increased bandwidth, extended reachability and reduced latency. Unlike previous generations of wireless technologies, 5G represents a first opportunity for the Service Provider to extend its reach beyond mere connectivity.

In parallel, the Cloud industry is shaping its own pivot toward distributed computing, pushing compute closer to the user for support of localized creation and consumption of data that will result from highly sophisticated connected devices of the future (e.g. self-driving vehicles).

The Internet of Things (IoT) market has also been evolving on an independent, yet parallel, path. Recent advances in machine intelligence and robotics have started to shape IoT in a way that's anticipated to affect all facets of our lives, as it revolutionizes a multitude of industries.

ENCQOR will provide a platform on which these industries can evolve and harmonize their development of a distributed construct that brings together services from Telecommunications Companies, ICP and Internet of Things providers in a dynamic cloud continuum.

**Project:**

Ciena is targeting a fully adaptive innovation corridor underpinned with Self Optimizing Fabric (SOF); a new paradigm to 'develop' and 'operate' ultra-lean adaptive systems.

From a developer perspective, SOF a logical representation of disparate physical and virtual resources contributed by heterogeneous sources stitched together with open APIs, shared information models, and common algorithms for cohesive delivery of a service.

From a functional perspective, SOF is a library of fully contained functional components that could be assembled into a fully operational (ideally, self-contained) system, often, created on-demand, to serve a specific user segment.

The SOF will greatly increase the efficiency and responsiveness of the phase one technology. From the resources in the ENCQOR locations across Quebec and Ontario, dynamic compositions underpinned with SOF will, for each client, create the appearance of having their own unique distributed data center and communications infrastructure. The capability provided in each client's particular composition will be available from any access point to the innovation corridor.

The goal of the project is to develop and test SOF on the ENCQOR network to gather data and identify approaches for wider scale deployment. The project will involve multiple solution providers in collaboration.

This Challenge Statement is open to Academics that have proven technologies or services that could be integrated as part of an SOF solution. The project will focus on research and prototyping leading to validation of fundamental concepts of SOF:

- I. Dynamic discovery and peering of heterogeneous resources (possibly from disparate fabrics) to stitch a e2e virtual fabric dedicated to a task. This will be developed and verified in a phased approach:
  - a. E-W peering of heterogeneous fabrics within a data center (common jurisdiction)
  - b. N-S control for federation of peered entities within a data center (multiple jurisdictions)
  - c. E-W peering of heterogeneous fabrics across two data centers (common jurisdiction)
  - d. N-S federation of peered entities across multiple data centers (multiple jurisdictions)
- II. Static protocol and capability negotiation (E-W & N-S)

	<ul style="list-style-type: none"> <li>III. Dynamic capability negotiation (E-W &amp; N-S)</li> <li>IV. ML driven dynamic capability discovery and negotiation (E-W only)</li> <li>V. ML driven policy federation across multiple jurisdictions (E-W &amp; N-S)</li> <li>VI. ML driven resource federation and optimization (E-W &amp; N-S)</li> <li>VII. Self optimized outer loop (N-S only)</li> <li>VIII. Autonomic system behaviors with self optimized components (E-W &amp; N-S)</li> <li>IX. Dynamic Semantics discovery and negotiation: self learning protocols to be discovered at the point of attachment (E-W &amp; N-S)</li> <li>X. Dynamic fabric allocation, optimization and monetization with resources contributed by multiple ENCQOR IDCs, each IDC governed to be under a unique jurisdiction.</li> </ul>
<p><b>Project Goals/ Outcomes</b></p>	<ul style="list-style-type: none"> <li>• Successful integration of the applicant’s technology or services into the development of a Self Optimizing Fabric for the ENCQOR Network.</li> <li>• A functional prototype for operation of Self Optimizing Fabric on the ENCQOR network- to be developed in collaboration with other partners/ solution providers</li> <li>• Data and results that validate functionality</li> <li>• Reports and other tools to help share project learnings and guide future implementation</li> </ul>
<p><b>Applicant Capabilities</b></p>	<p>Academics with technologies or services in the following key technology areas are encouraged to submit an application:</p> <ul style="list-style-type: none"> <li>• Whitebox Radio Technologies</li> <li>• Disaggregated Cloud System design (e.g. Intel Rack Scale Architecture)</li> <li>• Distributed Systems and Advanced IPC techniques, e.g. RINA</li> <li>• Data Science, Artificial Intelligence, Deep Learning</li> <li>• Cyber Security</li> <li>• Self Optimizing systems design, models and algorithms</li> <li>• Autonomic systems design, models and algorithms</li> <li>• Industrial IoT application developer expertise</li> <li>• Advanced Consumer Application developer expertise (e.g. AR/VR/MR)</li> </ul>
<p><b>Additional Information</b></p>	<ul style="list-style-type: none"> <li>• Funded projects will be a collaboration with researchers and scientists from the ENCQOR partners, as well as researchers, scientists and developers from SME and Academia.</li> <li>• Multiple applicants may be selected for funding</li> </ul>

