



# Canada's National Design Network<sup>®</sup>

Lowering the Barriers to Technology Adoption

2017  2018

# CMC Microsystems

Fueling innovation in Canada's advanced manufacturing industries.

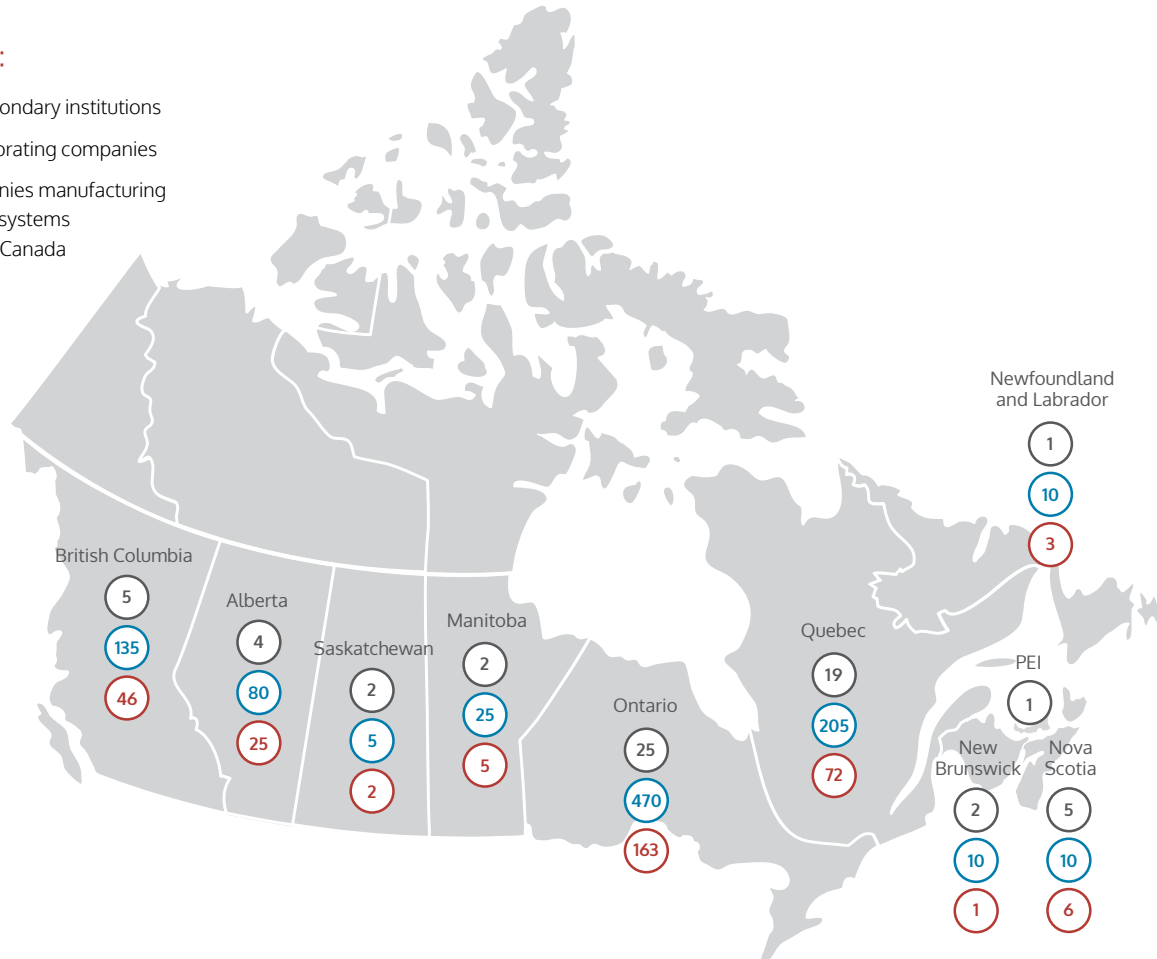
- ✓ CMC Microsystems (CMC) is a not-for-profit founded in 1984
- ✓ It manages a Canada's National Design Network (CNDN) that provides critical infrastructure for innovation in Canada
- ✓ It simplifies access to state-of-the-art design, manufacturing, and testing facilities
- ✓ It lowers costs of R&D for professors and companies
- ✓ The services provided by CMC are essential for the research and training required to advance Canada's digital economy: Industry 4.0, autonomous vehicles, big data, Internet of Things (IoT), cyber defence/security, 5G, quantum computing, artificial intelligence (AI)

# Canada's National Design Network

A national network of 10,000 academic participants developing innovations in micro-nanotechnologies. CNDN is managed by CMC Microsystems.

## Connecting:

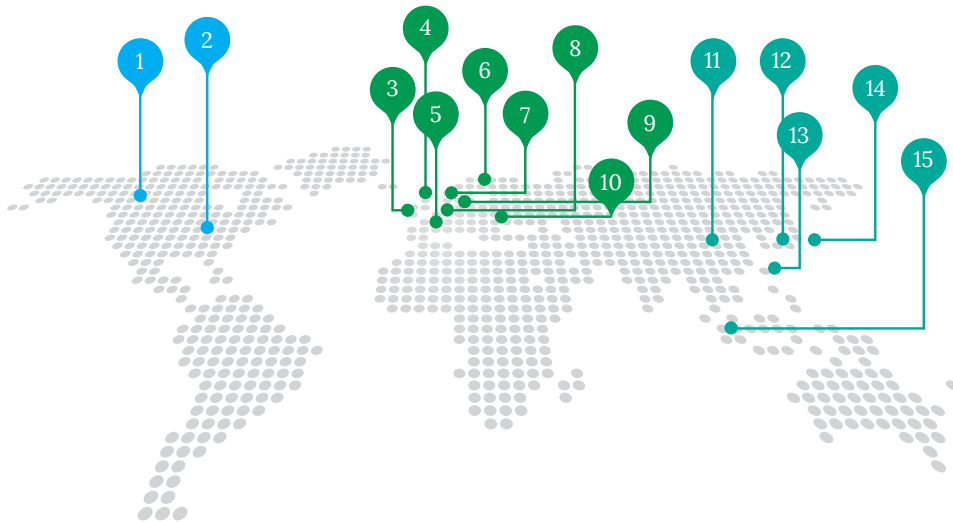
- 66 Post-secondary institutions
- 950 Collaborating companies
- 323 Companies manufacturing micro-nanosystems products in Canada



# Strategic engagements, global partners

CMC builds relationships with companies and organizations worldwide, resulting in supply chains and access to manufacturing capabilities for innovative R&D.

Global sources of essential micro-nanotechnologies for CNDN:



## North America

- |           |   |
|-----------|---|
| 1. Canada | 14 CAD   8 FAB   13 LABs<br>19 Systems & Components<br>42 University MNT LABS   |
| 2. USA    | 1 Co-operative Initiative<br>15 CAD   5 FAB   11 LABs<br>8 Systems & Components |

## Europe

- |                |                                   |
|----------------|-----------------------------------|
|                | 1 Co-operative Initiative         |
| 3. Ireland     | 1 FAB                             |
| 4. UK          | 1 CAD   1 Systems & Components    |
| 5. France      | 2 FAB   1 Co-operative Initiative |
| 6. Sweden      | 1 CAD                             |
| 7. Netherlands | 2 FAB                             |
| 8. Belgium     | 1 FAB                             |
| 9. Germany     | 1 CAD   2 FAB                     |
| 10. Austria    | 1 FAB                             |

## Asia

- |                 |  |
|-----------------|--|
| 11. China       | 1 Co-operative Initiative  |
| 12. South Korea | 1 Co-operative Initiative  |
| 13. Taiwan      | 1 Co-operative Initiative<br>2 FAB   1 LAB<br>2 Systems & Components |
| 14. Japan       | 1 Co-operative Initiative  |
| 15. Singapore   | 3 FAB  |

# From idea to manufacturable prototype

Industry-grade tools, technologies and support give researchers the capabilities they need to design innovative micro-nanotechnologies:



**25** multi-project wafer services available through nine foundries worldwide, offering industrial-scale manufacturing



**40** university-based micro-nanotechnology (MNT) fabrication labs across Canada, helping researchers customize their designs



**80** pieces of test equipment for loan in lab



**560** tools and modules



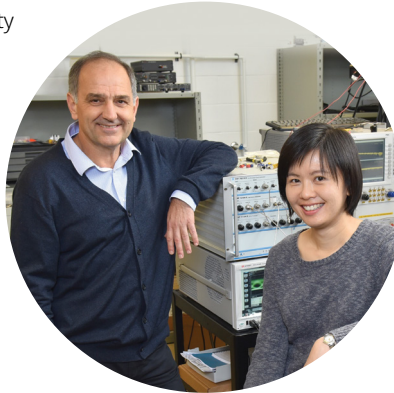
**600** development systems



**450** design flows, user guides and application notes

## Solving a short-distance challenge

Joyce Poon (right) and Sorin Voinigescu (University of Toronto) were globally recognized at OFC 2017 for solving a significant problem in short-distance communications. Their 3D integrated silicon photonic electro-optic transmitter offers high performance at low power, with potential for cost-effective, high-volume manufacturability.

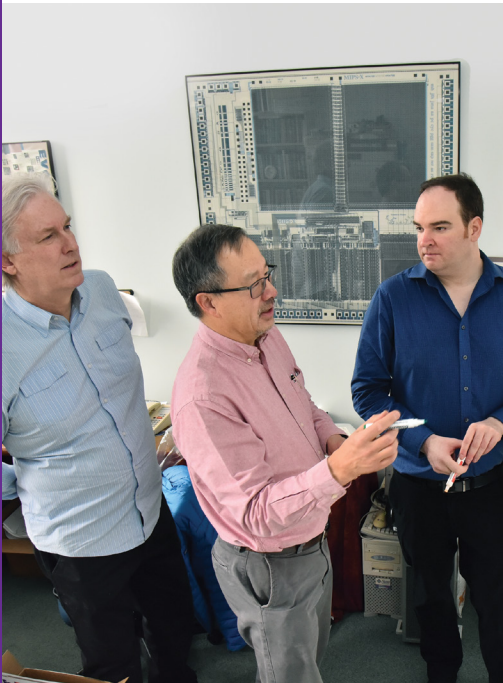


## Resolving a quantum conundrum

Nanomechanics specialist John P. Davis (left) and his students Pearse Doolin and Callum Doolin developed the first digital photodetector capable of measuring the quantum properties of nanomechanical systems. Their instrument, now on the market through their startup company Resolved Instruments, opens up new opportunities in the emerging field of quantum technologies.

## A novel solution for heterogeneous computing

Through his work with global standards consortium Khronos, AJ Guillon (right) and John Reynolds (left), founders of YetiWare Inc., partnered with University of Toronto's Dr. Paul Chow (centre), a specialist in computer architectures, and CMC to create a novel operating system that enables faster, simpler development of programs for heterogeneous computing.





## Making way for a batteryless future

A fresh approach to wireless transceiver design enabled Professors Frédéric Nabki (right) and colleague Dominic Deslandes to develop a new microsystems technology with dramatically lower energy requirements, offering potential for devices that never need recharging. Their chip is now being commercialized by their startup, SPARK Microsystems.



## Tiny sensors sound out new markets

Microsensor innovator Dr. Behraad Bahreyni (left) and his team at Simon Fraser University developed hyper-sensitive underwater vibration sensors for global defence company Ultra, creating next-generation sound detectors. Now his award-winning startup company axSense Technologies is advancing its technologies into civilian applications such as earthquake detection and pipeline integrity monitoring.

## Nanofab experience, award-winning technology

Nanofabrication capabilities and hands-on training helped Queen's University Chemical Engineering researchers and PhD candidates Hannah Dies (shown) and Josh Raveendran develop a novel, highly sensitive portable biosensor that can be manufactured simply and inexpensively. Their nanotechnology now forms the basis of an award-winning startup company, Spectra Plasmonics.



# CMC impact, by the numbers

CMC Microsystems works with researchers and industry across Canada's National Design Network, supporting Canadian research, innovation, education and training.

## \$30.3M

in tools/technologies  
delivered



## 3,780

publications

## 110

national/  
international  
awards

## 780

HQP moved  
to industry

## 98%



would recommend to  
another researcher

## 160

patents  
(applied for/  
issued)



## 500

collaborations  
with industry



## 15

startups