Canadian Cancer Trials Group

Groupe canadien des essais sur le cancer

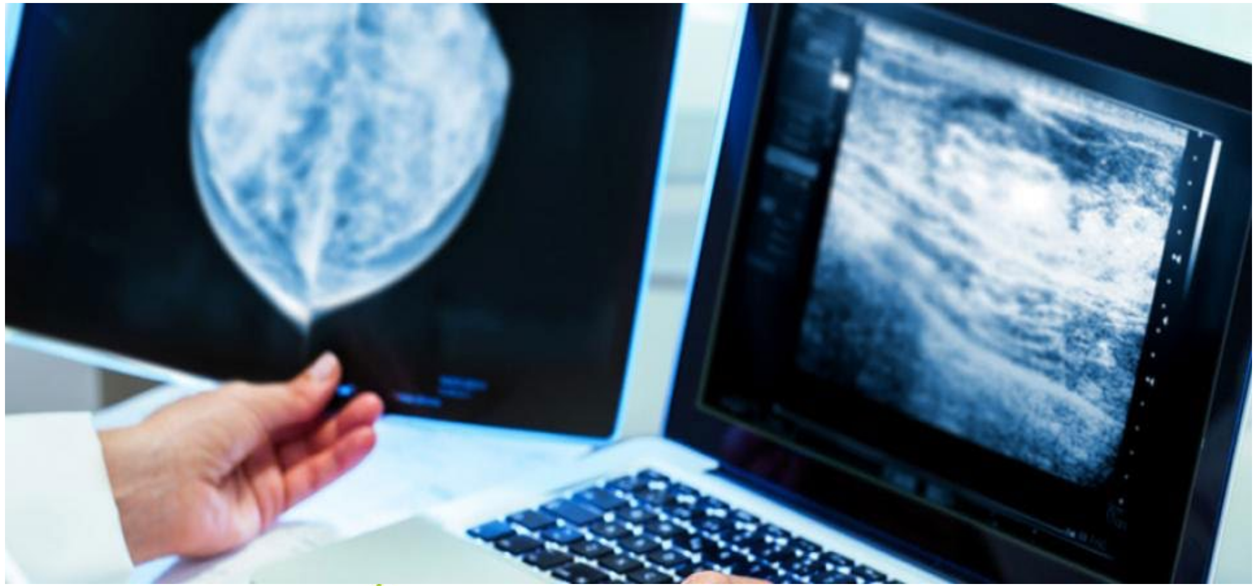
Cybersecurity at CCTG and Queen's University

Canada Foundation for Innovation
2021 Major Science Initiatives Workshop
March 18, 2021

Lam Pho
Chief Information Officer

Mission

To Develop and Conduct Clinical Trials Aimed at Improving the Treatment and Prevention of Cancer, with the Ultimate Goal or Reducing Morbidity and Mortality from this Disease



Canadian Cancer Trials Group Groupe canadien des essais sur le cancer

#trialsthatmatter

CCTG IMPACT AND REACH

EXTENSIVE NETWORK | LEADING ACADEMIC CENTERS

- Operations and statistical centre at Queen’s University
- >85 Canadian institutions,
- >600 international centres | 40 countries | 6 continents
- Only Ex-US Recognized group member of the NIH-NCI National Cancer Clinical Trial Network

IMPACT

- > 80,000 patients enrolled | 1,500-3,000 patients/year
- >508 trials ongoing or completed
- >2000 publications
- New standards of care, diagnostics, drug approvals, methods

CAPACITY

- > 150 trials running concurrently

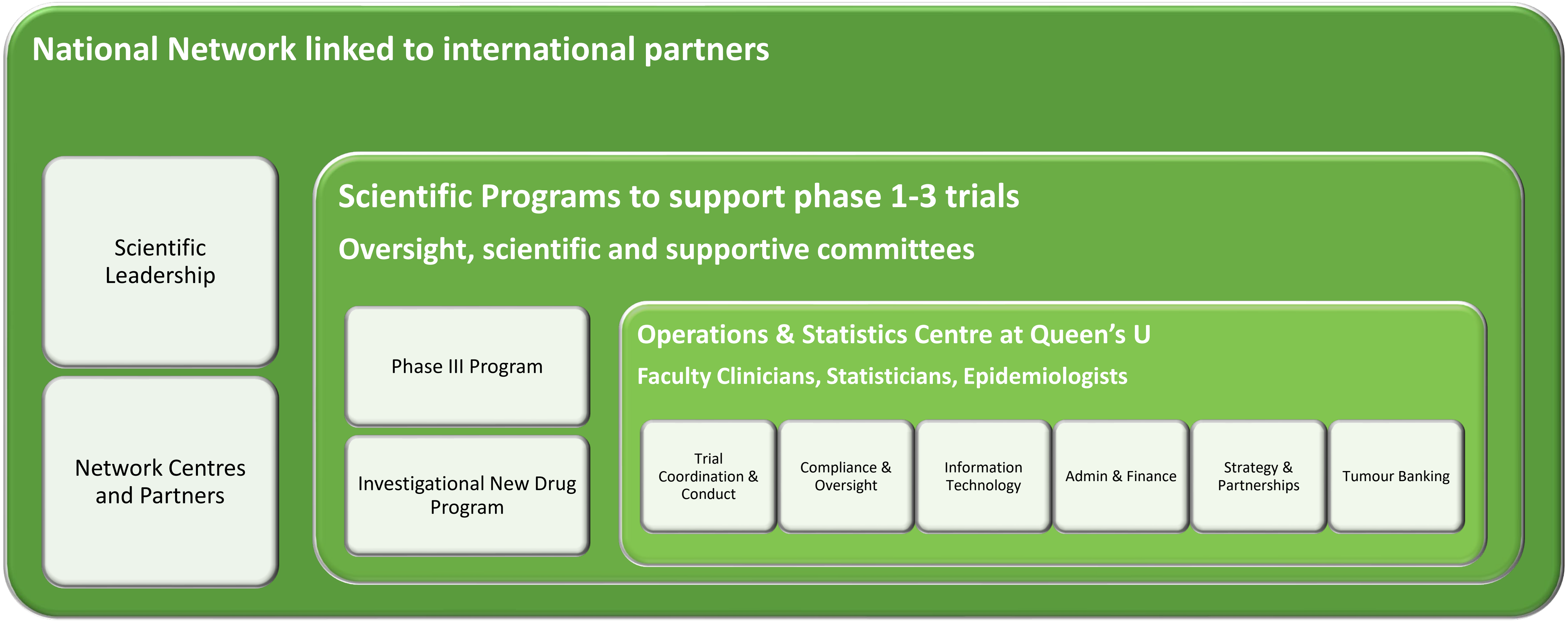
CORRELATIVE RESEARCH / BIO-BANKING FACILITIES

- >400,000 specimens
- From 120 trials and >24,000 trial patients
- Blood, plasma, serum + buffy coat, RBC pellets, DNA, RNA

Canadian Cancer
Trials Group

Groupe canadien
des essais sur le cancer

Canadian Cancer Trials Group



National Network linked to international partners

Scientific Leadership

Network Centres and Partners

Scientific Programs to support phase 1-3 trials

Oversight, scientific and supportive committees

Phase III Program

Investigational New Drug Program

Operations & Statistics Centre at Queen's U

Faculty Clinicians, Statisticians, Epidemiologists

Trial Coordination & Conduct

Compliance & Oversight

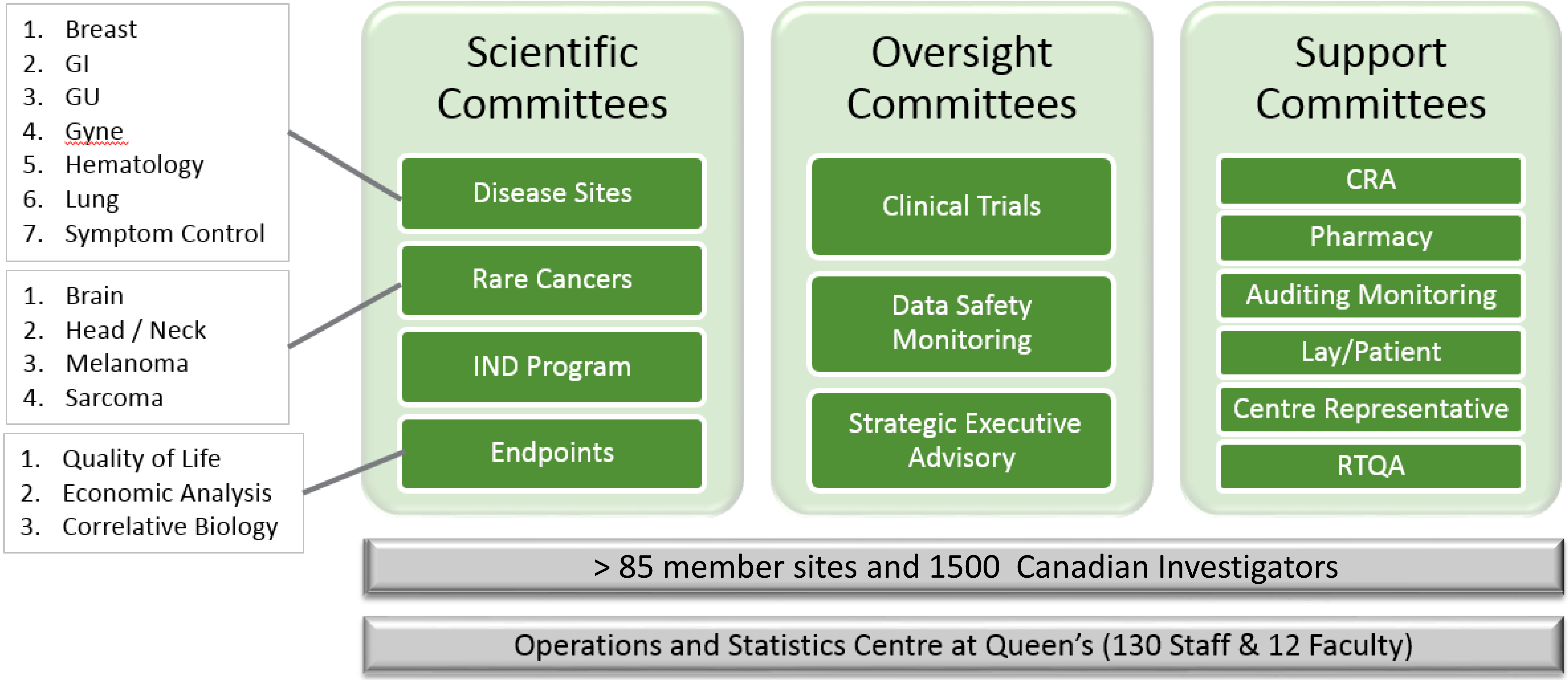
Information Technology

Admin & Finance

Strategy & Partnerships

Tumour Banking

CCTG ORGANIZATION



1. Breast
2. GI
3. GU
4. Gyne
5. Hematology
6. Lung
7. Symptom Control

1. Brain
2. Head / Neck
3. Melanoma
4. Sarcoma

1. Quality of Life
2. Economic Analysis
3. Correlative Biology

Scientific Committees

- Disease Sites
- Rare Cancers
- IND Program
- Endpoints

Oversight Committees

- Clinical Trials
- Data Safety Monitoring
- Strategic Executive Advisory

Support Committees

- CRA
- Pharmacy
- Auditing Monitoring
- Lay/Patient
- Centre Representative
- RTQA

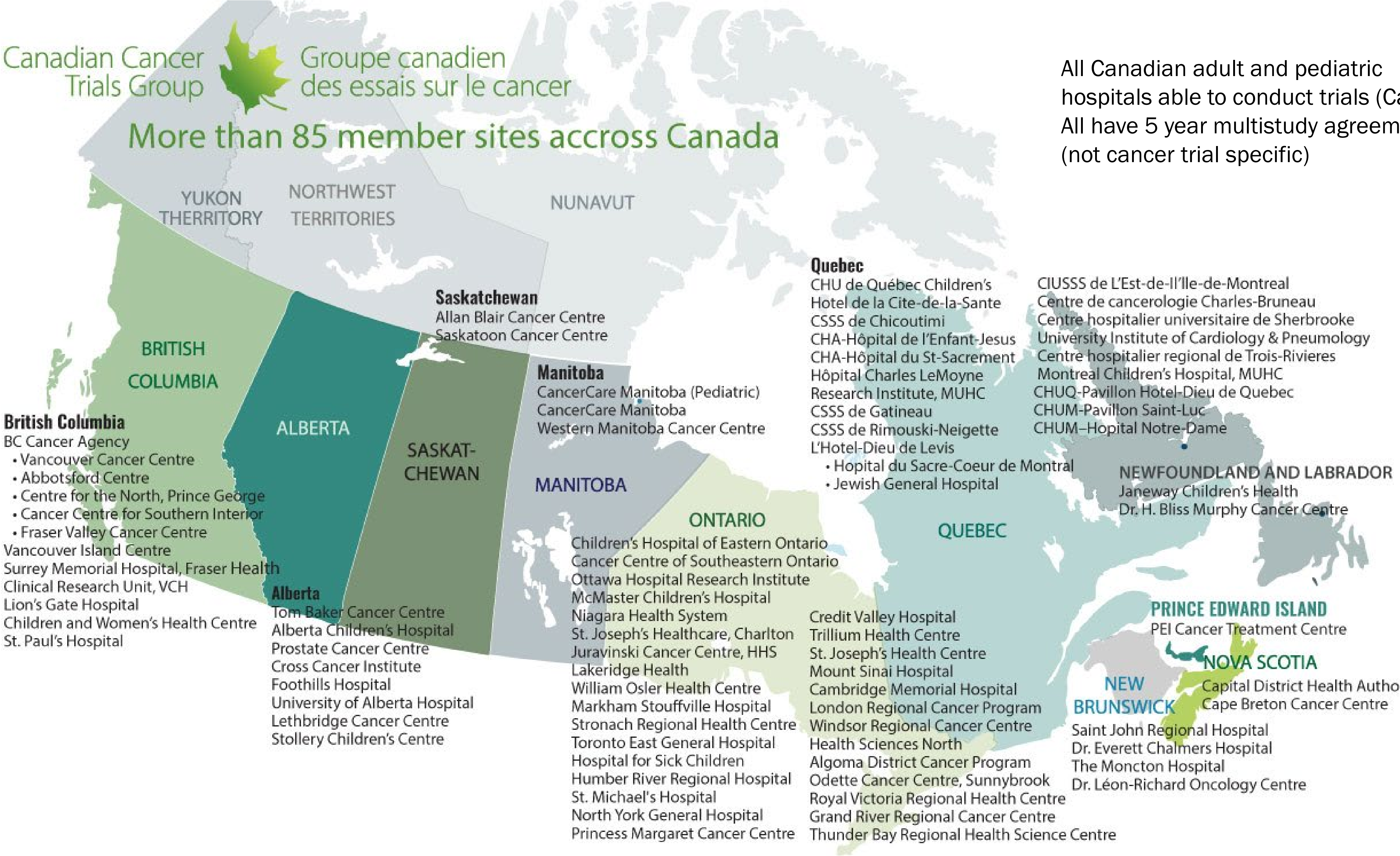
> 85 member sites and 1500 Canadian Investigators

Operations and Statistics Centre at Queen's (130 Staff & 12 Faculty)

Canadian Cancer Trials Group | Groupe canadien des essais sur le cancer

More than 85 member sites accross Canada

All Canadian adult and pediatric hospitals able to conduct trials (Cancer)
All have 5 year multistudy agreements (not cancer trial specific)



British Columbia
BC Cancer Agency
- Vancouver Cancer Centre
- Abbotsford Centre
- Centre for the North, Prince George
- Cancer Centre for Southern Interior
- Fraser Valley Cancer Centre

Vancouver Island Centre
Surrey Memorial Hospital, Fraser Health
Clinical Research Unit, VCH
Lion's Gate Hospital
Children and Women's Health Centre
St. Paul's Hospital

Alberta
Tom Baker Cancer Centre
Alberta Children's Hospital
Prostate Cancer Centre
Cross Cancer Institute
Foothills Hospital
University of Alberta Hospital
Lethbridge Cancer Centre
Stollery Children's Centre

Saskatchewan
Allan Blair Cancer Centre
Saskatoon Cancer Centre

Manitoba
CancerCare Manitoba (Pediatric)
CancerCare Manitoba
Western Manitoba Cancer Centre

ONTARIO
Children's Hospital of Eastern Ontario
Cancer Centre of Southeastern Ontario
Ottawa Hospital Research Institute
McMaster Children's Hospital
Niagara Health System
St. Joseph's Healthcare, Charlton
Juravinski Cancer Centre, HHS
Lakeridge Health
William Osler Health Centre
Markham Stouffville Hospital
Stronach Regional Health Centre
Toronto East General Hospital
Hospital for Sick Children
Humber River Regional Hospital
St. Michael's Hospital
North York General Hospital
Princess Margaret Cancer Centre
Credit Valley Hospital
Trillium Health Centre
St. Joseph's Health Centre
Mount Sinai Hospital
Cambridge Memorial Hospital
London Regional Cancer Program
Windsor Regional Cancer Centre
Health Sciences North
Algoma District Cancer Program
Odette Cancer Centre, Sunnybrook
Royal Victoria Regional Health Centre
Grand River Regional Cancer Centre
Thunder Bay Regional Health Science Centre

Quebec
CHU de Québec Children's
Hotel de la Cite-de-la-Sante
CSSS de Chicoutimi
CHA-Hôpital de l'Enfant-Jesus
CHA-Hôpital du St-Sacrement
Hôpital Charles LeMoyne
Research Institute, MUHC
CSSS de Gatineau
CSSS de Rimouski-Neigette
L'Hotel-Dieu de Levis
- Hopital du Sacre-Coeur de Montral
- Jewish General Hospital

CIUSSS de L'Est-de-Il'Ile-de-Montreal
Centre de cancerologie Charles-Bruneau
Centre hospitalier universitaire de Sherbrooke
University Institute of Cardiology & Pneumology
Centre hospitalier regional de Trois-Rivieres
Montreal Children's Hospital, MUHC
CHUQ-Pavillon Hotel-Dieu de Quebec
CHUM-Pavillon Saint-Luc
CHUM–Hopital Notre-Dame

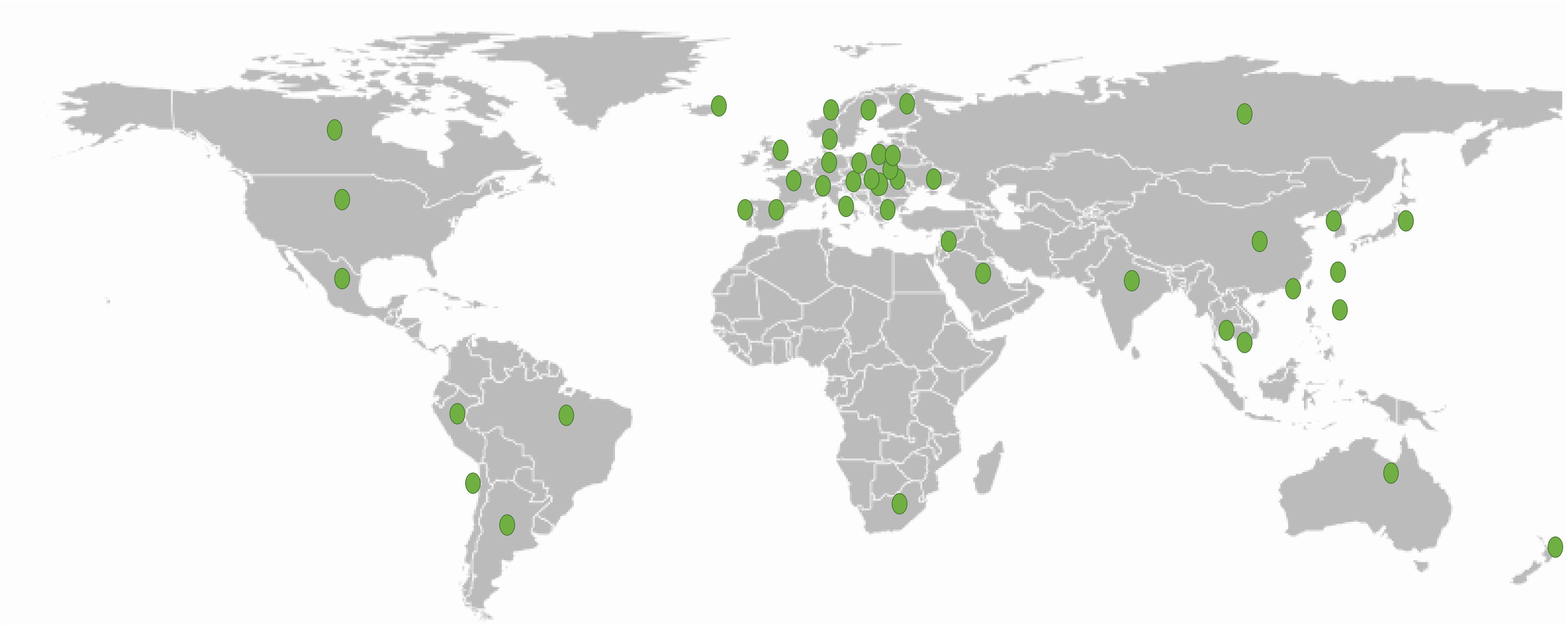
NEWFOUNDLAND AND LABRADOR
Janeway Children's Health
Dr. H. Bliss Murphy Cancer Centre

PRINCE EDWARD ISLAND
PEI Cancer Treatment Centre

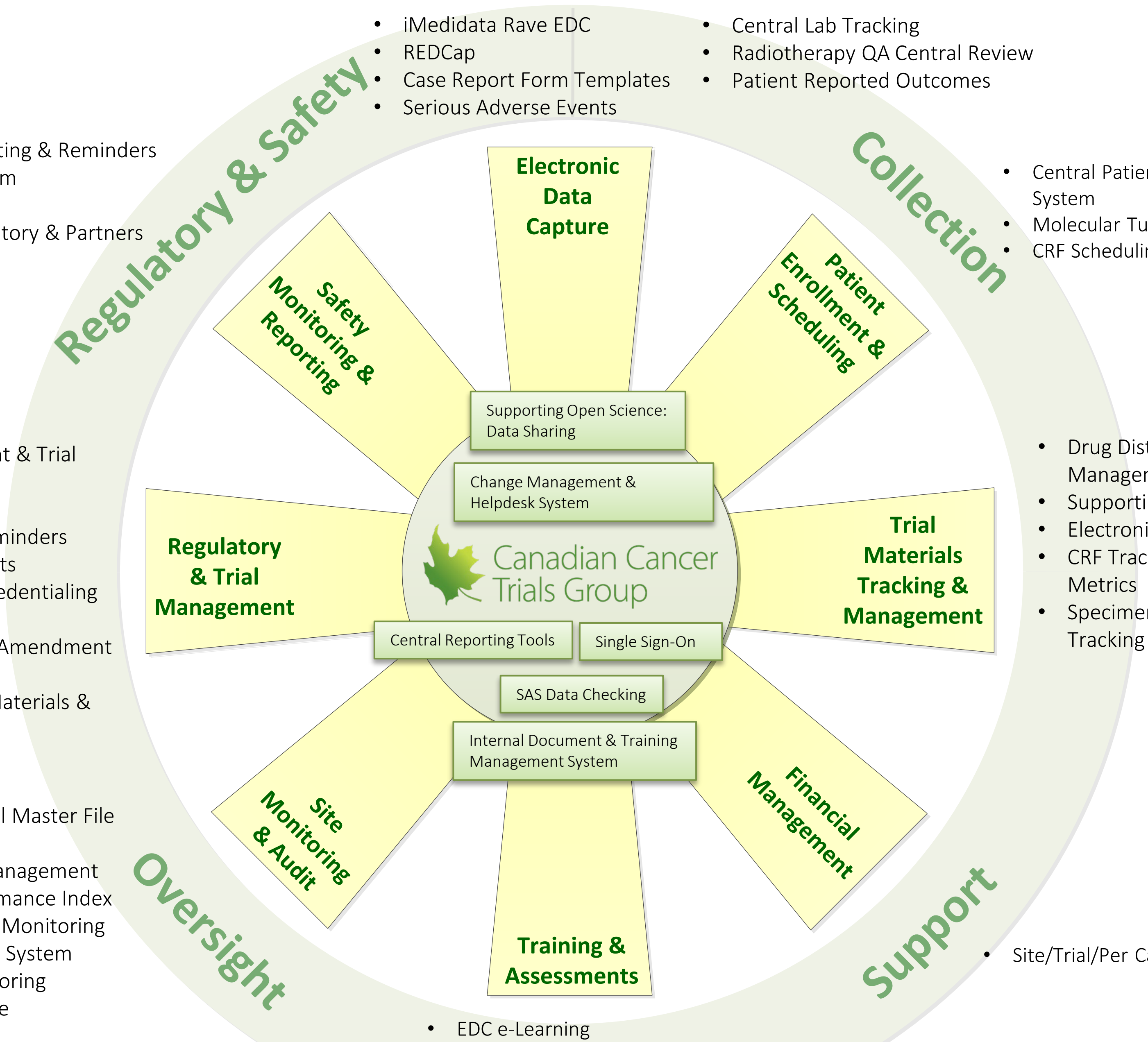
NOVA SCOTIA
Capital District Health Authority
Cape Breton Cancer Centre

NEW BRUNSWICK
Saint John Regional Hospital
Dr. Everett Chalmers Hospital
The Moncton Hospital
Dr. Léon-Richard Oncology Centre

International Partners



- Since 1980 International collaboration with >40 countries with academic groups and sites
- Since 2010, 50% of trials involve one or more international group or site
- 2010 – 2016 collaborating with > 25 countries across trials and > 700 sites



Canadian Cancer Trials Group

Supporting Open Science: Data Sharing

Change Management & Helpdesk System

Central Reporting Tools

Single Sign-On

SAS Data Checking

Internal Document & Training Management System

Regulatory & Safety

Safety Monitoring & Reporting

- SAE & Safety Reporting & Reminders
- e-Assessment System
- Pharmacovigilance
- Reporting to Regulatory & Partners
- CIOMS, PDF, XML

Regulatory & Trial Management

- Account Management & Trial Delegation Log
- Membership Roster
- Ethics Tracking & Reminders
- Regulatory Documents
- Radiotherapy Site Credentialing
- Trial Webpage
- Protocol, Consent & Amendment Management
- Data Management Materials & Manuals

Collection

Electronic Data Capture

- iMedidata Rave EDC
- REDCap
- Case Report Form Templates
- Serious Adverse Events
- Central Lab Tracking
- Radiotherapy QA Central Review
- Patient Reported Outcomes

Patient Enrollment & Scheduling

- Central Patient Enrollment & Credentialing System
- Molecular Tumour Board Review
- CRF Scheduling & Reminders

Support

Trial Materials Tracking & Management

- Drug Distribution and Tracking Management System
- Supporting Document Upload
- Electronic Tissue Tracking
- CRF Tracking, Review Status, & Metrics
- Specimen & Image Collection & Tracking

Financial Management

- Site/Trial/Per Case Funding

Oversight

Training & Assessments

- EDC e-Learning
- GCP & Health Canada Division 5
- Site Training Utility
- CCTG Supplementary Training
- CCTG Document Management & Training

Site Monitoring & Audit

- Electronic Trial Master File
- Accrual Utility
- Trial & Site Management
- Centre Performance Index
- Central Office Monitoring
- Data Checking System
- On-Site Monitoring
- Audit Database

Canadian Cancer Trials Group Groupe canadien des essais sur le cancer

Considerations for Implementing Cybersecurity Programs

- Cybersecurity program focuses on foundational decisions about organizational **mission alignment**, **governance**, **resources**, and **controls**
- Does my organization need its own Cybersecurity Program?
  - Stand-alone
  - Unit of larger organization (i.e. CCTG is an unit of a large organization which is Queen’s University)
    - Very large and complex on its own?
    - Face cyber threats that are different from the larger organization?
    - Have stakeholders and cybersecurity obligations that are distinctive from the larger organization?
    - Have a distinct set of users or suppliers significantly different than the larger organization?
    - Have leadership roles with significant autonomy or discretion in terms of risk taking, budget, hiring, business development, and/or procurement?
    - Does the larger organization’s baseline control set and implementation clash with the unit’s mission?
    - Is the unit’s mission highly distinctive in some other way that warrants special attention and may be outside the standard operations for the majority of the rest of the business?
    - For more details - Appendix A of Trusted CI Framework Implementation Guide
- If your organization is part of larger organization:
  - “Get to know” large organization’s CIO, CISO, CTO, Strategy & Architecture Director
  - Be part of the larger organization’s cybersecurity committees/initiatives:
    - Member of Queen’s University Enterprise Information Technology Advisory Committee (EITAC) and Change Advocate Group

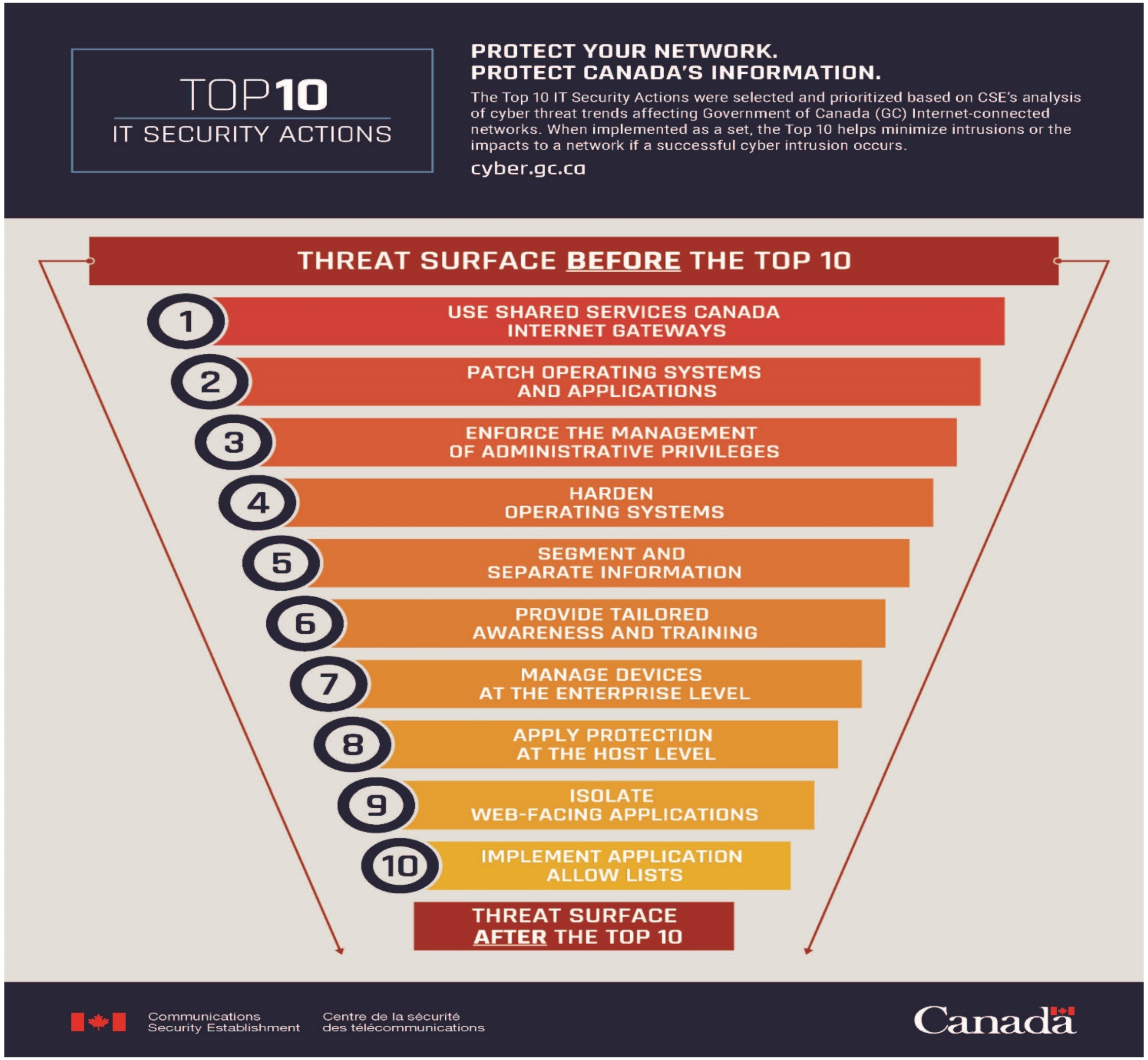
The Path to Cybersecurity for small and medium organizations

- Recommended path for
    1. Baseline Cybersecurity Controls for Small and Medium Organizations
        - https://cyber.gc.ca/sites/default/files/publications/Baseline.Controls.SMO1_.2-e%20.pdf
    2. Canadian Centre for Cyber Security (CCCS) Top 10 IT Security Actions
        - https://cyber.gc.ca/en/top-10-it-security-actions
- Other comprehensive Enterprise Cybersecurity Frameworks – large organizations
    3. NIST CSF (National Institute of Standards and Technology Cybersecurity Framework)
    4. ISO/IEC 27001 (International Organization for Standardization/International Electrotechnical Commission)
    5. NIST 800-53, ITSG-33
- Highly recommend to look at the Trusted CI Framework Implementation Guide
    - https://www.trustedci.org/framework

Baseline Controls for Small and Medium Organizations

- Have an incident response plan
- Securely configure devices
- Enable security software
- Use strong user authentication
- Provide employee awareness and training
- Backup and encrypt data
- Secure mobility
- Establish perimeter defenses
- Secure outsourced IT services
- Secure websites
- Have access control & authorization
- Secure portable media

CCCS Top 10 IT Security Actions



TOP10
IT SECURITY ACTIONS

PROTECT YOUR NETWORK.
PROTECT CANADA'S INFORMATION.

The Top 10 IT Security Actions were selected and prioritized based on CSE's analysis of cyber threat trends affecting Government of Canada (GC) Internet-connected networks. When implemented as a set, the Top 10 helps minimize intrusions or the impacts to a network if a successful cyber intrusion occurs.

cyber.gc.ca

THREAT SURFACE **BEFORE** THE TOP 10

1. USE SHARED SERVICES CANADA INTERNET GATEWAYS
2. PATCH OPERATING SYSTEMS AND APPLICATIONS
3. ENFORCE THE MANAGEMENT OF ADMINISTRATIVE PRIVILEGES
4. HARDEN OPERATING SYSTEMS
5. SEGMENT AND SEPARATE INFORMATION
6. PROVIDE TAILORED AWARENESS AND TRAINING
7. MANAGE DEVICES AT THE ENTERPRISE LEVEL
8. APPLY PROTECTION AT THE HOST LEVEL
9. ISOLATE WEB-FACING APPLICATIONS
10. IMPLEMENT APPLICATION ALLOW LISTS

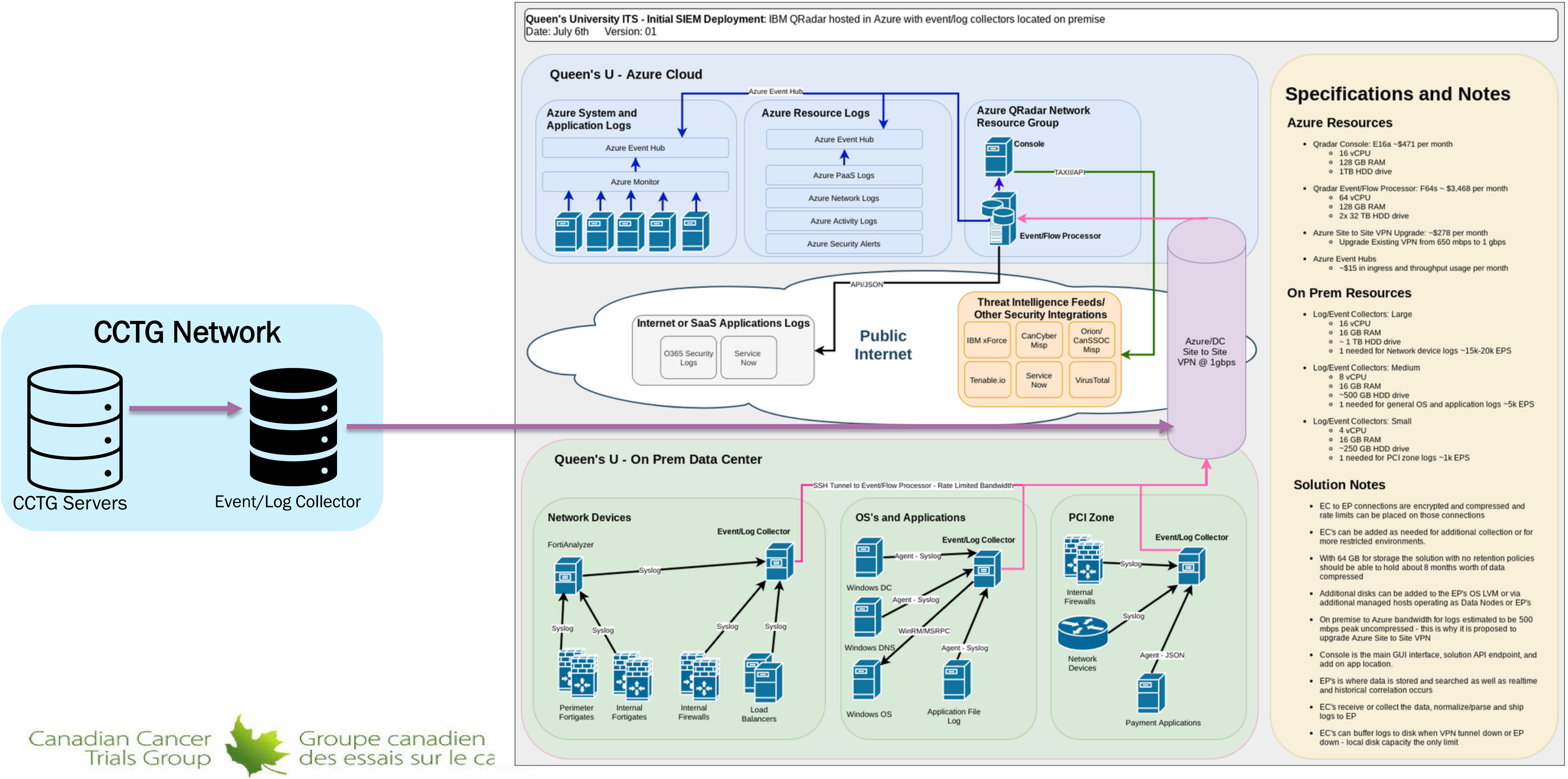
THREAT SURFACE **AFTER** THE TOP 10

Communications Security Establishment
Centre de la sécurité des télécommunications
Canadä

Implementing Cybersecurity at Queen's and CCTG

- Cybersecurity Education & Awareness Training
- Identity and Access Management (IAM)
- Multi-Factor Authentication (MFA)
- Endpoint Protection Platform (EPP)
- Vulnerability Scanner
- Network Intrusion Detection System
- Data Protection (@CCTG): Encryption-at-Rest, Encryption-in-Flight
- Firewalls (Palo Alto, Wildfire)

Real-Time Monitoring



Queen's University ITS - Initial SIEM Deployment: IBM QRadar hosted in Azure with event/log collectors located on premise
Date: July 6th Version: 01

Specifications and Notes

Azure Resources

- Qradar Console: E16a ~$471 per month
  - 16 vCPU
  - 128 GB RAM
  - 1TB HDD drive
- Qradar Event/Flow Processor: F64s ~ $3,468 per month
  - 64 vCPU
  - 128 GB RAM
  - 2x 32 TB HDD drive
- Azure Site to Site VPN Upgrade: ~$278 per month
  - Upgrade Existing VPN from 650 mbps to 1 gbps
- Azure Event Hubs
  - ~$15 in ingress and throughput usage per month

On Prem Resources

- Log/Event Collectors: Large
  - 16 vCPU
  - 16 GB RAM
  - ~ 1 TB HDD drive
  - 1 needed for Network device logs ~15k-20k EPS
- Log/Event Collectors: Medium
  - 8 vCPU
  - 16 GB RAM
  - ~500 GB HDD drive
  - 1 needed for general OS and application logs ~5k EPS
- Log/Event Collectors: Small
  - 4 vCPU
  - 16 GB RAM
  - ~250 GB HDD drive
  - 1 needed for PCI zone logs ~1k EPS

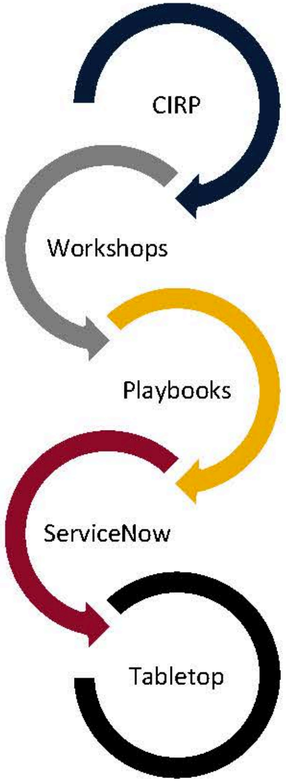
Solution Notes

- EC to EP connections are encrypted and compressed and rate limits can be placed on those connections
- EC's can be added as needed for additional collection or for more restricted environments.
- With 64 GB for storage the solution with no retention policies should be able to hold about 8 months worth of data compressed
- Additional disks can be added to the EP's OS LVM or via additional managed hosts operating as Data Nodes or EP's
- On premise to Azure bandwidth for logs estimated to be 500 mbps peak uncompressed - this is why it is proposed to upgrade Azure Site to Site VPN
- Console is the main GUI interface, solution API endpoint, and add on app location.
- EP's is where data is stored and searched as well as realtime and historical correlation occurs
- EC's receive or collect the data, normalize/parse and ship logs to EP
- EC's can buffer logs to disk when VPN tunnel down or EP down - local disk capacity the only limit

Canadian Cancer Trials Group
Groupe canadien des essais sur le ca

The Cybersecurity Incident Response Plan

IT Services is launching a revised Cybersecurity Incident Response Plan (CIRP) to improve its effectiveness, alignment, and cohesiveness. The CIRP describes the process Queen's follows to prepare for and respond to a cybersecurity event. The CIRP defines the roles, responsibilities, authorities, and tasks associated with each phase of a security incident to ensure a coordinated and effective response. The CIRP is intended to be referenced by all stakeholders identified as having a role in cybersecurity incident response.



The CIRP

Provides the foundation for responding to security incidents and the playbook development

Workshops

Conducted with three targeted groups to leverage their input to develop and fine-tune the playbooks

Playbooks

Developed by reviewing existing incident response documents and leveraging workshop outputs

ServiceNow

Implementation of playbooks into ServiceNow to enable relevant stakeholders to take necessary action

Tabletop Exercises

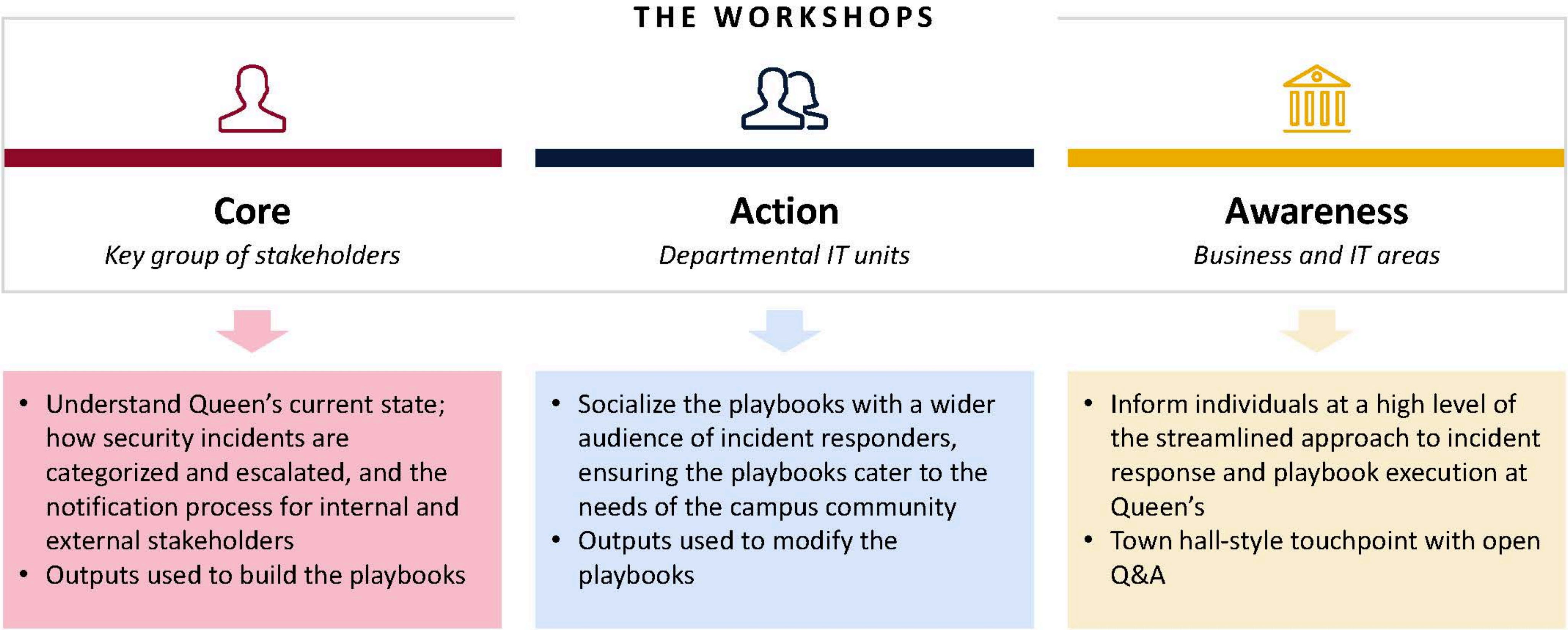
To simulate the incident response plan and playbooks

Benefits

- Increase **visibility** and **awareness** of security incidents by offering a common University-wide platform (ServiceNow)
- Improve response to incidents by developing **standardised and actionable steps** to contain an incident and appropriately escalate and delegate incident response actions
- Enhance **communication** by developing templates to notify the appropriate internal and external stakeholders in the event of a security incident

The Consultative Approach

A series of workshops will be conducted with three targeted stakeholder groups, and their input will be leveraged to develop the seven playbooks implemented in ServiceNow.



THE WORKSHOPS

Core

Key group of stakeholders

- Understand Queen’s current state; how security incidents are categorized and escalated, and the notification process for internal and external stakeholders
- Outputs used to build the playbooks

Action

Departmental IT units

- Socialize the playbooks with a wider audience of incident responders, ensuring the playbooks cater to the needs of the campus community
- Outputs used to modify the playbooks

Awareness

Business and IT areas

- Inform individuals at a high level of the streamlined approach to incident response and playbook execution at Queen’s
- Town hall-style touchpoint with open Q&A

The Playbooks

The playbook scenarios are being designed and developed in two waves. The playbooks will outline the appropriate roles, responsibilities, and actions required when responding to seven types of threat scenarios. The implementation of these playbooks in ServiceNow will enable departments to get hands on access to the playbooks and escalation tools.

Wave 1

Spear Phishing

In the event that a threat actor sends an email specifically targeting a Queen's employee to acquire sensitive data from the individual.

Malware

In the event that a malicious program is inserted into a Queen's system with the intent of compromising the confidentiality, integrity, or availability of data and applications.

Ransomware

In the event that a computer system at Queen's is infected by a ransomware. Ransomware is a type of malware that encrypts files on a computer and makes them inaccessible to the user, unless a ransom is paid to the threat actor.

Wave 2

Unauthorized Access

In the event that an individual (internal or external) has gained access without permission to sensitive Queen's systems.

Web Application Compromise

In the event that a threat actor has compromised/is attempting to compromise a flaw or weakness in a web-based application that belongs to Queen's or is hosted on Queen's infrastructure.

Data Breach

In the event that a threat actor has compromised and potentially exfiltrated sensitive data from Queen's systems.

Distributed Denial of Service (DDoS)

In the event that a threat actor prevents authorized access to Queen's resources and delays time-critical operations through the coordinated disruption of services by various attacking systems.

Thank You