C2 and the Primacy of Information

Dr. Hengameh Irandoust

DRDC, Valcartier Research Center

ICCRTS
November 2018

Outline

- Factors behind the Primacy of Information
  - Modern warfare complexity
  - Efficiency goal
- Data / Information / Intelligence
- C2 transformation:
  - Information as an enabler
  - Information-based decision making
  - Information as an effector

Modern Warfare Complexity

Sophisticated & Diversified Threat

Multiple – Multi-axis – Coordinated
Adaptive – Multi-domain

Adversary Tactics

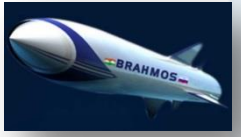
Unconventional Tactics – Field Knowledge

Severe Constraints

Time – Monetary – Error Cost

Congested & Contested Environment

Littoral – Urban Areas





Missile Threat

Detection

Neutralization

Defending Asset

Impact

Efficiency Goal

Effectively deal with the challenges of the new threat environment, while keeping the cost of operations at a reasonable level

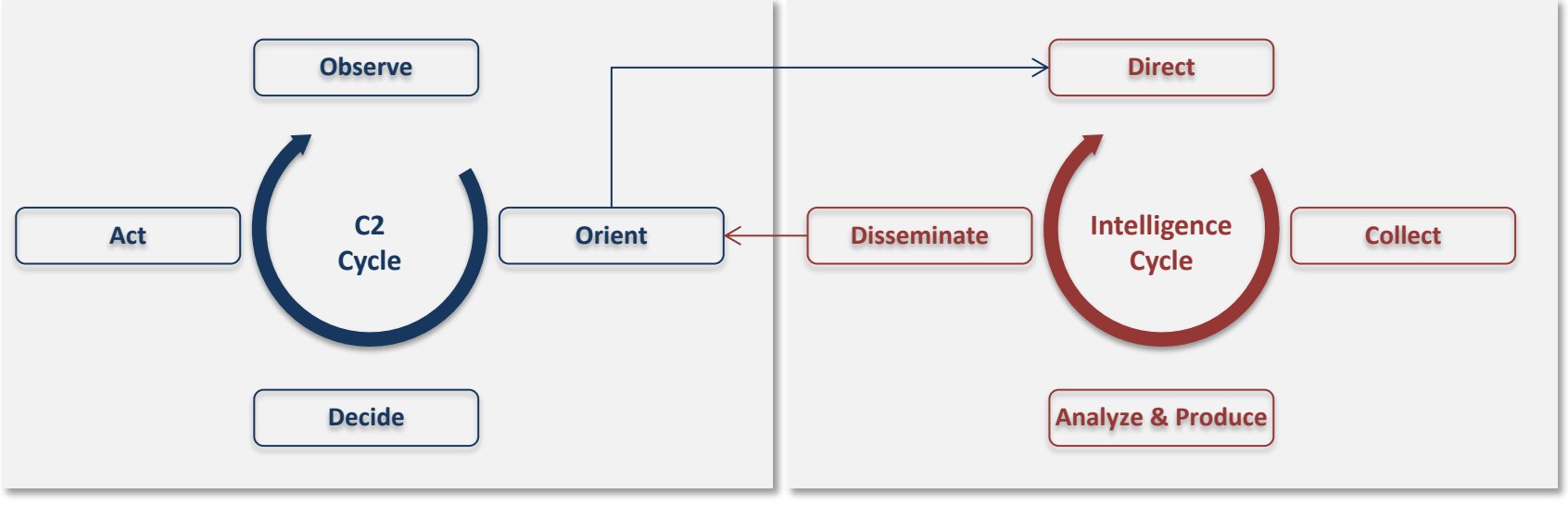
- Drives the majority of warfare concepts introduced in the past 20 years
- Enabled by information platforms/networks, which:
  - Allow information acquisition and exploitation for military objectives;
  - Are sources of data for military intelligence; and
  - Provide a new operational domain

Data / Information / Intelligence

- **Data**: Any low-level signal, sign, symbol or sequence of symbols that supports calculation
- **Information:** Contextual and (higher-level/aggregate) data, meaningful for the task at hand
- **Intelligence:** Privileged and/or protected information that has been actively looked for and acquired to be used for the benefit of an individual, group, organization, or nation

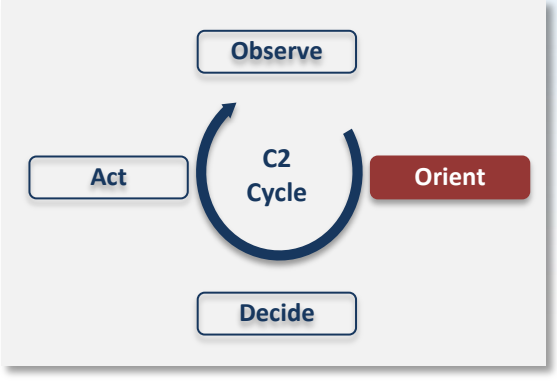
Information as an Enabler

'The ability to collect, understand and disseminate relevant information and intelligence has become fundamental to the military's ability to succeed on operations.'



Information Superiority

- Use new capabilities that can provide massive data while allowing remote monitoring and control, e.g.:
  - Surveillance aircraft,
  - Remotely piloted systems,
  - Space-based surveillance assets, and
  - Social/information networks



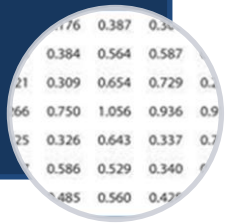
- Expand military forces to assets from other environments and nations
  - Exploit assets unique capabilities
  - Increase sensor and effector coverage and reaction time
  - Provide more flexibility
  - Augment and optimize combat power, making it more affordable

Information Exploitation Challenges

- Raw data is rarely accurate, current or reliable enough
- Fusion of heterogeneous data is still a challenge

- **Data Imperfection**
- Limitations of the physical systems that capture or communicate raw data
- Adaptive/deceptive behaviors exhibited by the adversary

Structured Data



- **Inherent Complexity and Ambiguity**
- Common sense knowledge
- Contextual information
- Flexible models
- Multiple interpretation levels (still exclusive to human beings)

Unstructured Data

Information Sharing Challenges

Physical Domain

- Lack of connectivity and interoperability among platforms and systems

Information Domain

- Lack of information vs. information overload

Social Domain

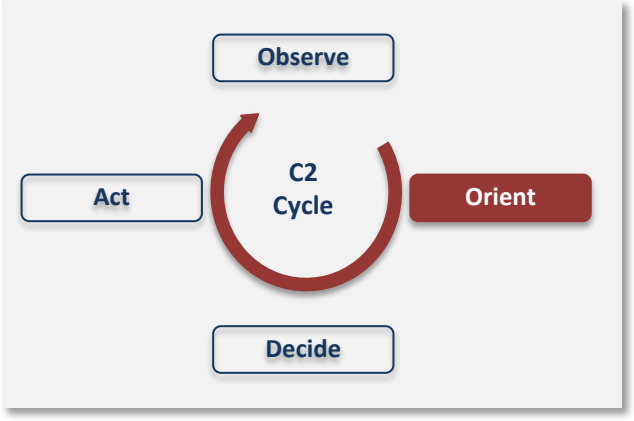
- Lack of willingness to share information on national capabilities

Cognitive Domain

- Lack of contextual information (remote communication)
- Lack of a common reference frame for information interpretation

Proactive vs. Reactive Decision Making

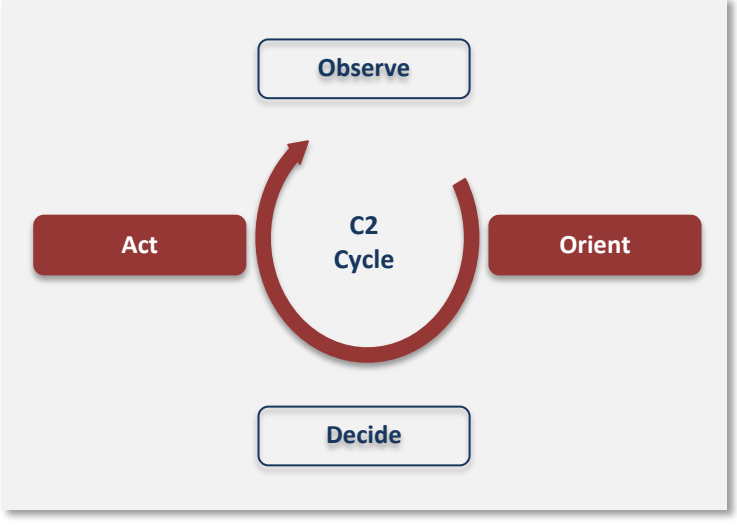
- Establish desired strategic effects, based on the prior comprehension of the adversary's system, and plan back to operational/tactical level actions
  - Limits scope of military action to critical and high-payoff targets
  - Imposes tempo
  - Provides control
  - Streamlines and rationalizes the decision cycle



Operational C2 vs. Targeting

Information as an Effector

- Smart use of information can offset other military advantages (personnel, equipment)
- Information can be used to:
  - influence and manipulate specific groups or the general public opinion
  - subvert and corrupt existing information
  - disrupt and degrade entire systems and infrastructures



New Operational Domains

- Extension of battlespace to new environments (space, cyberspace, public information domain, etc.)
  - *Psy Ops*
  - *Influence Ops*
  - *Electronic Ops/Warfare*
  - *Cyber Ops/Warfare*
  - *Information Ops/Warfare*
  - *Hybrid Warfare*
- Plan military action can be planned within different domains, with consideration of direct effects, as well as desired/undesired informational ramifications

Challenges of Information Warfare

- Multi-effect operations involve a large number of variables and predicted effects may be very uncertain
- Requires deep understanding of the characteristics of targeted areas/functions
- Very difficult to manoeuvre and take action in the information space without being exposed or targeted

Conclusion

- C2 is
  - Increasingly reliant on previously acquired and analyzed information (**intelligence-based**)
  - Driven by desired effects **(proactive)**
  - Expected to produce effects across the full spectrum of societal functions (**multi-domain**)

Thank You

DRDC | RDDC

SCIENCE, TECHNOLOGY AND KNOWLEDGE FOR CANADA'S DEFENCE AND SECURITY

SCIENCE, TECHNOLOGIE ET SAVOIR POUR LA DÉFENSE ET LA SÉCURITÉ DU CANADA

For additional information, please contact:

Dr. Hengameh Irandoust
+1 (418) 844-4000 Ext. 4193
hengameh.irandoust@drdc-rddc.gc.ca