

## **Part 2 ANNEX A – Tactical Command and Control**

### **Information System Modernization**

### **Project DESCRIPTION – Revision 001**

#### **1.5 Project Scope**

##### **1.5.1 Overview of Refined Scope**

- 1.5.1.1 *Strong, Secure, Engaged*: Canada's Defence Policy outlines the level of ambition for the Canadian Armed Forces and presents a new strategic vision for defence. *Strong, Secure, Engaged* also states that the Canadian Armed Forces will be prepared to simultaneously deploy to two different theatres of operation, including one as a lead nation. This predicates the need for the Canadian Army to have enough assets to support simultaneous operations of 500 to 1500 personnel in two different operational theatres or one brigade group of up to 4800 personnel. In order to meet the objectives laid out in *Strong, Secure, Engaged*, Canada needs an agile, multi-purpose, and combat-ready military, operated by highly trained, well led, and well-equipped soldiers. *Strong, Secure, Engaged* Initiative 42 captures the Government of Canada commitment to modernize land-based command and control system.
- 1.5.1.2 The Tactical Command and Control Information System Modernization (TacC2IS Mod) project will deliver on *Strong, Secure, Engaged* Initiative 42 by providing the Canadian Army with a robust, flexible, and interoperable Tactical Command and Control Information System Modernization that will support adaptive dispersed operations.
- 1.5.1.3 To deliver these specific operational outputs at the assigned responsiveness levels, the Canadian Armed Forces must possess its own modern digitalized network assets that are operationally ready at all times, and capable of deployment in both combat and aid to civil power situations. A baseline scenario demonstrating a brigade group operating in Warfighting and Peace Support/Asymmetric missions is contained in para 1.8.
- 1.5.1.4 To achieve battlefield dominance, operational agility, and Joint multinational interoperability, the Canadian Army relies on flexible, modern, and deployable command and control systems. The Land Command Support System (LCSS) is the term used to refer to the command and control systems, and supporting communication infrastructures, used by the Canadian Army for Land operations. The Integrated Tactical Network (ITN) will provide the network layer for the future Canadian Army tactical network. This network layer will be provided primarily by the Tactical Communications Modernization project, while the Tactical Command & Control Information System Modernization project will provide the command and control tools and applications, which will leverage the Integrated Tactical Network.

##### **1.5.2 Confirmed TacC2IS Mod Project Scope**

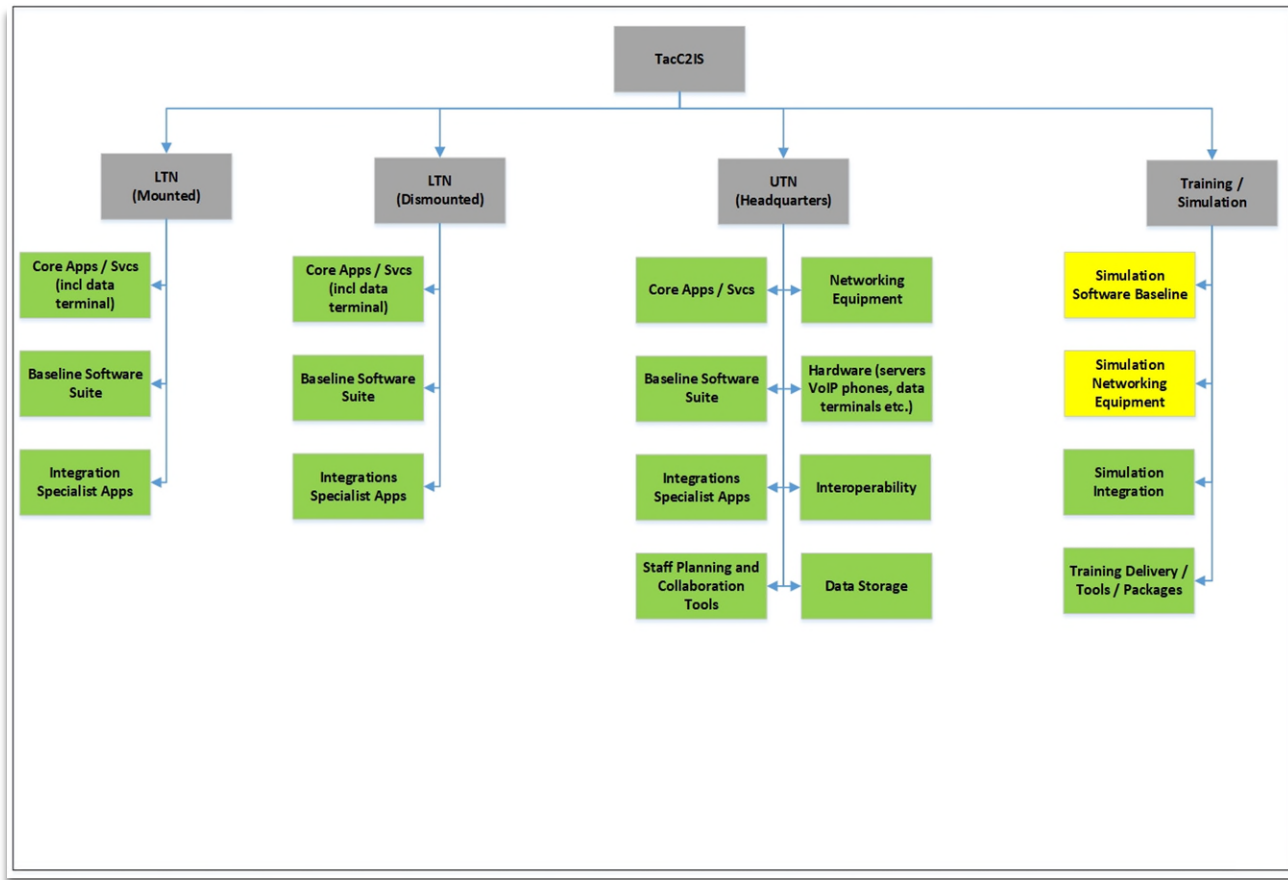
- 1.5.2.1 In order to accomplish its mission objective in the land domain and to support its ground manoeuvre forces, the Canadian Army requires the capability to enable the Commander and their staff the ability to exert command and control over the assigned forces, through the entire spectrum of conflict. The execution of command by the Commander, of planning by their staff and of conduct by the trained soldiers will be coordinated and delivered using the LCSS for which the Tactical Command and Control Information System Modernization project is responsible to deliver a suite of command and control applications and tools, along with

associated training, to provide the Canadian Army with increased command and control capabilities at the tactical level. An LCSS with modernized and integrated command and control applications, for example, would enable the Position Location Information (PLI) of vehicles and dismounted soldiers to be shared across the tactical network, via the Integrated Tactical Network; instantly; improving overall situational awareness at the tactical level.

The Integrated Tactical Network is split into two primary networks. The first network is referred to as the Upper Tactical Network (UTN). The UTN provides a high-capacity network, and advanced command and control systems that are primarily used by a tactical headquarters or higher level command post to plan, direct and manage operations. Tactical Command and Control Information System Modernization project will modernize the UTN. The second network is referred to as the Lower Tactical Network (LTN), and is used within Canadian Army vehicles (i.e., mounted) and in a dismounted capacity. The LTN provides highly mobile, light-weight and simplified command and control systems to support commanders and soldiers that are tactically maneuvering. The mounted and dismounted capabilities use command and control applications running on data terminals or other portable end user devices that are connected to tactical radios through the vehicles local area network or directly through a network cable in the case of dismounted soldiers. The Tactical Command and Control Information System Modernization project will only modernize the data terminals or end user devices, as well as the command and control software baseline and tools used by vehicle crew commanders and dismounted elements to effectively command and control their forces maneuvering on the battlefield. The vehicles local area network and tactical radios will be modernized by the TCM project.

The TacC2IS Mod project shall deliver a modernized version of the components identified in figure 1 below. The core applications and services, which are common across the LTN and UTN, provide war fighters and commanders with a common set of essential tools and services that are important to enable them to effectively command, control, coordinate, and fight at the tactical level. These core applications and services include but **are** not limited to the following: provision of the Land tactical common operating picture (COP), chat service, limited set of planning tools, file sharing capabilities, and video viewer.

To ensure that the Canadian Army continues to be a relevant and effective fighting force on the modern battlefield, the modernization of the Tactical Command and Control Information System is critical. This will better enable interoperability with our closest allies, and ensure integration between important specialist applications, and the command and control suite of applications.



**FIGURE 1 – TACC2IS COMPONENT VIEW**

The effective operation of a network-enabled force rests on the following four basic tenets, which the Tactical Command and Control Information System Modernization project will deliver important capabilities for:

- A robustly networked force will improve information sharing,
- Information sharing will enhance the quality of information and shared Situational Awareness (SA),
- Shared SA will enable collaboration and synchronization, as well as enhance sustainability and speed of command; and
- These will in turn dramatically increase mission effectiveness.<sup>1</sup>

Figure - 2 below depicts the different capabilities being delivered by the Tactical Communications Modernization project and the Tactical Command and Control Information System Modernization project within both the Upper Tactical Network and Lower Tactical Network of the Canadian Army's Integrated Tactical Network.

<sup>1</sup> Land Operations 2021: Adverse Dispersed Operations, p. 23

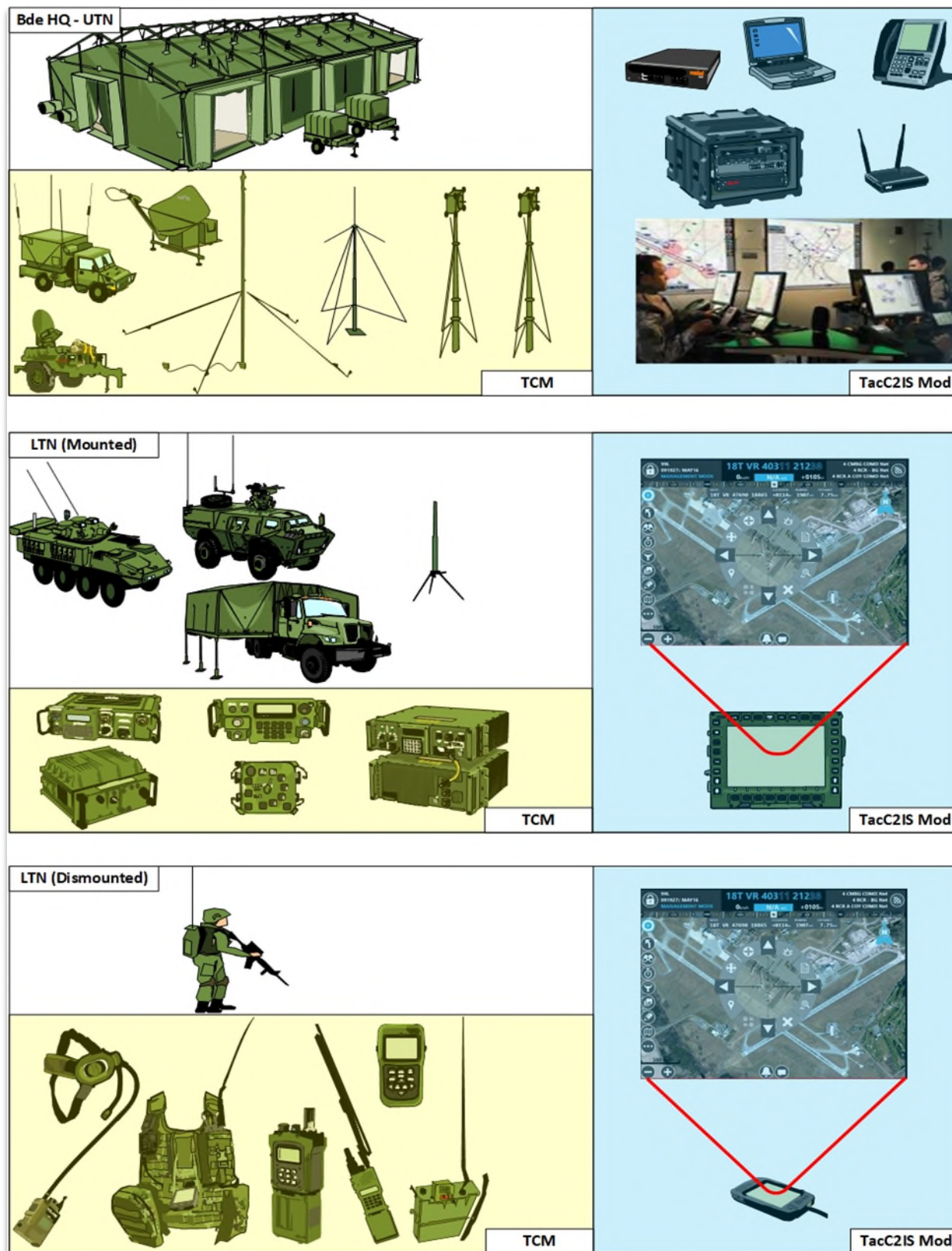


FIGURE 2 – UPPER / LOWER TACTICAL NETWORK CAPABILITIES FOR TCM AND TacC2IS MOD

### 1.5.2.2 High Level Mandatory Requirements (HLMR)

To achieve its overall objective, the project must fulfill the following HLMR:

<b>LCSS TacC2IS Mod — High Level Mandatory Requirements</b>		
<b>#</b>	<b>Themes</b>	<b>HLMR Description (High level descriptions) Ability to:</b>
<b>1</b>	<b>Command and Control</b>	The ability for tactical CA commanders and staff to collaborate in the preparation of plans and orders within a headquarters or command post, and share up-to-date battlefield information enabling rapid coordination of deployed tactical land forces.
<b>2</b>	<b>Survivability</b>	The ability to operate in diverse geographical land environments, under natural and human-made, including denied, degraded, intermittent, or limited-bandwidth environments with minimal loss of essential functionality.
<b>3</b>	<b>Interoperability</b>	The ability to share secure battlefield information with other CA information systems, CAF deployed networks, and coalition partner information systems and environments through compliance with NATO Federated Mission Network (FMN) Spiral standards and American, British, Canadian, Australian and New Zealand Armies Program (ABCANZ) Mission Partner Environment (MPE) standards.
<b>4</b>	<b>Reach</b>	The ability to rapidly establish a command and control network within an area of operations, from section (sub-subunit level) to Brigade (formation level) for three Canadian Mechanized Brigade Groups and one Canadian Combat Support Brigade, and maintain collaboration and information sharing as force elements of various sizes manoeuvre on the battlefield, including frequent moves of tactical-level headquarters in response to threats.
<b>5</b>	<b>Flexibility</b>	The ability to accommodate and sustain any operation within the full spectrum of operations, while promptly adapting to changes in the task organization.
<b>6</b>	<b>Upgradability / Growth Capacity</b>	The ability to upgrade the capability as technology and standards evolve.
<b>7</b>	<b>Readiness Throughput</b>	The ability to continually and rapidly train CA commanders, staff, and soldiers, both individually and collectively, on the capabilities according to the managed readiness plan, including the use of simulation services that are interoperable with coalition partners in order to enhance training.



### 1.5.2.3 Boundaries

<b>Boundaries</b>	
<b>Included:</b>	<b>Excluded:</b>
<b>Equipment</b>	
Laptops and other end-user devices (i.e. data terminals)	
Servers, routers, switches to establish UTN	Routers / switch boxes within vehicular platforms
Cables for distributing UTN within the headquarters	Cabling within vehicle platforms and used by dismounted soldier for enabling tactical command and control capabilities
Portable rack mounted cases for UTN	Racks mounted within vehicle platforms
	Power systems
	HQ Shelters
	Communication systems (i.e., bearers) <sup>2</sup>
<b>System Tools</b>	
Command and control application (i.e., battle management system)	Specialist applications provided by other modernization projects
System management tools	
Network management, monitoring and configuration tools	
Quality of Service tools	
Applications and network security tools, such as Firewalls	
	Tactical cross domain solutions
<b>Training</b>	
Delivery of conversion training, initial cadre training and regenerative training for operators and maintainers, including system managers	Building of new infrastructure
Establishment of ISS contract(s) procurement strategy for the maintenance of training and support of capabilities provided by the project	
Deliver an effective simulation network for delivery of operator and maintainer training	Integration of specialist applications and capabilities provided by other modernization projects onto the simulation network
Establishment of representative coalition network environment to support individual and collective training.	

<sup>2</sup> To be noted, communication systems (i.e., bearers) are out of scope for the project and will be provided by the Tactical Communications Modernization project.

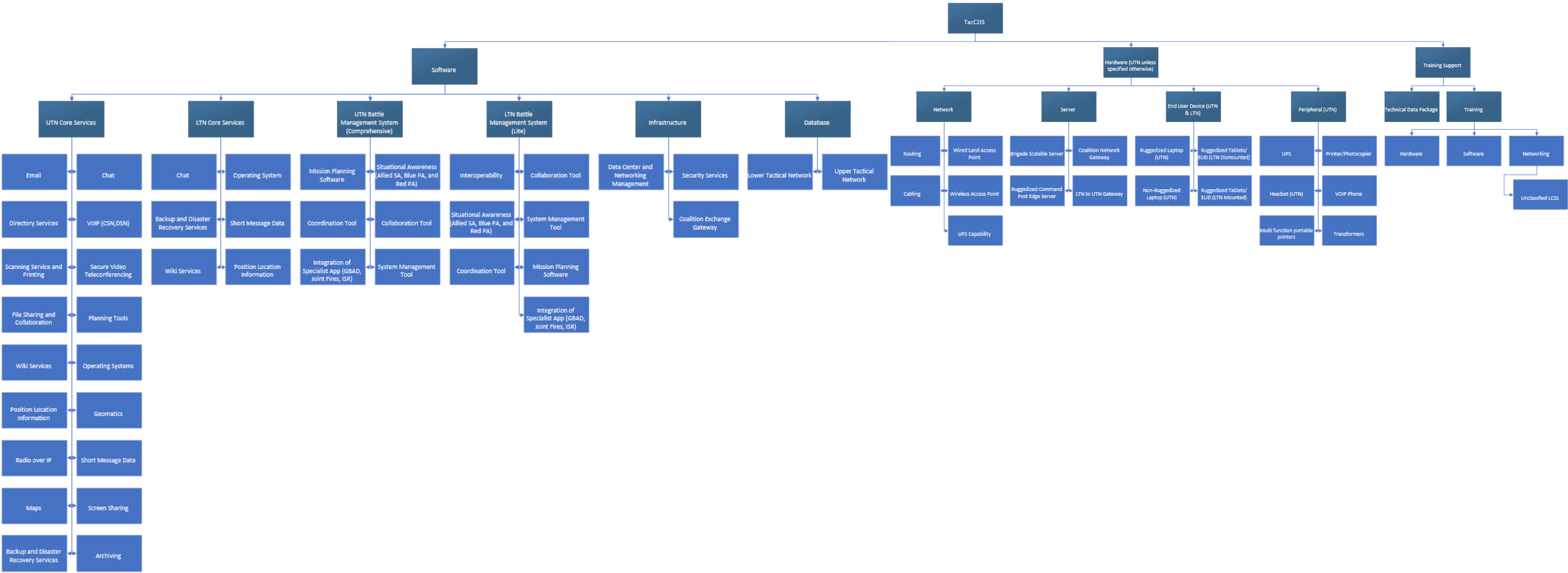
## 1.6 Deliverables

The approved viable option is a comprehensive modernization of the Canadian Army's Tactical Command and Control Information System capabilities contained within the Upper Tactical Network and Lower Tactical Network, including associated training capabilities, ensuring an effective and fully integrated tactical Command and Control system. It also ensures interoperability with coalition partners and fully integrated capabilities.

The modernization of the entirety of the Upper Tactical Network will provide enhanced survivability and reach for the Canadian Mechanized Brigade Group (CMBG) headquarters, and its higher-level unit command posts. Both of which are important considerations, particularly in the context of a warfighting operation during adaptive dispersed operations, where the Canadian Mechanized Brigade Group headquarters and its higher-level command posts will need to move regularly in order to avoid detection and keep pace with the battle. A completely modernized Upper Tactical Network would allow the project to take full advantage of cyber mission assurance processes and implement the latest security enhancements. It would also provide modernized hardware and networking equipment, which would ultimately provide for greater mobility to the headquarters and higher-level command posts.

The Tactical Command and Control Information System Modernization project system breakdown structure is depicted in Figure 3 below. Figure 3 visually depicts the project's system breakdown structure in hierarchical form and then explains each project deliverable in detail.

FIGURE 3: TacC2IS MOD SYSTEM BREAKDOWN STRUCTURE





### 1.6.1 Upper Tactical Network

**It is of importance to note that the Upper Tactical Network will process information up to and including the CLASSIFIED level.** The Upper Tactical Network can be subdivided into the following components.

- a. **Networking Equipment and Hardware.** The Tactical Command and Control Information System Upper Tactical Network will provide the networking equipment and hardware needed to establish a local area network in support of a Canadian Mechanized Brigade Group headquarters or battle group command post depending on the deployment. The following is a list of typical networking equipment and hardware currently supported by the Land Command Support System to establish the Upper Tactical Network: routers, switches, servers, data storage capabilities, data terminals, power distribution units, networking cables, ancillaries, telecommunications equipment such as VoIP phones.
- b. **Staff Planning and Collaboration.** The Upper Tactical Network will provide tactical commanders and their staff with robust planning and collaboration tools to facilitate effective planning.
- c. **Core Applications and Services.** The project will provide a set of core applications and services within the Upper Tactical Network, which include basic tools required by commanders and their staff to plan and coordinate operations at the tactical level.
- d. **Baseline Software Suite.** The baseline software suite includes all back-end software, which are required by user facing command and control applications, including planning and collaboration tools, to effectively function. This includes operating system, comprehensive Battle Management System (BMS), wiki services, short messaging data, position location information (PLI), Email, chat, directory services, VOIP, Mapping and geomatics services, backup and disaster recovery, archiving, network monitoring and security, secure Video Teleconferencing (SVTC), file sharing, network exchange gateway, printing and scanning, client collaboration, and planning tools. This also includes critical network security software (i.e., cyber security).
- e. **Integration and Interoperability.** Effective integration with other specialist applications provided by other capital projects will be required to share critical command and control data, such as friendly force positional awareness (e.g., PLI) or enemy force positional awareness. Information provided by specialist applications will also need to be shared across to the command and control system (i.e., the battle management system). To facilitate this integration, the project must provide a system Application Programming Interface (API) that utilises a common and commercially available API protocol. Effective interoperability with coalition partners will be required. The project must adopt the relevant interoperability ABCANZ standards and the latest FMN Spiral capability. The system must also efficiently adopt the latest interoperability standards as they evolve over the life of the capability.

### 1.6.2 Lower Tactical Network

While the Upper Tactical Network will operate at the SECRET classification level in order to support operational level planning; for the Lower Tactical Network, which processes land

tactical information, the Canadian Army will look at adopting a lower classification level that is inline with the US Army and its primary European NATO allies.

Land tactical information is information that is needed to maintain situational awareness (SA) at the tactical level. The following three main components are required to maintain effective situational awareness: maps, real-time data, and mission-specific tools. The Tactical Command and Control Information System Modernization Project will not only modernize these three components within the Lower Tactical Network, but the project will also modernize the end user devices that will process and store the data and information from these three components. These end user devices will be operated by Canadian Army soldiers and will be comprised of ruggedized tablets or laptop computers used within Canadian Army combat vehicles, and smartphones or other similar end user devices used by dismounted soldiers. All capabilities provided by the Tactical Command and Control Information System Modernization project must be intuitive, simple to use, and easily supportable. Any software application being fielded for the Lower Tactical Network must also be “lightweight” and capable of effectively running on a variety of small end user devices, such as tablet computers and smartphones.

### **1.6.3 Training and Support**

The training element will seek to deliver modernized simplified training for users, both individually and collectively, on the use of the equipment and applications. It will leverage existing training infrastructures to support force generation and validation training requirements.

## **1.7 Overview of TacC2IS Mod Concept of Operations and Employment**

### **1.7.1 System Concept of Operations**

The capabilities provided by the Tactical Command and Control Information System Modernization project will allow brigade commanders and commanding officers to effectively command and control their forces while on operation. Moreover, these capabilities must be capable of supporting all operations contained in the spectrum of conflict. In the context of major combat operations against a peer adversary, the system must be mobile and enable adaptive dispersed operations. This implies that commanders and key staff must effectively and efficiently setup the Upper Tactical Network, be it wired or wireless, with support from embedded technical support staff to enable the services required of a brigade headquarters. The Upper Tactical Network must always remain operational, even when disconnected from its higher-level headquarters, or when connectivity with services that are hosted off site become unavailable for extended periods of time. Once connectivity is re-established, the system should seamlessly synchronize with minimal user intervention required.

In order to conduct proper and effective operational and tactical planning, all unit command post vehicles, including the vehicles of tactical commanders (i.e. brigade commanders) and selected key staff, must have the ability to leverage the Upper Tactical Network planning tools and services from within their vehicles, and remotely from outside their vehicles.

For the Lower Tactical Network capability, all soldiers that have access to an end-user device, either within their vehicles or in a dismounted role, will have access to land tactical information, which will provide them with enhanced situational awareness. To achieve effective situational awareness at the tactical level, the following three main components are required by the Tactical Command and Control Information System Modernization Project:

- Maps. Digital maps and knowing where you are located on a map.
- Real-Time Situational Awareness. Although maps normally do not change often, data such as your location on a map or the location of friendly forces will change frequently, particularly at the tactical level. Maintaining real-time situational awareness of your position and those of friendly forces on a map is important. Real-Time situational awareness can also come in the form of pictures or videos feeds. The Lower Tactical Network must enable video feeds from assets, such as Unmanned Aerial Vehicles or vehicle sensors, to be viewed on end user devices. Effective real-time communication is also critical in maintaining situational awareness. This is normally achieved through voice communication means but can also be done using text-based applications. Voice communications, using tactical radios, will be provided by the Tactical Communications Modernization Project, while text-based chat service will be provided by the Tactical Command and Control Information System Modernization Project.
- Mission-Specific Tools. Mission planning and execution tools such as measurement tools (range and bearing), route planning, simple drawing tools, and tools to enable collaboration are also important in improving overall situational awareness. The Tactical Command and Control Information System Modernization Project must provide for these mission-specific tools within the Lower Tactical Network.

These components, also referred to as the core applications and services, must always remain operational, even when fighting elements are disconnected for extended periods of time from their unit or formation. When connectivity is re-established, the system must automatically synchronize and refresh all tactical level information (i.e., data that is part of the core applications and services).

The Lower Tactical Network and Upper Tactical Network capabilities must also allow for the sharing of critical land tactical information between both networks. The Lower Tactical Network and Upper Tactical Network must also enable the effective integration of capabilities from specialist applications being provided by other projects such as the Joint Fires Modernization, Intelligence Surveillance and Reconnaissance Modernization, Ground Based Air Defence, etc. Not only must the Upper Tactical Network and Lower Tactical Network allow for the effective integration with these specialist applications, but they also must also be interoperable with systems being used by our FVEY and NATO allies. Because of these requirements, the project will seek to acquire Commercial Off the Shelf (COTS) and Military Off The Shelf (MOTS) solutions, which have been used and proven successful by coalition partners during coalition operations and major coalition exercises. The use of proven and reputable COTS/MOTS capabilities would also be more cost effective when compared to developing proprietary systems or capabilities. COTS/MOTS capabilities would also provide for increased integration with present and future specialist applications seeing that these capabilities tend to adopt the latest industry and commercial standards, allowing them to effectively evolve over time.

## **1.8 System Concept of Employment**

The CA, as the element responsible for conducting the land-based operations to accomplish mission objectives across the full spectrum of conflict, trains and operates at the brigade group level. The brigade group consists of approximately 4,800 soldiers, organized in eight major units generally including Artillery, Armour, Infantry, Engineer, and Combat Service Support organizations. During operations, these units are organized and operate together in “battle groups” to provide the Joint force with the requisite firepower, mobility, protection, sustainment,

and command and control functions to effectively coordinate their employment.<sup>3</sup> CA almost always operates with other elements (i.e. Navy, Air Force), in joint operations or with allies and coalition partners (NATO<sup>4</sup>, NORAD<sup>5</sup>, FVEY<sup>6</sup>, 'Coalitions of the willing', etc.), all of whom bring multiple assets, such as fighter planes, remotely piloted aerial systems, and ships, which produce effects that influence the land battle. This trend is confirmed in *Close Engagement: Land Power in an Age of Uncertainty*. *Close Engagement* is the capstone operating concept for the Canadian Army of tomorrow. This concept governs the way the Canadian Army will be developed to meet the challenges of the future. All forces deployed by Canada will be joint forces, so this concept will nest within and inform the emerging Canadian Armed Forces joint operating concept.<sup>7</sup>

Because of this, one of the key goals of the Tactical Command and Control Information System Modernization project will be to enhance interoperability with our allies and joint partners. Moreover, the services that the project will provide will ensure that the Canadian Army has the information it needs to make effective and timely command and control decisions and, inter alia, operational commanders will now be able to command their forces digitally using the latest specialist tools all integrated within a modernized Land Command Support System. To this end, the Tactical Command and Control Information System Modernization project will provide a set of common interfaces, using open standards, to better enable the integration of specialist applications into the Integrated Tactical Network, i.e., the Upper Tactical Network and Lower Tactical Network.

The CA structure will continue to be based on a deployable formation consisting of a Brigade Group, reporting to a Divisional or Joint Deployable Headquarters, that will be a mobile, protected headquarters with the ability to expand, and will act as the central Canadian Army command, control, and coordination element. It will command up to four manoeuvre units, with integral combat support and combat service support capabilities, and will coordinate aviation assets. As such, it will employ higher level and joint assets.

Whereas the information exchange requirements at the Brigade Group and Divisional Headquarters will reside primarily within the Upper Tactical Network (UTN), the information exchange requirements for tactically operating mounted and dismounted elements will primarily take place within the Lower Tactical Network (LTN). The UTN will require a high bandwidth local area network to support collaboration and sharing of big data exchanges amongst commanders, advisors, staff, and coordination centers working with the headquarters. Although communication by voice will be the primary means of communication for dismounted and mounted elements operation within the LTN, there is still a requirement for data exchange at the LTN. The Joint Command, Control, Communication Computer, Intelligence, Surveillance and Reconnaissance (Joint C4ISR) Network View in Figure 4 illustrates this relationship.

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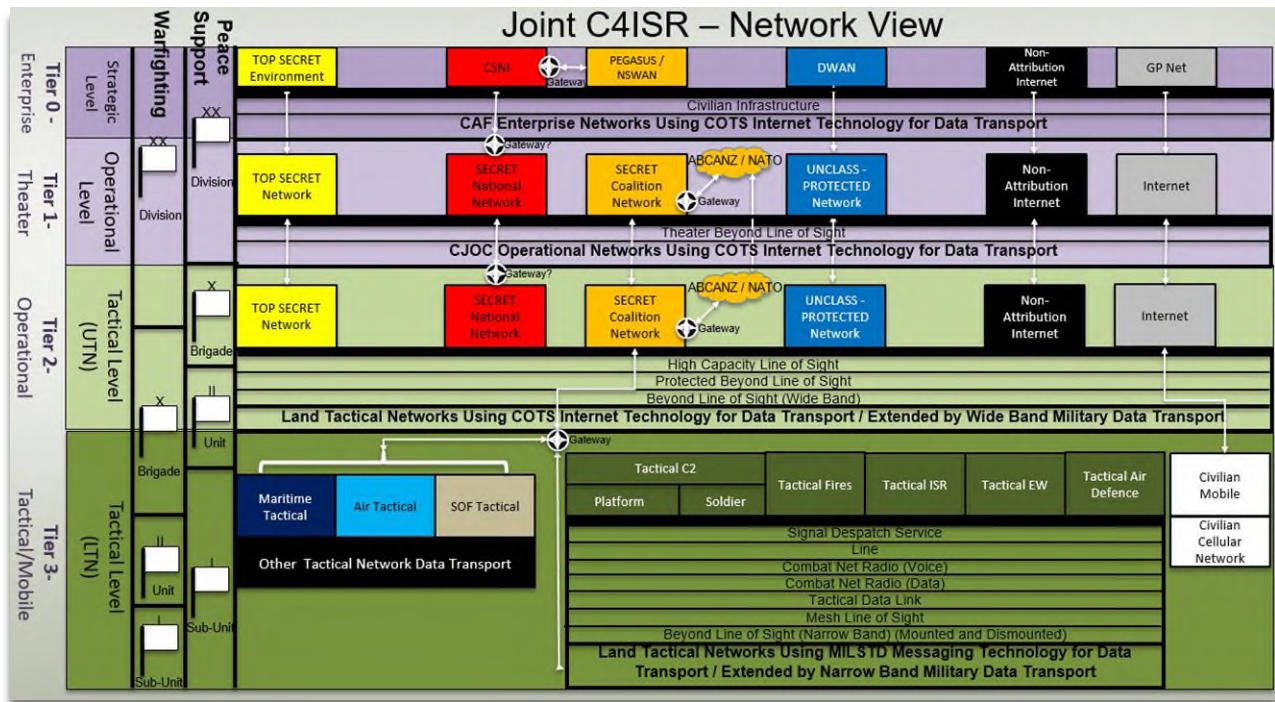
<sup>3</sup> SSE - Canadian Defence Policy, 2017, p. 36.

<sup>4</sup> North Atlantic Treaty Organization

<sup>5</sup> North American Aerospace Defense Command

<sup>6</sup> America, Britain, Canada, Australia, New Zealand

<sup>7</sup> *Close Engagement: Land Power in an Age of Uncertainty*, 2017 pp. 2-3.

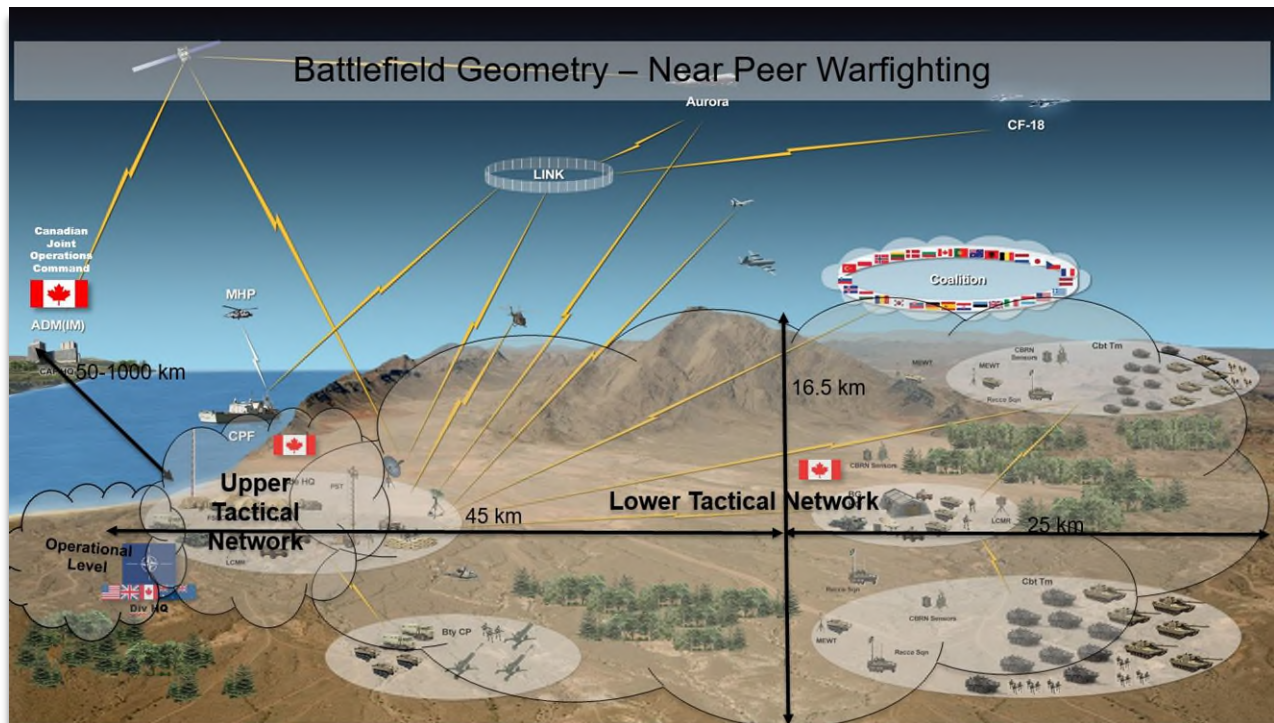


**FIGURE 4 – JOINT C4ISR NETWORK VIEW**

#### 1.8.1 Concept of Operations/Employment – Warfighting

In a Warfighting scenario, the Brigade Group is considered a tactical organization with the need to process operational information for deliberate planning. As such, the Upper/Lower Tactical Network demarcation will occur at the Brigade Headquarters. Figure 5 below illustrates this scenario. In a Warfighting scenario, the key capabilities and concerns are focused primarily on the Lower Tactical Network, where survivability and mobility of TacC2IS capabilities are important. Because the Brigade is most likely to exist within an international construct, interoperability is required at all levels (i.e. UTN and LTN). Rapid digitalization of the systems will provide the ability to automate information exchange, such as position location information, to allow for timely and accurate situational awareness and enable force multipliers, like digital fires, to increase the Brigade lethality.



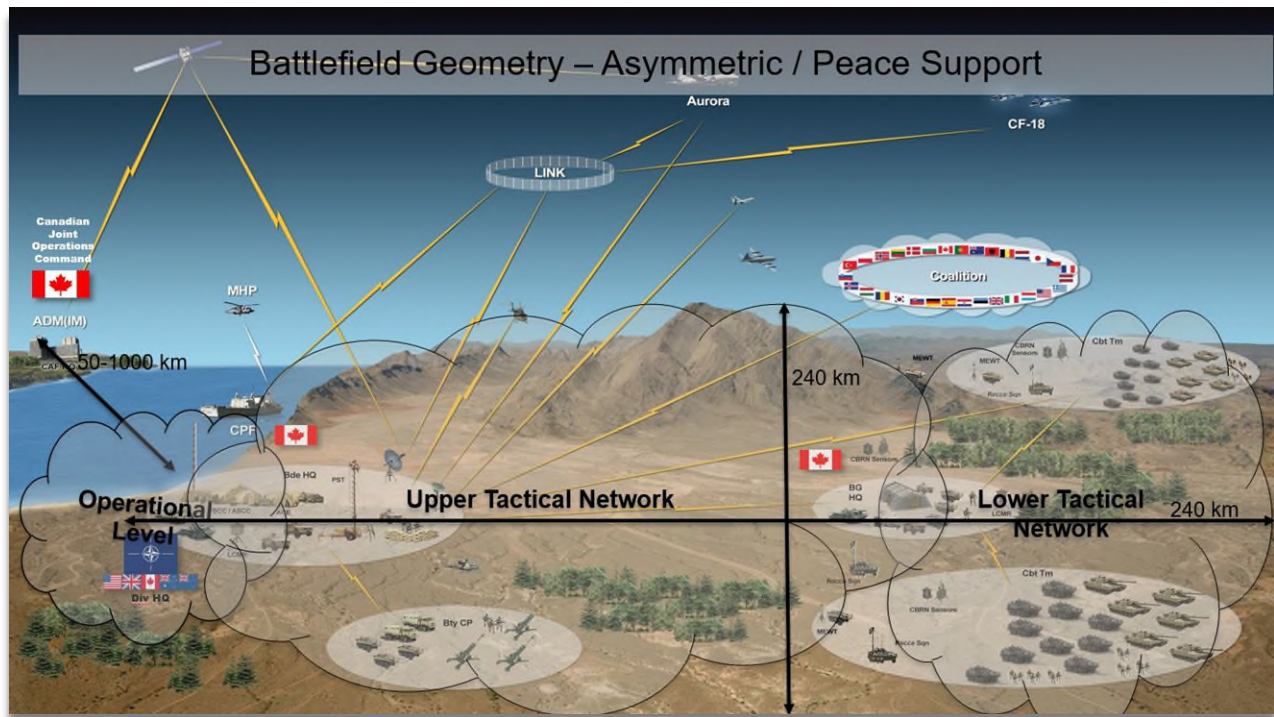


**FIGURE 5 – WARFIGHTING SCENARIO**

### 1.8.2 Concept of Operations/Employment – Peace Support/Asymmetric Operations

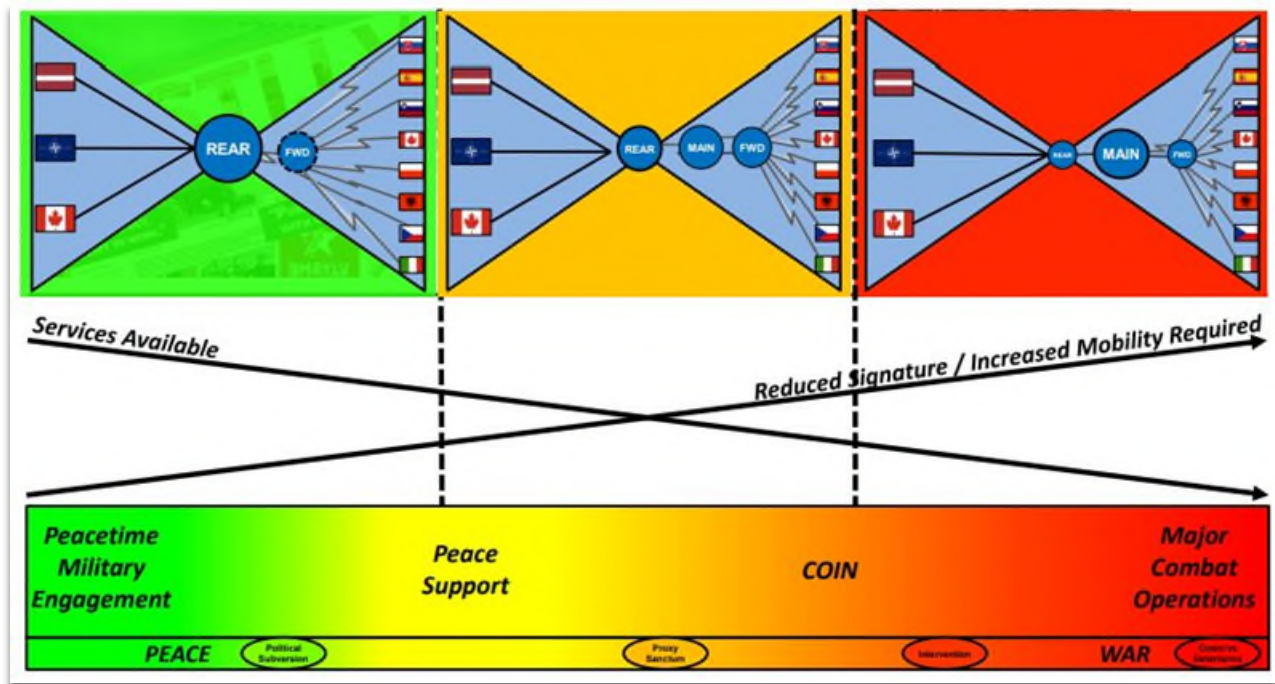
In a Peace Support/Asymmetric Operational scenario, the Brigade HQ would reside exclusively at the operational level and operate on the Upper Tactical Network. The Upper Tactical Network/ Lower Tactical Network demarcation occurs at the Battle Group/Unit level. Figure 6 below illustrates this scenario. There is an increased requirement for a command and control system to support sharing and collaborative big data exchanges at the Upper Tactical Network. Interoperability, particularly at the Upper Tactical Network, and rapid digitalization are still required.





**FIGURE 6 – PEACE SUPPORT – ASYMMETRIC SCENARIO**

The focus in Warfighting / major combat operations with a peer to peer, or near peer to peer adversary, would be placed primarily on the LTN. Forces would need to be highly mobile and resilient, with voice communications being the primary means of communication with a lesser requirement placed on data exchange. Within this context, the Battle Group HQ and Command Post (CP) elements (Battle Group rear, main, and forward), would be operating primarily within the LTN. In contrast, a peace-support operation requires more robust data communications, with Brigade HQ elements, including Battle Group rear CPs, operating primarily within the UTN and being more static to enable the higher bandwidth network requirements. Figure 7 below shows the relationship between the mobility requirements and subsequent data requirements for each type of operation that the CA could be called upon to operate in.



**FIGURE 7 – SPECTRUM OF CONFLICT - OPERATIONAL DATA AND VOICE VS MOBILITY RELATIONSHIP**

In summary, the TacC2IS Mod project will provide the CA with flexible and scalable command and control capabilities capable of effectively supporting all operations within the spectrum of conflict. A fully integrated digitalized TacC2IS will provide the CA with the ability to distribute and share critical information more rapidly. Enabling Commanders to make quicker and more effective decisions.