



Information Brief
**Integrated High Frequency Radio
Systems Project
AFCEA HFIA**

27 January 2011

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DICCR 4
IHFRSP Project Director**



IHFRSP Options Analysis Preview – January 2011

**DRAFT – FOR DISCUSSION
PURPOSES ONLY**





Why a Strategic HF System?

1. Guaranteed Sovereignty

- **By 2015 it is predicted that the Protected Military Satellite Communications Project will finally be operational but that only a small amount of terminals will have been delivered and be operational. Of those terminals, the availability of the system, especially domestically, will be limited. MERCURY GLOBAL is predicted to deliver high bandwidth space based communications to the CF by 2016. This system is based on the US WGS constellation of satellites, owned and operated by the US DoD and is likely to be denied to the CF in a crisis situation. There is a wide range of commercial SATCOM services being deployed in the CF to support operations, both domestically and worldwide. None of these systems are controlled or governed by either the CF or the Government of Canada and are likely to be pre-empted or denied if the vendors so choose, for whatever reasons they provide.**



Why a Strategic HF System?

2. The Threat is Real

- **Consider that North Korea has detonated a nuclear weapon underground and is testing missiles that could someday carry nuclear warheads. Iran says their nuclear ambitions are for peaceful energy purposes, but they resist inspections to verify their claims. The electro-magnetic pulse from a nuclear warhead aboard a missile could disable all our space based services along with those of our allies. China disavowed its air force commander Xu Qiliang's statement last fall that called the militarization of space a "historical inevitability." Yet, China has recently demonstrated a proven anti-satellite capability. Aside from a direct threat from a nation-state, on orbit technology faces threats from debris and out-of-control satellites like the defunct Russian satellite that smashed into and destroyed an Iridium satellite in February 2009.**



Why a Strategic HF System?

3. To Command and Control

- **IHFRSP is pivotal in supporting CF operational and tactical level Command and Control (C2) functions. By virtue of the ability to exchange information quickly and efficiently between participating units, IHFRSP and the inherent Tactical Datalink's coupled with IRC chat, provide the CF and it's subordinate C2 agencies with real and near real-time (RT/NRT) data on battle space information. This data necessarily includes the precise location of land, maritime and air platforms - friendly or otherwise - which can be extrapolated to compile a tactical or Common Operating Picture (COP), along with information on weapons control and engagement status, intelligence, Electronic Warfare (EW) and C2 directives.**



Why a Strategic HF System?





Why a Strategic HF System?





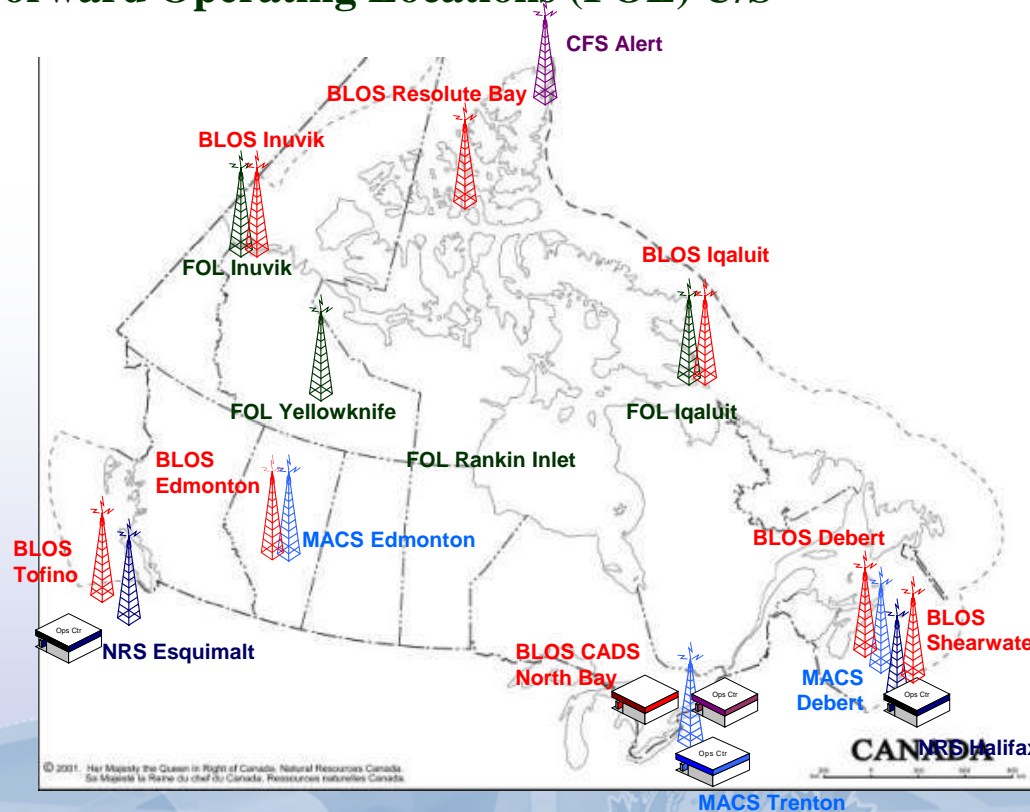
Current Work

- **To revise the project approach to developing the capability**
 - **Initial approach was to revitalise, integrate, modernise and upgrade the current 30-40 yr old systems**
 - **Revised recommended approach is to rationalise and reuse based on rationalisation studies but to generally take a broad based Green Field approach.**
 - **Greenfield approach is to build new sites with entirely new infrastructure and equipment, potentially over top of the old establishments.**
 - **Approach is also based on service provision of a 2020 requirement**



The Genesis of the IHFRS Project

- **Military Aeronautical Communications System (MACS)**
- **Naval Radio Stations (NRS)**
- **Canadian Air Defence Sector (CADS) Beyond Line Of Sight (BLOS) Sites**
- **Canadian Forces Information Operations Group (CFIOG) Site(s)**
- **NORAD Forward Operating Locations (FOL) U/S**



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Statement of Deficiency

- **Significant components of existing systems obsolete or beyond economic repair. Cannibalization possibilities ending.**
 - \$5M per year to maintain
- **Existing stovepipe systems exacerbate O&M costs in procurement, trg, maint and operation**
 - Structures and Infrastructure significantly degraded/in need of modernisation
 - Ref: BN for DGIMT dated 30 Nov 2010 – Critical Status of DND's HF Strategic Systems
- **Inability to take advantage of technological improvements in automatic link establishment, throughput, voice quality, remote operation/control and NETCENTRIC operations.**
- **Inadequate coverage in North**



3 Conceptual Approaches

- Maintain

- Integrate, Upgrade and Modernise
- This approach attempts to satisfy the approved SS (ID).
- **\$70M** is the funding level from the SCIP and the approved plan.
- **\$500M** is the best estimate of the actual cost of achieving the system as described in the SS (ID)

- Greenfield

- Delivers current services
- Delivers future services
- Allows for significant technological advances
- Decentralised, fully redundant data path
- **\$100 - 300M**



Work Plan

- ✓ **Continue Research, Development and Analysis of Concept (2011)**
 - ✓ NATO BLOS WG
 - ✓ HFIA
 - ✓ JTF(N) NCCIS WG
 - ✓ TRIDENT WARRIOR/SPAWARS HFIP Development Work
 - ✓ CRC and DRDC Concept Work and Analysis
 - ✓ Spectrum Management Initiatives (DIMTPS 5)
- ✓ **Build Staff (2011)**
 - ✓ This is a significant issue. Without more staff, the project will not move.
- ✓ **Senior Level Socialisation (C4ISR OC and DCB)**
- ✓ **Develop and Approve Revised SS (ID)**
- ✓ **Develop CONOP (MAR 2011)**
 - ✓ Draft exists now
- ✓ **Develop SOR (Fall 2011)**
- ✓ **Industry Day (Fall 2011)**
 - ✓ Focus is on RFI for costing analysis
- ✓ **Preliminary Project Approval – June 2012**



Break - Questions





Current Work, Development and Analysis

OR

Where I see Industry contributing to IHFRSP





Why Networked?

- **Metcalfe's Law:**
 - **The cost of deploying a network increases linearly with the number of nodes in a network, but the potential *value of a network increases (scales) as a function of the square of the number of nodes that are connected by the network.***





Wideband HF Radios

- **Rockwell Collins and Harris are working together to create wideband HF waveform standards**
- **New appendices have been drafted for MIL-STD-188-110C (Appendix X)**
- **Bandwidths in 3 kHz increments up to 24 kHz**
 - 12 kHz ~ 64 kbps
 - 24 kHz ~ 120 kbps
- **Rockwell Collins has invited AUSCANNZUKUS and SPAWAR Systems Center Pacific to conduct HF IP tests over their prototype wideband waveforms**



Wideband High Frequency Internet Protocol Testing





Cognitive
Automatic
Link
Establishment





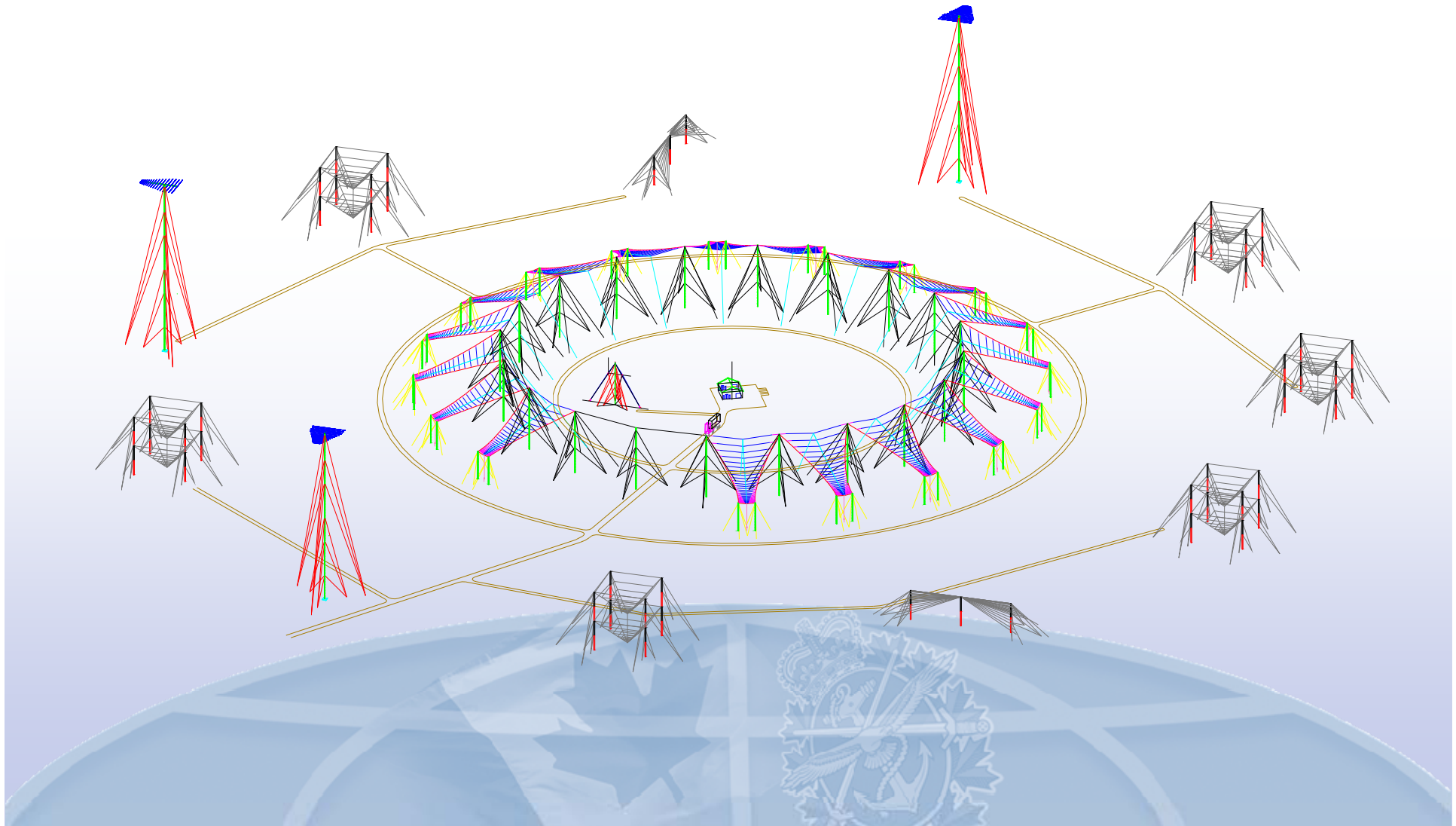
Software Defined Radios

“The virtue of software-programmable radios in this setting is that new types of signals can be downloaded as they are developed, continuously improving system versatility and performance. The baseline version will be able to communicate with legacy ground radios, satellites and a new network from day one, and the intrinsic flexibility of the system will permit other features to be added as they become available. That means the CF won't have to buy a lot of new hardware to keep up with technological breakthroughs, and it also won't have to get rid of serviceable radios it previously purchased, because SDR uses agile software to keep the whole network connected even in the midst of combat. It's really quite an achievement, and it is available for fielding today.”





Advanced Antenna Design





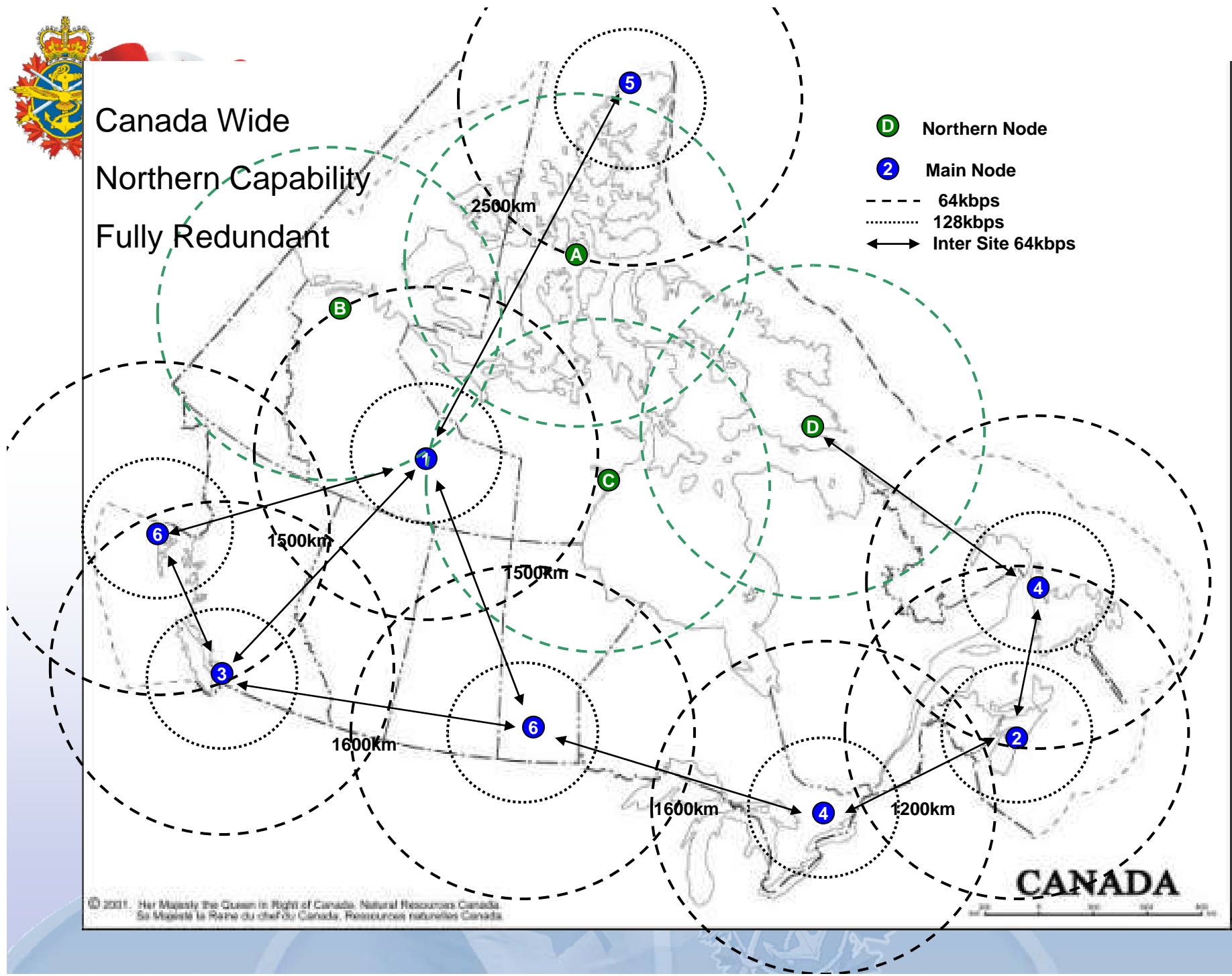
Proposed Options - Concepts





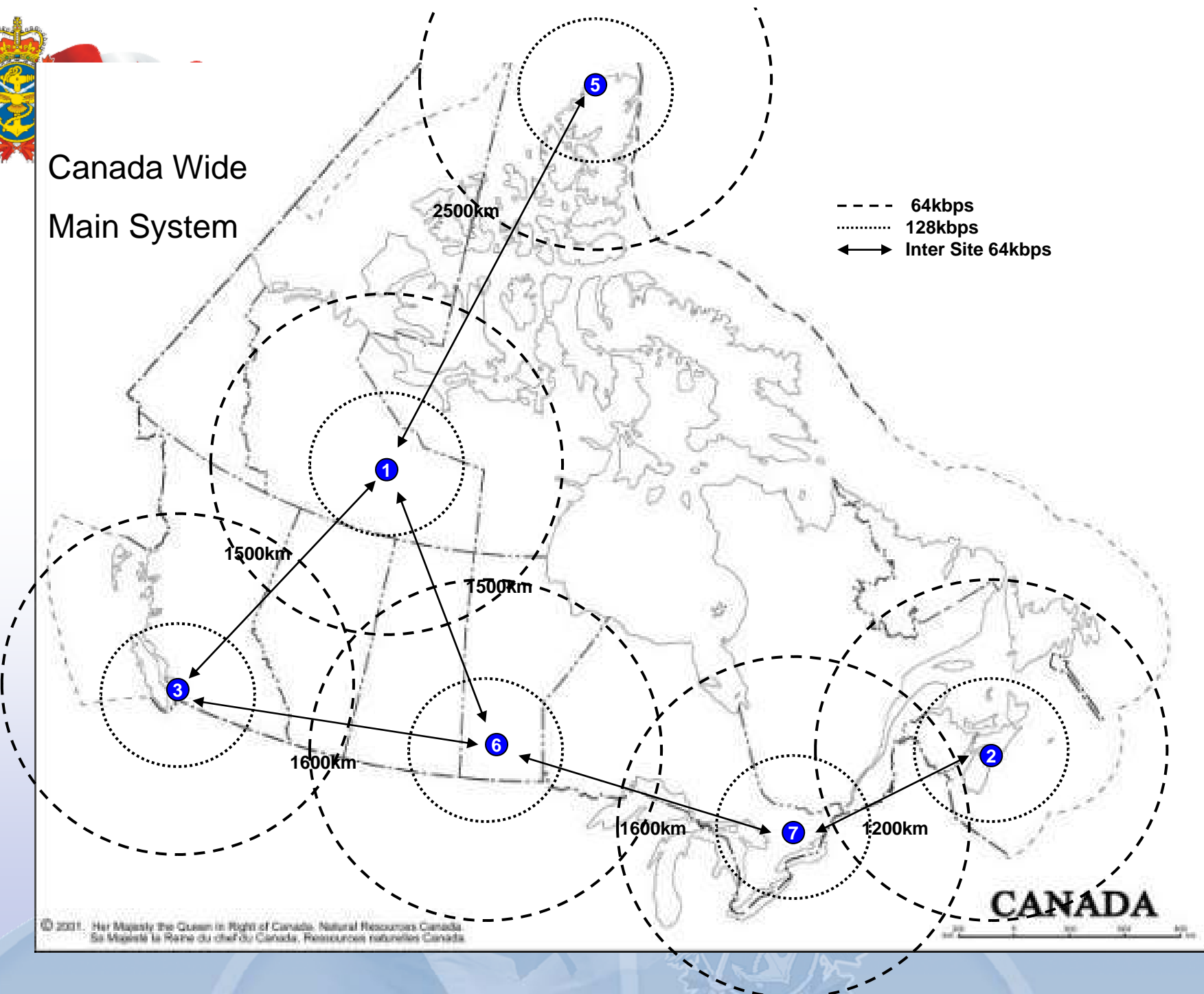
Canada Wide
Northern Capability
Fully Redundant

- D** Northern Node
- 2** Main Node
- - - 64kbps
- 128kbps
- ↔ Inter Site 64kbps



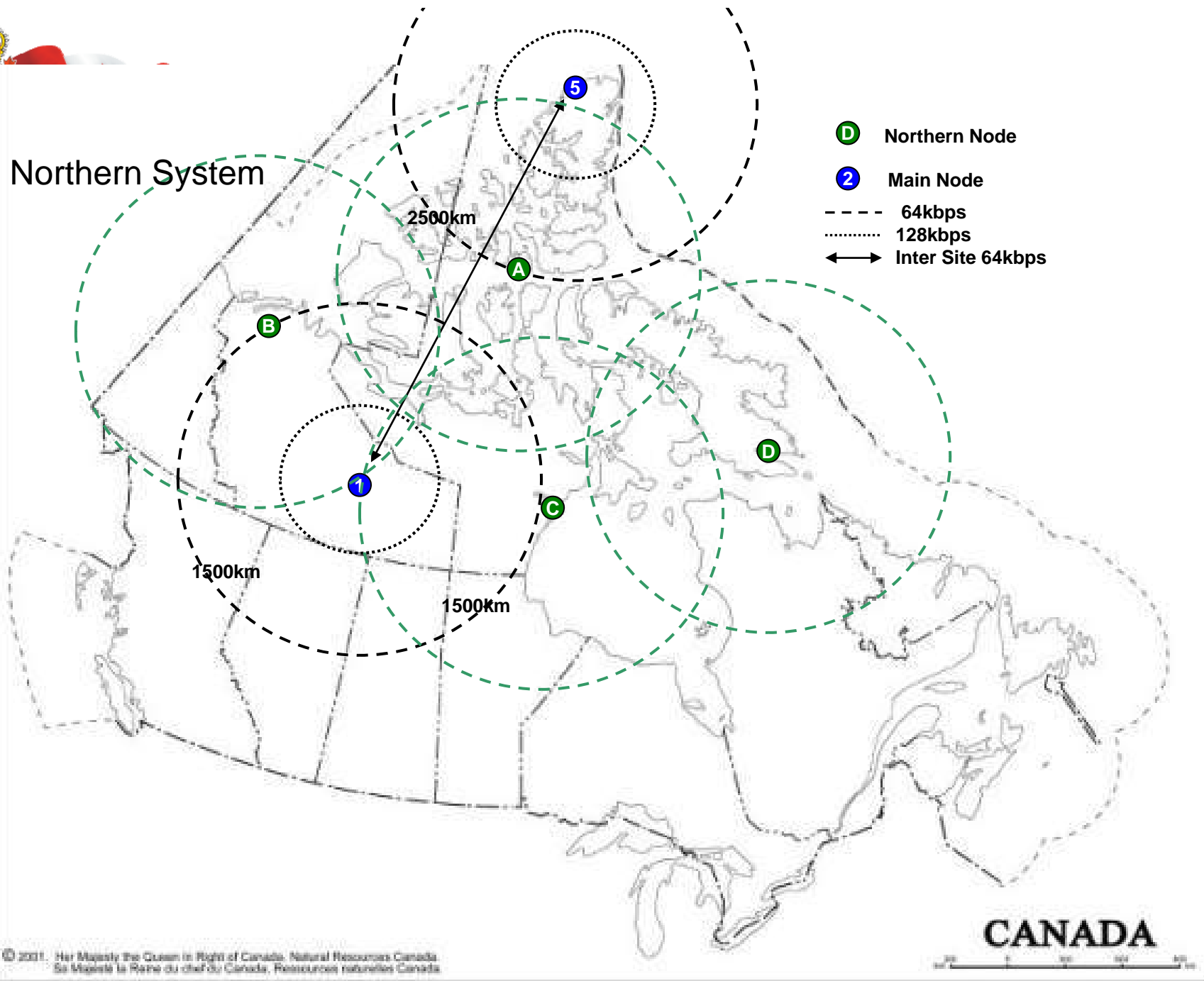


Canada Wide Main System





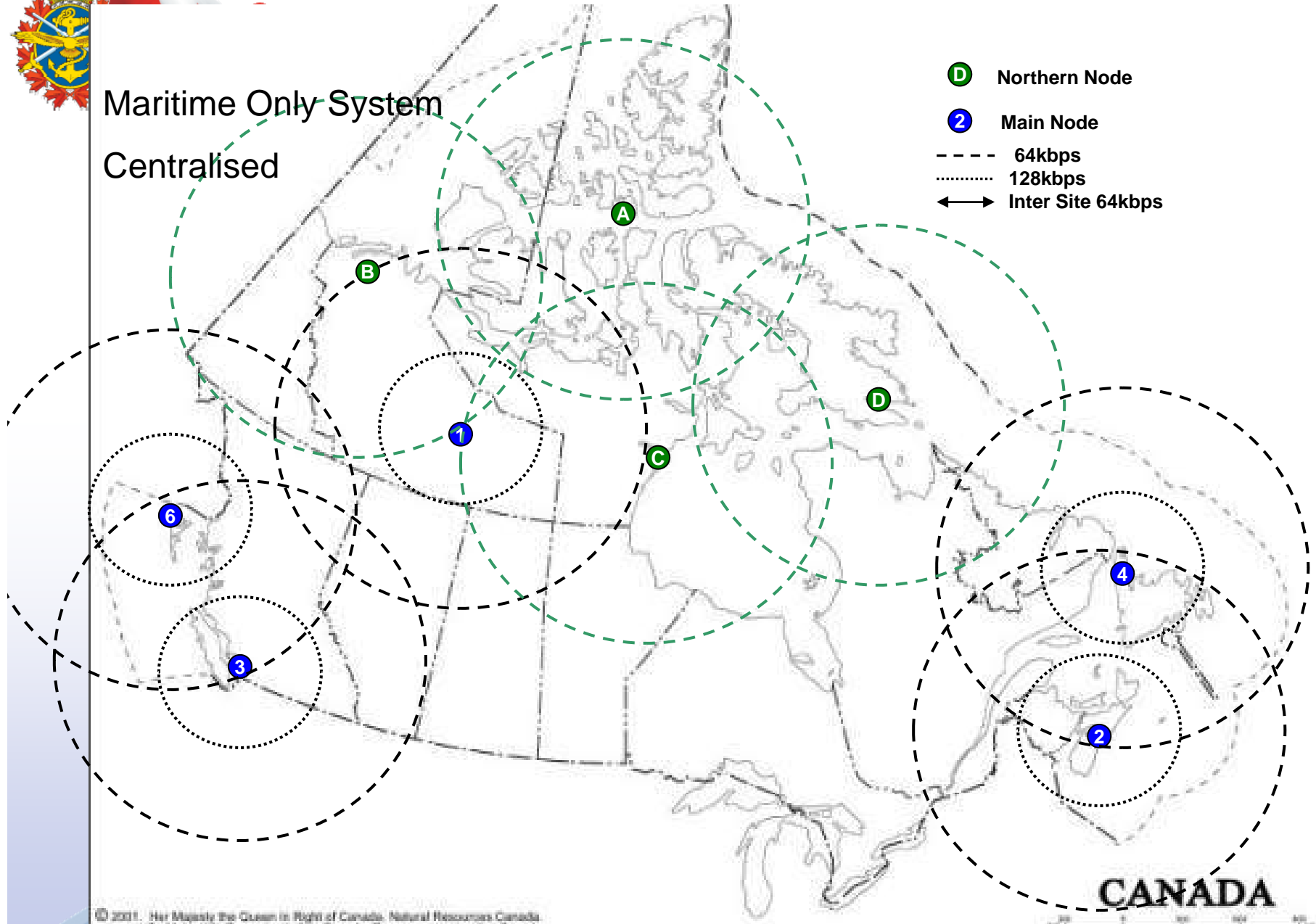
Northern System





Maritime Only System Centralised

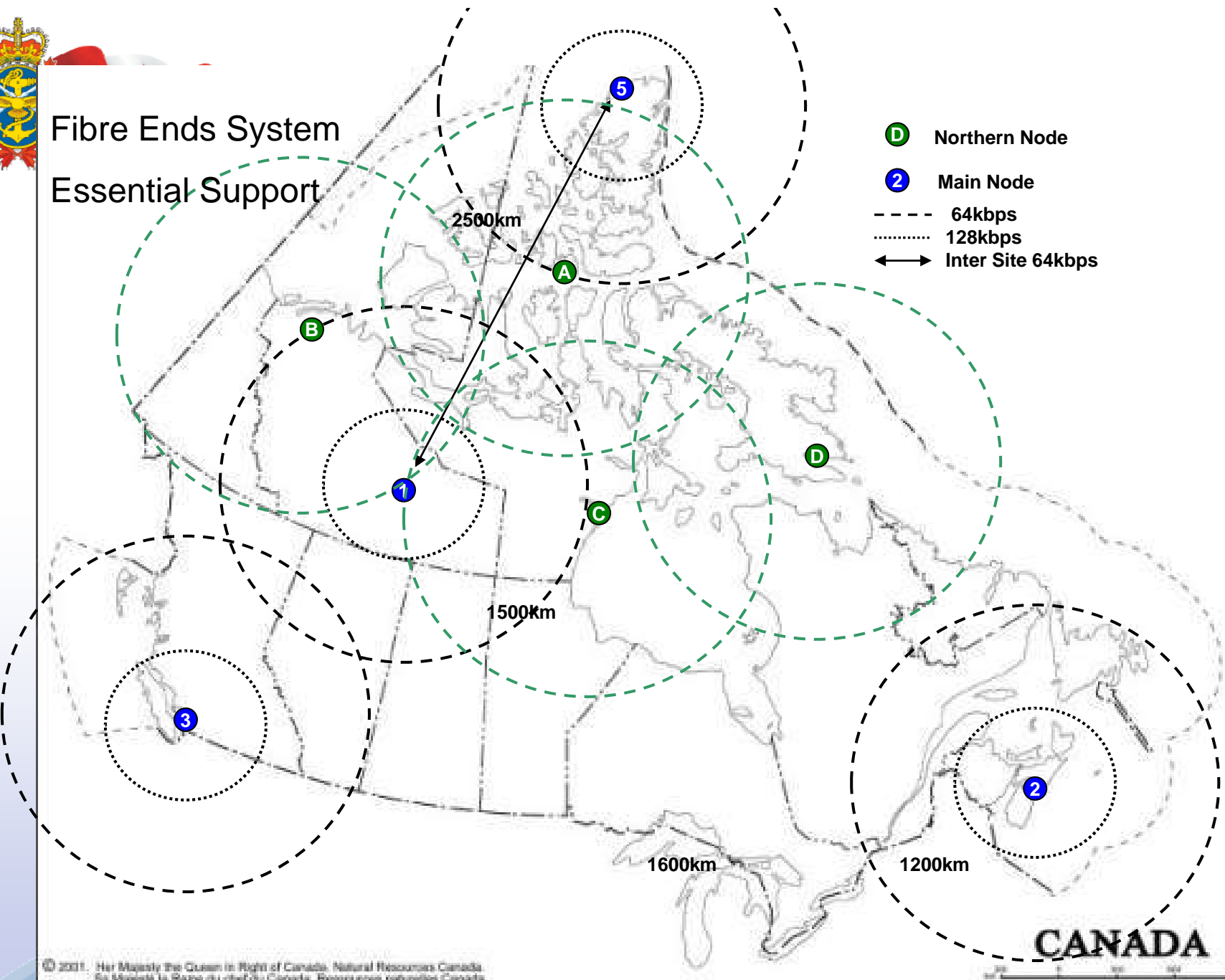
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CANADA



Fibre Ends System Essential Support





Questions

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