



**To: Manager, Mobile Technology and Services, DGEPS
Industry Canada
300 Slater Street,
Ottawa, Ontario K1A 0C8
Spectrum.Engineering@ic.gc.ca**

**From: Acting Chief Technology Officer
Royal Canadian Mounted Police
1200 Vanier Parkway, CIO Building
Ottawa, Ontario K1A 0R2**

February 28, 2011

**Royal Canadian Mounted Police Comments on Canada Gazette Notice SMSE-018-10:
Consultation on a Policy and Technical Framework for the 700 MHz Band
and Aspects Related to Commercial Mobile Spectrum**

The Royal Canadian Mounted Police is pleased to provide comments on the above consultation. We thank the Department for addressing these important needs in a timely manner.

The RCMP firmly believes that Canada should provide leadership in allocating sufficient contiguous spectrum to accommodate public safety broadband requirements. Ideally, Canada should match its public safety 700 MHz band plan with the United States revisions however the U.S. may not allocate 10 + 10 MHz in the near future limiting public safety options. Therefore, the RCMP recommends to Industry Canada that 10 + 10 MHz of broadband spectrum be set aside for the exclusive use of public safety immediately.

Because of the unique opportunity afforded us, the RCMP has and continues to participate with other public safety partners and with Public Safety Canada for this consultation.

The 700 MHz band is important for the future of public safety mobile communications systems. It will allow for the development of public safety specific solutions and will provide common spectrum/harmonized rules for enhanced interoperability between Canadian and United States agencies.

The RCMP as other public safety partners relies heavily on modern communication technologies to maintain officer and public safety. In fact, the RCMP pursues greater functionality in the mobile environment to support its many levels of policing functions. We strongly believe that this allocation of broadband spectrum will be a key enabler to help shape public safety communications for a very long time.

We request your consideration to make these future initiatives a reality.

Additional comments are provided in the attached document.

Sincerely,
Paul Boudreau,
Acting Chief Technology Officer

**Royal Canadian Mounted Police Comments to
Canada Gazette Notice SMSE-018-10:****Consultation on a Policy and Technical Framework for the 700 MHz Band and Aspects
Related to Commercial Mobile Spectrum****Executive Summary**

- 1.1 The Royal Canadian Mounted Police is the Canadian national police service and an agency of the Ministry of Public Safety Canada.
- 1.2 The RCMP is unique in the world since it is a national, federal, provincial, territorial and municipal policing body. We provide federal policing service to all Canadians and policing services under contract to the three territories, eight provinces (except Ontario and Quebec), more than 190 municipalities, 184 Aboriginal communities and three international airports.
- 1.3 As a large organization encompassing many areas across Canada, the RCMP must interact with public safety partners for law enforcement, national security and emergency relief purposes. A national mobile broadband and interoperable network or a “network of networks” is an essential modern tool for our organization to deliver its mandate in partnership with other Federal Departments and public safety agencies.

The main points of the RCMP comments on the 700 MHz Broadband Consultation are summarized below and addressed in more detail subsequently in the rest of the document.

- 1.4 The RCMP fully supports the recommendations on this Consultation from the Department of Public Safety Canada and from their Tri-Service Interoperability Committee members (Canadian Association of Chiefs of Police, Canadian Association of Fire Chiefs and Emergency Medical Services Chiefs of Canada).

- 1.5 The RCMP requests the Department to set aside 10 + 10 MHz of broadband spectrum for the exclusive use of public safety in Canada.
- 1.6 Public safety agencies must not be competing with consumers for access to broadband services; they require dedicated spectrum and network facilities of their own.
- 1.7 No flexible reuse of current public safety 700 MHz narrowband spectrum should be allowed for broadband purposes at this time, either for public safety as a substitute to separate 700 MHz PS BB spectrum or to introduce a new band plan structure such as the Asia-Pacific Telecommunity – the APT plan.
- 1.8 The Department must reassert quickly that the 700 MHz public safety narrowband spectrum is available and that narrowband infrastructure initiatives may proceed without undue delays.
- 1.9 The RCMP agrees that it is important to harmonize with the United States on a public safety band plan and on equipment specifications as much as possible, enabling economies of scale and greater equipment availability and interoperability.
- 1.10 Once broadband spectrum is allocated to public safety groups in Canada, they must identify and adopt sets of technical and business rules to permit the deployment of interoperable broadband networks nationally and with the United States.
- 1.11 We request the Department to continue to work diligently with Public Safety Canada and the main first responder associations in order to develop a framework conducive in meeting the above goals. The Department should

initiate another consultation on these specific public safety rules as soon as possible.

- 1.12 Another important issue with broadband network deployment is backhaul linking methodology. Spectrum availability may become a limiting factor for viable technical and financially affordable solutions, in particular in rural areas. We suggest that the Department incorporates considerations for these future needs in the separate spectrum bands reserved for the fixed service.

The RCMP is pleased to provide comments on the 700 MHz Consultation Paper for areas of concern to our mission. These comments may also be a reflection of the responses and surveys that were prepared by other organizations such as: Public Safety Canada, Radio Advisory Board of Canada and Canadian Advanced Technology Alliance.

5.1 700 MHz Band Plan Architecture for Commercial Mobile Systems

Industry Canada

In considering the band plan architecture to be implemented in Canada, the Department is proposing four options for consideration:

- **Option 1:** Harmonize with the U.S. band plan;
- **Option 2a:** U.S. band plan with slight adjustments – with 8 and 10 MHz channel blocks in the Lower 700 MHz;
- **Option 2b:** U.S. band plan with slight adjustments – with a mix of 3 and 5 MHz channel blocks in the Lower 700 MHz;
- **Option 3:** Harmonize with the APT band plan.

Q 5-1. Based on the criteria listed above, which of the four band plan options should be adopted in Canada? Why is this option preferred over the other options?

If Option 3 (APT band plan) is selected, what should the block sizes be?

In providing your responses, include supporting arguments, including potential benefits to wireless subscribers.

5.1.1 The RCMP supports the adoption of Option 1 as a preferred band plan for the public safety in Canada. The Option 1 has many advantages. As a band plan harmonized with the United States, it will bring market availability of common and compatible equipment to the public safety.

5.1.2 The RCMP does not support Option 3; the Asia-Pacific Telecommunity (APT) band plan. The APT band plan overlaps the current Canadian public safety designated 700 MHz spectrum for narrowband use. The adoption of this plan would result in major setback to the public safety users in Canada and it would disrupt efforts to establish modern voice and data systems for years to come. It would stall shared public safety infrastructure initiatives underway, for example in the Alberta and in the Maritimes Provinces. Lastly, it would affect seriously interoperability with U.S. partners and would complicate interference coordination at the border as the APT plan duplexing direction is reversed to the current FCC 700 MHz plan.

Q 5-2. The band plans presented in the options above include guardbands. Should the Department auction the guardbands, or should these frequencies be held in reserve for future use such that they are technically compatible with services in the adjacent bands?

Also comment on any related aspects not addressed above or other possible options, including combinations of options.

- 5.2.1 Guardbands were identified in the SRSP 511 to protect the current 700 MHz public safety narrowband and future broadband communications from the commercial broadband networks. The blocks, 768-769, 775-776 and 798-799 MHz should be retained for that purpose.
- 5.2.2 The block 805-806 MHz was identified as a transition between new PS 700 MHz narrowband and current 800 MHz narrowband systems by other incumbents. It is intended for low power simplex use and should be retained as such.
- 5.2.3 Other guardbands are required between the public safety and commercial broadband systems, i.e. 757-758 and 787-788 MHz for 10+10 MHz PS allocated broadband spectrum. Should the Department allocate only 5+5 MHz spectrum to PS, then the 1 MHz guardbands will be required at 762-763 and 792-793 MHz to protect the PS broadband systems.
- 5.2.3 Important coverage and throughput degradations can occur due to the near-far effects between broadband radio systems when they operate on adjacent spectrum channels in the same geographic area with no protection. A Motorola study¹ indicates that for the above scenario, a throughput loss of 55% (or an equivalent coverage loss of 22%) could be experienced by public safety users in the cases where towers are not co-located, are at different heights and that cell sizes are different than a commercial entity. These conditions would be more likely to happen as public safety and commercial carriers' networks would have different deployment targets and constraints.
- 5.2.4 Because of this potential for important degradation of the public safety network performance, guardbands should be held in reserve and not auctioned.

5.2 Options for use of 758-768 MHz Paired with 788-798 MHz for Public Safety and/or Commercial Systems

**Q 5-3. Do public safety agencies need spectrum for broadband applications? If so:
(a) How much and for which type of applications?**

- 5.3.1 (a) The RCMP believes that additional spectrum will permit the deployment and use of more data intensive applications. Current RCMP applications of mobile data are limited to standard CAD and RMS functions (electronic dispatching, database queries). As part of the RCMP mandate of

¹ Presentation filed as public record in Ex Parte by Motorola on April 12, 2010 on WT Docket 06-150 and PS Docket 06-229 <http://fjallfoss.fcc.gov/ecfs/document/view?id=7020408742>

“Safe Homes and Safe Communities”, there is an increasing demand to make a police vehicle an office providing access to corporate email, Intranet and other applications. There will also be a need for incident live video feeds, scanning video, automotive telemetry, facial/fingerprint recognition, license plate recognition and still image transfers to name only a few. These future applications are expected to be bandwidth intensive.

5.3.2 (a) The only way that this can be achieved reliably in a mission critical environment is with a public safety-owned spectrum and a dedicated system under its control. Otherwise public safety is at the mercy of the commercial providers to ensure that enough bandwidth is allocated and that Quality of Service instituted is sufficient for public safety requirements.

5.3.3 (a) RCMP continues to pursue greater functionality in the mobile environment to support its many levels of policing functions.

5.3.4 (a) Mission-critical voice requirements will continue to be provided by separate land mobile radio networks as new broadband technologies such as LTE – Long Term Evolution has not proven that it can provide the same level of availability, reliability and Quality of Service for mission-critical voice and functionalities essential to public safety operations (peer-to-peer and peer-to-many peers communications without the use of a cell site for example). Nor can they provide the integrity and confidentiality suitable for ever increasing security concerns in a public safety system.

5.3.5 (a) Studies in Canada, United States and across the world have projected that the demand for mobile broadband spectrum will grow several folds in the next 5 years². In particular, it states that “The sum of all forms of video (TV, video on demand, Internet, and P2P) will continue to exceed 91 percent of global consumer traffic by 2014. Internet video alone will account for 57 percent of all consumer Internet traffic in 2014.”

5.3.6 (a) Public safety requirements have also been studied extensively and show a similar trend for the increasing need to access data and video during all emergency incidents.^{3 4 5 6}. Public safety agencies, their associations and the industry supporting their needs, all advocate that a minimum of 20 MHz of mobile broadband spectrum will be required. The RCMP fully

² Cisco Visual Networking Index: Forecast and Methodology, 2009–2014

³ CSS Technical Assessment of Public Safety 700 MHz Spectrum Requirement for Broadband Mobile Data Communications (see attached Summary) February 2011

⁴ NPSTC Public Safety 700MHz Broadband Statement of Requirements, Version 0.6, November 8th, 2007

⁵ Motorola Public Safety Capacity Requirements Analysis Study, April 9th, 2010
<http://fjallfoss.fcc.gov/ecfs/document/view?id=7020408742>

⁶ NYC White Paper to the FCC, 700 MHz Broadband Public Safety Applications And Spectrum Requirements, February 2010

subscribes to this request. Sufficient contiguous spectrum at 700 MHz will be the foundation of future public safety mobile broadband solutions in Canada. It is critical that the Department allocates 10+10 MHz of broadband spectrum in 700 MHz to public safety at the outset in Canada.

- 5.3.7 (a) The Centre for Security Science on behalf of national public safety stakeholders and Public Safety Canada has undertaken a technical study of the bandwidth requirements for the public safety community. The results of the study showed that in three different predictable events, the need for bandwidth exceeded the 10+10 MHz allocation being considered in the first 10 years. After that period, it is expected that the LTE technology spectral efficiency will improve but not sufficiently to lower the needs below a 10+10 MHz bandwidth.
- 5.3.8 (a) In the above study, the data demand was established and validated in a survey that involved public safety stakeholders across Canada. The data demand was translated into bandwidth requirements using the capacity of the LTE Release 8. This technology is expected to be a likely candidate for Canadian public safety agencies. LTE has been adopted by the public safety agencies in the U.S. and mandated by the FCC⁷. This now becomes the common air interoperability standard for their future mobile broadband public safety networks.
- 5.3.9 (a) The CSS study concludes that in order to manage demands that could exceed a full 10+10 MHz broadband allocation, “the public safety community should develop policies and procedures, and make use of appropriate bandwidth management technology in order to avoid congestion-related issues during emergency situations.”

**5-3. Do public safety agencies need spectrum for broadband applications? If so:
(b) What are the anticipated deployment plans and the possible constraints, if any, in implementing these plans?**

- 5.3.10 (b) The implementation of LMR systems by the RCMP to support its provincial policing functions (also known as Contract policing) has always been predicated on obtaining Provincial approval since 70% of the cost is borne by the Province. In addition, focus has been primarily on voice communications. The use of mobile data has relied on commercial-based systems since the implementation of a separate data overlay would have been cost prohibitive. The implementation of a 700 MHz broadband system in conjunction with a 700 MHz narrowband LMR system may be technically possible and hold more of an appeal to Provinces. Business cases will need to be made to Provinces and a quick adoption and implementation may not be possible. However, the long term objective of a public safety controlled network remains. It

⁷ FCC Third Report and Order and Fourth Further Notice of Proposed Rulemaking, WT Docket No. 06-150, PS Docket No. 06-229, WP Docket No. 07-100, January 25, 2011

will allow the public safety agencies to apply appropriate security measures not possible through current commercial operators.

**5-3. Do public safety agencies need spectrum for broadband applications? If so:
(c) Is there suitable alternate spectrum to the 700 MHz to meet these broadband requirements?**

5.3.11 (c) The RCMP does not believe that any suitable alternate spectrum exists that would satisfy broadband requirements. The 700 MHz band has propagation properties that make a wide area network possible. The availability of frequencies at a lower spectrum is problematic and the use of frequencies at higher spectrum would be hampered by less propagation. In addition, a direct benefit to having national contiguous spectrum at 700 MHz, would allow the RCMP to buy equipment that is consistent across the country.

**Q 5-4. Comments are sought on the need for public safety broadband radio systems to be interoperable:
(a) between various Canadian public safety agencies;
(b) between Canadian and U.S. public safety agencies.**

5.4.1 (a) The issue of interoperability for the RCMP is critical since it is the primary agency in many instances and needs to interact with EMS, Fire on a day-to-day basis and with CBSA, National Defence and Coast Guard on Federal policing matters and with provincial/ municipal police forces for combined operations. The sharing of tactical, building or other type of plans, as well as access to common information databases or to create a common situational awareness through the sharing of dispatch and other types of data is becoming critical for a timely and effective response to an incident or event. A broadband radio system with a LTE layer may allow for this data interoperability and roaming.

5.4.2 (a) In addition to “various Canadian Public Safety Agencies”, it is important to note that even communicating inter-provincially amongst various RCMP Divisions and/or sections poses issues because they use presently different spectrum bands. A broadband radio system with a LTE layer may also help in this situation.

5.4.3 (b) The issue of interoperability for the RCMP with the U.S. remains critical for a timely and effective response to an incident or event in proximity of the border and to provide secure and smart borders. Although governance can be problematic, that item must be resolved prior to sharing of information and systems through an interoperable public safety broadband radio system. The sharing with U.S. of tactical, building and other type of plans, or video or

information databases will become critical and may be possible through a broadband radio system.

- 5.4.4. (b) President Obama and Prime Minister Harper announced on February 5, 2011 the creation of a trade and security perimeter⁸ ... "Canadian and U.S. officials are also seeking a joint approach to beefing up infrastructure at the top 10 publicly owned ports of entry. Harper and Obama plan to establish bi-national port of entry committees to co-ordinate planning and funding of border infrastructure." It is still early in the initiation phase but it is envisioned that interoperable broadband networks will play an important role in this new initiative.

Q 5-5. What are the challenges faced today by public safety agencies to have cross-border radio interoperability in other frequency bands?

Supporting rationale for your responses to the above questions should be provided.

- 5.5.1 Many challenges still exist today for an effective implementation of interoperability between public safety agencies whether they are in Canada or on opposite sides of the border.
- 5.5.2 A multi-faceted approach is needed to achieve the desired level of interoperability. The SAFECOM Interoperability Continuum model includes 5 building blocks. One of the elements, Technology, is established as a critical part of interoperability.
- 5.5.3 Previous studies such as the L'Abbe/Poirier⁹ and U.S. PWSAC¹⁰ reports have recognized that incompatible technologies and fragmented/congested spectrum allocations have plagued the radio interoperability between public safety agencies over the years.
- 5.5.4 These factors are worsened at the border as the traditional frequency bands for land mobile voice radio systems in the VHF 150 MHz, UHF 400 MHz and 800 MHz are not aligned in both countries with no common interoperability channels for public safety use. As these bands are severely congested, it is a daunting task to find a channel to share on each side of the border or to fill a coverage hole and to successfully coordinate it with the existing licensees.
- 5.5.5 Also as a legacy of the past, disparate radio infrastructure technologies are still deployed as not at the end of their lifecycle. Each case requires a different solution to bridge the interoperability gap, with mitigated operational success, often at high cost and after a lot of efforts and time from all parties involved.

⁸ http://www.canada.com/story_print.html?id=4225641&sponsor=

⁹ Canadian Public Safety Radiocommunications Project, Final Report published in March 2003. 'This report is the result of research undertaken by RBP Associates and L'ABBE Consulting Services under contract with Industry Canada'.

¹⁰ Final Report of the Public Safety Wireless Advisory Committee to the Federal Communications Commission and the National Telecommunications and Information Administration (Sept. 11, 1996).

- 5.5.6 Sometimes, no LMR or cellular voice communications at all exist along the border due to the remoteness and rugged terrain. Therefore, there is no ability to fall back on commercial communications in this scenario. However, there is still a requirement to have interoperable communications between first responders during emergencies or to safeguard the border from illegal products or entrants. A study commissioned by Defence Research and Development Canada, the CANUS Project¹¹, will assess the extent of the radio coverage problem for all public safety services (police, fire, emergency medical services) in the border area situation. In addition, it intends to identify technology solutions that could support interoperability requirements for public safety response to emergency incidents in these areas.
- 5.5.7 Other collaborative efforts have been undertaken by Industry Canada, the FCC and NTIA and public safety users at cross-border interoperability workshops¹² to identify regulatory, administrative and technical issues and next steps to remedy the situations.
- 5.5.8 The above positive steps combined with future technology advancements hold much promise. For example, the more widespread adoption by public safety of open standards such as Project 25, IP based networks and gateways will improve the connectivity of distinct radio networks together. Multi-band radios and shared networks will certainly provide opportunities for improving interoperability in the existing LMR frequency bands.
- 5.5.9 No commercial service currently provides adequate protection of sensitive information (for example national security issues that are prevalent at the border). Therefore a public safety LMR network is the best way to satisfy the interoperability and security issues.

Q 5-6. Notwithstanding your responses to questions 5-3 to 5-5, the Department seeks comments on whether public safety broadband needs can be met by using commercial systems with priority access rights for public safety, at commercial rates.

(a) Your views and comments are invited on priority access rights, including pre-emption, and on the feasibility of such a system.

(b) What public safety technical and operational requirements cannot be met by commercial systems, from either a public safety or commercial operator point of view?

(c) What specific rules, if any, should be mandated by the Department to make such a system viable?

- 5.6.1 (a) The RCMP believes that new technology (LTE technology) can support levels of priority access, however commercial interest of its implementation inhibit its use. It is also the RCMP's belief that the complexity of levels of priority assignments during incidents (multi-agency/multi-discipline) and the need to adjust these dynamically would require that the

¹¹ http://www.defsec-consult.ca/CANUS_Debrief_En.htm

¹² Canada-U.S. Cross Border Interoperable Communications Workshop, Windsor Sep-13-15, 2010
<http://www.cacp.ca/index/eventscontent?contentId=940>

communications be managed by a public safety entity and at a higher level than the network level to ensure that public safety needs are met. The RCMP does not any have practical experience with LTE, however we would insist that any commercial implementation should be tested rigorously prior to any RCMP commitment.

- 5.6.2 (b) The RCMP believes that public safety agencies' future wireless broadband technical and operational requirements cannot be met by commercial providers. The issues of quality of service (QoS) and priority accesses have and continue to be a challenge with existing commercial networks. The creation and enforcement of service level agreements (SLAs) with these networks remain problematic. In fact, the existing wireless service contract as negotiated by PWGSC for the Federal Government, including the RCMP, is insufficient for rigorous public safety requirements. Combined with those issues is the inability of certain technologies/systems to implement such functions. The RCMP believes that public safety stakeholders should have complete control over the governance of dedicated 700 MHz spectrum for public safety and such control might ensure satisfactory priority access and QoS. Only through public safety ownership of the 700 MHz spectrum can pre-emption and priority rights be successfully implemented in the future. In addition, pre-emptive and priority rights for commercial services are not based on the same model of service delivery than public safety (public safety needs coverage everywhere to respond to calls for services).
- 5.6.3 (b) Public safety agencies should not be competing with consumers for access to broadband services; they require dedicated spectrum and network facilities to provide the capacity they need when they need it. Special events or emergencies would generate extra volume of transactions for the public safety. This is when, most often, that the commercial networks are saturated and unavailable for public safety emergency use.
- 5.6.4 (c) Mandatory acceptance of public safety grade SLA terms by commercial providers would be required.

Q 5-7. Comments are sought on the need for regional (local, provincial, etc.) dedicated broadband networks to provide access to all public safety agencies, and the institutional feasibility of implementing such a system (Governance, licensing structure, financing, technical and operational, etc...)

- 5.7.1 As indicated previously, the RCMP provides federal policing service and is under contract to the three territories, eight provinces (except Ontario and Quebec), more than 190 municipalities, 184 Aboriginal communities and three international airports. Therefore, the RCMP would likely be involved in any local or provincial dedicated networks. The RCMP agrees that using regional (local, provincial, etc.) dedicated broadband spectrum networks to provide access to all public safety agencies is a necessary model given the existing economic or fiscal restraints. With sufficient capacity and a proper design, the RCMP believes that a local or

provincial system for all PS agencies is possible and can ensure interoperability. It is important to note that in many communities (for example the Northern regions of most provinces), commercial broadband service providers are not available and therefore no alternatives exist.

- 5.7.2 The RCMP acknowledges that many challenges present themselves in such a model and that agreed-to governance and funding models are absolutely essential for a local or provincial broadband system.
- 5.7.3 The RCMP disagrees that the complexities of managing interoperability of regional networks makes the regional alternative unfeasible. The RCMP is in fact a partner in many multi-agency LMR systems (E-COMM, Saskatchewan, Nova Scotia) and the complexities have been addressed.
- 5.7.4 Business and technical rules will be necessary for seamless roaming between such regional public safety networks and to meet the ultimate goal of a national interoperable public safety broadband network or “system of systems”.
- 5.7.5 U.S. model and lessons-learned may provide some insight into the necessary ingredients for the deployment of a national interoperable broadband network in Canada. Early build outs may also permit the adjustments of a set of rules necessary to be established in advance of more widespread deployments. It may also be an opportunity to test the technology and determine more precisely what special configuration is essential to seamless roaming.

Q 5-8. Is there a need for a dedicated national interoperable broadband network to provide access to all public safety agencies? The Department seeks comments on the institutional feasibility of implementing such a system. Provide supporting arguments for your responses to the above questions.

- 5.8.1 There is a need for a fully integrated and nationally interoperable network or ‘network of networks’ as discussed in our previous comments.
- 5.8.2 In the best model, funding of the initial expense of a cross-Canada wireless broadband interoperable network should be provided by the Federal government with the contribution from other levels of government as part their infrastructure plans. However, in the present economic conditions, private-public partnerships may be the most pragmatic approach. Responsibility for operating a cross-Canada wireless broadband interoperable network must rest with the concerned agencies. However, for a smooth integration with other agencies and seamless roaming of user equipment, there is a need for an over-arching organization that will serve the interests of public safety by coordinating roaming and priority accesses.
- 5.8.3 Our organization envisions that smaller scale implementations of mobile broadband systems could start in a 2 to 5 years time frame. However, large-scale implementations at provincial level will take longer. This gradual implementation of broadband systems will lead to a complete a national interoperable public safety broadband network.

5.8.4 The RCMP supports Public Safety Canada's proposal to set up a three phase concept to launch the 700MHz program, in line with the Communications Interoperability Strategy and Action Plan for Canada¹³ approved by the Federal-Provincial-Territorial Ministers responsible for emergency management on January 26, 2011.

700 MHz Band Plan Architecture for Public Safety Systems

Industry Canada

In preparation for the auction of the 700 MHz commercial spectrum, Industry Canada is considering the following three options with respect to designating spectrum for broadband public safety and/or commercial systems use in the sub-bands 758-768 MHz and 788-798 MHz:

- **Option 1** designates 5+5 MHz to public safety systems and 5+5 MHz to commercial systems;
- **Option 2** designates the entire 10+10 MHz of spectrum for commercial systems, with possible provisions for priority access for public safety systems;
- **Option 3** designates the entire 10+10 MHz of spectrum for public safety systems.

Q 5-9. If band plan Option 1, 2a, or 2b in Section 5.1 is chosen, which one of the three options described above should be adopted and why is this option preferred over the other options?

Provide supporting rationale.

5.9.1 The RCMP believes that Option 3 (10+10 MHz) is the preferred approach for public safety. Historically, the availability of contiguous spectrum for public safety has been limited. This is a once in a lifetime opportunity for the public safety to acquire radio spectrum to bring the mobile office to the field members. Once the 700 MHz broadband is allocated, there will not be another opportunity for PS partners.

5.9.2. An important benefit of Option 3 is the opportunity to become better harmonized with the U.S. President Obama¹⁴ expressed in his State of the Union address his commitment for funding and the reallocation of the D block in support of "public safety officials to access state-of-the-art, secure, nationwide, and interoperable mobile communications".

¹³ <http://www.publicsafety.gc.ca/prg/em/cisapc-scicpa-eng.aspx>

¹⁴ President Obama Details Plan to Win the Future through Expanded Wireless Access, February 10, 2011
<http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access>

- 5.9.3 The combination of new broadband technologies like LTE, on a 10+10 MHz, as opposed to only 5+5 MHz spectrum will provide better spectral efficiency (trunking efficiency)¹⁵ ¹⁶ resulting into greater throughput and long term capacity requirements for the RCMP and public safety partners.
- 5.9.4 The RCMP currently subscribes to commercial carrier networks for our mobile data requirements and the primary reason for use of these commercial networks has been a combination of wide area coverage, reasonable recurring cost and the lack of any other cost effective mobile data solution. However, the RCMP believes that the best longer term solution would be to acquire and make use of dedicated PS broadband spectrum as commercial '3G' system may be prone to high levels of contention during busy periods. In addition the overall throughput may be degraded affecting PS and the RCMP. If public safety has its own dedicated system, these priority access issues and throughput may be eliminated.
- 5.9.5 Although not proposed by the Department, the option of using the 700 MHz narrowband spectrum currently allocated to public safety should not be considered for many reasons. The FCC is considering this approach to provide 20 MHz for public safety mobile broadband as an alternative to the allocation of the D Block. Deployment of both narrowband and broadband infrastructures in the same geographical area would be mutually exclusive as the spectrum left for narrowband use would be minimal, guardbands and buffer zones would be required and already established interoperability channels would be impacted severely.

Q 5-10. If commercial operators are mandated to support public safety services, what tier size should be applied in order to ensure adequate public safety coverage?

- 5.10.1 We advocate public safety owned networks but may be built/operated networks by commercial partners under the governance of public safety may be an alternative to be explored. An arrangement/business model would require making the areas supported effective and allow for seamless handoffs to other neighbor broadband PS systems.
- 5.10.2 Under these scenarios, different tier sizes might be required with some supporting core urban areas and other supporting suburban and rural areas.

¹⁵ HSPA+ is Here! What's Next?", (Qualcomm Incorporated), May 2010

¹⁶ "Carrier Load Balancing Methods with Bursty Traffic for LTE-Advanced Systems", (Yuanye Wang*, Klaus I. Pedersen†, Preben E. Mogensen*†, and Troels B. Sørensen*; *Aalborg University, †Nokia Siemens Networks – Denmark), 2010

Q 5-11. If the APT band plan (See Option 3 in Section 5.1) is adopted:

- (a) Given that the APT band plan requires a 55 MHz duplexing separation, can Canadian public safety services operate their current narrowband systems in this band plan configuration? If not, what are possible alternatives to address public safety needs?**
- (b) Should spectrum be designated for dedicated public safety broadband systems, and how much?**

You are also invited to comment on any related aspects that are not addressed above, including whether the decision should be delayed until the U.S. situation is known.

- 5.11.1 (a) As mentioned previously in our comments to question 5.1, we do not support the APT band plan (Option 3 in Section 5.1) for a number of reasons.
- 5.11.2 (a) The APT Plan duplexing separation (55 MHz) is different than the current public safety narrowband plan (30 MHz) and it is also reversed (APT base transmitter would be adjacent to PS mobile receiver and the reciprocal) creating potential for interference at adjacent channels.
- 5.11.3 (a) The same comment would apply between the APT plan and the U.S. 700 MHz narrowband and broadband plans. Cross-border interoperability would be lost; cross-border frequency coordination would become very complex.
- 5.11.4 (a) Manufacturers advised that the equipment could not be reconfigured easily to a 55 MHz separation. In the event that this changes and that narrowband equipment could be reconfigured, it would make the very small Canadian market very different in comparison to the United States market. It would impact equipment availability and cost.
- 5.11.5 (a) It would make the process to be interoperable with the U.S. public safety agencies very difficult, if not impossible as equipment and band plans would be different.
- 5.11.6 (a) There is no suitable alternatives to address the public safety narrowband needs, new infrastructure initiatives are underway and at an advanced stage and cannot sustain delays.
- 5.11.7 (b) Same amount of spectrum (20 MHz) is required for dedicated PS broadband systems.

5.4 Treatment of Existing Spectrum Users

Effective immediately, no new broadcasting certificates will be issued for LPTV stations in TV channels 52-59 (698-746 MHz).

The Department proposes that the displacement of the incumbent LPTV stations be subject to a notification period of one year for LPTV stations located in urban areas or in specific geographic areas, such as along highway corridors; and a period of two years for LPTV stations in all other areas. A displacement notification can be issued only after technical determination is made concluding that continued operation of the incumbent LPTV station would impede the deployment of new licensed systems in the 700 MHz band.

Q 5-14. The Department seeks comments on the transition policy proposed above.

- 5.14.1 The RCMP supports the Department's proposals for the termination of LPTV stations operating above 698 MHz with specific recommendations with respect to TV channels 63, 64, 68 and 69 that are designated for public safety use. LPTV channels that are adjacent to these dedicated public safety channels should also be cleared to protect public safety communications.
- 5.14.2 As the date for the clearing of analog and digital stations in the above channels approaches quickly, the RCMP recommends that the Department initiate discussions with LPTV licensees in order to reassign them to other TV channels below the 700 MHz as quickly as possible after August 31, 2011.

5-15. The Department seeks comments regarding its proposal to permit low-power licensed devices, including wireless microphones, to operate in the band 698-764 MHz and 776-794 MHz only until March 31, 2012.

- 5.15.1 The RCMP agrees with the Department's proposed March 31, 2012 date for the termination of wireless microphones and other devices licensed in spectrum above 698 MHz; however, the Department should consider taking additional regulatory action to remove the unlicensed devices believed to be still operating in these bands.

6. Changes to Canadian Table of Frequency Allocations

Industry Canada:

614 – ~~698-746~~

BROADCASTING

5.293 MOD C24

~~746~~ 698 - 806

BROADCASTING

FIXED

MOBILE 5.317A MOD C7

5.293 ~~C22-C24~~

SUP

~~C22 (CAN-04) In the band 746-806 MHz, the gradual use of spectrum for the mobile service will be subject to the development of a series of spectrum utilization policies as the transition of digital television progresses.~~

MOD

C24 (CAN-04) In the bands 470-512 MHz and 614-806 MHz, international footnote **5.293** has raised the fixed and mobile services to a co-primary status with the broadcasting service for

Canada. To support broadcasting requirements during the transition to digital television, the Department is only allocating the mobile service in the band 746-806 MHz at this time. The Department will carry out public consultation in the future in order to adopt the other service allocation provisions of international footnote **5.293** in the frequency bands 470-512 MHz and 614-698 MHz

MOD

C7 (CAN-09) International Footnote **5.317A** provides administrations with the flexibility to implement International Mobile Telecommunications (IMT) in parts of the band 698-960 MHz that are allocated to the mobile service on a primary basis. For the time being, the application of **5.317A** is limited to the bands designated for cellular mobile radio systems ~~cellular mobile telephony and trunked mobile systems~~. The bands 698-764 MHz and 776-794 MHz, 824-849 MHz and 869-894 MHz are designated for cellular mobile radio systems ~~cellular telephony services~~ and the bands 806-821 MHz, 851-866 MHz, 896-902 MHz and 935-941 MHz are designated for trunked mobile services and, as such, can evolve to accommodate IMT service capabilities.

Q 6-1. The Department seeks comments on its proposed changes to the Canadian Table of Frequency Allocations for the band 698-806 MHz

6.1.1 The RCMP agrees with the proposed changes to the Canadian Table of Frequency Allocations.

Spectrum Utilization Policy

Q 6-2. The Department seeks comments on the spectrum utilization policy proposed above.

6.2.1 The RCMP agrees with the MBS designation and notes that SP-746 and SP-768 have already designated 764-776 MHz and 794-806 MHz for public safety use.

8. Promoting Service Deployment in Rural Areas

Q8-1. In the above context, the Department seeks comments on challenges and specific problems affecting the deployment of broadband mobile services to low-density rural and remote areas.

Rationale and supporting evidence that substantiate your responses should be provided.

8.1.1 As indicated previously in 5.7 and 5.8, the RCMP foresees that it may be difficult to deploy broadband systems in low-density rural and remote areas, both from technical and financial perspectives. The RCMP being mostly a rural police force, it could leverage the radio sites already implemented.

- 8.1.2 Other alternatives could be explored such as extending the first responder user-group base to include other partners that normally lend support to public safety in cases of emergencies but are not included in the Category 1 (Police, Fire and EMS). There could be partnerships opportunities for investment in-kind or sharing one-another backbone/infrastructure with these partners or with other public/private entities that are deployed in rural settings as part of their service delivery. Examples of such arrangements could include other levels of government, the utilities, railways, etc ...
- 8.1.3 These sharing arrangements may alleviate somewhat the linking/backhaul demands to some degree where cost and technical solutions may become a limiting factor to deployment of a public safety mobile broadband network.

Abstract

In response to a request for technical advice by Public Safety Canada on behalf of national public safety stakeholders, the Centre for Security Science conducted a technical assessment of the 700 MHz spectrum requirements for broadband mobile data communications for public safety and security. The impetus to this assessment relates to the upcoming Industry Canada call for consultation SMSE-018-10. The goal was to determine how much spectrum is required to meet the needs of the public safety community for mobile broadband wireless data communications within a 20-year time frame. The data demand for recurring emergency situations was modeled through an interactive process with active participation from Canadian public safety stakeholders. In addition, the capabilities of LTE technology to support the data demands were also modeled. The results show that the amount of bandwidth required to satisfy the needs of public safety is greater than 20MHz in the near-to-mid term, and likely to also exceed 20MHz in the long term, despite advances in technology. This result is based on an analysis that applies relatively conservative estimates for the growth in demand for mobile data communications for public safety and security applications, and relatively aggressive estimates for the rate of technological improvement of spectrum efficiency projected into the future.

Résumé

En réponse à une demande de conseils techniques faite par Sécurité publique Canada au nom des intervenants nationaux de la sécurité publique, le Centre des sciences pour la sécurité a effectué une évaluation technique des besoins de la fréquence de 700 MHz pour la transmission mobile à large bande de données destinée à la sécurité publique. C'est l'appel de consultation SMSE-018-10 que lancera bientôt Industrie Canada qui a motivé l'exécution de cette évaluation. L'objectif consistait à déterminer quelle part du spectre est requise pour répondre aux besoins du milieu de la sécurité publique pour la transmission mobile de données à large bande au cours des 20 prochaines années. La demande en données pour les situations d'urgences récurrentes a été modélisée à l'aide d'un processus interactif auquel les intervenants de la sécurité publique du Canada ont participé activement. Il y a de plus une modélisation des capacités de la technologie LTE pour répondre aux demandes de données. Les résultats démontrent que la part de la bande passante nécessaire pour répondre aux besoins de la sécurité publique est supérieure à 20 MHz à court et à moyen terme, et dépassera aussi probablement 20 MHz à long terme, et ce, malgré les progrès technologiques. Ce résultat repose sur une analyse ayant recours à des évaluations relativement prudentes de la croissance de la demande pour la transmission mobile de données à des fins de sécurité publique, ainsi qu'à des évaluations relativement ambitieuses du degré d'amélioration technologique de l'efficacité spectrale dans le futur.

Executive summary

700MHz spectrum requirements for Canadian public safety interoperable mobile broadband data communications.

Claudio Lucente, MARTELLO DEFENSE SECURITY CONSULTANTS INC.

DRDC CSS CR 2011-01

In response to a request for technical advice by Public Safety Canada and on behalf of the national public safety community, the Centre for Security Science, with technical oversight by the Communications Research Center, conducted a scientific assessment of the 700 MHz spectrum requirements for broadband mobile data communications. This assessment is provided in support of the upcoming Industry Canada call for consultation SMSE-018-10.

The conversion of the broadcast television from analog to digital signals and the resulting re-allocation of the channels has attracted significant interest for the vacated RF spectrum on the part of commercial, private, and public entities. In particular, the Canadian public safety community has a strong interest in a segment of the 700MHz spectrum as described in the Industry Canada call for consultation (SMSE-018-10). Given the excellent propagation properties of this frequency band, it views this as a unique opportunity to lay the foundation for a national mobile broadband communications network that will allow various public safety agencies to better plan, coordinate, and execute their missions, for their day-to-day operations and when responding to crisis events.

New technologies and applications are at hand that can enhance situational awareness and improve coordination between public safety personnel. The mobile broadband wireless network must have suitable bandwidth to provide the data throughput required by the many applications required by today's public safety personnel such as real-time video surveillance, vehicle and blue force tracking devices, ambulance patient video. The bandwidth requirements will evidently vary depending on the operations being conducted be it day-to-day routine calls, crowd control, or major emergency situations. Since the network must be designed to provide connectivity that responders can rely on at all time, the bandwidth requirements must be addressed in the context of how responders intend to use the mobile broadband network during emergencies.

In order to assess the requirement with appropriate context and relevance, stakeholders were consulted across the nation, facilitated through linkages provided by the Canadian Interoperable Technologies Interest Group. Three incident scenarios were selected as case studies for public safety stakeholders to develop the incident-response profiles. The profiles consisted of establishing how many resources and assets would be assigned to each incident and, what applications would they make use of during each incident. The incidents that were chosen as case studies represent major but commonly re-occurring events (such as a sports event). We know that catastrophic events of the scale of a major earthquake or a concerted terrorist attack (9/11) would create demands that would far exceed any available spectrum and so such situations were not considered in the analysis.

Technical Assessment of Public Safety 700 MHz Spectrum Requirement for Broadband Mobile Data Communications

The data throughput for each application was derived from empirical studies conducted by public safety agencies, support organizations, and research labs. Thus, the Data Demand Model (DDM) is derived from the incident-response profiles and the applications throughput requirements, in addition to growth assumptions over a 20-year horizon. Particular attention was paid to tactical video as it is expected to prevail in enhancing situational awareness and is often critical, particularly to security operations. It is also the largest consumer of bandwidth. As such, various techniques are considered in the DDM to reduce the preserve bandwidth requirement in the presence of video traffic.

Because of the large push by the commercial sector to deploy Long Term evolution (LTE) networks as the 4th generation of cellular system and since the United States has selected LTE as the technology for public safety mobile broadband, using the same technology in Canada would leverage the economies of scale and enhance interoperability between Canadian and US public safety agencies LTE was therefore selected as the basis to develop the Capacity Model for this report. There are substantial research efforts underway to enhance the capacity of LTE and therefore, the Capacity Model introduces a factor to account for a number of anticipated enhancements in spectral efficiency at various intervals over the 20-year horizon of the model.

Finally, the required bandwidth is revealed by correlating the data demand with the capacity. Several fundamental assumptions are used in the models such as the rate at which research into spectral efficiency is transformed into reality and, the number of users accessing the same applications simultaneously. The effect of varying these assumptions on required bandwidth is examined, as is the effect of uncertainty in predictions, which increases with time particularly as we look into the future 15-20 years.

The result of the modeling, taking into account uncertainty factors, shows that the amount of bandwidth required to satisfy the needs of public safety to conduct their missions during commonly re-occurring major emergency situations with modern tools and applications is greater than 20MHz in the near-to-mid term, and likely to also exceed 20MHz in the long term, despite advances in technology. Clearly even with the full 10 + 10 MHz allocated, the community will need to take measures to efficiently manage broadband data communications carefully during periods of peak demand.

Sommaire

Évaluation technique des besoins de la fréquence de 700 MHz réservée à la sécurité publique pour la transmission mobile à large bande de données

Claudio Lucente, MARTELLO DEFENSE SECURITY CONSULTANTS INC.

DRDC CSS CR 2011-01

En réponse à une demande de conseils techniques faite par Sécurité publique Canada au nom de la collectivité nationale de la sécurité publique, le Centre des sciences pour la sécurité, sous la supervision technique du Centre de recherches sur les communications, a mené une évaluation scientifique des besoins de la fréquence de 700 MHz pour la transmission mobile de données à large bande. Cette évaluation vient en soutien à la demande de consultation SMSE-018-10 que lancera bientôt Industrie Canada.

La transition des signaux analogues aux signaux numériques des services de télédiffusion et la nouvelle répartition des canaux ont suscité un vif intérêt vis-à-vis du spectre des radiofréquences libéré chez les entités commerciales, privées et publiques. Le milieu canadien de la sécurité publique s'intéresse énormément à un segment de la bande de 700 MHz tel qu'il est décrit dans la demande de consultation SMSE-018-10 d'Industrie Canada. Étant donné les excellentes propriétés de propagation de cette bande de fréquence, on considère qu'il s'agit d'une occasion unique de jeter les bases d'un réseau national de transmission mobile à large bande qui permettra aux divers organismes de sécurité publique de mieux planifier, coordonner et exécuter leurs mandats, tant dans le cadre de leurs activités quotidiennes que lors des interventions en situation de crise.

Il existe de nouvelles technologies et applications qui peuvent accroître la connaissance de la situation et améliorer la coordination entre les intervenants de la sécurité publique. Le réseau mobile sans fil à large bande doit avoir une bande passante suffisante pour fournir le débit de données nécessaires aux nombreuses applications exigées de nos jours par les intervenants de la sécurité publique, comme la vidéosurveillance en temps réel, les appareils de suivi des véhicules et des forces bleues et la vidéo de patients transportés par ambulance. Les besoins en bande passante varieront évidemment en fonction des activités, qu'il s'agisse d'appels quotidiens de routine, du contrôle des foules ou de situations d'urgence majeures. Puisque le réseau doit être conçu de manière à offrir une connectivité à laquelle les intervenants peuvent se fier en tout temps, il faut tenir compte des besoins en bande passante en fonction de la manière dont les intervenants ont l'intention d'utiliser le réseau mobile à large bande pendant des situations d'urgence.

En vue d'évaluer les besoins en fonction des bons contextes et de leur pertinence, on a consulté des intervenants partout aux pays, grâce aux liens fournis par le Groupe d'intérêt canadien en technologie de l'interopérabilité. Trois scénarios d'incident ont servi d'études de cas aux intervenants de la sécurité publique pour définir les profils d'intervention des incidents. Les profils visaient à établir la quantité de ressources et de

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biens qui seraient affectés à chaque incident et à déterminer quelles applications ils utiliseraient dans chaque cas. Les incidents choisis à titre d'études de cas représentent des événements majeurs récurrents (comme une manifestation sportive). Nous savons que les catastrophes comme un important tremblement de terre ou une attaque terroriste concertée (attaques du 11 septembre) engendreraient des demandes qui iraient bien au-delà de tout spectre disponible. Par conséquent, de telles situations n'ont pas été prises en considération dans l'analyse.

Le débit des données pour chaque application a été obtenu à partir d'études empiriques effectuées par des organismes de sécurité publique, des organismes de soutien et des laboratoires de recherche. Par conséquent, le modèle de demande de données repose sur les profils d'intervention aux incidents et les besoins des applications en débit des données, ainsi que sur les hypothèses de croissance pour les 20 prochaines années. On a porté une attention particulière à la vidéo à des fins tactiques puisque celle-ci devrait s'imposer pour améliorer la connaissance de la situation et s'avère souvent essentielle, notamment aux activités de sécurité. C'est aussi elle qui utilise le plus de bande passante. Le modèle de demande de données a donc pris en considération diverses technologies pour réduire le besoin de bande passante réservée en présence de trafic vidéo.

En raison de l'offensive du secteur commercial visant la mise en place de réseaux LTE en guise de 4^e génération de système cellulaire et puisque les États-Unis ont choisi la technologie LTE pour la transmission mobile à large bande de la sécurité publique, l'utilisation de la même technologie au Canada permettrait de faire des économies d'échelle et améliorerait l'interopérabilité entre les organismes de sécurité publique des États-Unis et du Canada. La technologie LTE a donc servi de base à l'élaboration du modèle de capacité du présent rapport. D'importants travaux de recherche sont en cours en vue d'améliorer la capacité de la technologie LTE. Par conséquent, le modèle de capacité introduit un facteur qui tient compte de certaines améliorations prévues de l'efficacité spectrale à divers intervalles au cours des 20 prochaines années du modèle.

Enfin, la bande passante nécessaire est déterminée par la corrélation entre la demande de données et la capacité. Les modèles utilisent plusieurs hypothèses de base, comme la vitesse à laquelle la recherche sur l'efficacité spectrale se transforme en application pratique et le nombre d'utilisateurs accédant simultanément aux mêmes applications. On examine les répercussions d'une variation de ces hypothèses sur la bande passante ainsi que l'incidence de l'incertitude dans les prédictions, qui augmente au fil du temps puisqu'il s'agit d'une évaluation portant sur les 15 à 20 prochaines années.

Les résultats de la modélisation, qui tient compte des facteurs d'incertitude, démontrent que la part de la bande passante nécessaire aux activités du milieu de la sécurité publique ayant recours aux outils et aux applications modernes lors de situations d'urgence majeures et récurrentes est supérieure à 20 MHz à court et à moyen terme, et qu'elle dépassera probablement 20 MHz à long terme, et ce, malgré les progrès technologiques. De toute évidence, même avec une pleine attribution de 10 + 10 MHz, la communauté devra prendre des mesures pour gérer efficacement et prudemment la transmission de données à large bande pendant les périodes de demande de pointe.