



Canadian
Electricity
Association

Association
canadienne
de l'électricité

January 12, 2018

By Email

Stephanie Cleroux
Contracts and Procurement Officer, Corporate Management Sector
Innovation, Science and Economic Development Canada/Government of Canada
235 Queen Street
Ottawa, Ontario K1A 0H5
Canada
Stephanie.cleroux2@canada.ca

Martin Proulx
Director General
Engineering, Planning and Standards Branch
Spectrum, Information Technologies and Telecommunications Sector
Innovation, Science and Economic Development Canada
martin.proulx@canada.ca

Re: 2017 Public Safety Broadband Network – Request for Information # ISED 401700

1.0 INTRODUCTION

Although the request for information (RFI) is clearly directed at mobile network operators (MNOs), the CEA membership believes strongly that public safety and critical infrastructure users have a deeply vested interest in the outcome. Therefore, to balance the MNO perspective, this response presents the view of the CEA. Our response addresses relevant parts of Q1 and Q3 of the RFI.

1.1 Canadian Electricity Association (CEA)

Founded in 1891, CEA is the national forum and voice of the evolving electricity business in Canada. The Association contributes to the regional, national, and international success of its members. CEA is governed by a Board of Directors comprised of senior executives from its Corporate Utility Members. Our mission is to be the national voice for safe, secure, and sustainable electricity for all Canadians.

CEA members generate, transmit, and distribute electrical energy to industrial, commercial, residential, and institutional customers across Canada. Members include integrated electric utilities, independent power producers, transmission and distribution companies, power marketers, manufacturers and suppliers of materials, technology, and services that keep the industry running smoothly. The Association's strategic goal, on behalf of its membership, is to provide a comprehensive roadmap to address the industry's most pressing issues, including: infrastructure renewal, environmental protection,



innovation and technology, indigenous and North American partnerships, and regulation and security. CEA strives to deliver a coherent and convincing industry viewpoint to decision makers on critical policy and regulatory issues.

1.2 Public Safety and Critical Infrastructure

The importance of public safety agencies and critical infrastructure (including transport, energy and communication networks) is self evident. The safe, effective and efficient delivery of these services relies on adequate communications. Adequate means sufficient capacity (bit rate), reliability, affordability and security. The concept of adequacy has elevated importance during periods of emergency response to natural and human induced incidents, as well as during recovery from such events. Recognizing the importance of responding effectively to emergencies, the North American Electric Reliability Corporation (NERC) holds a two-day Grid Security Exercise (GridEx) every two years with electric utilities, the government and other stakeholders [1,2]. These emergencies include simulated physical and cyber attacks on the grid.

To a certain extent, public safety and critical infrastructure also rely on one another for their safe, effective and efficient operation. Therefore, clearly there are potential synergies for cooperation between these groups as well as the commercial mobile network operators. This RFI response presents a well reasoned proposal for the PSBN that draws on these synergies.

2.0 A PSBN DEPLOYMENT PROPOSAL

The following proposal is based on a hybrid public private business model that exploits the network sharing capability of current (and future) generation cellular mobile radio systems. The proposal was developed over a period of several months and benefits from extensive dialog and engagement at PSBN workshops by CEA members.

2.1 Context

The Government of Canada (GoC), in collaboration with the Provinces and Territories, is committed to establishing a Public Safety Broadband Network (PSBN) to protect the health, safety and security of the public and public infrastructure. The GoC can leverage its existing departments and their legislated accountability to establish a National Entity (NE) to set standards, guidelines, and promote the PSBN. Public Safety Canada, a department of the federal government, has explored multiple deployment options including: (i) private, (ii) public, and (iii) public-private partnership (P3).

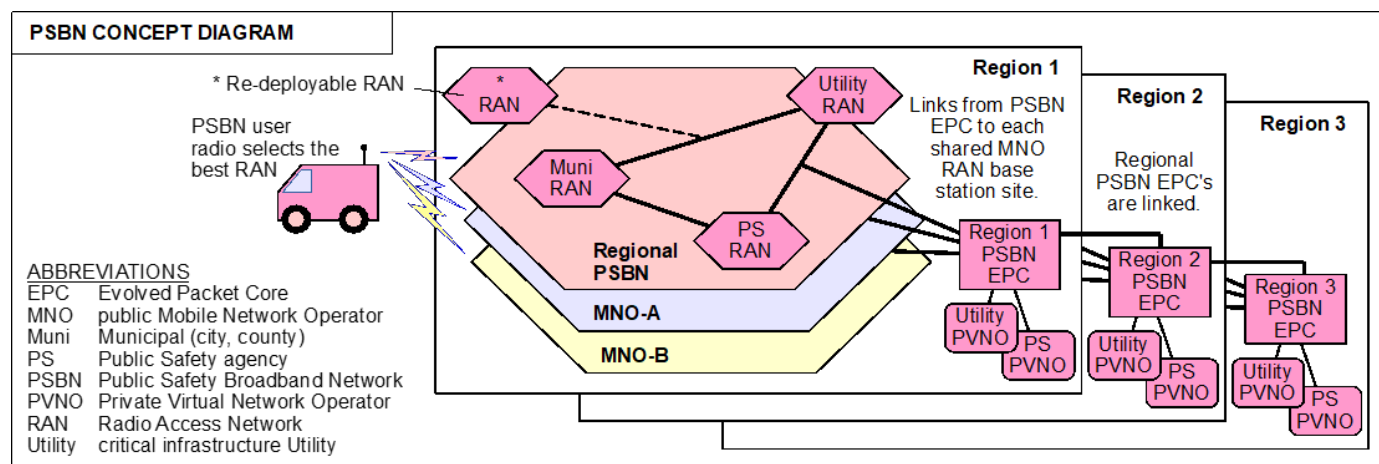
It is logical for the Provinces and Territories to establish Regional Entities (RE) for the purpose of deploying and operating the PSBN. Regions should be province based, and probably groups of provinces and territories, as there are economies of scale advantages.

2.2 Overview

The PSBN will exploit Long-Term Evolution (LTE) technology standards from the 3GPP (3rd Generation Partnership Project). Technology from 3GPP underpins the global cellular mobile network. Recent releases of the LTE standards included provisions for features required by public safety agencies [3]. LTE also has provisions for network sharing baked-in to the standards [4] and is ready-made to accommodate the operating modes required for this proposal.

This deployment proposal is best described as a type of public private partnership that uses mainly public sector investment. It involves MNOs that are private sector entities that own cellular mobile radio access network (RAN) infrastructure. The PSBN will be a closed network involving government agencies, departments and enterprises, as well as private sector utilities.

Essentially the PSBN would be deployed regionally by Regional Entities (REs) using a combination of: (i) virtual network overlays on multiple commercial radio access networks through wholesale and roaming agreements, (ii) dedicated fixed and deployable infrastructure, and (iii) shared infrastructure. The concept diagram is a high-level architecture of the proposal.



This approach enables rapid deployment of a PSBN that is more resilient than existing commercial services, while maintaining the flexibility to deploy optimised dedicated infrastructure where appropriate. More resilient because the virtual overlay would involve multiple MNOs that have independent (competing) RAN infrastructure and backhaul.

Note that since existing commercial RANs are utilized, Band 14, public safety spectrum, is retained for the deployment of fixed or deployable dedicated network infrastructure. Incumbent MNOs should

support this arrangement as the public safety spectrum will not be used to compete with their commercial service offerings.

Also note NB-IoT can be deployed in Band 14 guard bands, allowing telemetry services without impacting broadband Public Safety users.

2.3 Implementation and Operating Model

Contracts for services may be let by the National Entity or the Regional Entities. The NE would be able to leverage federal shared services procurement practices and national public safety buying power. The RE would be able to leverage provincial procurement practices, existing provincial contracts, emergency management operating relationships, and the buying power of the broader public sector. While both options are valid, relying on the RE to conduct the procurement for the PSBN has the benefit of flexibility and allowing regions to move forward at their own pace.

The implementation can be considered in three parts: (i) the radio access network (RAN), (ii) the evolved packet core (EPC) and (iii) the backhaul or transport network that connects the RAN and EPC. The technology is based on 3GPP standards, starting with the Long-Term Evolution (LTE) Advanced-Pro release. The 3GPP continues to evolve this technology, including into the next generation (so-called 5G).

PSBN control over its subscribers and their services is essential. Therefore, the PSBN will need to control the EPC as well as appropriate operational and business support systems (OSS/BSS). This may be accomplished by purchasing and operating the necessary information technology (IT) infrastructure, or by obtaining the EPC as a service through an appropriate Platform as a Service.

(PaaS) provider (e.g., a mobile virtual network enabler or MVNE). Each PSBN user group can either control and administer their subscribers directly as a private virtual network operator (PVNO), or outsource this function (e.g., to a core operating entity of the regional PSBN or to the PaaS or MVNE provider). The decision will depend on the user groups size and their appetite for detailed user administration responsibilities.

For wide area coverage where commercial LTE service already exists, the regional PSBN operator will enter into a business agreement with the existing public mobile network operators (MNOs) to obtain bulk access to RAN services at wholesale rates. From the MNOs perspective, the PSBN will be a "full" mobile virtual network operator (MVNO) and provide its own SIM and all EPC functions. Roaming agreements would be used for coverage outside the regions and for reliability. Beyond existing coverage, new RAN and transport infrastructure will be required. Depending on the situation, the PSBN operator may own dedicated RAN infrastructure or share the RAN infrastructure. For example at a generating station, the PSBN operator may own and operate the dedicated RAN infrastructure. In a remote community, the PSBN may share the RAN infrastructure with a commercial MNO. Who owns, who operates and who maintains the shared infrastructure would be a negotiated business decision between the parties.

The backhaul is a significant component, as each base station site in the region that is part of the PSBN (both shared and dedicated) will require a backhaul to the PSBN's regional EPC.

2.4 Implementation Considerations

Implementation planning will need to deal with a variety of considerations and resolve a range of issues including, for example, the following.

- Number portability will be required.
- Accounting and billing systems.
- Cost recovery for roaming.
- Integration with existing systems.
- Embedded subscriber identity modules (eSIM) will be an advantage or required.
- Establishing the regional entities as a form of special purpose vehicle.
- Decisions on hardening existing MNO RAN sites must be tempered by the issue of enhancing incumbent MNOs at the expense of new entrants.
- Accommodating national and multi-region user groups in the regional operating model.

This proposal presents a concept. It is recognized that additional study and planning is required to resolve these and other implementation aspects and issues.

2.5 Business Model

The PSBN regional operator will meet its capital expenditure requirements for new infrastructure by obtaining capital contributions from its membership. The contributions will be pro-rated by expected usage and priority access requirements. Operating expenditures will be recovered from subscriber revenues. Subscriber rates will be based on some service usage model.

2.6 Governance Model

The National Entity with an overall coordination and strategic planning role would provide guidance to regional entities that have operational responsibilities. The NE could also provide a single formal point of contact for coordinating arrangements with the national MNOs and with FirstNet for interworking with US first responders. Coordination would be national but each regional entity would likely strike their own agreements.

For example, the NE would coordinate the implementation such that PSBN subscribers roaming outside their region have consistent treatment by coordinating quality of service and priority profiles (e.g., through promulgating standard arrangements for QCI and ARP). User committees comprising members

from the participating public safety and critical infrastructure groups would have significant authority to set coverage requirements and establish performance standards. The user committee would have national and regional levels.

2.7 Applications

Mobile applications are available now for public safety and critical infrastructure users. These run on any mobile Data Network and can be introduced at any time.

3.0 ADVANTAGES

This section concludes by summarizing the benefits of the PSBN deployment proposal.

- Rapidly delivers nationwide PSBN coverage.
- Avoids the regulatory and market issues associated with awarding the PSBN to a single MNO.
- Provides the advantage of MNO infrastructure diversity for improved reliability.
- Interoperability across MNOs and roaming is built-in.
- Brings state-of-the-art LTE technology to public safety and critical infrastructure groups.
- By incorporating NB-IoT in Band 14 guard bands, telemetry use is enabled without impacting broadband users.
- Improves PSBN resiliency and capacity in urban areas. Substations typically have an existing radio tower and in urban areas are fiber feed. This infrastructure is separate from the commercial MNOs RAN and backhaul.
- Expands PSBN and commercial cellular coverage into rural areas by leveraging electric utility communications infrastructure.
- Regional operating entities provide flexibility to accommodate unique regional needs and priorities.
- Dedicated PSBN EPC infrastructure provides control over security enabling compliance with public safety and utility grade security requirements independent of commercial MNOs.
- Global standards and 3GPP specifications reduce technology and future investment risk. The 3GPP is evolving LTE technology into the next cellular mobile generation (5G).

RFI Q1. BUSINESS MODEL

Q1. Considering, but not limited to, the international approaches as examples, what business model(s) do you recommend for Canada in order to meet the vision of a PSBN?

A1. We recommend consideration of the above implementation and business model.



- a) Cost considerations: This proposal fully utilizes existing and ongoing investments, and it allows public funds to contribute to extending and hardening these networks where that makes sense and does not introduce regulatory issues relating to competition. Public funds would also be used to add dedicated and shared PSBN infrastructure in situations where that makes sense.
- b) New infrastructure: As noted above, investments would leverage existing infrastructure and add to it optimally (through extensions and hardening).
- c) Spectrum considerations: Band 14 would be held by the PSBN, but there should be flexibility to allow Band 14 to be implemented by an MNO for PSBN subscribers using active RAN sharing technology. Further study would be needed to resolve any regulatory issues and develop guidelines.
- d) Leverage PSBN and commercial spectrum: PSBN spectrum could be implemented on the commercial MNOs RAN for PSBN subscribers. The conditions where this should apply requires further study.
- e) Coverage: This proposal exploits all existing commercial coverage and allows the flexibility for critical infrastructure partners to prioritize and extend coverage where it is operationally most important. A PSBN Geographic Difference Policy should be instituted to facilitate rural development.
- f) Services and pricing: Service plans and pricing would be set for operating cost recovery including wholesale rates.
- g) Operator involvement: All operators would have an opportunity and would be encouraged to participate as RAN sharing MNOs and/or as roaming partners.
- h) User profile control: Through the PSBN Core operator, public safety and critical infrastructure users would have access and control over their user profiles. This would be independent of the RAN providers.

RFI Q3. GOVERNANCE MODEL

Q3. Taking into consideration the legislative and regulatory framework, and considering but not limited to international approaches, which governance models do you feel would be best suited to support a Canadian PSBN?

A3. We recommend consideration of the above proposed governance model.

- a) National entity: Overall coordination and strategic planning.
- b) Regional entity: Operational responsibility within its region including contracting and administering contracts.
- c) National / regional governance: Governance between the layers requires more study; however user committees should drive requirements.
- d) PSBN license holders: The national entity on behalf of the regional entities.



Canadian
Electricity
Association

Association
canadienne
de l'électricité

e) Ecosystem for applications, services and devices: These would be driven by national and regional user committees.

All of which is respectfully submitted.

Francis Bradley,
Chief Operating Officer and VP Policy
Canadian Electricity Association



Canadian
Electricity
Association

Association
canadienne
de l'électricité



REFERENCES

- [1] "Grid Security Exercise GridEx III Report," NERC, March 2016. [Link](#)
- [2] "GridEx IV Fact Sheet," NERC, 2017-11-16. [Link](#)
- [3] "Network 2020: Mission Critical Communications," GSMA, 2016. [Link](#)
- [4] "Network Sharing; Architecture and functional description (Release 10)," 3rd Generation Partnership Project, Technical Specification, 3GPP TS 23.251 V10.1.0, 2011-03. [Link](#)