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May 15, 2019

M. Claude Doucet
Secretary General
Canadian Radio-television and Telecommunications Commission
Ottawa, Ontario
K1A 0N2

Subject: *Telecom notice of Consultation CRTC 2019-57 - Review of mobile wireless services*

1. The Railway Association of Canada (RAC) welcomes the opportunity to comment on the Review of mobile wireless services. **The RAC requests to appear at the public hearing.**

2. On March 26th, 2019, a joint workshop on wireless broadband access for critical infrastructure operators (CIO) hosted by the RAC and the Canadian Electricity Association (CEA) was held in Ottawa. The workshop highlighted that plain commercial wireless broadband subscriptions are limited in supporting communications requirements for advanced technological applications of rail and electrical utility operations.

3. The RAC is proposing an innovative approach through a standard architectural solution, a private version of the Mobile Virtual Network Operator (MVNO) status, namely a Private Virtual Network Operator (PVNO) status.

4. Through our submission, we will demonstrate how PVNOs solution will pave the road to the wide adoption of broadband wireless technology to enhance safe, reliable and resilient railway operations and, in addition, benefit underserved communities in areas around our vast Critical Infrastructure footprint.

All of which is respectfully submitted.

Marc Brazeau
President and CEO

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Railway Association Association des chemins
of Canada de fer du Canada

BEFORE THE CANADIAN RADIO-TELEVISION AND TELECOMMUNICATION COMMISSION

IN THE MATTER OF

TELECOM NOTICE OF CONSULTATION

CRTC 2019-57

REVIEW OF MOBILE WIRELESS SERVICES

INTERVENTION BY

RAILWAY ASSOCIATION OF CANADA

MAY 15, 2019

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Glossary of acronyms

3GPP	3rd Generation Partnership Project
5G	Fifth-generation
CEA	Canadian Electricity Association
CIO	Critical Infrastructure Operator
CRTC	Canadian Radio-television and Telecommunications Commission
IMSI	International Mobile Subscriber Identity
IIoT	Industrial Internet of Things
IoT	Internet of Things
ISED	Innovation, Science and Economic Development
LTE	Long-Term Evolution
LTE-A	Long Term Evolution – Advanced
MOCN	Multiple Operator Core Network
MNC	Mobile Network Code
MNO	Mobile Network Operator
MVNO	Mobile Virtual Network Operator
PDN-GW	Packet Data Network – Gateway
PLMN-id	Public Land Mobile Network - identity
PVNO	Private Virtual Network Operator
PSC	Public Safety Canada
QPP	Quality of Service, Priority and Pre-emption
RAC	Railway Association of Canada
RAN	Radio Access Network
SLA	Service Level Agreement
SLO	Service Level Objective
TC	Transport Canada

EXECUTIVE SUMMARY

ES1.   The mission-critical wireless communications requirements of the railway industry have traditionally been covered by dedicated radio solutions, typically using narrowband licensed frequencies, with limited capacity but capable of fulfilling the reliability, resiliency and availability requirements of the applications that depend on them.

ES2.   Narrowband wireless solutions have become a bottleneck in the evolution of operations technology, because of their limited capabilities. New mission-critical cases require increased data communication capabilities that only broadband can offer.

ES3.   Commercial mobile broadband wireless cellular communications have lately had a visible but cautious degree of adoption by sectors outside the traditional consumer electronics space. The railway industry is no exception to this trend. However, for critical infrastructure, the insufficient control over coverage, resiliency, availability and reliability of commercial cellular networks is a hindrance to realizing the wealth of benefits that broadband wireless could bring to advance operational uses.

ES4.   Transport Canada's report of May 2018 on the *Rail Safety Act Review* [1]states the following:

> "Dedicated radio spectrum is vital for putting an effective train control strategy in place across the national rail network. Spectrum, however, is in high demand, and individual railway companies cannot ensure sufficient bandwidth is available to meet their identified communication needs for high-speed mobile data and radio spectrum."

Proposal for Consideration of the Commission

ES5.   Railway operators need to build and control their own wireless communication infrastructure over a major portion of their rail network footprint. To take advantage of state of the art or developing standard technologies, such as 3GPP, LTE and LTE-A which will achieve the performance targets sought by RAC members, the railway industry needs to be an authorized assignee of Mobile Network Code numbers (MNC).

ES6.   The assignment of an MNC enables the implementation of two types of network architecture configurations which present a great potential for efficient wireless as increased connectivity becomes essential for Critical Infrastructure Operators (CIO) such as the railway industry, namely: shared Radio Access Network (RAN) and Private Virtual Network Operator (PVNO).

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[1] *Enhancing Rail Safety in Canada: Working Together For Safer Communities The 2018 Rail Safety Act Review* (May 2018) pp 51-52 , online: Transport Canada <http://www.tc.gc.ca/en/reviews/railway-safety-act-review/enhancing-rail-safety-canada-working-together-safer-communities.html>.

ES7.   **The shared RAN** solution would be operated and configured according to mission critical standards and QPP (Quality of Service, Priority and Pre-emption) as such architecture will enable traffic separation and prioritization between the incumbent's and the railways' respective data traffic.

ES8.   **The PVNO** solution is an extension of Mobile Virtual Network Operator (MVNO) architecture. This architecture is usually recommended in geographical areas where multiple Mobile Network Operators (MNOs) have robust coverage and service presence, typically in urban settings.

ES9.   Just as a commercial MVNO, PVNOs' Core Networks are interfacing with incumbent commercial MNO radio access networks. The difference is that the PVNO Core Network does not depend on a single MNO for radio access. Instead, it connects its devices through multiple MNOs' radio networks to the PVNO Core.

ES10. The usage of multiple radio access networks would provide an enhanced level of redundancy to improve reliability and availability levels required by the railway industry.

CIOs such as railways need to be allocated a dedicated mobile network code (MNC)

ES11. Both PVNO and shared RAN solutions require that the CRTC enact regulatory changes that will allow CIOs to be allocated their own mobile network code (MNC) number(s).

ES12. The CRTC, under the provisions of sections 46.1 and 58 of the *Telecommunication Act* has the power to enact this change.

ES13. The Commission can direct the CRTC Interconnection Steering Committee (CISC) to modify the *Guidelines* so that MNC numbers be provided to the railway industry.

ES14. The RAC would be pleased to actively participate in the work of CISC in that regard.

Introduction

1. The Railway Association of Canada (RAC) was established back in 1917 to ensure the efficient movement of troops and supplies during the First World War. Its role may have changed over the years, but it remains just as relevant today as the day it was formed. RAC represents close to 60 freight and passenger railway companies. Those railways transport more than 84 million passengers and over $310 billion worth of goods across our country each year. As part of the fifth largest rail network in the world, RAC members are the backbone of Canada's transportation system.

2. While safely transporting goods and people from coast to coast, Canada's railway system is also powering our economy. RAC members employ more than 31,000 Canadians in railway operations, technology, safety, security and leadership positions. This highly productive workforce moves close to 70 per cent of all surface goods and half of the nation's exports every year—delivering Canada's products to the country and the world.

3. As for all industry sectors, railways must take advantage of the technology changes in order to maintain its edge and improve its performance levels. In the railway industry, this means calling on wireless broadband systems.

4. The challenge in accessing broadband communication systems lies mainly with the footprint of RAC members' network: a large portion of the networks lies in rural or remote areas where readily available or retail wireless communication systems are either non-existent or limited. Moreover, the reliability and availability of the existing commercial systems are below the acceptable level of the operational requirements of RAC members.

5. Hence, the mission-critical wireless communications needs of the railway industry have traditionally been fulfilled by dedicated radio solutions, typically using narrowband licensed frequencies, with limited capacity but capable of meeting the reliability, resiliency and availability requirements of the applications that depend on them. Until now.

6. These narrowband wireless solutions have started hindering the deployment of evolved railway operational technology and innovation, because of their limited capabilities. New mission-critical situations require increased data communication capabilities that only broadband wireless can provide. These new solutions may only be deployed if the Commission allows RAC members to become assignees of Mobile Networks Code (MNC) number under the Canadian IMSI *Guidelines*.[2]

7. RAC members are not the only network-based operators feeling the heat of this challenge. The Canadian Electricity Association (CEA), shares similar challenges and petitioned the CRTC in October 2018 to enact changes to address the changing need of its industry.

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[2] Canadian International Mobile Subscription Identity (IMSI) Assignment Guidelines, Version 5.0, approved by *Telecom Decision* (6 November 2015), 2015-496.

8. These two major Canadian Critical Infrastructure operators, rail and electrical utilities, represented by their respective associations, Railway Association of Canada and Canadian Electricity Association, identified remarkable synergies in their wireless communications challenges to support their field area network operations. The similarities revolve around the need for a significantly higher level of control over the performance of wireless broadband cellular networks, if CIOs are to expand the use of these technologies to mission-critical and advanced field operations' use cases.

9. A multi-sectorial workshop, hosted by both associations, took place in Ottawa on March 26th, 2019, including representation from Innovation Science & Economic Development (ISED), as well as Transport Canada. At the closure of the event, three joint resolution statements were adopted by the two industry associations, as follows:

    1) Rail and Electrical Utilities will collaborate in pursuing jointly the access to a Mobile Network Code number as Critical Infrastructure Operator Industries.
    2) A working group will be formed ensuring that there is cross-industry awareness and support to each other's submissions to CRTC.
    3) CIOs will look forward to partnering with the Canadian Government in creating a wireless infrastructure, enabling Canada as a world leader in intelligent critical infrastructure in the domains of Transportation, Utilities and beyond.

10. The current intervention in this consultation represents the view of the rail industry. We have exchanged our view with those of the Canadian Electricity Association. The CRTC will certainly note several similarities between ours and CEA's proposal. RAC is committed, as CEA, to serve Canadians better in our respective Critical Infrastructure sectors.

11. The RAC agrees with the CRTC that this current policy review of the mobile wireless services is the perfect opportunity to address the issues raised by the CEA in 2018, as well as the proposal here presented by the RAC.

12. Railways are part of the transport infrastructure which is identified as critical infrastructure partner by Public Safety Canada[3]. We respectfully invite the CRTC to give this qualification its due weight in the scope of the analysis of our submission.

13. This submission is divided in two main sections. The first one, divided in four chapters, provides an overview of the current and future wireless communication needs of RAC members. The second one provides responses to some of the specific questions presented by the CRTC in its Notice of Consultation Telecom CRTC 2019-57.

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[3] See: *Critical Infrastructure,* online: Public Safety Canada <https://www.publicsafety.gc.ca/cnt/ntnl-scrt/crtcl-nfrstrctr/index-en.aspx>.

CURRENT AND FUTURE COMMUNICATION NEEDS

Wireless Communications in the Critical Infrastructure Domain

14. Wireless communications are a foundational component of Critical Infrastructure operations, such as railways. The disperse geographical footprint of railway networks, the mobile nature of some of their assets (e.g. rolling stock in the Transportation segment, mobile operation crews, etc.) and most importantly their safety requirements call for dedicated wireless communication systems.

15. The mission critical wireless communications requirements of Critical Infrastructure operators have traditionally been covered by dedicated radio solutions, typically using narrowband licensed frequencies, with limited capacity but capable of fulfilling reliability, resiliency and availability requirements of the operational applications depending on them.

16. Narrowband wireless solutions have become unavoidable bottlenecks in the evolution of operations technology, due to their limited capabilities. New mission critical use cases are starting to require an order of magnitude increase in data communication capabilities that only broadband can offer.

17. Mobile broadband wireless cellular communications have recently been cautiously adopted by sectors outside their targeted consumer and business electronics markets. Critical Infrastructure operators/Operators (CIIs/CIOs), such as the Transportation segment and, more specifically the rail industry, are no exception to this trend. However, in this Critical Infrastructure domain, insufficient control of the coverage areas, the resiliency, the availability and the reliability of the commercial cellular networks has become a hindrance to realizing the wealth of benefits that broadband wireless could bring to advance operational use cases.

18. The rail industry has limited the usage of commercial wireless services to secondary or non-vital data and voice communications. For example, cellular modems with commercial subscriptions are used mostly as last resort communications systems before enforcing local fail-safe mechanisms. It is the dedicated narrowband radios that are still the primary communications option for vital data communications in incident and accident prevention systems such as train safety applications.

19. Broadband cellular wireless technologies, such as LTE, LTE-A and soon 5G, propelled by strong open technology standardization bodies, such as 3GPP, have given rise to a mature and rich inter-operable vendor ecosystem of Core and Radio Access Network equipment, as well as devices (a.k.a. User Equipment in 3GPP terminology).

20. Wireless technology providers and their standardization groups have also embraced this very trend on a global scale. The Internet-of-Things (IoT) and Industrial-Internet-of-Things (IIoT) have become central to the mobile wireless industry's research and development roadmaps.

21. Despite the wealth of characteristics mentioned above, the levels of adoption remain shy of their full potential for the rail industry. Now that equipment is available, the availability, or rather the absence thereof, of <u>mobile networks dedicated to operational purposes of railway networks</u> is an impediment to the deployment of these new applications within the operations of the members of RAC.

22. The current mobile wireless service regulation considers two types of providers: facilities-based mobile network operators (MNO) and now with this notice of consultation, mobile virtual network operators (MVNO). Either category of provider is subscriber-based and aims the same markets: consumers and business commercial clients. Their performance levels are tailored to these markets and such performance levels are not satisfactory for an overall integration within the Critical Infrastructure Operators/Industries.

23. More specifically, mobile commercial networks' coverage is uncertain and does not replicate the footprint of railway networks, and MNOs do not commit to service level agreements (SLAs) but rather offer Service Level Objectives (SLOs), hence falling short of our stringent operational and safety requirements. The service delivery model of commercial Mobile Networks is primarily oriented to satisfy consumer and business clients, mostly in urban settings; not critical infrastructure operations located in rural and remote areas. As a result, while theoretically MNOs should provide to the rail industry benefits of the evolving wireless technologies, their performance specifications are not in keeping with our industry's requirements.

Safety Perspective in the Rail Industry

24. There is an intrinsic relationship between safety, rail operations and technological innovation. Relentless innovation in operational technologies bring the wealth of remarkable operational enhancements and efficiency gains, in operational activities such as transport network density, freight traceability, dispatching and various types of automation. These benefits trickle down to the communities in Canada, in the form of a highly safe and efficient transportation network, fuelling domestic and international trade and underpinning social and economic development for all Canadians.

25. Often times, rail operational technologies are composed of distributed systems, spanning across extensive field area networks, covering both urban and rural settings, across provinces or even nationwide. Such distributed systems and their technological evolution rely on dependable (highly reliable, highly capable and highly available) wireless communications to fulfill their mission critical goals. Examples of such technologies in the rail industry are:

   a) Train Control applications; ensuring safe and efficient transportation of goods, through automated accident and incident prevention mechanisms.

   b) Infrastructure Integrity monitoring applications, guaranteeing optimal operational conditions and early detection of faults in rail assets with the very goal of preserving safety at all costs.

26. These Critical Infrastructure rail operations must abide by the highest safety standards, as the overarching principle guiding any operational improvements. Integrating LTE, LTE-A and 5G technologies into our operations demands rigorous adherence to the highest safety standards, supported by stringent reliability, availability and maintainability targets.

27. These high reliability, availability and maintainability performance indicators in the railway industry serve not only RAC members' business practices, they also secure part of the backbone of Canada's national security.

Public Safety and Transport Canada Safety Perspective

28. Public Safety Canada, as part of its "National Strategy and Action Plan" for National Security, outlines the following definition:

   "Critical infrastructure refers to processes, systems, facilities, technologies, networks, assets and services essential to the health, safety, security or economic well-being of Canadians and the effective functioning of government. Critical infrastructure can be stand-alone or interconnected and interdependent within and across provinces, territories and national borders. Disruptions of critical infrastructure could result in catastrophic loss of life, adverse economic effects and significant harm to public confidence."[4]

29. Transportation, energy and utilities are some of the industrial sectors identified by Public Safety Canada as providers and operators of critical infrastructure.[5]

30. The *Strategy* also calls for a sound collaboration between Critical Infrastructure Partners stating the following requirement:

   "In light of the interconnected nature of Canada's critical infrastructure, partnerships are required among government and critical infrastructure stakeholders, including owners and operators, law enforcement and the research and development community. Building on this approach, Public Safety Canada works with its partners to manage risks reduce vulnerabilities and strengthen the resilience of critical infrastructure across the ten sectors: Health, Food, Finance, Water, Information and Communication Technology, Safety, Energy and utilities, Manufacturing. Government, Transportation."[6]

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[4] *Critical Infrastructure,* online: Public Safety Canada <https://www.publicsafety.gc.ca/cnt/ntnl-scrt/crtcl-nfrstrctr/index-en.aspx>.
[5] *Ibid.*
[6] *Ibid.*

31. Transport Canada's report of May 2018 on the *Rail Safety Act Review* [7] states the following:

> "Dedicated radio spectrum is vital for putting an effective train control strategy in place across the national rail network. Spectrum, however, is in high demand, and individual railway companies cannot ensure sufficient bandwidth is available to meet their identified communication needs for high-speed mobile data and radio spectrum."

32. The proposal from RAC, if approved by the CRTC, will improve not only the operational performances of the railway industry, it will improve the fulfillment of the objectives of Canada's National Security Strategy[8] and its Action Plan.[9]

Proposal for Consideration of the Commission

MNC Eligibility for the Railway Industry

33. Railway operators need to build and control their own wireless communication infrastructure over a major portion of their rail network footprint. To take advantage of the state of the art or developing standard technologies, such as 3GPP, LTE, LTE-A which will achieve the performance targets sought by RAC members, the railway industry needs to be an authorized assignee of Mobile Network Code numbers.

34. Hence, for the RAC members to be capable of implementing any viable and efficient wireless solution in support of their operations and its safety, the existing Canadian IMSI Guidelines need to be amended. This amendment is the corner stone of the deployment of evolved wireless communication systems for the railway industry. Regulatory justifications and steps to reach the RAC's request are detailed in our response to Question 17.

35. The next section provides responses to some of the specific questions put forth by the Commission.

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[7] *Enhancing Rail Safety in Canada: Working Together For Safer Communities The 2018 Rail Safety Act Review* (May 2018) p. 51-52 , online: Transport Canada <http://www.tc.gc.ca/en/reviews/railway-safety-act-review/enhancing-rail-safety-canada-working-together-safer-communities.html>.

[8] *National Strategy for Critical Infrastructure,* online: Public Safety Canada <https://www.publicsafety.gc.ca/cnt/rsrcs/pblctns/srtg-crtcl-nfrstrctr/index-en.aspx >.

[9] *National Cross Sector Forum 2018-2020 Action Plan for Critical Infrastructure,* online: Public Safety Canada < https://www.publicsafety.gc.ca/cnt/rsrcs/pblctns/pln-crtcl-nfrstrctr-2018-20/index-en.aspx>.

RESPONSES TO THE QUESTIONS LISTED IN NOTICE OF CONSULTATION CRTC 2019-57

Competition in the retail wireless service market

Q1. Provide your views on how the Commission should define markets for the purpose of assessing the state of competition in the retail market.

  a) **How should the relevant product market be defined for the purpose of assessing retail competition? Can the product market be segmented for this analysis and, if so, how? For example, should the Commission consider the prepaid and postpaid markets separately?**

  b) **What is the appropriate geographic market for the assessment retail competition?**

  c) **Identify the key market indicators for the assessment of the state of retail competition in the mobile wireless service market(s). In other words, what specific evidence should the Commission gather and how can that information be used to assess competitiveness?**

36. Use of mobile wireless services by RAC members is not an issue of the market, but rather an issue of access, priority of signal treatment, and reliability. These criteria and the fact that wireless communications for our members need to be available in rural, remote and even isolated areas, are the determining characteristics that, in our view, should convince the CRTC to establish a tailored regulatory regime for mobile wireless services dedicated to the railway industry.

37. The nature of such a regime, and the regulatory measures necessary to implement it, are described in our response to Question 17.

Q2. Comment on the competitiveness of the mobile wireless service market(s). Are the mobile wireless service needs of Canadians currently being met? How have competitive conditions changed over the past five years? If the Commission's mobile wireless service regulatory framework remains unchanged, what do you expect the level of competition to be in the future?

38. No such market exists for the use and purposes of railway network operations as it was five years ago. Competition at the retail level will not improve the offering for RAC members in the future because relevant wireless applications for our members are niche and need not only to provide high reliability levels, they need to be controlled by the railway operators themselves.

39. A CRTC regulatory intervention is necessary to enable the deployment of operational solutions for railway systems in IoT age.

Q3. Are there issues that require regulatory measures at the retail level (i.e. beyond current measures such as the Wireless Code and mandatory participation in the Commission for Complaints for Telecom-television Services Inc. [CCTS])? If so, what are the issues and what measures would be required? Explain why these measures are necessary.

40. RAC has no specific comment to provide on this question.

Q4. Discuss how Canada's retail mobile wireless service market(s) compare(s) internationally and provide any studies and reports you have in this regard. Which countries offer the best comparisons with Canada and why? Discuss whether international comparisons are meaningful in the context of mobile wireless service regulation.

41. On the question of wireless connectivity and industrial use for the Internet of Things, the Body of European Regulators for Electronic Communications (BEREC), and the Organisation for Economic Co-operation and Development (OECD) are continuously doing studies and providing reports.

42. Of particular interest for RAC's current application and the CRTC in the scope of this consultation, two specific reports, namely:

   ➤ BEREC Report BoR (16) 39 - *Report Enabling the Internet of Things*, BoR (16) 39 (12 February 2016), online: Body of European Regulators for Electronic Communications <https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5755-berec-report-on-enabling-the-internet-of-things>

   ➤ OECD 2016 report Digital Economy Paper 252
   OECD Digital Economy Papers no. 252 (2016),*The Internet of Things : Seizing the Benefits and Addressing the Challenges*, online: OECDiLibrary <https://www.oecd-ilibrary.org/fr/science-and-technology/the-internet-of-things_5jlwvzz8td0n-en>

43. Both reports address the wireless connectivity challenge for industries in implementing 5G technology and using the IoT to improve the efficiency and safety of industrial processes.

44. Given that the OECD and BEREC aim their research toward societies with comparable democratic, social and economic systems to the Canadian ones, the approaches detailed in their reports are, in our opinion, a source of valid inspiration for the Canadian regulatory system.

45. On the regulatory side, we would like to point to the Commission's attention the 2014 reform of the *Telecommunications Act* in the Netherlands, the *Decree of the Minister of Economic Affairs [Minister van Economische Zaken] of 3 March 2014, no. ETM/TM/14024019, containing amendments to the Numbering Plan for international mobile subscription identities (IMSIs) relating to the use of IMSIs by private networks.*

46. This legislative initiative resulted in the type of connectivity flexibility for railway systems in the Netherlands that RAC are seeking to obtain. A copy of this decree has been filed as Annex B of our submission.

Q5. If the retail market, or a portion of it, is found to be insufficiently competitive to protect the interests of users, what regulatory measures (e.g. the application of additional conditions of service or mandating of the provision of lower-cost data-only plans), if any, ought to be applied to ensure that the policy objectives of the Act, as well as the Policy Direction, are met?

47. Retail market does not and will not in the future meet the interests of users such as RAC members and other utility network providers. Please refer to our response to Question 17 of the details on the proposed regulatory measure, conditions proposed and explanations as to how our proposal meets the objectives of the Act and the Policy Direction.

Wholesale mobile wireless service regulatory framework (roaming and MVNO access)

Q6. Discuss whether the current wholesale mobile wireless service regulatory framework effectively supports competition in the retail market.

48. RAC has no specific comment to provide on this question.

Q7. Discuss whether there have been any developments, technological or otherwise, that would require the current wholesale roaming policy to be modified. For any proposals to modify that policy, provide rationale for why the change is necessary and how it would benefit retail competition.

49. RAC has no specific comment to provide on this question.

Q8. Comment on whether the Commission's preliminary view that the national wireless carriers should be required to provide wholesale MVNO access on a mandated basis is appropriate. Should this requirement apply to other wireless carriers as well and, if yes, why?

50. RAC has no specific comment to provide on this question at this time.

Q9. Comment on how a wholesale MVNO service should be structured and implemented. In particular, discuss the following:

   a) **whether there should be a requirement for an MVNO to own a minimum amount of facilities in order to be eligible for a wholesale MVNO service. If so, what should that amount be and how should evidence of facilities ownership be demonstrated by a potential MVNO seeking access?**

51. RAC has no specific comment to provide on this question.

   b) **whether there should be other restrictions or eligibility criteria. If so, why?**

52. RAC has no specific comment to provide on this question.

c) **whether it would be appropriate and/or feasible to establish different regulatory requirements for wholesale MVNO service on the basis of geographic divisions. For example, should the service be mandated provincially or on another basis, as opposed to nationally?**

53. RAC has no specific comment to provide on this question at this time.

Q10. What terms or conditions should apply to regulated wholesale MVNO access?

54. RAC has no specific comment to provide on this question.

Q11. Discuss whether the Commission should set a wholesale rate for MVNO access.

a) **If a rate is to be set, would it be appropriate to establish an interim rate as part of this proceeding and, if so, what principle(s) should be used to set that rate?**

55. In RAC's opinion an interim rate should be set as it would allow for a more rapid implementation of MVNO access.

b) **Alternatively, should the national wireless carriers be required to make available a certain amount of capacity on their networks for MVNOs to use at commercially negotiated rates? If so, how should the amount of reserve capacity be determined? In this scenario, would it be appropriate to have a default tariffed rate to act as a backstop if negotiations fail?**

56. The word negotiation is used quite loosely in this environment where there are, at most, three facilities-based wireless providers in any given region of Canada. The proposal to have a default tariffed rate is indeed appropriate. However, negotiations should not be a prerequisite to call on this tariff. If should be the default enforceable rate, until or unless all parties involved agree on different conditions. Agreed upon conditions between parties should be filed, confidentially with the Commission.

c) **What are the advantages and disadvantages of each approach?**

57. By providing a default tariff, the Commission fulfills the objectives of the Canadian Telecommunication Policy, more specifically render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada , enhance the efficiency and competitiveness, at the national [...] level[s], of Canadian telecommunications and ensure that regulation is efficient and effective.

Q12. Discuss what would be an appropriate phase-out process for a mandated wholesale MVNO access service. For example, should the service be phased out on a specific, pre-determined date, be subject to a trigger that initiates a phase-out period, or be subject to another process?

58. Phase-out of mandated MVNO access service should not be considered at this point. The Commission should commit no further than to revisiting the issue 7 years after the entry into force of a new policy on mandated wholesale MVNO access service.

Future of Mobile Wireless Services in Canada

Q13. Provide your views on the future of retail and wholesale mobile wireless services in Canada. How do you foresee the rollout of small cells and 5G technology taking place? Over what time period do you expect this rollout to occur?

59. The RAC would refer the CRTC to studies published by BEREC and the OECD for insight on this matter.

Q14. What are the challenges facing carriers as they continue to deploy their networks, particularly with respect to small cells?

60. RAC telecommunications challenges are detailed in the report entitled *Canadian Rail Communication: Beyond 2020* included in Annex A to our submission. This report has been filed with our intervention, in French as well as in English.

Q15. Identify any expected changes or new technologies that are likely to be deployed in Canadian wireless networks that will have regulatory implications in the near term. How can the Commission ensure that its regulatory frameworks account for market and technological changes?

61. RAC members would like the CRTC to take notice of two network architecture configurations which present a great potential for efficient wireless solutions in remote and rural areas as increased connectivity becomes essential for industrial sectors such as the railway industry.

62. One of them is shared Radio Access Network (RAN). The other one is Private Virtual Network Operator (PVNO). Both types of wireless architecture are currently under consideration by the railway industry in its search for an advanced and reliable communication solution in the coming 5G environment.

Shared Radio Access Network

63. Members of the Railway Association of Canada may, conditional on the appropriate regulatory environment, build their wireless facilities in regions where no existing incumbent offer coverage for obvious financial reasons. These radio networks would provide railway operators with the level of control and performance required for their sensitive operational activities.

64. These new private dedicated networks may then partner with existing incumbent operators to complete their radio communication footprint as they may so require, thus creating a shared RAN.

65. A shared RAN of this nature would be operated and configured according to mission-critical standards and QPP (Quality of Service, Priority and Pre-emption) as such architecture will enable traffic separation and prioritization between the incumbent's and the railways' respective data traffic.

Private Virtual Network Operator (PVNO)

66. PVNO is an extension of Mobile Virtual Network Operator (MVNO) architecture. This architecture is usually recommended in geographical areas where multiple MNOs have robust coverage and service presence, typically in urban settings.

67. Just as an MVNO, PVNOs' Core Networks are interfacing with incumbent commercial MNO radio access networks. The difference is that the PVNO Core Network does not depend on a single MNO for radio access. Instead, it connects its devices through multiple MNOs' radio networks to the PVNO Core. Control of critical parts of the Core Network, such as the Packet Data Network Gateway (PDN-GW) can provide to a CIO (Critical Infrastructure Operator) operating a PVNO, an enhanced control over network resiliency and security of information.

68. The usage of multiple radio access networks would provide an enhanced level of redundancy to improve reliability and availability levels required by the railway industry.

MNC Eligibility: a necessary regulatory feature

69. Shared RAN Multiple Operator Core Network architecture requires the transmission of every participant's Public Land Mobile Network identity (PLMN-id), i.e. its own Mobile Network Code (MNC). The Mobile Network Code allows devices to select the appropriate radio access network and is the binding mechanism ensuring the routing of data flows to their corresponding Core Networks.

70. PVNO architecture uses its Mobile Network Code to allow the MNO network (radio and portions of the MNO core) to route the PVNO traffic to its independent PDN-GW.

71. A hybrid approach using PVNO, mostly in urban settings, combined with Shared RAN can also be an effective solution for CIOs to introduce broadband communications into advanced mission critical usage. As the same Core Network could serve both architectures, a hybrid approach offers a balanced solution that avoids putting undue pressure on the limitations of MNOs commercial service.

Q16. What are the issues associated with wireless carriers obtaining access to infrastructure, including towers, sites, structures, and fibre transport? Discuss whether the Commission's existing rules are sufficient to address these issues and what changes, if any, could be made to improve these rules under the Commission's current statutory framework.

   a) **If there is a need for the Commission to mandate additional wholesale services to support network deployment, identify those services and demonstrate their essentiality in accordance with the Essentiality Test set out in Telecom Decision 2015-326.**

72. RAC has no specific comment to provide on this question.

   b) **If a wholesale service that ought to be mandated is currently forborne from regulation, explain how that service no longer satisfies the conditions for forbearance under section 34 of the Act**.

73. RAC has no specific comment to provide on this question.

Other matters

Q17. Are there any other matters, issues, or proposals related to mobile wireless services, beyond those listed above, that the Commission should be aware of and potentially make determinations on as part of this proceeding? Identify and explain why those issues are relevant and include proposed regulatory solutions.

74. Members of the Railway Association of Canada, as Critical Infrastructure operators, recommend a regulatory path towards the eligibility for a Mobile Network Code assignment for CIOs.

75. The Railway Safety Act Review report[10] and the *Canadian Rail Communication: Beyond 2020*[11] share important conclusion on the matter of the future and relevance of Canadian railways' role in the social, political and economic development of the country: the railway industry will need to depend on enhanced dedicated wireless communications to play the role it has assigned.

76. The unique characteristics of the operational environment of railways:

   - heterogeneousness of the territory served;
   - diverse sizes of railway networks;
   - extreme gaps of meteorological conditions from one day to the next;
   - from ecologically fragile to hostile terrain;
   - located in densely populated or deserted areas;

77. require robust, dedicated, reliable communication systems to continue and improve is service performance for the Canadian public. The existing narrowband wireless systems need to be, not replaced but rather enhanced by the addition of wireless broadband systems. Several solutions may be implemented, but they have one thing in common: the wireless broadband systems will need to rely on dedicated addressable spectrum. This can be achieved by assigning MNC to railway operators.

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[10] *Enhancing Rail Safety in Canada: Working Together For Safer Communities The 2018 Rail Safety Act Review* (May 2018), online: Transport Canada <http://www.tc.gc.ca/en/reviews/railway-safety-act-review/enhancing-rail-safety-canada-working-together-safer-communities.html>.
[11] See Annex A.

78. Hence the railway industry depends on the will of the CRTC for the assignment of MNC numbers, so it will become an IoT player and pushes its operation in the era of 5G connectivity.

Regulatory change required

79. The CRTC, under the provisions of section 46.1 of the *Act*[12] has delegated the responsibility of managing the telecommunication numbering system to an administrative body. At the same time, it uses its power under section 58 of the *Act* to publish *Guidelines*[13], which may change from time to time, to keep the numbering management relevant to the industry as technology evolves.

80. The Commission can direct the CRTC Interconnection Steering Committee (CISC) to modify the *Guidelines* so that MNC numbers be provided to the railway industry. The RAC would be pleased to actively participate in the work of CISC in that regard.

81. By improving the operational performance of the railway industry, providing MNC numbers to railway operators will all contribute to the achievement of several objectives of the Canadian Telecom Policy, specifically.

- facilitate the orderly development throughout Canada of a telecommunications system that serves to safeguard, enrich and strengthen the social and economic fabric of Canada and its regions:[14]

- respond to the economic and social requirements of users of telecommunications services;[15]

- enhance the efficiency at the national level, of Canadian telecommunications[16] and,

- to stimulate research and development in Canada in the field of telecommunications and to encourage innovation in the provision of telecommunications services.[17]

82. This proposed non-economic regulatory amendment is in line with the *Policy Direction of 2006*[18]. Communications needs of the railway industry is clearly not market-driven as it is needed in rural, remote and even isolated regions where readily broadband access is not commercially available nor is it expected to be in the near future, hence making this intervention by the Commission not only appropriate but essential.

83. The development of criteria for the purpose of assignment of MNC numbers to railway operators by CISC, and its approval by the Commission, will ensure its symmetrical effect on all operators and finally, it will enable the emergence of new technology and connectivity schemes for the benefit of the entire Canadian telecommunication system.

*************END OF DOCUMENT*************

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[12] *Telecommunications Act*, SC 1993, c 38 [the *Act*].
[13] Canadian International Mobile Subscription Identity (IMSI) Assignment Guidelines, Version 5.0, approved by *Telecom Decision* (6 November 2015), 2015-496.
[14] See the *Act* s 7a).
[15] See the *Act* s 7h).
[16] See the *Act* s 7c).
[17] See the *Act* s 7g).
[18] *Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives*, SOR/2006 355.