



Telecom Notice of Consultation CRTC 2018-105

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Public record: 1011-NOC2018-0105

Call for comments

Next-generation 9-1-1 network design efficiencies

Deadline for submission of interventions: 25 April 2018

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The Commission hereby initiates a proceeding to examine matters related to next-generation 9-1-1 (NG9-1-1) network design efficiencies, including roles and responsibilities related to the provision of location information servers and customer information databases, NG9-1-1 network components that could be shared, and efficient interconnection arrangements.

Background

1. Effective access to emergency services in Canada is critical to the health and safety of Canadians, and is an important part of ensuring that Canadians have access to a world-class communication system. Over time, the Commission has established many regulatory measures so that telecommunications networks provide reliable and effective access to 9-1-1 services in Canada.
2. These regulatory measures include policies that specify how and where telecommunications service providers (TSPs)¹ are mandated to connect to incumbent local exchange carriers' (ILECs) points of interconnection (POIs) for the exchange of 9-1-1 traffic.
3. For existing services, for example, the Commission has established policies regarding (i) how competitive local exchange carriers' time-division multiplexing voice networks are required to interconnect with ILECs at a POI within each local interconnection region (LIR),² (ii) how 9-1-1 traffic must be delivered to these POIs, (iii) POI diversity, and (iv) the sharing of associated costs.³

¹ Today, TSPs offer wireline and wireless local exchange telephone services, including local voice over Internet Protocol (VoIP) services. In the future, TSPs could be expanded to include other types of providers as new next-generation 9-1-1 services are introduced.

² The Commission established LIRs in Telecom Decision 2004-46. In that decision, the Commission found that consolidation of exchanges to form larger LIRs would provide for more efficiency and lower the costs of interconnection.

³ See Telecom Decisions 2006-35 and 2006-14.

4. Moreover, the Commission has established regulatory measures related to the automatic provision of a 9-1-1 caller's location, telephone number, and other pertinent information to 9-1-1 call centres,⁴ also known as public safety answering points (PSAPs),⁵ using 9-1-1 technology such as Automatic Location Identification / Automatic Number Identification (ALI/ANI) database information.
5. The proliferation of Internet Protocol (IP) networks, however, has shifted the Commission's regulatory approach in multiple ways. For example, when establishing the IP network interconnection regime for voice services set out in Telecom Regulatory Policy 2012-24, the Commission weighed the benefits of consolidating POIs versus mandating a set number of POIs between carriers, such as two per province. Given that carriers in different regions may face unique circumstances or challenges in terms of their network capabilities and deployment, the Commission determined that the number of POIs for IP voice network interconnection should be established by the carriers through negotiations.
6. In the coming years, as telecommunications networks across Canada continue to evolve, the transition to IP technology is expected to have a significant impact on the networks used to deliver 9-1-1 calls, and on other network elements, systems, and arrangements used to provide 9-1-1 services.

Transition to next-generation 9-1-1 networks

7. In Telecom Regulatory Policy 2017-182, the Commission set out its determinations on the implementation and provision of next-generation 9-1-1 (NG9-1-1) networks. NG9-1-1 in Canada is based on the National Emergency Number Association (NENA) i3 architecture standard (the i3 standard), as approved by the Commission in Telecom Decision 2015-531. An NG9-1-1 network is defined in the i3 standard as the Emergency Services IP Network (ESInet) / Next Generation Core Services (NGCS), and is further defined by the Commission in Telecom Regulatory Policy 2017-182.
8. In that decision, among other things, the Commission determined that an ILEC stewardship model under Commission oversight is the appropriate model with respect to the governance and funding of NG9-1-1, such that ILECs⁶ would be responsible for the construction, operation, and maintenance of NG9-1-1 networks.

⁴ See Telecom Decision 97-8.

⁵ PSAPs are established by provincial and territorial governments, which, in some cases, delegate the responsibility for the PSAPs, and the emergency responders that they dispatch, to municipal governments.

⁶ The term "ILECs" includes both large and small ILECs. Under the current 9-1-1 regulatory framework, many small ILECs have chosen to enter into commercial agreements with the larger ILECs, which provide all or part of the 9-1-1 network functionality, so that the small ILECs can meet their obligation to provide both their retail and wholesale customers with access to 9-1-1 services.

9. The Commission directed the ILECs to establish their NG9-1-1 networks and be ready to provide the first NG9-1-1 service, namely NG9-1-1 Voice service,⁷ by 30 June 2020 wherever PSAPs have been established in a particular region. The Commission also directed all TSPs to make the necessary changes to support NG9-1-1 Voice service throughout their operating territories by the same date wherever their networks are capable of doing so.
10. Recognizing the need for an NG9-1-1 system in Canada that is as reliable, resilient, secure, and cost efficient as possible, the Commission also determined that NG9-1-1 networks should take into account efficiencies that will be gained from taking advantage of economies of scale, using existing network components as appropriate, and routing traffic as efficiently as possible.
11. The Commission therefore directed the ILECs, as NG9-1-1 network providers, to collaborate and to provide the Commission with a single report setting out recommendations on the following:
 - the roles and responsibilities of NG9-1-1 network providers and TSPs related to the provision of NG9-1-1 location information servers (LISs)⁸ and customer information databases known as Additional Data Repositories (ADRs);⁹
 - specific NG9-1-1 network components that could be shared to take advantage of economies of scale; and
 - efficient interconnection arrangements applicable to NG9-1-1 networks, especially for TSPs.
12. The Commission indicated that following the receipt of this report, it intended to seek input from NG9-1-1 stakeholders on the recommendations made by the NG9-1-1 network providers, as appropriate.

The report

13. On 21 December 2017, Bell Canada, Saskatchewan Telecommunications (SaskTel), and TELUS Communications Inc. (TCI) filed the requested report, which is reproduced in the Appendix to this notice. The report explored several topics, including that

⁷ This service enables the end-to-end provision of an IP-based 9-1-1 voice call, as defined under the i3 standard. The service is expected, at a minimum, to provide the capabilities and functions of the 9-1-1 services in place today, including functions such as conference calling and calling back the person requesting emergency services following a disconnection.

⁸ LISs store location information related to IP endpoints attached to an IP network. One of the main purposes of LIS is to support emergency calling from those endpoints.

⁹ ADRs provide additional data about the call, namely subscriber information from TSPs that could be useful to PSAPs, such as the name and callback number of the subscriber.

- the responsibility for LISs and ADRs resides with TSPs that own and operate originating networks, as per the i3 standard. To achieve economies of scale and national consistency, the NG9-1-1 network providers could offer a hosted service¹⁰ for these functions to these TSPs;
- the NG9-1-1 network providers could also offer a hosted service for TSPs' Legacy Network Gateways (LNGs)¹¹ to provide efficiency gains, depending on the region and environment; and
- each TSP should interconnect at a minimum of two completely geo-diverse NG9-1-1 POIs in each regional ESInet¹² covering that region. In addition, an NG9-1-1 network provider may choose to deploy more than two POIs in its serving territory, depending on geography, resiliency, and other considerations. Further, all calls and associated data communications presented to a given NG9-1-1 POI should be localized (e.g. a call originating in Vancouver must be delivered to one of TCI's NG9-1-1 POIs).

14. The Commission subsequently received letters from the Independent Telecommunications Providers Association (ITPA) and TBayTel, in which the parties indicated that, for various reasons, they had not commented on the issues identified by the large ILECs that submitted the report.

Issues to be examined

15. The Commission hereby initiates a proceeding to examine the matters related to NG9-1-1 network design efficiencies as recommended in the report. The Commission is also inviting parties to identify any additional recommended NG9-1-1 network design efficiency opportunities that may have been overlooked in the report, and that were not addressed in the proceeding that led to Telecom Regulatory Policy 2017-182.
16. The determinations reached as a result of this proceeding will apply throughout the country, including in areas that currently offer Basic 9-1-1 services (e.g. Yukon).¹³ Interveners should address areas of the country that do not currently benefit from 9-1-1 services, such as Nunavut, to ensure that the Commission's resulting policy determinations are forward looking and cover all regions of Canada.

¹⁰ Hosted services are outsourced systems and functions. A hosted service provider owns and oversees infrastructure, software, and administrative tasks, and makes the system available to its clients.

¹¹ LNGs enable legacy originating networks to connect to IP-based NG9-1-1 networks.

¹² A regional ESInet is defined as an i3-standard-compliant emergency services IP network deployed to cover the entire 9-1-1 serving territory of a given NG9-1-1 network provider, irrespective of the number of provinces or territories served.

¹³ Basic 9-1-1 service enables callers to be connected to 9-1-1 PSAPs. Enhanced 9-1-1 service includes Basic 9-1-1 service but also automatically provides 9-1-1 PSAP operators with additional information, such as the telephone number and location of the caller.

17. The Commission establishes regulatory policies, standards, and conditions of service, and approves tariffs and agreements governing access by Canadians to PSAPs. Provincial, territorial, and municipal governments, however, are responsible for emergency responders and for the establishment and operations of the PSAPs that dispatch them. As such, the Commission will not consider NG9-1-1 design efficiency proposals related to network components or functional elements that are the responsibility of PSAPs, as per Telecom Regulatory Policy 2017-182 and the i3 standard.
18. Although the report explored design efficiencies related to LNGs, the Commission determined in Telecom Regulatory Policy 2017-182 that LNGs do not form part of the NG9-1-1 networks, but are instead part of the originating networks.¹⁴ Therefore, LNGs are not to be funded through the ILECs' NG9-1-1 tariffed network access rates. As well, LNGs should not be part of NG9-1-1 implementation plans and their use should be considered only as a last resort to connect to NG9-1-1 networks. As such, design efficiencies related to LNGs are not within in the scope of this proceeding. However, TSPs are not precluded from exploring possible efficiencies related to LNGs outside of this proceeding.
19. In addition, the Commission will not examine matters related to the overall transition of TSPs' originating networks to IP-based networks, except when the transition is relevant to 9-1-1 services.
20. Finally, the Commission will not be examining efficiencies related to wireless 9-1-1 caller location accuracy since it has, in the past, considered this topic separately due to the associated level of importance and complexity.¹⁵

Call for comments

21. The Commission invites comments on the issues within the scope of this proceeding identified above. Specific questions are outlined below. The Commission requests that each party set out separately its responses to each issue it chooses to address, but in one document, indicating which issue it is addressing at the beginning of each response.
22. As a result of this proceeding, the Commission may impose obligations on some or all TSPs, including NG9-1-1 network providers, whether or not they choose to actively participate in this proceeding.
23. The Commission requests that comments address the questions below and include supporting rationale.

¹⁴ Originating networks are defined as the shared networks, such as wireline and wireless networks, used by Canadians to place calls, including 9-1-1 calls.

¹⁵ For example, in Telecom Decision 2014-415, the Commission established wireless Enhanced 9-1-1 Phase II service location accuracy requirements for Canada, including benchmarks to measure improvements in 9-1-1 caller location accuracy.

Location information servers (paragraphs 2 to 13 of the report)

Q1. The report indicates that the i3 standard specifies that the responsibility for the LIS function resides with the TSPs that operate originating networks. However, NG9-1-1 network providers could offer a hosted LIS service to these TSPs for these functions.

- a. Do you agree that in Canada the provision of the LIS functionality should be the responsibility of the TSPs that own and operate originating networks? Justify your response with supporting evidence and rationale.
- b. Comment on the feasibility, pros, and cons of a model whereby the LIS is offered as a hosted service by the NG9-1-1 network providers to the TSPs that own and operate originating networks.
- c. Should TSPs have the option of either providing their own LIS functionality or subscribing to the NG9-1-1 network providers' proposed hosted LIS functionality? Justify your response with supporting evidence and rationale.
- d. Should NG9-1-1 network providers be obligated to provide a tariffed wholesale hosted LIS service to TSPs and, if so, should the cost of providing the hosted LIS service form part of their NG9-1-1 tariffed network access rate or be a separate tariffed rate for TSPs that subscribe to the hosted LIS service?

Q2. The report indicates that the responsibility for, maintenance of, and ownership of end-user location data used by the LIS function resides with the TSPs that operate originating networks.

- a. Do you agree that the responsibility for, maintenance of, and ownership of end-user location data used by the LIS function should remain with each TSP that serves the relevant end-users? Justify your response with supporting evidence and rationale.
- b. What requirements should be imposed on TSPs with regard to the provision and maintenance of end-user location data to the LIS under the scenarios whereby the LIS is provided by TSPs, or provided to TSPs as a hosted service by NG9-1-1 network providers?

Q3. Are there any other policy considerations in regard to the provision of the LIS functionality and its data that the Commission should address?

Additional Data Repositories (paragraphs 14 to 24 of the report)

Q4. The report indicates that the i3 standard places the ADR function outside the ESInet, with the responsibility for the ADR function and its data residing with the TSPs that operate originating networks. However, NG9-1-1 network providers could offer a hosted ADR service to these TSPs for these functions.

- a. Do you agree that in Canada the ADR functionality should be the responsibility of the TSPs that own and operate originating networks? Justify your response with supporting evidence and rationale.
- b. Comment on the feasibility, pros, and cons of a model whereby the ADR is offered as a hosted service by NG9-1-1 network providers to TSPs.
- c. Should TSPs have the option of either providing their own ADR functionality or subscribing to the NG9-1-1 network providers' proposed hosted ADR functionality? Justify your response with supporting evidence and rationale.
- d. Should the NG9-1-1 network providers be obligated to provide a tariffed wholesale hosted ADR service to TSPs and, if so, should the cost of the hosted ADR service form part of their NG9-1-1 tariffed network access rate, or be a separate tariffed rate for TSPs that subscribe to the hosted ADR service?

Q5. The report indicates that the responsibility for, maintenance of, and ownership of end-user subscriber data used by the ADR function resides with the TSPs that operate originating networks.

- a. Do you agree that the responsibility for, maintenance of, and ownership of end-user subscriber data used by the ADR function should remain with each TSP that serves the relevant end-users? Justify your response with supporting evidence and rationale.
- b. What requirements should be imposed on TSPs with regard to the provision, validation, and maintenance of end-user subscriber data to the ADR under the scenarios whereby the ADR is provided by the TSPs or provided to TSPs as a hosted service by the NG9-1-1 network providers?

Q6. Are there any other policy considerations in regard to the provision of the ADR functionality and its data that the Commission should address?

Sharing of NG9-1-1 network components (paragraphs 25 and 26 of the report)

Q7. The report indicates that due to the fact that NG9-1-1 is an evolving framework that includes a number of standards and interface specifications, some of which have yet to be finalized, no core network components that could be shared to take advantage of economies of scale have been identified at this time. Identify specific core NG9-1-1 network components that could be shared to take advantage of economies of scale that may not have been considered in the report or that were already explored in the proceeding that led to Telecom Regulatory Policy 2017-182, along with supporting evidence and rationale.

Interconnection arrangements (paragraphs 27 to 42 of the report)

Q8: The report recommends that an NG9-1-1 network provider may choose to deploy more than two NG9-1-1 POIs in its serving territory, depending on geography, resiliency,

and other considerations. However, the report did not recommend where the NG9-1-1 POIs should be established, how many POIs there should be in NG9-1-1 network providers' serving territories, or the criteria for making interconnection determinations.

Comment on whether, in light of the transition to NG9-1-1, the Commission should maintain or depart from its existing IP voice interconnection policies (referred to in paragraph 5 above) with regard to where ILECs, as NG9-1-1 network providers, are required to establish POIs for TSPs operating originating networks to exchange NG9-1-1 traffic with the NG9-1-1 network. Provide supporting evidence and rationale, including your views on

- a. whether the Commission should set out criteria regarding how NG9-1-1 interconnection regions (e.g. per LIR, per province, or per ESInet) should be defined;
- b. how many NG9-1-1 POIs should be made available in each proposed interconnection region, based on which criteria, and who should determine this number and criteria (e.g. the Commission, NG9-1-1 network providers, TSPs, or NG9-1-1 network providers and TSPs through negotiations); and
- c. in which specific municipalities or areas of the country NG9-1-1 POIs should be made available.

Q9. The report recommends that TSPs that operate originating networks should interconnect at a minimum of two completely geo-diverse POIs within each interconnection region. Do you agree with this recommendation? Justify your response with supporting evidence and rationale, and include a proposed definition of geo-diversity with regard to POIs.

Q10. The report does not specifically discuss NG9-1-1 POI arrangements between TSPs and small ILECs as the NG9-1-1 network providers in their serving territories. In light of your responses to the questions above, would the same approach apply to the establishment of POIs in the small ILECs' serving territories, or would special considerations need to be taken into account? Justify your response with supporting evidence and rationale.

Q11. The report recommends that all calls and associated data communications presented to a given NG9-1-1 POI should be localized, i.e. associated with the domain of the serving NG9-1-1 network provider (e.g. a call originating in Vancouver must be delivered to one of TCI's NG9-1-1 POIs). Do you agree with this recommendation? Justify your response with supporting evidence and rationale.

Q12: The report indicates that public Internet-based interconnection will not be supported for security and safety reasons. Do you agree with this statement? Justify your response with supporting evidence and rationale.

Procedure

24. The *Canadian Radio-television and Telecommunications Commission Rules of Practice and Procedure* (the Rules of Procedure) apply to this proceeding. The Rules of Procedure set out, among other things, the rules for the content, format, filing, and service of interventions, answers, replies, and requests for information; the procedure for filing confidential information and requesting its disclosure; and the conduct of public hearings. Accordingly, the procedure set out below must be read in conjunction with the Rules of Procedure and related documents, which can be found on the Commission's website at www.crtc.gc.ca, under "[Statutes and Regulations](#)." The guidelines set out in Broadcasting and Telecom Information Bulletin 2010-959 provide information to help interested persons and parties understand the Rules of Procedure so that they can more effectively participate in Commission proceedings.
25. NG9-1-1 network providers, including small and large ILECs, as well as TSPs, are made parties to this proceeding and may file interventions with the Commission by **25 April 2018**.
26. Interested persons who wish to become parties to this proceeding must file an intervention with the Commission regarding the above-noted issues by **25 April 2018**. The intervention must be filed in accordance with section 26 of the Rules of Procedure.
27. Parties are encouraged to coordinate, organize, and file, in a single submission, interventions by other interested persons who share their position. Information on how to file this type of submission, known as a joint supporting intervention, as well as a [template](#) for the accompanying cover letter to be filed by parties, can be found in Telecom Information Bulletin 2011-693.
28. All parties may file replies to interventions with the Commission by **11 June 2018**.
29. The Commission encourages interested persons and parties to monitor the record of this proceeding, available on the Commission's website at www.crtc.gc.ca, for additional information that they may find useful when preparing their submissions.
30. Submissions longer than five pages should include a summary. Each paragraph of all submissions should be numbered, and the line *****End of document***** should follow the last paragraph. This will help the Commission verify that the document has not been damaged during electronic transmission.
31. Pursuant to Broadcasting and Telecom Information Bulletin 2015-242, the Commission expects incorporated entities and associations, and encourages all Canadians, to file submissions for Commission proceedings in accessible formats (for example, text-based file formats that enable text to be enlarged or modified, or read by screen readers). To provide assistance in this regard, the Commission has posted on its website [guidelines](#) for preparing documents in accessible formats.

32. Submissions must be filed by sending them to the Secretary General of the Commission using **only one** of the following means:

by completing the
[\[Intervention form\]](#)

or

by mail to
CRTC, Ottawa, Ontario K1A 0N2

or

by fax to
819-994-0218

33. Parties who send documents electronically must ensure that they will be able to prove, upon Commission request, that filing, or where required, service of a particular document was completed. Accordingly, parties must keep proof of the sending and receipt of each document for 180 days after the date on which the document is filed or served. The Commission advises parties who file or serve documents by electronic means to exercise caution when using email for the service of documents, as it may be difficult to establish that service has occurred.
34. In accordance with the Rules of Procedure, a document must be received by the Commission and all relevant parties by 5 p.m. Vancouver time (8 p.m. Ottawa time) on the date it is due. Parties are responsible for ensuring the timely delivery of their submissions and will not be notified if their submissions are received after the deadline. Late submissions, including those due to postal delays, will not be considered by the Commission and will not be made part of the public record.
35. The Commission will not formally acknowledge submissions. It will, however, fully consider all submissions, which will form part of the public record of the proceeding, provided that the procedure for filing set out above has been followed.

Important notice

36. All information that parties provide as part of this public process, except information designated confidential, whether sent by postal mail, facsimile, email, or through the Commission's website at www.crtc.gc.ca, becomes part of a publicly accessible file and will be posted on the Commission's website. This includes all personal information, such as full names, email addresses, postal/street addresses, and telephone and facsimile numbers.
37. The personal information that parties provide will be used and may be disclosed for the purpose for which the information was obtained or compiled by the Commission, or for a use consistent with that purpose.

38. Documents received electronically or otherwise will be posted on the Commission's website in their entirety exactly as received, including any personal information contained therein, in the official language and format in which they are received. Documents not received electronically will be available in PDF format.
39. The information that parties provide to the Commission as part of this public process is entered into an unsearchable database dedicated to this specific public process. This database is accessible only from the web page of this particular public process. As a result, a general search of the Commission's website with the help of either its search engine or a third-party search engine will not provide access to the information that was provided as part of this public process.

Availability of documents

40. Electronic versions of the interventions and other documents referred to in this notice are available on the Commission's website at www.crtc.gc.ca by using the public record number provided at the beginning of this notice or by visiting the "Have your say!" section, then selecting "our open processes." Documents can then be accessed by clicking on the links in the "Subject" and "Related Documents" columns associated with this particular notice.
41. Documents are also available at the following address, upon request, during normal business hours.

Les Terrasses de la Chaudière
Central Building
1 Promenade du Portage
Gatineau, Quebec
J8X 4B1
Tel.: 819-997-2429
Fax: 819-994-0218

Toll-free telephone: 1-877-249-2782
Toll-free TDD: 1-877-909-2782

Secretary General

Related documents

- *Next-generation 9-1-1 – Modernizing 9-1-1 networks to meet the public safety needs of Canadians*, Telecom Regulatory Policy CRTC 2017-182, 1 June 2017
- *CISC Emergency Services Working Group – Consensus report regarding a Next-Generation 9-1-1 network architecture standard for Canada*, Telecom Decision CRTC 2015-531, 30 November 2015
- *Filing submissions for Commission proceedings in accessible formats*, Broadcasting and Telecom Information Bulletin CRTC 2015-242, 8 June 2015

- *CISC Emergency Services Working Group – Consensus report regarding wireless enhanced 9-1-1 Phase II location accuracy requirements*, Telecom Decision CRTC 2014-415, 6 August 2014
- *Network interconnection for voice services*, Telecom Regulatory Policy CRTC 2012-24, 19 January 2012
- *Filing of joint supporting interventions*, Telecom Information Bulletin CRTC 2011-693, 8 November 2011
- *Guidelines on the CRTC Rules of Practice and Procedure*, Broadcasting and Telecom Information Bulletin CRTC 2010-959, 23 December 2010
- *Follow-up to Trunking arrangements for the interchange of traffic and the point of interconnection between local exchange carriers*, *Telecom Decision CRTC 2004-46*, Telecom Decision CRTC 2006-35, 29 May 2006
- *Revised regulatory framework for the small incumbent local exchange carriers*, Telecom Decision CRTC 2006-14, 29 March 2006
- *Trunking arrangements for the interchange of traffic and the point of interconnection between local exchange carriers*, Telecom Decision CRTC 2004-46, 14 July 2004
- *Local competition*, Telecom Decision CRTC 97-8, 1 May 1997

Appendix to Telecom Notice of Consultation CRTC 2018-105

FOLLOW UP TO TELECOM REGULATORY POLICY CRTC 2017-182

NEXT-GENERATION 9-1-1 – MODERNIZING 9-1-1 NETWORKS TO MEET THE PUBLIC SAFETY NEEDS OF CANADIANS

REPORT OF BELL CANADA, SASKTEL AND TELUS DETAILING RECOMMENDATIONS ON MATTERS ASSOCIATED WITH THE INTRODUCTION OF NEXT GENERATION 9-1-1 NETWORKS IN CANADA

21 DECEMBER 2017

Table of Contents

- 1.0 [Introduction](#)
- 2.0 [Network components, responsibilities and interconnection](#)
 - 2.1 [Local Information Server](#)
 - 2.2 [Additional Data Repository](#)
 - 2.3 [Specific NG9-1-1 network components that could be shared to take advantage of economies of scale](#)
 - 2.4 [Efficient interconnection arrangements applicable to NG9-1-1 networks, especially for TSPs](#)
- 3.0 [Conclusion](#)

1.0 INTRODUCTION

1. On 1 June 2017, the Commission issued Telecom Regulatory Policy CRTC 2017-182¹ in which it set out its determinations on the implementation and provisioning of Next Generation 9-1-1 (NG9-1-1) networks and services in Canada. The Commission noted that this will require coordination and collaboration between numerous stakeholders, including the Commission; telecommunications service providers that provide 9-1-1 services (TSPs); 9-1-1 network providers; the CRTC Interconnection Steering Committee (CISC); federal, provincial, territorial, and municipal governments; emergency responders; and public safety answering points (PSAPs). As such, the Commission made a number of recommendations in which all stakeholders will have a role to play. In TRP 2017-182, the Commission stated that to introduce an NG9-1-1 system in Canada that is as reliable, resilient, secure, and cost-efficient as possible, the stakeholders involved in the design of the NG9-1-1 networks should take into account efficiencies that will be gained from taking advantage of economies of scale, using existing network components as appropriate, and routing traffic as efficiently as possible². In keeping with this guiding principle and the Commission's associated directions in TRP 2017-182³, Bell, SaskTel and TELUS, collectively the Next-Generation 911 ("NG9-1-1") service providers, jointly file this report detailing our recommendations on the following:

- (a) the roles and responsibilities of the NG9-1-1 network providers and telecommunications service providers that provide 9-1-1 services (TSPs) related to the provision of NG9-1-1 location information servers and customer information databases;
- (b) specific NG9-1-1 network components that could be shared to take advantage of economies of scale; and
- (c) efficient interconnection arrangements applicable to NG9-1-1 networks, especially for TSPs.

2.0 NETWORK COMPONENTS, RESPONSIBILITIES AND INTERCONNECTION

2.1 Location Information Server

2. A location information server (LIS) is a function that stores location information of Internet Protocol (IP) endpoints attached to an IP network. One of its main purposes is to support emergency calling from those endpoints. A LIS is intimately associated with the IP network it serves and the mobility of the endpoints running over it as such, not all LISs are created alike.

¹ Telecom Regulatory Policy CRTC 2017-182, *Next-generation 9-1-1 – Modernizing 9-1-1 networks to meet the public safety needs of Canadians*.

² TRP 2017-182, paragraph 136.

³ TRP 2017-182, paragraph 137.

3. The LIS will support the National Emergency Number Association (NENA) standardized interfaces for location retrieval including the Presence Information Data Format Location Object (PIDF-LO) format.
4. To determine roles and responsibilities of the LIS, one need only answer "who owns the data". Following the chain of custody of the data will determine party responsible for ensuring its accuracy.
5. Historically with Enhanced 9-1-1 (E9-1-1), TSPs capture the location information of their customers. The same holds true with NG9-1-1.
6. The NENA i3 Standard recognizes that and places the LIS function outside of the Emergency Services IP Network (ESInet) /NGCS with the responsibility of operating it squarely under the originating networks. NG9-1-1 network providers are in full support of this concept.
7. One NG9-1-1 TSPs' responsibility is to ensure that a civic-formatted location to be stored in a LIS in the originating network can be validated prior to being used for emergency calling by exposing a Location Validation Function (LVF).
8. Another NG9-1-1 network providers' responsibility is to route emergency calls based on the location provided by the LIS of the originating network to the appropriate or designated public safety answering point (PSAP).
9. While the responsibility of the LIS and its data falls under the originating networks, it is conceivable that a LIS hosted by the NG9-1-1 network providers could be provided. A Hosted LIS service could serve to standardize NG9-1-1 across small incumbent local exchange carriers (SILECs), RILECs, Inuit Tapirisat of Canada (ITCs) and other parties who may not wish to operate a LIS in the same way they do not operate E9-1-1 facilities today.
10. A Hosted LIS would also provide an equal choice to all carriers who could choose to utilise it or operate their own or a combination of both across different territories.
11. A hosted LIS service would require that a provisioning interface be defined as currently no such standard exists.
12. For fixed location IP endpoints, including wireless cell sectors, this hosted solution could be fairly simple however as the industry evolves to support location-capable nomadic and mobile IP endpoints, the complexity of such arrangement will likely augment considerably.
13. In a hosted environment the responsibility, maintenance and ownership of the data would continue to remain with the originating networks. The hosted arrangement would provide a platform-centric, centralized, managed repository and access facility similar to database management systems in use today for E9-1-1.

2.2 Additional Data Repository

14. The Customer Information Database Functional Element (CIDB) referred to in NENA i3v1 was generalized to Additional Data Repository (ADR) in NENA i3v2. The specific ADR that provides the functions of the defunct CIDB is the one that provides Additional Data about the call.
15. As per the specification, Additional Data about the call is information that a service provider, wireline or wireless, has about its subscribers that could be useful for the PSAPs.
16. Similar to the LIS, to determine roles and responsibilities of the ADR, one need only answer "who owns the data". Following the chain of custody of the data will determine party responsible for ensuring its accuracy.
17. Historically with E9-1-1, TSPs capture subscriber information of their customers. The same holds true with NG9-1-1.
18. NENA i3 recognizes that and places the ADR function outside of the ESInet/NGCS with the responsibility of operating it squarely under the originating networks and NG9-1-1 network providers are in support of this concept.
19. The responsibility of the NG9-1-1 network providers towards Additional Data about the call is to carry the information provided by the originating networks to the appropriate or designated PSAP.
20. While the responsibility of the Additional Data about the call ADR and its data falls under the originating networks, it is conceivable that an ADR hosted by the NG9-1-1 network providers could be provided.
21. The advantages, benefits and flexibility specified for the Hosted LIS equally apply to a Hosted ADR.
22. For wireless subscriber information, the hosted environment would have to be populated with all of the requisite information from the wireless service providers.
23. A hosted Additional Data about the call ADR service would require that a provisioning interface be defined as currently no such standard exists.
24. In a hosted environment the responsibility, maintenance and ownership of the data would continue to remain with the originating network similar to the Hosted LIS. The hosted arrangement would provide a platform-centric, centralized, managed repository and access facility similar to database management systems in use today for E9-1-1.

2.3 Specific NG9-1-1 network components that could be shared to take advantage of economies of scale

25. NG9-1-1 is an evolving framework that includes a number of standards and interface specifications, some of which that have yet to be finalized. As a result, from a core network component perspective, at this time, the NG9-1-1 network providers have not been able to identify any components that could be effectively shared to take advantage of economies of scale without potentially impacting the robustness of the network as well as target deployment dates. Given that this topology is brand new with evolving standards, our experience with it will continue to evolve and it is quite possible that such possibilities may exist for future components.
26. This does not preclude that elements outside of the NGCS cannot also be analyzed to look to maximize efficiency. From an interconnection perspective a number of efficiencies which have been identified elsewhere within this report will reduce the cost and complexity of these networks in comparison to the current TDM-based model. Additionally, concepts such as each NG9-1-1 network provider offering - hosted LIS/ADR and LNG capabilities may also prove to offer efficiency gains depending on the region and environment. All carriers could benefit from this consolidation however it is certain that SILECs, RILECs, ITCs and other 9-1-1 partners will benefit from a shared cost model.

2.4 Efficient interconnection arrangements applicable to NG9-1-1 networks, especially for TSPs

27. As an IP-based network, NG9-1-1 provides for a far more efficient interconnection methodology.
28. -As in any network design, the challenge is finding the right balance between redundancy, resiliency, cost and complexity.
29. -NG9-1-1 Points of Interconnection (POIs) provide a mechanism to:
 - Provide the ability to monitor and alarm critical 9-1-1 facilities;
 - expedite fault isolation and resolution;
 - ensure call quality;
 - prevent inefficiencies associated with overbuilding;
 - ensure network reliability by providing redundancy for facilities, power and other supporting structures for and between POIs;
 - provide a dedicated and secure environment;
 - support competitively neutral transport to common POIs within each NG9-1-1 network provider's domain; and
 - maintain single point of contact with NG9-1-1 network providers.

30. The NG9-1-1 network providers are of the opinion that each TSP and wireless service provider (WSP) offering telecommunications services in a given region should interconnect at a minimum of two completely geo-diverse POIs in each Regional ESInet covering that region. A Regional ESInet is defined as an i3-compliant Emergency services IP Network deployed to cover the entire 9-1-1 serving territory of a given NG9-1-1 network provider irrespective of the number of Provinces.
31. A NG9-1-1 Network provider may choose to deploy more than two POIs in its serving territory depending on geography, resiliency and other considerations.
32. where possible, WSPs and TSPs may opt to interconnect to more than two POIs in order to provide a greater level of resiliency or to accommodate a growth in traffic volumes.
33. All calls and associated data communications presented to a given POI should be localized, i.e., associated to the domain of the serving NG9-1-1 network provider (e.g., a call originating in Vancouver must be delivered to one of TELUS' POIs.).
34. Any designated POI for a given NG9-1-1 network provider will be capable of receiving calls originated within its entire 9-1-1 footprint (i.e., if the NG9-1-1 network provider serves more than one Province, calls from any Provinces served by a given NG9-1-1 network provider can be presented to any of the POIs designated by that NG9-1-1 network provider).
35. POIs will be identified where dedicated facilities will be used. Public Internet-based interconnection will not be supported for obvious security and safety reasons.
36. POIs and interconnecting facilities shall be architected such that data sovereignty is always maintained in accordance with paragraph 125 of TRP 2017-182 as well as other laws and policies across various Canadian jurisdictions.
37. In accordance with TRP 2017-182, NG9-1-1 network providers will interconnect their regional ESInets in order to form a reliable and resilient national network.
38. This "network of networks" is expressly architected to facilitate inter-territory information exchange and call transfers between i3 PSAPs.
39. This network is not being designed or scaled to act as a transit network and accordingly is not envisioned to need to account for things such as settlement. Specifically, NG9-1-1 network providers intend to establish a common transport factor to ensure adequate facilities and bandwidth can support failover, and other cross-jurisdictional considerations without the need for post-payments, imbalance payments or other factors that will destabilize 9-1-1 rates on an annual and even monthly basis. This methodology has the benefits of offering a clearly defined and structured interconnection regime for NG9-1-1 as well as cost stability.

40. ESInet Interconnection arrangements to the i3 PSAPs will leverage the existing Internet Protocol Virtual Private Network (IP-VPN) circuits where deployed.
41. For security reasons and consistent with the NENA i3 Architecture, it is expected that i3-compliant PSAPs will deploy i3 Border Control Functions at the entry point of the PSAP premise, facing the IP-VPN circuits. The demarcation point will remain at the PSAP's Customer Edge router provided by the NG9-1-1 Network Provider.
42. Specifications and details related to routing, addressing and protocols will be included as part of the 31 March 2018 report and recommendations associated with development of the technical details of NG9-1-1 network interconnections. It is the intention of the NG9-1-1 network providers that this interface specification will be as consistent as practicable across the NG9-1-1 network providers thereby providing additional efficiencies which cannot be assessed at this time.

3.0 CONCLUSION

43. As reports are finalized in the first quarter of 2018, assuming the Commission approves the requests for extension, other opportunities for resiliency and efficiency will be considered. To date, Emergency Services Working Group has undertaken several initiatives to examine additional efficiency and resiliency as part of ongoing Task Identification Forms and issues to be resolved. We anticipate this collaborative spirit to continue throughout the planning and deployment process.