Canadian Radio-television and Telecommunications Commission
Conseil de la radiodiffusion et des télécommunications canadiennes

Telecom Notice of Consultation CRTC 2015-305

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Call for comments

Matters related to the reliability and resiliency of the 9-1-1 networks

Deadline for submission of interventions: 7 October 2015

[Submit an intervention or view related documents]

Telecommunications networks are critical to the provision of 9-1-1 services. Given the importance of 9-1-1 services to the health and safety of Canadians, the Commission, to benefit Canadians, is initiating a proceeding to examine, as a preventive measure, the reliability and resiliency of the current 9-1-1 networks, as well as to determine whether it is necessary to establish related requirements by way of regulatory measures and, if so, what they should be. The Commission will also examine whether it should mandate 9-1-1 network quality-of-service standards. Further, the Commission will examine to what extent, if any, 9-1-1 network providers should be required to notify affected public safety answering points (PSAPs), affected telephone service providers, and the Commission of 9-1-1 network outages, and whether telephone service providers should be required to notify affected 9-1-1 network providers, affected PSAPs, and the Commission of outages of the 9-1-1 dedicated trunks or equivalent voice lines, which connect the originating network to the point of interconnection with the 9-1-1 network.

Introduction

1. Effective access to emergency services is critical to the health and safety of citizens, and is an important part of the Commission's role to ensure that Canadians have access to a world-class communication system. Canadians have come to rely on the continuous and uninterrupted operation of 9-1-1 services to seek help during an emergency. Given that 9-1-1 networks are critical in the provision of 9-1-1 services, the Commission is proactively reviewing the reliability and resiliency of these networks, as identified in its 9-1-1 action plan.[1]

2. Canadians have access to either Basic or Enhanced 9-1-1 service[2] through wireline, wireless, and voice over Internet Protocol (VoIP) telephone services[3] in areas where

[1] The 9-1-1 action plan can be found in Telecom Regulatory Policy 2014-342.

[2] Basic 9-1-1 service enables callers to be connected to call takers in specialized 9-1-1 call centres, also known as public safety answering points (PSAPs), who dispatch the appropriate emergency responders.

9-1-1 call centres, also known as public safety answering points (PSAPs), have been established by provincial, territorial, or municipal governments.

3. In Canada, 9-1-1 services began as an initiative to provide citizens with quick access to emergency services. Over time, and due to the increasingly widespread implementation of 9-1-1 services in municipalities, incumbent local exchange carriers (ILECs) and small ILECs have established specialized 9-1-1 networks within their serving territories that provide enhanced functionality, increased reliability, and a reduced risk of congestion for 9-1-1 calls. These 9-1-1 networks comprise the components and transmission facilities required to route 9-1-1 calls and ancillary information from the telephone service provider[4] to the appropriate PSAP. The list of elements that the Commission considers to comprise the 9-1-1 network[5] can be found in paragraph 20.

4. As a result of significant 9-1-1 service disruptions in the United States due to natural disasters, the Federal Communications Commission conducted a review to identify 9-1-1 network vulnerabilities that could have been prevented.[6] While there have been no similar large-scale 9-1-1 network disruptions in Canada, the Commission considers it important, as a preventive measure, to examine whether it is necessary to make improvements to Canadian 9-1-1 networks.

5. Although each telephone service provider is responsible for ensuring that the 9-1-1 calls made by their subscribers are properly routed, many of these service providers rely on the ILECs or the small ILECs to provide the 9-1-1 network to fulfill this obligation. A telephone service provider that operates any or all elements of a 9-1-1 network is referred to in this notice as a 9-1-1 network provider. 9-1-1 network functionality is provided through wholesale 9-1-1 access tariffs, as well as agreements between the ILECs or small ILECs and competitive local exchange carriers (CLECs), wireless carriers, VoIP providers, or resellers.

Enhanced 9-1-1 service includes basic 9-1-1 service but also automatically provides 9-1-1 call takers with the telephone number and location of the caller.

[3] For more information on the Commission's role with respect to 9-1-1 services, refer to the "9-1-1 Services in Canada" page of the Commission's website at www.crtc.gc.ca.

[4] Telephone service providers include traditional wireline, wireless, and VoIP local exchange telephone service providers.

[5] Most companies do not currently have an individual tariff item dedicated to all the elements of the 9-1-1 network. Appendix 4 provides a list of some of the relevant tariffs that currently address the provision of 9-1-1 services, including elements of the 9-1-1 network.

[6] Refer to Federal Communications Commission 13-185, *Report and Order: Improving 911 Reliability – Reliability and Continuity of Communications Networks, Including Broadband Technologies*, Adopted on 12 December 2013.

Jurisdiction and regulatory framework

6. The Commission will examine the matters raised in this proceeding in light of the policy objectives set out in section 7 of the *Telecommunications Act* (the Act) and the Policy Direction.[7]

7. The provision of 9-1-1 services requires collaboration between numerous stakeholders. The provincial, territorial, and municipal governments are responsible for emergency response (such as police, fire, and ambulance) and for the establishment and management of the PSAPs that dispatch emergency responders. The other key stakeholders are telephone service providers, which are traditional wireline, wireless, and VoIP local exchange telephone service providers.

8. The Commission, through its regulatory authority over the provision of telecommunications services, has mandated telephone service providers to provide their customers with access to 9-1-1 services where provincial/territorial and municipal governments have established PSAPs. Specifically, each telephone service provider must ensure that when a customer dials 9-1-1, the call is routed to the appropriate PSAP. The Commission has imposed a series of additional obligations to (i) implement this functionality, (ii) address new types of telephone services, technological changes, and emerging issues, as well as (iii) add new 9-1-1 functionalities, such as Enhanced 9-1-1 and Text with 9-1-1. This has resulted in the current regulatory framework for 9-1-1 services, set out in Commission policies and directions, as well as in the terms of service set out in Commission-approved tariffs and agreements.

Issues to be examined

9. It is in the public interest for 9-1-1 network providers to take reasonable measures to ensure that 9-1-1 networks are reliable and resilient to the maximum extent feasible.

10. The Commission hereby initiates a proceeding to examine the reliability and resiliency of the current 9-1-1 networks, as well as to determine whether it is necessary to establish related requirements by way of regulatory measures and, if so, what they should be.

11. The Commission will also examine whether 9-1-1 network quality-of-service standards or service-level agreements between parties should be established and, if so, the appropriate regulatory measures by which they should be imposed.

12. Further, the Commission will examine to what extent, if any, 9-1-1 network providers should be required to notify affected PSAPs, affected telephone service providers, and the Commission of 9-1-1 network outages, and whether telephone service providers should be required to notify affected 9-1-1 network providers, affected

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[7] *Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives*, P.C. 2006-1534, 14 December 2006

PSAPs, and the Commission of outages of 9-1-1-dedicated trunks or equivalent voice lines, which connect the originating network to the point of interconnection with the 9-1-1 network. The Commission will examine to what extent, if any, PSAPs, in turn, should be encouraged to notify affected 9-1-1 network providers, affected telephone service providers, and the Commission of PSAP outages.

13. The Commission will also examine which additional regulatory measures, if any, are appropriate as a result of this proceeding. The Commission may impose regulatory measures on 9-1-1 network providers and on telephone service providers, whether or not they choose to participate in this proceeding.

Scope of the proceeding

14. The scope of this proceeding is limited to the matters that fall under the Commission's jurisdiction, namely the 9-1-1 networks and the other issues referred to above. The Commission's intent is not to examine the reliability and resiliency of the portion of the telephone service providers' networks from which telephone calls, including 9-1-1 calls, are made (the originating networks[8]).

15. Rather, the Commission will examine the specialized and shared 9-1-1 service portion of the 9-1-1 network providers' networks through which 9-1-1 calls are routed. The reliability of a particular 9-1-1 network has a direct impact on the 9-1-1 service provided by all telephone service providers served by that 9-1-1 network, as it extends from the originating network's point of interconnection[9] with the 9-1-1 network to the PSAP.

16. The Commission also does not intend to examine the reliability and resiliency of the connections between primary PSAPs and secondary PSAPs[10] or the emergency responders' radio communication networks since their implementation and operation fall under the responsibility of provincial, territorial, or municipal governments.

17. The Commission understands the importance of ensuring that Next-Generation 9-1-1 networks are reliable and resilient; however, this matter will not be the focus of this proceeding. Next-Generation 9-1-1 networks have been identified in the Commission's three-year plan.[11]

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[8] There are different types of originating networks that provide wireline, wireless, or VoIP telephone services.

[9] A point of interconnection refers to the physical link between two networks, in this case, between the originating network, whether for wireline, wireless, or VoIP services, and the 9-1-1 network.

[10] 9-1-1 calls are routed from the 9-1-1 network directly to the primary PSAP, which is responsible for receiving and processing those calls according to the PSAP's operational policy and procedures. 9-1-1 calls may subsequently be transferred to secondary PSAPs, which include downstream agencies (e.g. police, fire, and ambulance services). For the purpose of this notice, the term "PSAP" will refer to primary PSAPs only. The connections between the primary and secondary PSAPs may fall within the Commission's jurisdiction.

[11] See the *CRTC Three-Year Plan 2015-2018* on the "Plans and Reports" page of the Commission's website at www.crtc.gc.ca.

Call for comments

18. To assist interveners in this proceeding in forming their submissions, the Commission requires that 9-1-1 network providers respond to the request for information set out in Appendix 1. PSAPs are requested to respond to the request for information set out in Appendix 2. To ensure a consistent use of terms, terminology and associated descriptions relating to 9-1-1 network reliability and resiliency engineering principles are set out in Appendix 3.

19. The Commission invites detailed interventions to address the issues identified in this notice. In their interventions, parties should provide supporting rationale and all evidence on which they rely to formulate their positions.

20. In addition, the Commission requests that interveners address all of the following matters:

9-1-1 network

The following is a list of components and transmission facilities that the Commission considers to be part of the 9-1-1 network:

- 9-1-1 primary and secondary tandem switches and/or selective routers;
- the central office switch(es) that may be used to route 9-1-1 calls from the tandem switch or selective router to the PSAP;
- 9-1-1 voice trunks (or equivalent voice lines), dedicated or otherwise, including the point of interconnection with telephone service providers to the 9-1-1 primary and secondary tandem switch(es);
- 9-1-1 voice trunks (or equivalent voice lines) from the 9-1-1 primary and secondary tandem switches to the demarcation point[12] with the PSAP's equipment or facilities;
- Automatic Location Identification (ALI) primary and secondary databases;[13]
- the 9-1-1 data links from the point of interconnection with telephone service providers to the ALI database, and from the ALI database to the demarcation point with the PSAP;
- 9-1-1 network monitoring links;[14]

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[12] The demarcation point is a physical boundary where the network infrastructure or hardware of the 9-1-1 service provider connects to that of the PSAP.

[13] Through these databases, the caller's telephone number, the address or location of the telephone, and supplementary emergency service information on the location from which a call originates are automatically displayed at the PSAP.

- the Text with 9-1-1 gateway; and

- the 9-1-1 data links from the Text with 9-1-1 gateway to the demarcation point with the PSAP.

Q.1: Provide your views on whether the 9-1-1 network components and transmission facilities listed above are representative and comprehensive. If you do not concur with this list, explain why, with supporting rationale, and explain to what extent, if any, this difference impacts your views and responses to the questions set out in this notice.

Possible Commission action

Q.2: Provide your views on the current level of reliability and resiliency of each of the 9-1-1 networks, as described by the 9-1-1 network providers in their responses to the Commission's request for information set out in Appendix 1.

Q.3: Provide your views on the extent to which, if at all, the Commission should establish regulatory measures related to the reliability and resiliency of the 9-1-1 networks.

Reliability and resiliency regulatory measures

Q.4: Should the Commission find it necessary to establish reliability and resiliency requirement(s) for 9-1-1 networks, propose appropriate requirement(s), with supporting rationale. Parties may define the requirements in different ways, for example,

- as a requirement statement (e.g. no single points of failure[15] in the 9-1-1 network);

- as a network performance standard (e.g. the 9-1-1 network must be available 99.999% of the time, or can be subject to a maximum of 5.26 minutes of downtime per year); and

- as a defined set of industry best practices (e.g. annual reliability and resiliency audits) or engineering principles.[16]

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[14] 9-1-1 network monitoring links are connections used to notify the 9-1-1 network administrator of the performance of the 9-1-1 network. Refer to the 9-1-1 network outage detection paragraph in Appendix 3 for more information.

[15] A single point of failure within a 9-1-1 network refers to a risk posed by a network configuration (e.g. a lack of redundancy), such that one fault or malfunction in equipment or a transmission facility could disable the proper functioning of the 9-1-1 network.

[16] Refer to Appendix 3 for terminology and associated descriptions relating to these principles.

Provide your views on the feasibility of implementing the requirement(s), taking into account the benefits to Canadians, as well as the associated costs and implementation challenges. Include your views regarding to whom the requirement(s) should apply.

Q.5: Identify the regulatory measures (e.g. the submission of an annual attestation of compliance with the measures by or on behalf of the 9-1-1 network providers), with supporting rationale, that the Commission should put in place to implement any proposed requirement(s) in Q.4. Explain the feasibility of implementing those regulatory measures in a manner that balances the benefits to Canadians with the associated costs and implementation challenges.

9-1-1 network outage notification

Q.6: To what extent, if any, should the Commission require affected parties to notify each other in the event of 9-1-1 network outage(s), namely, should

- 9-1-1 network providers notify affected PSAPs, affected telephone service providers, and the Commission of 9-1-1 network outages?

- telephone service providers notify affected 9-1-1 network providers, affected PSAPs, and the Commission of outages of the 9-1-1-dedicated trunks or equivalent voice lines, which connect the originating network to the point of interconnection with the 9-1-1 network?

- the Commission encourage PSAPs to notify affected 9-1-1 network providers, affected telephone service providers, and the Commission of PSAP outages and, if so, to what extent?

Provide supporting rationale and propose procedure(s) or mechanism(s) for providing these notifications, including the criteria and thresholds that would trigger the notification (e.g. outages greater than X minutes, affecting more than Y population, or covering Z km^2 area). As well, identify any associated challenges in implementing the proposed procedure(s) or mechanism(s).

Quality of service

Q.7: Provide your views on the extent to which, if any, the Commission should establish quality-of-service standards or require service-level agreements for the provision of the 9-1-1 networks by 9-1-1 network providers, with supporting rationale. Include in your response example(s) of metrics that could be adopted for reporting purposes.

Other matters

Q.8: Identify and provide your views on any other reliability and resiliency matters with respect to the 9-1-1 networks that are within the scope of this proceeding.

Procedure

21. 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, replies, and requests for information; the procedure for filing confidential information and requesting its disclosure; and the conduct of public hearings, where applicable. Accordingly, the procedure set out below must be read in conjunction with the Rules of Procedure and their accompanying documents, which can be found on the Commission's website at www.crtc.gc.ca, under "Statutes and Regulations." The *Guidelines on the CRTC Rules of Practice and Procedure*, as 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.

22. 9-1-1 network providers (i.e. Bell Aliant Regional Communications, Limited Partnership; Bell Canada; CityWest Telephone Corporation; MTS Inc.; Northwestel Inc.; Saskatchewan Telecommunications; TBayTel; and TELUS Communications Company) must file responses to the request for information set out in Appendix 1 by **24 August 2015**. Other 9-1-1 network providers may file responses if they so choose. PSAPs may file responses to the request for information set out in Appendix 2 by **24 August 2015**.

23. The 9-1-1 network providers listed in paragraph 22 are made parties to this proceeding and must file interventions with the Commission by **7 October 2015**.

24. Interested persons who wish to become parties to this proceeding must file an intervention with the Commission by **7 October 2015**. The intervention must be filed in accordance with section 26 of the Rules of Procedure.

25. Parties are permitted 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.

26. All parties who filed an intervention may file replies to interventions with the Commission by **2 November 2015**.

27. The Commission encourages interested persons and parties to monitor the record of this proceeding, available on the Commission's website, for additional information that they may find useful when preparing their submissions.

28. 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.

29. 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.

30. 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

31. Parties who send documents electronically must ensure that they will be able to prove, upon Commission request, that filing 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. The Commission advises parties who file 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.

32. 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.

33. 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

34. 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.

35. 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.

36. 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.

37. 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

38. 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 file number provided at the beginning of this notice or by visiting the "Participate" section of the Commission's website, selecting "Submit Ideas and Comments," 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.

39. Documents are also available from Commission offices, upon request, during normal business hours.

Commission offices

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

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Vancouver, British Columbia V6B 1C1
Tel.: 604-666-2111
Fax: 604-666-8322

Secretary General

Related documents

- *Filing submissions for Commission proceedings in accessible formats*, Broadcasting and Telecom Information Bulletin CRTC 2015-242, 8 June 2015

- *9-1-1 action plan*, Telecom Regulatory Policy CRTC 2014-342, 25 June 2014, as amended by Telecom Regulatory Policy CRTC 2014-342-1, 30 January 2015

- *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

Appendix 1

Request for information – 9-1-1 network providers

9-1-1 network providers are requested to provide responses to the questions below, based on the terminology set out in Appendix 3. The Commission expects that given the sensitivity of the issues discussed and the potential security risk of publicly divulging any potential 9-1-1 network vulnerabilities, parties may designate certain information in their responses as confidential. The Commission reminds parties that rationale must be provided when designating information as confidential, and that abridged versions of documents must be filed for the public record. Where possible, parties should consider providing summarized or anonymized information for the public record, in addition to the detailed information that they designate as confidential, to enable a meaningful discussion given the importance of the 9-1-1 networks to the health and safety of Canadians.

Reliability and resiliency of the 9-1-1 networks

1. Provide a list of the primary PSAPs to whom your company delivers 9-1-1 calls, and their addresses. In addition, include the address of any physical or logical backup PSAP. Include which central office serves the primary and backup PSAPs.

2. Provide an overview of the telecommunications services, both tariffed and non-tariffed, that your company provides as part of the 9-1-1 network, to PSAPs and other telephone service providers. If the services are tariffed, provide the applicable tariff numbers. If the service is governed by an agreement, describe the key terms relating to reliability and resiliency, outage notification and quality of service, or provide a sample 9-1-1 agreement.

3. Provide a sample 9-1-1 agreement with a municipal/provincial/territorial government for each province/territory your company serves.

4. Provide a brief description of and data regarding any major outage(s) of the 9-1-1 network over the last five years that affected 9-1-1 services, during which any 9-1-1 calls, and/or Automatic Location Identification / Automatic Number Identification (ALI/ANI) database information, were not delivered to the PSAP's demarcation point. Include the cause and duration of the outage(s), as well as the remedial actions taken.

5. Identify and describe the reliability and resiliency requirements, industry best practices, or engineering principles[17] implemented or observed in the management of your company's 9-1-1 network.

6. Describe the current level of reliability and resiliency of your company's 9-1-1 network, and how your company measures this level.

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[17] Refer to Appendix 3 for terminology and associated descriptions relating to these principles.

7. Provide a high-level summary of the findings of any vulnerability assessments, diversity audits, and any other similar analysis conducted in the last two years regarding your company's 9-1-1 network, as well as any remedial actions taken or planned as a result of these findings.

8. Describe all situations where your company does not consider it feasible to fully address all potential 9-1-1 network reliability and resiliency vulnerabilities and single points of failure, such as a lack of network component redundancy or physical route diversity. Provide supporting rationale why it is not considered feasible, as well as the estimated cost of addressing the issue(s). Use network diagram(s) to show the various scenarios.

9. Describe any plans over the next five years, with estimated implementation timelines and costs, to increase the reliability and resiliency of your company's 9-1-1 network.

Backup power in central offices

10. For each central office that hosts a 9-1-1 tandem switch and/or a selective router, or from which your company directly serves a PSAP, describe how your company ensures continuous operations of the 9-1-1 network in the event of a power outage. Include any provisions that have been made to shed non-essential load in the event of extended power outages.

    a. For what amount of time have provisions been made for backup power at full capacity?

    b. Indicate the maximum amount of time before your company switches to backup power. Describe the switchover process (i.e. manual or automatic).

    c. Describe your company's arrangements to access and allocate additional generator fuel during a power outage that extends beyond the capacity held by on-site fuel tanks.

    d. Describe the testing and maintenance of your company's backup power system in relation to the manufacturer's specifications.

    e. Describe any real and potential vulnerabilities in the backup power configuration, as well as any associated limits.

9-1-1 network monitoring

11. Describe how your company ensures the continuous and uninterrupted monitoring of the 9-1-1 network. If your company does not ensure the continuous and uninterrupted monitoring of the 9-1-1 network, provide rationale and alternative measures.

    a. Is your company's 9-1-1 network monitoring performed through a network monitoring centre? If so, describe any contingency plans that your company has

put in place in the event of an inability to access the network monitoring centre or a disruption in the operation of the centre.

b. Describe the reliability and resiliency engineering principles used in your company's design and implementation of the 9-1-1 network monitoring links, such as whether your company's monitoring links are physically and geographically diverse, and any potential single points of failure.

c. Describe future plans to address any potential single points of failure, or why it is not feasible to address them.

9-1-1 network outage notification

12. Does your company's 9-1-1 agreement with municipal/provincial/territorial governments require 9-1-1 network or PSAP outage notification between each party?

    a. Does your company have a process to notify telephone service providers and PSAPs of 9-1-1 network outages that may affect them? If not, provide rationale. If so, describe this process and the means of sharing changes or updates to the process or contact information with PSAPs. Include the criteria and thresholds that trigger PSAP notifications of both planned maintenance and unplanned outages of 9-1-1 networks (e.g. outages greater than X minutes, affecting more than Y population, or covering Z km^2 area).

    b. What is the maximum amount of time the notification process above allows for your company to make initial contact with the affected PSAPs?

    c. Describe any challenges in notifying PSAPs of 9-1-1 network outages.

Appendix 2

Request for information – PSAPs

The Commission is interested in hearing from all parties affected by the reliability and resiliency of the 9-1-1 networks. PSAPs are therefore requested to submit their responses to the questions below, and may submit joint responses as feasible and appropriate.

The Commission expects that given the sensitivity of the issues discussed and the potential security risk of publicly divulging any potential 9-1-1 network vulnerabilities, parties may designate certain information in their responses as confidential. The Commission reminds parties that rationale must be provided when designating information as confidential, and that abridged versions of documents must be filed for the public record. Where possible, parties should consider providing summarized or anonymized information for the public record, in addition to the detailed information that they designate as confidential, to enable a meaningful discussion given the importance of the 9-1-1 networks to the health and safety of Canadians.

1. List any telecommunications services your PSAP receives or purchases from a 9-1-1 network provider that are part of the 9-1-1 network. Indicate the service provider and, if the services are tariffed, provide the applicable tariff numbers where available.

2. Comment on the reliability and resiliency of the telecommunications services provided to your PSAP as part of the 9-1-1 network, and indicate any concerns regarding the reliability and resiliency of those services, with supporting evidence and rationale.

3. Do your PSAP's primary and backup (where applicable) building locations have diverse physical entries of 9-1-1 network trunks to the demarcation points? If not, explain why not. Provide the addresses of both the primary and backup locations.

4. What provisions, if any, are in place for your PSAP building in the case of a power outage?

    a. Can your PSAP operate at full capacity using these provisions? If so, for how long?

    b. If your PSAP does not have any power backup arrangements, what are the impediments to putting these arrangements in place?

5. What provisions, if any, are in place for your PSAP in cases where the primary call centre location is not functional or accessible?

    a. Does your PSAP have a backup location? If so,

        - How long does it take to transfer operations to the backup location? What happens to 9-1-1 calls during this time?

- Can your PSAP operate at full capacity at this backup location? If so, for how long?

b. Does your PSAP have arrangements in place with another PSAP to handle calls during outages?

6. What are your PSAP's requirements for notification from your 9-1-1 network provider of 9-1-1 network outages?

7. Does your PSAP have an established process to notify, on a 24/7 basis, affected telephone service providers and affected 9-1-1 network providers of any PSAP outages (both planned and unplanned)? If so, describe the process. If not, explain why not with supporting rationale.

   a. Are any procedures in place with telephone service providers or your PSAP's 9-1-1 network provider to exchange and maintain personnel contact information so that personnel can be contacted to provide outage notification on a 24/7 basis?

   b. If applicable, what is the maximum amount of time allowed under the above-mentioned notification process for your PSAP to make initial contact with telephone service providers and 9-1-1 network providers?

   c. What criteria and thresholds trigger notifications of both planned maintenance and unplanned PSAP outages (e.g. outages greater than X minutes)?

   d. Describe any challenges in notifying telephone service providers and 9-1-1 network providers of PSAP outages.

Appendix 3

Terminology for 9-1-1 network reliability and resiliency engineering principles

The Commission requests that, in their submissions, parties use the terminology relating to 9-1-1 network reliability and resiliency engineering principles as described below to ensure consistency in submissions.

Several principles can be used in the *design* of a 9-1-1 network to reduce single of points of failure which, in turn, can reduce potential network downtime. These principles ensure 9-1-1 network reliability and resiliency, such that if one part of the network fails (e.g. a network connection or equipment), another part of the network can take over its function seamlessly.

- *Critical component backup* – duplication of critical components, such that if one fails, a second is ready to automatically replace it (e.g. primary and secondary 9-1-1 tandem switches and/or selective routers)

- *Location (or site) diversity* – duplication of the functionality of the system or part of the system in a different geographical location (geo-redundancy) [e.g. if a 9-1-1 tandem switch is not functional, calls are automatically re-routed to a backup 9-1-1 tandem switch that is located in a different geographical area, such as in a different city]

- *Transport network diversity* – physically diverse routes between endpoints (i.e. more than one physical route between components with no common points of failure,[18] comprised of the same or different media)

- *Technology diversity* – the re-routing of calls to the PSAP using a different technology (e.g. where Internet Protocol infrastructure has been deployed, the legacy network is maintained as a backup)

- *Backup power for central offices that directly serve a primary PSAP*[19] – the provision of an alternate power source in case of a commercial power failure, i.e. generators (on-site or portable), batteries, or a combination of both, excluding functions not related to 9-1-1 services (e.g. administrative or back office functions)

- *Functionality diversity* – the transfer of functionality from one system to another [e.g. if a PSAP is not functional, or if call volumes exceed capacity,

[18] Facilities that share a common portion are not physically diverse even if they are logically diverse for the purpose of data transmission.

[19] A central office directly serves a PSAP if it hosts a tandem switch or a selective router, or if it connects to a PSAP through a 9-1-1-dedicated trunk or an equivalent voice line.

calls are re-routed to another PSAP, which handles calls on the former PSAP's behalf (e.g. through a call-handling arrangement between PSAPs)]

To *maintain* the designed diversity, certain measures can be taken. These measures include periodically analyzing the geographical routing of the 9-1-1 network components to detect any changes in the original diverse design (e.g. diversity audits), and tagging the critical circuits, physically, logically, or both, to prevent inadvertent changes.

In the event that a 9-1-1 network outage occurs, downtime is dependent on how quickly the outage is *detected*. For this reason, many telephone service providers have a network monitoring centre. Telephone service providers place alarms on critical 9-1-1 network components, and these signals are relayed to the network monitoring centre using 9-1-1 network monitoring links. The use of physically diverse network monitoring links further increases the level of the 9-1-1 network's reliability.

As well, plans should be in place to *recover* from unforeseen circumstances, such that the 9-1-1 network's operation can be quickly restored. These plans can include relationships and/or priority agreements with utility services (e.g. power and gas) and municipal services (e.g. snow removal services, and water pumping services in cases of floods).

Appendix 4

9-1-1 tariffs

ILECs

Bell Canada

- Access Services Tariff for Interconnection with Carriers and Other Service Providers, CRTC 7516, Part 2, item 105.4 – Rates and Charges

- Special Facilities Tariff, CRTC 7396, item G21 – Wireless Service Provider Enhanced 9-1-1 Service

TELUS Communications Company

- TELUS Communications Inc. Carrier Access Tariff, CRTC 18008, item 215.4 – Rates and Charges

- General Tariff, CRTC 21461, item 201 – Wireless Service Provider Enhanced Provincial 9-1-1 Network Access Service and item 203.3 – Rates

MTS Inc.

- MTS Allstream Inc. Supplementary Tariff, Access Services for Interconnection with Carriers and Other Service Providers, Access Arrangements, CRTC 24006, Part II, item 105.4 – Rates and Charges

- General Tariff, CRTC 24001, Part II, Exchange Service Rates, item 485.4 – Rates and Charges and Part IV, Other Services and Facilities, item 3050 – Wireless Service Provider Enhanced 9-1-1 Service (WSP E9-1-1)

Saskatchewan Telecommunications

- Competitor Access Tariff, CRTC 21414, item 610.18.4.2 – Network Component Unbundling and item 610.05 – Wireless Service Provider Enhanced Provincial 9-1-1 Network Access Service

- General Tariff, Basic Services, CRTC 21411, item 140.05.3 – Rates

Small ILECs

CityWest Telephone Corporation

- General Regulations, CRTC 25700, item 11 – Accessories

TBayTel

- Carrier Access Tariff for Interconnection with Carriers and Other Service Providers, CRTC 25571, section 8000.4(5)