A Report on Matters Related to Emergency 9-1-1 Services

Prepared for the
Canadian Radio-television and Telecommunications Commission
By
Commissioner Timothy Denton
Inquiry Officer

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I INTRODUCTION

A. Background

1. On 17 December 2012, the Commission issued Telecom Notice of Consultation 2012-686,[1] announcing my appointment as Inquiry Officer to conduct a review of matters related to emergency 9-1-1 services.

B. Purpose of the inquiry and report

2. As described in the Notice of Consultation, the purpose of the review was to focus on three broad areas:

    a. The performance and adequacy of the technology currently employed by 9-1-1 services, such as that used to locate a caller using a cellphone;
    b. The issues related to the provision of 9-1-1 services on next-generation networks, including how systems should be designed and the appropriate institutional arrangements; and
    c. Policy considerations on 9-1-1 matters.

3. The purpose of this report is to convey the results of the inquiry that I carried out on behalf of the Commission.

C. Methodology

4. This inquiry began with one-on-one and small group meetings with key stakeholders here in Canada, as well as with regulatory and industry experts in the United States and Europe. A listing of interviews that I conducted is included in Appendix 1.

5. In addition, I requested public comment on a number of questions that had been included in the Notice of Consultation. In response, on 1 March 2012, comments were received from various individuals, groups, telecommunications service providers, and government organizations with reply comments being received on 15 March 2012. The full record of these responses can be found on the CRTC's Interventions web page.

6. The information that was obtained through my meetings with stakeholders and experts, as well as the comments that were received in response to the Notice of Consultation, were then reviewed, analyzed and summarized for this report in order to form the basis for the recommendations found further in this document.

D. Organization of the balance of the report

7. The balance of this report is divided into five sections. In Section II, I summarize some of my initial thoughts. Section III provides general background information on 9-1-1, both here

[1] *Appointment of an Inquiry Officer to review matters related to 9-1-1*, Telecom Notice of Consultation CRTC 2012-686, 17 December 2012

in Canada and in other jurisdictions. Section IV is a discussion of the current state of our 9-1-1 system, and contains descriptions of a number of issues raised during the course of the inquiry. Section V addresses expectations surrounding the implementation of a next-generation 9-1-1 system (NG 9-1-1). Finally, Section VI contains my findings and recommendations for the Commission's consideration.

II INITIAL THOUGHTS

8. Based on the comments that I received during the course of my inquiry, there are a number of shortcomings with the current 9-1-1 system that should be addressed:

    - There is a wide gap between Canadians' expectations and the reality of the 9-1-1 system, or put another way, there is no 9-1-1 brand with consistent features throughout Canada.
    - Data collection about the 9-1-1 system can be significantly improved.
    - The governance structure for 9-1-1 in Canada is fragmented and inconsistent.
    - The funding of the 9-1-1 system in Canada is uneven, likely mismatched with respect to costs, and inadequately measured.
    - Wireless and voice over Internet protocol (VoIP) caller location accuracy remains a serious unresolved issue.
    - NG 9-1-1 is not the solution to all of our problems.

9. I will address these issues in more detail further on in my report, but I note that not all of them can, or should, be addressed by the Commission itself.

10. However, first, I would like to offer some initial thoughts.

A. Importance, context, and jurisdictions

11. 9-1-1 has become one of the most important ways the citizen calls upon government services, and arguably the most vital. The decision to summon help engages a series of actors, all of whom are in the service of the public: first responders; carriers; and public safety answering points (PSAPs), which dispatch first responders to the scene.

12. When we talk about 9-1-1, our discussion can in general terms include Reverse 9-1-1: a public alerting system that allows public safety organizations to deliver recorded emergency notifications to people in defined geographic areas. In addition, nearly every comment about the 9-1-1 system's deficiencies can with equal justice be applied to search and rescue, which is outside the scope of this paper, but whose problems became evident in the interviews conducted for my report.

13. From the point of view of the user, 9-1-1 service is one thing, not several. The person calling for help has no interest or concern that one part of the service is under federal jurisdiction and the other is under his or her province's or territory's jurisdiction. He or she cares only about help arriving in a timely fashion.

14. Accordingly, governments themselves need to consider 9-1-1 from the citizen's point of view first; namely, that it is one thing, not several, and that the whole needs to work

seamlessly. The organization of 9-1-1 and policy development in regard to 9-1-1 should follow from this fundamental reality.

15. Regulating the communications portion of 9-1-1 is within the Commission's jurisdiction. Other aspects of public security and emergency response are within the federal government's powers, while some are exclusively provincial/territorial. Certain provinces and territories have taken a hands-off approach and allowed responsibility for 9-1-1 to reside with municipalities. My report is not confined to the boundaries of the Commission's telecommunications jurisdiction for this reason, because to focus exclusively on that aspect, important though it is, would be to miss the other parts of the elephant in the room.

16. In that sense, 9-1-1 is like a brand, but unlike a commercial brand, the actual product – police, fire and ambulance assistance when you need it – is delivered different ways in different provinces/territories, and at different service levels. Sometimes, it is not available at all. This reflects the differing approaches adopted by the provinces and territories, and the fact that first responders must be based locally. But, though 9-1-1 has evolved by scales appropriate to driving distances, the common identifier (9-1-1), and the possibilities of modern computer communications, work in the other direction, from the brand outward. The 9-1-1 brand cuts across jurisdictions and, therefore, solutions to problems with 9-1-1 service delivery must do the same.

B. Relationship of 9-1-1 to emergency response and public security

17. During the course of my inquiry, it also became apparent that 9-1-1 is included in a broader set of concerns along with emergency response and public security.

18. Emergency response is usually seen as the government responding to natural and broad-scale civil emergencies, whereas 9-1-1 connotes agencies of government responding to personal emergencies. Yet personal and public emergencies can blend into one another, and sometimes the distinction between public emergencies and 9-1-1 rests on the number of vehicles dispatched to a given area.

19. 9-1-1 and its responders fit into a broader context of emergency response and public security. This being so, there are reasonable grounds for the departments and agencies that concern themselves with 9-1-1 to be in contact with each other and to coordinate with other agencies concerned with public safety, as and where appropriate. My inquiry found that there was a lack of coordination of 9-1-1 with emergency preparedness and public security because the institutions and relationships that would allow it are not yet in place. I have also observed that there is no forum whereby the Commission can meet with provincial/territorial 9-1-1 and emergency management officials on 9-1-1 policy as opposed to technical standards. Nor has the Commission dedicated a single individual to 9-1-1.

C. Institutions and governance

20. The following table gives a high-level summary of the government institutions involved in providing public security and emergency response services to Canadians.

Table 1: Government institutions

Institution	Responsibilities
Federal government	
- CRTC	Regulates the telecommunications carriers that provide the necessary network infrastructure to direct and connect 9-1-1 calls to the PSAPs.
- Industry Canada	Makes radio spectrum available for first responders.
- Public Safety Canada	Coordinates across federal departments and agencies responsible for national security and the safety of Canadians. Also works with other levels of government, first responders, community groups, the private sector and other nations.
- Royal Canadian Mounted Police	Provide first responder services (police).
Provincial/territorial governments	In some cases, collect and distribute funding for PSAPs, as well as play an oversight and coordination role in establishing province-wide/territory-wide PSAP standards and policies. Provide first responder services (fire, ambulance and police).
Municipal governments	Responsible for establishing and managing PSAPs. Provide first responder services (fire, ambulance and police).

21. Improved governance is the key to getting better results. Only when the appropriate institutional relationships are established can we start to solve some of the technical and performance issues in 9-1-1 service delivery, and in related areas. These issues cannot be solved unless we notice them. They will not be noticed until we measure them, and they will not be measured until we have decisions about who measures what, and which institutions carry out these measurements.

22. A comprehensive view of the 9-1-1 system is missing. It is something that has grown organically from a series of decisions over time. Now, through this report, the 9-1-1 complex of institutions is undergoing its first general review. The paper submissions I received and the oral interviews I conducted have led me to the conclusion that the 9-1-1 system is working because of the good faith of its participants, but not because we have the appropriate institutions of governance.

23. Accountability to whom, and for what, is unclear. Provinces/territories and the Commission authorize money to be collected for 9-1-1 purposes from various sources, but the efficiency with which it reaches its targets is unknown. By all accounts, and to my observation, carriers diligently carry out their duties, but no one is measuring the details. The

Commission sets national policies in relation to 9-1-1 telecommunications requirements and functionality, and receives consensus technical advice from its Emergency Services Working Group (ESWG) of the CRTC Interconnection Steering Committee (CISC). However, there exists no pan-Canadian body gathering all the players, including the PSAPs; police, fire and ambulance services; and relevant provincial/territorial and federal authorities, that works out issues of policy regarding 9-1-1. In the absence of a multi-stakeholder forum at which cross-agency multi-jurisdictional issues can be discussed, technical advice substitutes for policy discussion.

24. Given that there is an oncoming tsunami of technical change, as we migrate to all-Internet protocol (IP) communications systems, these somewhat haphazard arrangements will be extremely stressed. The change in communications technologies is completely foreseeable; it is happening now. Unfortunately, there does not exist a policy forum adequate to the task of coordinating and anticipating the changes that are coming.

25. The main thrust of this report is to the effect that institutions concerned with 9-1-1 need to be developed and, where they exist, improved. Institutional improvements need to be made in at least two areas: the establishment of a national policy forum for 9-1-1, and increased focus by the Commission on matters related to 9-1-1. It is the only place in telecommunications regulation where lives are at stake. The current arrangements are inadequate and we can do better.

D. NG 9-1-1

26. Finally, a word about NG 9-1-1. The transition plan and end state of NG 9-1-1 has yet to be completely specified, and it cannot be specified under existing institutional arrangements. We are evolving towards a world where everything travels on IP. In this world, assumptions of the former technological regime will be in question. Indeed, there may not be telephone or cable companies as we have come to understand them, or they may share space with a myriad of other organizations that communicate through new addressing schemes, without the use of telephone numbers or even IP addresses. Thus, if current governance arrangements for 9-1-1 are inadequate under the existing telephone numbering regime, they are even more inadequate under the assumptions of IP everywhere. Decisions will need to be made about who does what, and they are not primarily engineering issues. The companies which are assumed to be the backbone of the current system will not be using the same technologies, and new ways of integrating databases, locating people and reaching help will prevail. The worst assumption we could make in moving to NG 9-1-1 is that things will continue as they are. Yet, in order to get there, a process of modernization has to take place, for which appropriate institutions need to be devised or improved. In the word of Henning Schulzrinne, Chief Technology Officer of the Federal Communications Commission (FCC), “the really difficult problems are organizational,”[2] not technological.

[2] In interview at the FCC on November 29th, 2012.

III BACKGROUND

27. The availability of a reliable and consistent response to emergency calls has become a common expectation in modern societies. Given that callers could be in a situation where life or property is at risk, a key attribute of any emergency service response system is that calls are never abandoned and the callers can be located. Meeting this basic requirement presents a serious challenge from a logistical, organizational and technical perspective.

28. People typically call for help using special numbers, usually a three-digit code, designated within a country's public telephone system numbering plan that can be easily remembered and quickly dialled.

29. Emergency numbers can vary between countries, and some countries have different emergency numbers for each type of emergency service. In North America, 9-1-1 is the adopted standard that became widespread in the 1980s. In the European Union, Russia, Switzerland, Ukraine and others, 1-1-2 was introduced as a common emergency call number during the 1990s. Parts of Asia, such as China and Japan, use 1-1-9.

A. Origins

30. Early systems for emergency call numbers in Europe date back to as early as 1913. Currently, many members of the European Union use 1-1-2 as a common emergency call number. Some members use country-specific emergency call numbers in addition to 1-1-2.[3]

31. In North America, the first city to introduce a three-digit emergency number to access police, fire and ambulance services was Winnipeg, Manitoba, in 1959. The number used at the time was 9-9-9, the same number that had been in use in the United Kingdom for many years.

32. The 9-1-1 emergency call number was used for the first time in the United States in 1968. In 1973, the United States adopted a national policy to encourage the nationwide use of 9-1-1 as an emergency call number. Canada adopted 9-1-1 as its common emergency call number in 1972, but this number was not used until 1974, when it was activated in London, Ontario. Since 1974, the use of 9-1-1 has spread across Canada, and 9-1-1 is currently available to the majority of the Canadian population. It is estimated that 98% of the population of Canada currently has access to 9-1-1 service.[4]

33. As time has passed, public notification has become important, and Reverse 9-1-1 is a topic that should be included in any discussion related to public safety. Reverse 9-1-1 is used by public safety organizations to notify residents in certain geographic regions of emergency situations. For example, police in Watertown, Massachusetts, used Reverse 9-1-1 and asked residents to remain indoors while they conducted a search for one of the suspects involved in the Boston Marathon bombing.[5]

[3] For example, Great Britain uses 9-9-9, in addition to 1-1-2.

[4] See Appendix 2 for a map depicting where 9-1-1 is available in Canada.

[5] The Independent news website

B. How does 9-1-1 work?

34. When a Canadian dials 9-1-1, the call is routed through the telephone company's network to a PSAP. In Canada, PSAPs are operated by municipal or provincial/territorial governments and, in most cases, are managed by the local police force. When a 9-1-1 call arrives at a PSAP, the PSAP operator is responsible for assessing the call and dispatching the appropriate emergency response resources.

35. When 9-1-1 was first rolled out, it was on the basis of arrangements that are now referred to as Basic 9-1-1. If a Canadian dialed 9-1-1, the local telephone company's central office switch would translate 9-1-1 to a regular telephone number assigned to the PSAP serving the area where the Canadian lived. This approach allowed 9-1-1 to be implemented with minimal modifications to the telephone company's network, and 9-1-1 calls were essentially handled as normal telephone calls.

36. However, there were limitations. For a PSAP operator, calls were nothing more than ordinary incoming telephone calls. PSAP operators were not provided with a callback telephone number for the caller in case, for whatever reason, a call was disconnected. Furthermore, the caller had to verbally provide their location. In situations where a caller was unable to provide their location or a call was disconnected before the caller could provide their location, the PSAP operator had no idea where to send help.

37. In addition, the telephone company's network layout did not necessarily line up with the areas for which PSAPs were responsible. For instance, a single PSAP could be responsible for serving a large geographic area, but the telephone company required multiple central office switches to provide service in the same area. The opposite was also possible; an area to which the telephone company could provide service from a single central office could be covered by multiple PSAPs.

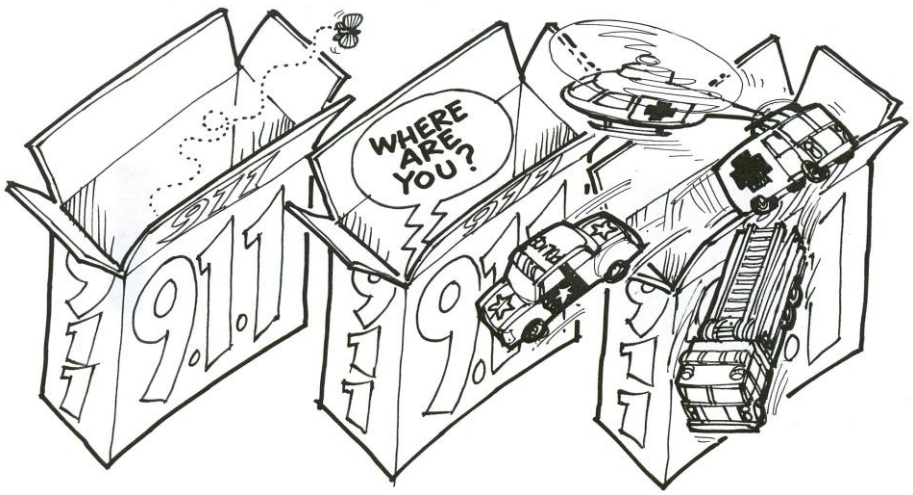
38. To overcome these limitations, a number of modifications were made so that 9-1-1 calls would be forwarded to the specific PSAP responsible for a given area, and so that a caller's name, telephone number and location information would automatically be provided to the PSAP operator. The result of these modifications was an arrangement that is referred to as Enhanced 9-1-1, or E9-1-1. Furthermore, there is now a movement towards a next generation of 9-1-1 services that will give additional capabilities.

Table 2: Comparison of Basic, Enhanced and NG 9-1-1

Basic	Phone call is directed to a local PSAP by a carrier
Enhanced	Incoming call is directed to the correct PSAP and transmits to the responder the • caller's name; • callback telephone number; • street address in the case of wireline phones; and

	• latitude and longitude in the case of cellphones.
NG	Capacities as yet undefined, but likely means • multimedia capacity; and • delivered by an IP device, not necessarily a telephone.

Figure 1: 9-1-1 is a brand with different outcomes across the country



39. An Automatic Location Identification, or ALI, database was installed by the telephone company in its network. Equipment at the PSAP was then connected to the telephone company's ALI database using data circuits. In addition, the telephone company added what is called selective routing functionality to its 9-1-1 network.

40. The purpose of the ALI database was to correlate existing telephone numbers with individual Canadians' names and addresses. Information for new customers would be added to the ALI when they subscribed to a new telephone service. Customer information is updated every time a customer changes telecommunications service providers or moves within the same exchange, all while keeping the same telephone number.

41. Selective routing overcomes the problem of the variance between the telephone company's network and the PSAP response areas. The telephone company upgraded certain switches to create 9-1-1 tandem switches, and installed a Selective Routing Database (SRDB). The purpose of the SRDB was to map telephone numbers to street addresses, and then link street addresses to the particular PSAP that covered the area. The network was then re-configured so that 9-1-1 calls originating from multiple central office switches would be aggregated at the 9-1-1 tandem. The 9-1-1 tandem could also route calls to multiple PSAPs.

42. With these changes, a 9-1-1 call was routed to the 9-1-1 tandem switch, along with the originating telephone number. Using the originating telephone number, the 9-1-1 tandem first queried the SRDB to determine the appropriate PSAP for the caller's location, and then routed the call to that PSAP. At the same time, the 9-1-1 tandem queried the ALI, and the ALI automatically "pushed" the caller's name, telephone number and location information over the data circuits connecting the ALI to the PSAP's equipment.

43. With the introduction of local competition in 1997, arrangements were put in place that allowed competitors to connect to the incumbent telephone companies' E9-1-1 network platforms.[6] The Commission required that emergency calls from a competitor's customers be dealt with exactly the same way as calls from the customers of the incumbent telephone company.

44. Telephone calls from wireless telephones posed a new and ongoing set of challenges for the 9-1-1 emergency calling system. Cellular telephone service was first introduced in Canada in the mid-1980s. Initially, the level of access to 9-1-1 service that wireless companies provided to their customers was equivalent to Basic 9-1-1. A customer would make a 9-1-1 call, the wireless company would transfer it to the local telephone company's central office switch serving the area where the call originated, and it, in turn, would connect the call to the PSAP serving that area. A callback telephone number was not provided and the caller had to verbally provide their location.

45. As the number of Canadians using wireless telephones increased, it became clear that improvements were required to the way emergency calls were dealt with. The ability to carry your telephone and place calls from nearly anywhere in Canada posed a major challenge for the 9-1-1 emergency calling system.

46. To address this issue and to provide a level of service to Canadian wireless customers comparable to what was available to wireline customers, significant changes to the 9-1-1 emergency calling system were required. The Commission mandated wireless telephone companies to adopt Wireless E9-1-1.[7] Wireless E9-1-1 was implemented in two phases:

    - Phase I – Wireless companies were to provide PSAPs with a callback number, the location of the cell site where a 9-1-1 call originated, and the sector of that cell site receiving that call.

    - Phase II – Wireless companies were to provide PSAPs with the location of a caller based on longitude and latitude coordinates for all wireless 9-1-1 calls.

47. Notwithstanding the implementation of Wireless E9-1-1, the location of the wireless customer provided to the PSAP can still be far from precise, and determining the accurate location of a wireless customer remains a significant issue.

48. Voice communications over the Internet present an even greater challenge for 9-1-1. With nomadic VoIP service, Canadians can typically obtain telephone numbers from different cities (for example a Canadian in Gatineau could have a Miami telephone number), and

[6] See Telecom Decision 97-8.
[7] See Telecom Decision 2005-53 and Telecom Regulatory Policy 2009-40.

they can make telephone calls (including 9-1-1 calls) from anywhere they have access to a high-speed Internet connection.

49. From a technical perspective, under the current system it is not possible, at this time, to reliably identify a caller's location when the call is made using VoIP technologies. Consequently, service providers cannot determine the appropriate PSAP to which a given call should be routed. In addition, existing 9-1-1 systems cannot handle out-of-territory telephone numbers. In order to ensure that Canadians using these services can at least contact a PSAP, an interim arrangement was put in place that effectively provides a level of service equivalent to Basic 9-1-1.

50. VoIP service providers connect 9-1-1 calls to a third-party operator, who verbally confirms the caller's location. The operator then determines the appropriate PSAP and transfers the call.

C. Reverse 9-1-1

51. Reverse 9-1-1 is provided through a service named Enhanced Community Notification Service (eCNS).

52. In 2007[8] the Commission determined that it was in the public interest to allow the incumbent telephone companies to provide enhanced information for a telephone-based community notification service, subject to certain limitations and safeguards. The result was that eCNS would be made available by the incumbent telephone companies to give government authorities responsible for emergency services access to the telephone service subscriber information in the ALI database.

53. The limitations and safeguards that were put in place included:

    a. The role of authorized administrator for eCNS was limited to PSAPs operated by municipalities or other public authorities responsible for the provision of emergency services;
    b. An emergency for eCNS was defined as an imminent or unfolding danger that threatens the life, health or security of an individual;
    c. The information provided by the incumbent was only to be used in response to the specific eCNS alert that required the use or disclosure of that information; and
    d. The information provided by the incumbent was to be deleted or destroyed once the notification related to a specific emergency had been completed.

54. In a next-generation environment, Reverse 9-1-1 could assist PSAPs to better manage emergency scenes. It is also an important link for public safety in general.

D. Coverage of the 9-1-1 emergency calling system in Canada

55. As stated above, it is estimated that 98% of the population of Canada has access to 9-1-1 service. PSAPs that support E9-1-1 services serve about 95% of the population, while the rest only support Basic 9-1-1 service. Where 9-1-1 service is not available, Canadians in

[8] See Telecom Decision 2007-13.

those areas dial a regular telephone number to reach emergency responders. The areas still without 9-1-1 service include some rural, remote and sparsely populated parts of the country.

E. Current funding model

56. Funding for the current 9-1-1 emergency calling system comes from several sources: Canadians; service providers; and government coffers.

57. The costs and funding of the current system is not, so far as I can tell, tracked in a systematic way at a national level, nor is the information about funding and costs made available to the public and decision-makers in an organized fashion.

58. Three sets of agents are involved:

    a. Retail telecommunications service providers put the necessary arrangements in place to provide individual Canadians with access to 9-1-1 services;
    b. Organizations or agencies are responsible for PSAP operations; and
    c. In between are the incumbent telephone companies that operate and maintain the network that connects 9-1-1 calls to the PSAPs.

Incumbent telephone companies

59. The incumbent telephone companies collect a Commission-approved monthly fee from their own retail wireline customers for the provision of access to 9-1-1 service. This monthly fee has been set based on each company's costs incurred to provide access to 9-1-1 service, and is reviewed on an annual basis.[9] The Commission does not regulate the rates of wireless service providers, including the wireless arms of the incumbent telephone companies, and consequently has not required the incumbents to charge their wireless customers for 9-1-1 service, despite the fact that about 70% of 9-1-1 calls are made from wireless devices.

60. In addition to collecting fees from their own retail wireline customers, the incumbent telephone companies are entitled to collect a Commission-approved wholesale fee from other wireline and wireless providers that operate in the incumbents' territories. These other telecommunications service providers deliver their customers' 9-1-1 calls to the PSAPs via the incumbent telephone companies' networks, and the wholesale fee compensates the incumbent telephone companies for that use of their networks.

Other retail telecommunications service providers

61. Other telecommunications service providers may or may not choose to charge an explicit fee to their customers for 9-1-1 service. The Commission does not regulate the rates of these providers. If they choose to charge an explicit fee, Commission approval is not required. If an explicit fee is not charged, it is safe to assume that the other telecommunications service providers recover their 9-1-1 costs through general pricing for their services.

[9] See Telecom Order 2000-630.

PSAPs

62. PSAP costs are primarily funded by provincial/territorial and/or municipal governments. However, local government authorities can enter into agreements with telecommunications service providers in their locality to collect a 9-1-1 levy to local telephone subscribers, provided that there is valid provincial/territorial or municipal law authorizing such a levy. The Commission requires wireline telecommunications service providers to act as billing agents to assist the local government authorities. While not required by the Commission, any provincial/territorial legislation that imposes a 9-1-1 levy on wireless customers to fund PSAPs will require that billing and collection arrangements be put in place between the wireless provider and the provincial/territorial government.

63. The following table provides a summary of the current levies:[10]

Table 3: Government 9-1-1 levies to fund PSAPs

Province	Government levy (per line)
Alberta (see note)	$0.44
British Columbia (see note)	$0.44 to $0.75
Quebec	$0.40
Saskatchewan	$0.62
Prince Edward Island	$0.70
New Brunswick	$0.53
Nova Scotia	$0.43

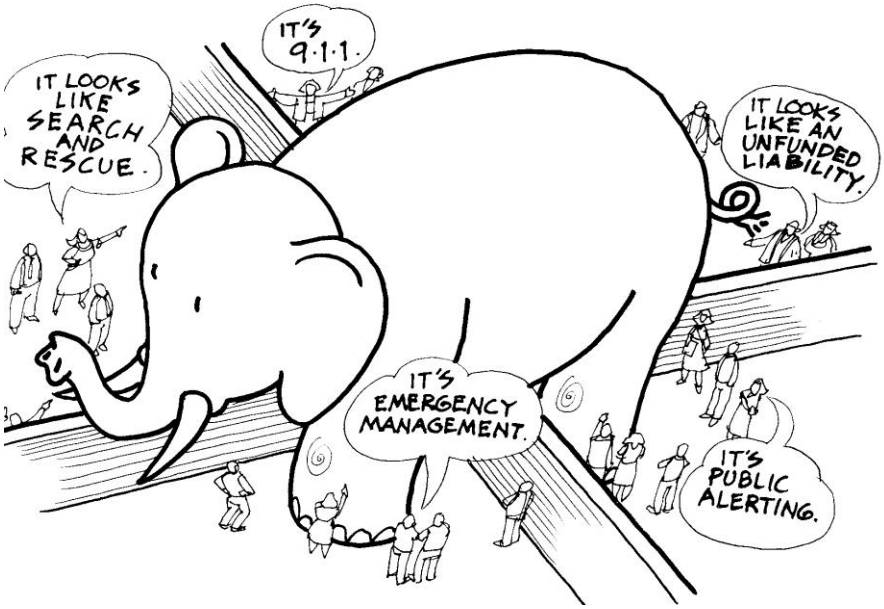
Note: This service is optional and is only collected at the specific request of a local government authority. Not all local government authorities in the province participate in the call answer levy. In Alberta, 350 municipalities participate in the call answer levy, while in British Columbia, 13 municipalities participate.

F. Current governance model in Canada

64. 9-1-1 service requires the collaboration of a number of stakeholders, including various levels of government, 9-1-1 advisory boards and associations, and 9-1-1 standards-making bodies.[11]

[10] From comments prepared by TELUS Communications Company

Figure 2: The Public Safety Elephant



CRTC

65. The Commission is an independent administrative tribunal that regulates and supervises the Canadian broadcasting and telecommunications systems. Its mandate is to ensure that both the broadcasting and telecommunications systems serve the Canadian public.

66. The Commission, under the *Telecommunications Act,* regulates the telecommunications carriers that provide the necessary network infrastructure to direct and connect 9-1-1 calls to PSAPs.

67. The Commission has made a number of decisions in relation to 9-1-1, including the requirements that:

    a. Telecommunications service providers make 9-1-1 service available for Canadians, wherever a PSAP has been established by the municipality or provincial/territorial government;
    b. The incumbent telephone companies allow their competitors to connect to the 9-1-1 network, so that the competitors can provide 9-1-1 services to their own customers;
    c. Wireline carriers bill and collect any 9-1-1 levies from their subscribers, on behalf of municipal or provincial/territorial governments, where such levies are authorized by provincial/territorial or municipal law; and
    d. Wireless and VoIP service providers provide customer notification regarding the availability, characteristics and limitations of their 9-1-1 services.

[11] See Appendix 3 for a chart depicting governance related to 9-1-1 in Canada, and Appendix 4 for a chart depicting the relationships between various organizations/institutions.

CISC

68. CISC was established by the Commission to assist in developing information, procedures and guidelines, and technical solutions that may be required in various aspects of the Commission's regulatory activities; initially in 1996 in support of introducing local competition in Canada.

69. CISC is composed of a Steering Committee, which is chaired by Commission staff, and a number of working groups. CISC is an open public forum where any interested party can participate in the various working groups. One such group is the Emergency Services Working Group (ESWG).

70. The ESWG undertakes tasks that are, for the most part, triggered by Commission requests for investigation of various technological, administrative and/or operational issues relating to access to 9-1-1 service. Upon completion of a task, the ESWG submits a report to the Steering Committee for review and acceptance. Once accepted, the Steering Committee forwards the report to the Commission. The only exception would be when the Commission requests the ESWG to submit a document directly to the Commission. The Commission, generally, reviews the ESWG's recommendations, conducts further process as it deems necessary, and issues a decision on the recommendations.

71. Depending on the case, if the Commission issues a decision approving ESWG recommendations, it may include implementation directives for telecommunications service providers. It may also request the ESWG to coordinate any implementation activities.

72. The ESWG is currently working on a number of tasks, including: implementation of the wireless text messaging to 9-1-1 service; the wireless 9-1-1 in-call location update feature (rebid);[12] ongoing evaluation of NG 9-1-1 architecture and standards; and the ongoing review of the wireless 9-1-1 location identification specifications.

Provincial/territorial and municipal governments

73. In Canada, municipal governments are responsible for establishing and managing PSAPs, with the provincial/territorial governments playing a direct role in this regard only in some instances.

74. In recent years, a number of provincial governments have become more involved, particularly in the collection and distribution of funding for PSAPs, as well as taking on an oversight and coordination role in establishing province-wide PSAP standards and policies. These include: Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Quebec and Saskatchewan. Alberta is in the process of creating a single provincial authority for 9-1-1 services. Newfoundland and Labrador is also currently in the process of creating a provincial 9-1-1 framework.

75. Quebec ensures that PSAPs which meet the standards set by the Ministry of Public Security of Quebec are adequately funded by collecting a 9-1-1 levy from Canadians, and distributing the funds to the various PSAPs, through a not-for-profit organization governed

[12] Will enable 9-1-1 call takers to request additional updates of a wireless caller's location, after the initial caller location has been automatically provided.

by a board of directors comprised of representatives of l'Union des municipalités du Québec, la Fédération québécoise des municipalités, and la Ville de Montréal. The government of Alberta has also announced that it intends to introduce similar measures in order to fund PSAPs and to enable them to transition to NG 9-1-1.

76. In contrast, the provincial governments in British Columbia and Ontario have played no direct role in the provision of 9-1-1 services or in providing any coordination or oversight of PSAPs. These two provinces have many municipalities with populations large enough to support the funding, establishment and maintenance of a PSAP on their own.

Public Safety Canada

77. Public Safety Canada was created in 2003 to ensure coordination across all federal departments and agencies responsible for national security and the safety of Canadians. It coordinates and supports the efforts of federal organizations ensuring national security and the safety of Canadians. It also works with other levels of government, first responders, community groups, the private sector and other nations.

78. Public Safety Canada is also responsible for Canada's National Disaster Mitigation Strategy, established to develop sustainable, disaster-resilient communities across Canada. This strategy has been developed collaboratively by the federal, provincial and territorial (FPT) governments, and sets out a comprehensive, multi-dimensional approach that anticipates joint contributions, community-based partnerships and national-level initiatives. Through the FPT Senior Officials Responsible for Emergency Management (SOREM) committee, all stakeholders work to promote and facilitate disaster mitigation initiatives within their own jurisdictions.[13]

79. Public Safety Canada has been tasked to develop an implementation strategy related to using a portion of the 700 MHz[14] spectrum for public safety.

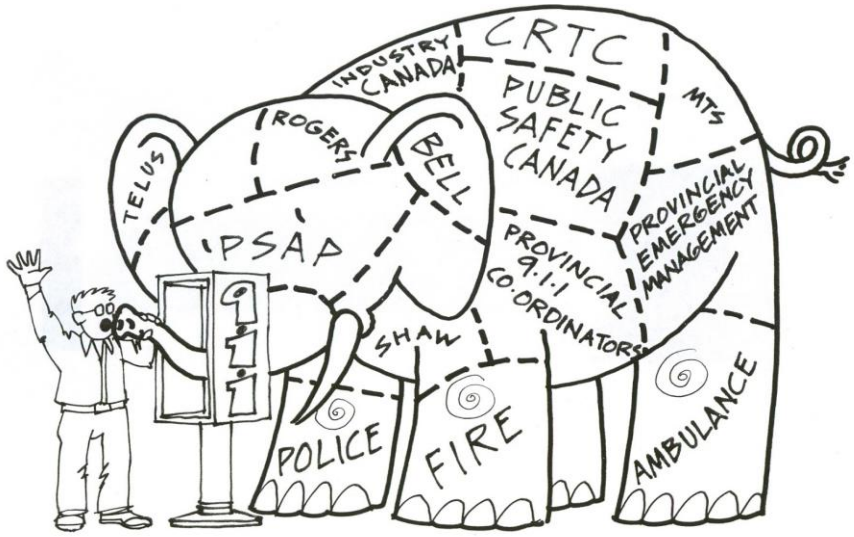
80. In addition, there are potential linkages between NG 9-1-1 and other information technology platforms currently under development, such as the Canadian multi-agency situational awareness system (MASAS). MASAS enables near real-time sharing of location-based situational awareness information and alerts within the emergency management community.

81. As a side note, I believe that Public Safety Canada and the Commission need to remain in regular communication and work together (possibly through a formal arrangement captured in a memorandum of understanding), as appropriate, in the provision of communication systems and services meant to enhance public safety.

Figure 3: 9-1-1 includes many actors

[13] Public Safety Canada's website

[14] The 700 MHz spectrum was previously used by television broadcasters, but became available for alternate uses following the transition to digital television broadcasting.



G. Current governance model in the United States

82. The United States has demonstrated a degree of seriousness about public safety in general, and 9-1-1 in particular, that Canada would do well to emulate. Starting with Dale Hatfield's 2001 report, the FCC has conducted or sponsored a series of studies of 9-1-1. In the legislature, the United States Congress maintains a caucus (a bipartisan group of interested senators and congressmen) devoted to 9-1-1 issues, which has been successful in moving forward legislation regarding several topics associated with 9-1-1. The FCC, being an agency of the Congress, has reported to its overseers on the state of 9-1-1 financing by the states. The FCC has its own Public Safety and Homeland Security branch, in which about one-third of the work concerns 9-1-1 issues, and public alerting and 9-1-1 are considered together.

83. The 9-1-1 system in the United States is made more complicated than Canada's by the existence of 50 state jurisdictions in telecommunications. The federal telecommunications regulator has jurisdiction over interstate communications and wireless communications. Intrastate wired telephony is within state jurisdiction. The federal government has, through the Department of Transport (DoT), provided a variety of capital grants to state and local authorities to ensure the uniformity of the 9-1-1 system as well as to provide ongoing support for high-cost areas, principally in rural areas. The DoT assists state 9-1-1 programs in the following ways:

    a. There is a national United States planning capacity for 9-1-1 in the DoT;
    b. The DoT is actively engaged in monitoring and improving 9-1-1, and considering NG 9-1-1;
    c. The DoT maintains a federal grant program for improving state 9-1-1 delivery capacities;

d. Federal assistance concerns model language for state legislation concerning 9-1-1, covering governance, liability, a state 9-1-1 coordinator's office and privacy/confidentiality;
e. Federal assistance also concerns generic advice on service delivery issues;
f. There is a pilot program for the assessment of state-wide 9-1-1 delivery; and
g. A blue ribbon panel has been convened to study funding models for NG 9-1-1.

FCC

84. The FCC has broad responsibility for regulating the 9-1-1 system, which is provisioned by carriers that are subject to its jurisdiction. The United States Congress specifically empowered the FCC to "promote the safety of life and property through the use of wire and radio communications." The FCC has been given the goal of "obtaining maximum effectiveness from the use of radio and wire communications in connection with safety of life and property" and charged with "investigating and studying all phases of the problem and the best methods of obtaining the cooperation and coordination of these systems."[15] In addition, the FCC was required to "designate 9-1-1 as the universal emergency telephone number for reporting an emergency to appropriate authorities and requesting assistance."[16]

85. The evidence indicates that the FCC considers 9-1-1, public alerting, disaster response, and resilient communications systems to be related subjects, and assigns them significant resources. Conversations with many people in and around the FCC and the United States government confirmed this impression.

86. The FCC has recently been tasked by law with reporting to Congress how much states collect for 9-1-1-services, and where the revenues end up. Two such reports have been issued. Cooperation from the states has generally been good, with usually 48 out of 50 states reporting. The reports are on the public record and provide an accountability snapshot, as they highlight which states have chosen to divert revenues arising from 9-1-1 levies to general revenues.

Public Safety and Homeland Security Bureau, and the Communications Security Reliability and Interoperability Council

87. The FCC's Public Safety and Homeland Security Bureau (PSHSB) is responsible for developing, recommending and administering the agency's policies pertaining to public safety communications issues. These policies include 9-1-1. The Bureau also coordinates forward-looking technical advice from the public, the industry and the public safety community through its Communications Security Reliability and Interoperability Council (CSRIC). CSRIC is a federal technical advisory committee constituted under the *Federal Advisory Committee Act*.[17]

88. The head of the PSHSB is a director, who stands on an equal footing with the directors of the other six bureaus of the FCC. The PSHSB launches proceedings, conducts inquiries such as that on the outage at the Fairfax County PSAP caused by tropical storm Derecho,

[15] 47 U.S.C. § 154(o).
[16] 47 U.S.C. § 251(e)(3).
[17] U.S. General Services Administration website

and generally plays an active role in assuring that the incumbent carriers serving PSAPs maintain service levels. Citing a recent speech by David Turetsky, head of the PSHSB, to the National Emergency Number Association (NENA) March 2013 conference:[18]

> "Those recommendations were that the Commission consider action to ensure that service providers conduct periodic physical audits of 9- 1-1 circuits; maintain adequate backup power and follow regular maintenance and testing procedures at relevant central offices; and have adequate network monitoring links. Of particular note for this audience, because notification to PSAPs of outages was a problem in the Derecho, the Bureau also recommended that service providers take on a more specific obligation to notify 9-1-1 call centres of breakdowns of 9-1-1 communications."

89. The Bureau has made liberal use of technical advisory committees in the planning of policy surrounding 9-1-1 over the past decade. Of note is the manner in which these committees are established.

90. These committees are organized and chartered for limited periods of time with different agendas and a rotating membership structure. Memberships are generally limited to two-year terms. Participants are not paid and there is no compensation for travel or reimbursement for expenses. Committee personnel may include academics and people from public interest groups, in addition to people from the industries directly involved.

91. Once nominations are collected, participants are selected and FCC staff develops a formal agenda of questions to be investigated, and the work proceeds, with regular quarterly meetings of the whole advisory committee and ongoing conference calls of task groups organized to address specific agenda items. Members are free to select specific items of interest to themselves, subject to the approval of FCC staff. The CSRIC model, which essentially involves tight mandates, fixed deadlines and carefully selected chairpersons, has been viewed by American observers to have been a significant success.

National Highway Traffic Safety Administration

92. The National Highway Traffic Safety Administration of the United States DoT provides extensive coordination of 9-1-1 activities. It also hosts the 911.gov national resource centre and provides model state legislative language concerning 9-1-1, technical assistance to public safety officials, and a limited grant program. The extent of the DoT's program has been described more fully above. No equivalent has been found to exist in the Canadian federal government.

Department of Homeland Security

93. The Department of Homeland Security Office of Emergency Communications coordinates public safety through its SAFECOM program.[19] The Department also developed the National Emergency Coordination Plan,[20] to be implemented and coordinated in part by the

[18] FCC website
[19] SAFECOM Program (Homeland Security website)
[20] National Emergency Communications Plan (NECP) Goals (Homeland Security website)

Federal Emergency Management Agency. These programs offer state and local governments a variety of services, including interoperability coordination, planning assistance, a limited grant program for hardware, and software training or consulting services.

H. Europe

94. 1-1-2 is managed and financed in the European Union by each member state (country), which also decides on the organization of the emergency call centres.

95. Evidence is anecdotal, but my investigation into the European 1-1-2 emergency service revealed that it is generally believed that some of the newer members of the European Union, from former East Bloc countries, have taken the provision of emergency services to their populations to be one of the key services that governments can deliver, and that they do so in the belief that the provision of effective emergency services builds confidence in nascent national institutions.

European Emergency Number Association (EENA)[21]

96. EENA is a Brussels-based non-government organization, set up in 1999, that is dedicated to promoting high-quality emergency services using 1-1-2 throughout the European Union. EENA serves as a discussion platform for emergency services, public authorities, decision makers, associations and solution providers in view of improving emergency response in accordance with citizens' requirements.

97. The EENA memberships include emergency services representatives from European countries, solution providers, and international associations/organizations, as well as members of the European Parliament.

98. In addition to gathering politicians, associations, international organizations and solution providers with a view to improving the entire 1-1-2 chain, EENA gathers individuals working for emergency services or relevant public authorities to foster sharing experience and best practices. EENA promotes 1-1-2 in the media, and has created a foundation that focuses on educating citizens about the existence and use of 1-1-2. It also organizes an awards ceremony each year to congratulate individuals and organizations contributing to the improvement of 1-1-2 and emergency communications.

99. From my perspective, two things should be noted about EENA. First, it is a model of an open, transparent organization. Its website (www.eena.org) is comprehensive and self-explanatory, and is kept up-to-date. It shows financial information, budgets, by-laws, committee structure, personnel, how to join, and the projects in which it engages. It keeps track of and shows the European legislation and directives that affect it. Many other Internet-based organizations do this as well.

100. More significantly, EENA is privately owned. It is a not-for-profit company. Its board of directors remains formally independent of its advisory boards, so that the organization retains freedom to act in advance of whether a consensus exists among the many

[21] EENA website

members and European Community member states. The particular structure of EENA allows its management to say that they are working for the citizen, and not for the carriers or the first-responder community. I am not recommending such a structure for Canada necessarily, but as an organization acting effectively in the emergency-response field, it has been a genuine success.

Sweden

101. In December 2011, the Swedish Government appointed a special investigator to review the current emergency services system in Sweden. The special investigator's report was presented to the Government in April of this year.

102. Much of the report deals with the current emergency infrastructure in Sweden, and national legislation.

103. The overall assessment was that there were problems with the current system, including fragmented notification systems and increased levels of complexity that hamper collaboration between emergency services agencies. There is a risk to society's ability to ensure peoples' safety, and communities' ability to deal with major incidents and emergencies.

104. The special investigator included a number of recommendations in his report. Of note are the following:

    a. An increased government commitment for emergency services is required.
    b. Fundamental provisions concerning emergency services should be regulated by law.
    c. A national emergency operation should be established by 1 January 2015, with the mission to ensure a fast, safe and effective emergency treatment.
        i. Operations would be conducted under government authority to meet the needs of long-term stable conditions, to provide better opportunities for collaboration amongst emergency service agencies, and to allow the Government to monitor and review the operations.
        ii. The new agency would be financed through a redeployment of appropriations within the state budget, as well as adjustments between the central government, municipalities and local authorities.
    d. There should be fewer and more robust emergency service centres in order to reduce costs and improve the efficiency and harmonization of services.
    e. A common technology platform should be developed for emergency treatment, information sharing, and information coordination.

105. The inclusion of this report to Sweden's Riksdag (parliament) in my inquiry report serves to emphasize that:

    a. European states take emergency response issues seriously;
    b. Nationwide standards are actively under development, even where jurisdiction is shared between municipalities and the central government;
    c. A national agency is advocated to overcome the problems of 1-1-2; and

d. A major European state, whose 1-1-2 system was voted by EENA to be the best in Europe in 2012, considers that more money and closer coordination of municipal and national efforts is required.

I. Technology and coordinating bodies

The National Emergency Number Association (NENA)

106. NENA (www.nena.org) is the leading public safety industry organization in the United States and Canada for defining technical issues and recommending solutions for technology service providers, equipment manufacturers and industry-related standard-setting bodies such as the Internet Engineering Task Force (IETF)[22] and the International Telecommunication Union (ITU). NENA has established itself as an industry leader in recommending technical solutions and standards that will: enable compatibility of 9-1-1 technologies; minimize costs involved in provisioning and maintaining public safety communications; increase the effectiveness of 9-1-1 call handling and emergency response; and promote teamwork among industry providers of public safety products and services.

107. In general, the development work at NENA is undertaken within standing or special committees established to address the complex operations and technology issues related to the provision and management of emergency communications services in specific topical areas. One of these committees is the NG 9-1-1 Transition Planning Committee. The primary objective of this committee is to identify technical and operational gaps in the transition to NG 9-1-1 and make recommendations on how to mitigate those gaps. As part of the work of this committee, a detailed blueprint known as NENA i3 was developed and continues to evolve to serve as the model for the end-state of an NG 9-1-1 system.

108. As discussed later on in my report, a number of Canadian companies have been involved in NENA's work to define and specify NG 9-1-1 building blocks.

109. The existence of the NENA i3 “standard” is spoken of by those within the public safety community as if it had a specific content, or as if it were agreed upon like a standard or protocol emerging from the IETF. This is not the case. The NENA i3 is a vision or a conception rather than a worked-out set of standards. The location of various functions within the NG 9-1-1 system has not been decided upon because, in reality, NENA is not the body that can make those decisions for Canada. Only governments can. Some functions could be housed within the incumbents, or they could be devolved to other organizations capable of maintaining databases. Should these databases be national, local or provincial/territorial? Should they be commercial or not-for-profit? Should they be maintained by incumbents or by third-party contractors? How should they link to other organizations in the 9-1-1 complex? Who should pay for them? These are open questions, and as I have maintained throughout, the institutions and processes whereby they could be answered have to be decided upon first, before the actual implementation takes place. The idea that NENA has a set of standards ready for us Canadians to implement is a fiction, for

[22] IETF website

two reasons. First, NENA is a standards-development body, but the standards are not yet ready to be implemented because they are still under active discussion. Second, the relevant decision-makers are governments, as far as the strategic questions are concerned.

110. Governments may adopt the views of those most concerned, but in Canada, those most concerned – the members of the ESWG – seem to have said that NENA will decide, and NENA is not the body that can make many of the largest decisions for Canada. These can be made only by the CRTC on matters within its jurisdiction, or by some 9-1-1 policy body on matters that straddle jurisdictions.

The Association of Public-Safety Communications Officials (APCO)

111. APCO is the world's largest organization of public safety communications professionals. It is a voluntary, not-for-profit organization dedicated to the enhancement of public safety communications. APCO Canada has been a charter member since 1987.

112. APCO Canada members come from various public safety organizations in the country, including PSAPs and police, fire and emergency medical agencies, as well as emergency management, disaster planning and federal search and rescue personnel. APCO Canada's Public Safety Communications Programs Committee was established to guide and direct the development of recommended minimum standards for Public Safety Communications Programs within Canada. In addition, APCO establishes ongoing partnerships with public safety organizations to deliver education and information, and with educational institutions to promote the minimum training standards for emergency communications programs.

113. APCO's standards development activities have a broad scope, ranging from the actual development of standards to the representation of public safety communications in other standards development areas. APCO has endorsed the architecture of NG 9-1-1 as described by NENA.

IV KEY ISSUES RAISED BY PARTICIPANTS ABOUT THE CURRENT 9-1-1 SYSTEM

A. Issues for Canadians

114. In the course of this inquiry, I heard from many Canadians who raised concerns about the adequacy of 9-1-1 service for those with disabilities.

115. While people with disabilities should have multiple modes of communication at their disposal, the current 9-1-1 emergency calling system does not always accommodate this.

116. For example, Canadians with hearing or speech disabilities presently have two methods of communicating: teletypewriter (TTY) or IP relay.

117. Direct access to local PSAPs by dialing 9-1-1 is currently available for some TTY users, but is not available for IP relay users. Direct access to PSAPs by dialing 9-1-1 is available by TTY only if the local PSAP is equipped with a TTY.

118. If the appropriate PSAP is not equipped with a TTY, the call is routed through the TTY relay call centre, where the operator then connects the caller to the appropriate PSAP.

119. 9-1-1 calls processed through IP relay are routed to the relay call centre, where an operator then connects the call to the identified PSAP, based on the user's location as listed in their personal profile, and then relays the conversation back and forth from text to speech and vice versa. When a Canadian registers for a relay service, their address, associated phone number, and personal information is collected by their telecommunications service provider (TSP). The problem is that it is the Canadian who is responsible for maintaining up-to-date information with their TSP for their personal file. The TSP, in turn, is responsible for ensuring that this information is up-to-date in the database.

120. It should be noted that a text messaging service that will improve access to 9-1-1 for hearing- or speech-impaired persons is currently being implemented.[23]

121. I also heard from some individual Canadians who had concerns about the level of training of 9-1-1 operators. Specifically, concerns about a lack of bilingual operators, better training on assessing emergency situations and identifying and requesting pertinent information from the caller to better inform emergency responders, and better training on handling calls from persons with a disability who may not be able to effectively communicate over the phone.

122. Finally, access to 9-1-1 services is not yet universal in Canada, and there are still parts of Canada that have no service or a low degree of service.

B. Issues for PSAPs

123. I have spoken to many organizations or agencies responsible for PSAP operations across the country, as well as individuals directly involved in this area . They have provided me with enormous insight into the challenges they face on a daily basis. Their message is clear: there are problems/limitations with the current 9-1-1 system. I have set out below some of the more significant issues they raised with me.

Caller location

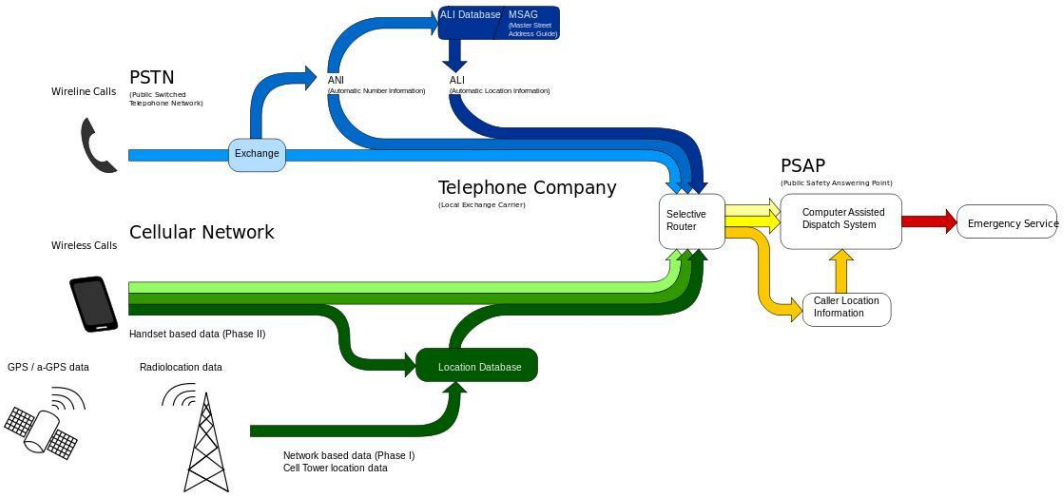
124. PSAPs indicated to me that as Canadians are increasingly turning to wireless and VoIP services for their everyday communications, the accuracy of the information they receive about caller location is of increasing importance. According to PSAPs, despite system changes that have been incorporated and intended to identify a wireless caller's location, the information is not always provided and, when it is, sometimes it is too inaccurate to be

[23] See Telecom Decision 2013-22.

useful.[24] In addition, while latitude and longitude coordinates may be provided for wireless calls (referred to as the 'x' and 'y' coordinates), there is no elevation information (referred to as the 'z' coordinate) available to effectively locate a caller within high-density buildings within urban areas. Furthermore, with nomadic VoIP services, there is no method for automatically relaying caller location information to the PSAP. The system relies on users providing that information verbally and updating their location information with their VoIP service providers.

125. At this point, it is worth exploring the notion of caller location as it pertains to the provision of emergency services. In my view, it is obvious that the ability to accurately locate the geographic source of an emergency is critical to saving both lives and properties. Specifically, the rising use of mobile technologies can be both a boon and a bane. A boon because situations can be reported and reacted to quickly. A bane because determining the location of a caller can be problematic.

126. By way of background, a caller's location is determined using different techniques, depending on how the call is received at a PSAP. The diagram below illustrates the components that are used by PSAPs to determine caller location when the caller is using a traditional phone, as compared to a cellphone.

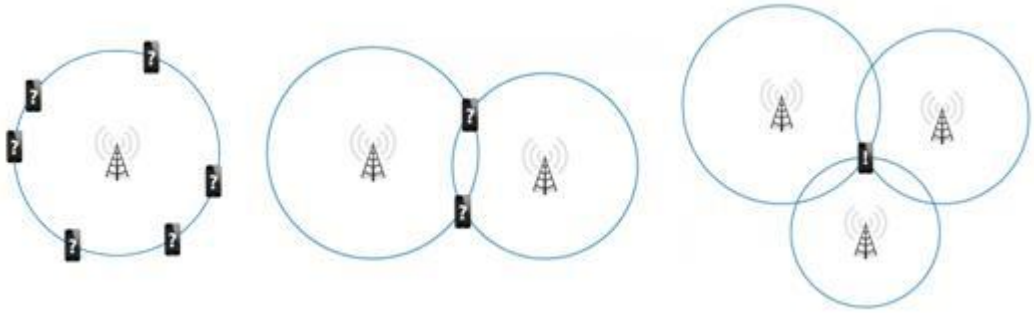


127. In a traditional landline-based call, the PSAP operator can determine a caller's location based on entries in the ALI database, which in Canada is maintained by the incumbent telephone company. Note that nomadic VoIP phone services currently rely on manual entries in the VoIP service provider's customer information database, and on users to inform their service provider if they change locations.

128. When it comes to determining the location of a caller using a cellphone, there are two principal methods employed:

[24] Submissions based on PSAP data from Mr. Ken Sluman, a now-retired policeman associated with the Peel Regional Police PSAP. Mr. Sluman estimated that 59% of wireless 9-1-1 calls are lacking complete location information.

a. Radiolocation (trilateration or triangulation), which relies on the cellular base stations to determine the location of a handset using various techniques. Accuracy here depends in part on how many towers can be used to determine the location. The more towers that can 'see' the handset, the more accurate the location (see image below).



b. Handset location technologies, principally the Global Positioning System (GPS) chips which exist in most modern handsets; these yield much more accurate locations, enabling better response. However, not all cellphones have GPS chips embedded in them. This situation is improving as people replace older handsets with newer ones.

129. The two location techniques mentioned above will essentially send location information to the PSAP operator in the form of a latitudinal and longitudinal coordinate. This information will also include an estimate of the 'uncertainty radius' as well as the confidence level of this information. However, one of the problems remaining is that there is no provision made for a 'z coordinate' or altitude, which becomes problematic when responding to emergencies within cities. While a PSAP operator may have information on the rough location, they will not be able to automatically determine what floor of a building a call originates from.

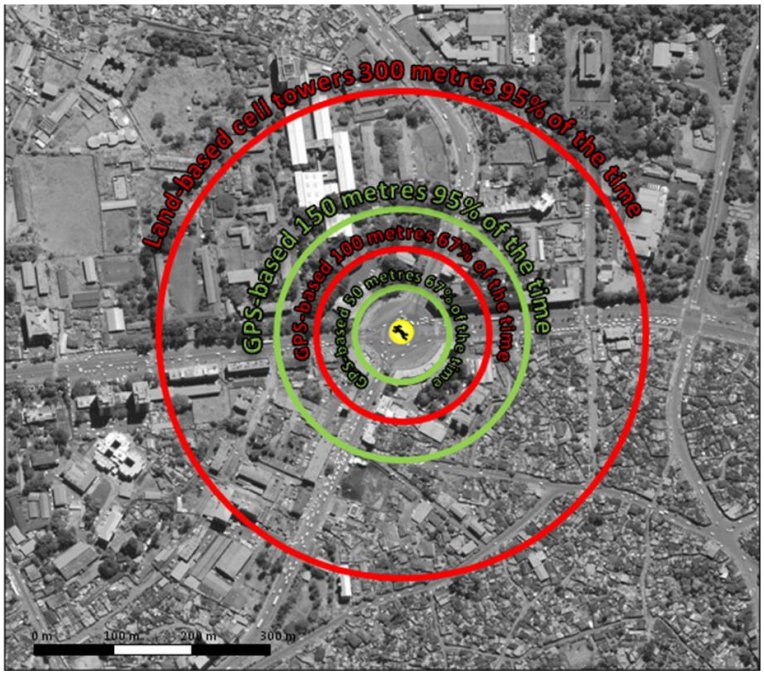
130. The standards applied to caller location information vary by jurisdiction throughout the world. Below is a simple table outlining the level of accuracy which is expected in different jurisdictions.

Table 4: Accuracy standards for caller location

Region	**Authority**	**Accuracy standards for caller location information provided to the PSAP**
Canada	CRTC	90% confidence level that the caller is located within location provided is required. The radius in metres (uncertainty) of the area is provided: no maximum or accuracy requirement on radius.

		Time to determine location: 30 seconds. System testing requirements: none.
United States	FCC	No set confidence level that the caller is located within location provided is required. The radius in metres (uncertainty) of the area is provided: no maximum or accuracy requirement on radius. Time to determine location: no limit. System testing requirements: for outdoor test calls only. Using network information: 67% of caller location accurate to within 100m; in at least 60% of counties, or PSAP areas accounting for 70% of population covered by carrier. Using handset information: 67% of caller location accurate to within 50m in all counties; 80% of caller location accurate to within 150m, in 85% of counties.
Europe	European Commission and national authorities	No specified accuracy requirements for wireless operators. Legislation states that mobile operators should use their "best efforts" to locate wireless 1-1-2 calls.

131. To put the information above in perspective, the following picture will give the reader an idea of what the United States guidelines on location accuracy actually mean in an urban setting.



132. With respect to calls originating from nomadic VoIP services, PSAPs indicated that calls to 9-1-1 need to be processed by a third-party call centre, and the lack of automated information creates delays in connecting callers to the proper PSAP. Location information is only as good as the information provided by the caller, which may not be accurate.

133. It is undeniable that calls from IP phones and IP-enabled devices will grow in importance. They pose very significant technical challenges for PSAPs. The very thing that makes IP addresses so useful, their independence of geographic location, makes them unsuitable as location-finding devices. Standard telephone numbers are undergoing the same process of becoming detached from geographic location. Consequently, how to deal with VoIP calls to 9-1-1 is becoming a matter for urgent discussion and debate. Of all the issues on which neutral and dispassionate inquiry is urgently needed, the problems of location-finding in an IP environment are probably highest on the list.

Pocket dials, misdials, disconnected calls

134. PSAPs indicated that unintentional calls to 9-1-1 are time-consuming and reduce a PSAP's ability to deal with legitimate emergency situations.

135. PSAPs also indicated that calls made to 9-1-1 but subsequently disconnected are a problem. There are four types of disconnected calls:

    a. Calls made to 9-1-1 that disconnect before they are forwarded to the PSAP;

    b. Calls that are forwarded to the PSAP, but are disconnected before they are answered by a call taker or before they can be placed in the 9-1-1 queue;

    c. Calls made from a wireless device for which cell site location information is received, but the call disconnects before latitude and longitude are received; and

d. Calls that disconnect before a call taker can obtain all the information from the caller, but for which all the anticipated callback and location information has been received at the PSAP.

Funding

136. PSAPs indicated to me that the lack of a common funding model within the provinces/territories and regions has led to regional differences in the 9-1-1 service provided.

137. PSAPs were concerned that the financial contribution levied by provincial/territorial governments on wireless service providers' customers for the funding of PSAPs is insufficient. In their view, this is particularly troubling when the majority of 9-1-1 calls originate from mobile devices, and these calls take longer to handle due to inconsistent and/or unreliable general location data provided. This is further compounded by the volume of pocket dials mobile devices cause.[25]

138. PSAPs indicated to me that some of the current practices of wireless service providers themselves can have significant impacts on their resources. For example, PSAPs indicated that 9-1-1 test calls from wireless devices create a significant demand on staffing resources and may impede a PSAP's ability to respond to other calls.

139. PSAPs also indicated that some wireless service providers have inaccurate or inadequate subscriber records, which in many situations can impede the ability of the PSAP to locate a caller in the case of a silent, hang-up or no-voice-contact 9-1-1 call. Inaccurate information arising from cell towers is also a significant problem in determining where callers are.

C. Issues for incumbent telephone companies

140. The incumbent telephone companies generally indicated to me their view that the current 9-1-1 network is a highly robust, diverse and redundant network that provides secure and reliable access to 9-1-1 features and systems to interconnecting carriers as well as PSAPs.

141. In contrast to the submissions provided by the PSAPs, the incumbent telephone companies indicated that, in their view, there is a high level of accuracy of the location information provided with wireless 9-1-1 calls. According to the incumbent telephone companies, in 2012, the system provided valid location information for 94.7% of Phase II Wireless E9-1-1 calls processed. Their sample data from December 2012 indicated that the level of accuracy provided was within a 500-metre radius for 60% of the calls. According to at least one incumbent telephone company, the industry standard is established at a 90% confidence level with the range of uncertainty varying based upon several factors.[26]

142. In addition to the information provided on caller accuracy, incumbent players noted that the location information in any case was being provided to PSAPs in a format and accuracy

[25] In his comments, Mr. Sluman concluded that wireless devices represent the vast majority of calls made to 9-1-1, and that they also generate a disproportionately high number of disconnected calls. Mr. Sluman estimates that the total number of disconnected 9-1-1 calls represents 39% of the total calls made to 9-1-1, and that the majority of these are initiated accidentally or unintentionally.

[26] From comments prepared by Saskatchewan Telecommunications.

level equal to, and in most cases superior to, the prescribed standards that have thus far been mandated. The Bell companies,[27] in their submission, further discussed work that is ongoing at CISC with respect to this challenge. In particular, they referred to CISC ESWG TIF [Task Identification Form] 69.[28] As part of this task identification form, there has been ongoing dialogue regarding whether or not location accuracy standards should be revisited by the CRTC.

143. Notwithstanding their generally positive view of the current 9-1-1 system, the incumbent telephone companies raised concerns around VoIP 9-1-1 calls. For example, in relation to information provided for VoIP 9-1-1 calls, there could be cases that involve spoofing[29] which result in new VoIP 9-1-1 challenges, the most serious being a phenomenon known as swatting.[30]

144. Incumbent telephone companies indicated to me that VoIP 9-1-1 service currently requires the involvement of a third party to determine the caller's location before conferencing and ultimately transferring the call to the appropriate PSAP, a much slower and less efficient process than for traditional 9-1-1 calls. The incumbent telephone companies also noted that if there is a problem communicating a caller's physical address during a call, the operator will rely on the caller's last known address. For this system to work, VoIP callers must provide updates to their location when travelling. While service providers can provide customers the ability to update their location information, the onus is ultimately on the customer to do so.[31]

145. The incumbent telephone companies submitted to me that no other country has successfully put in place an automatic location solution for VoIP calls. While, in their view, Canadians are therefore no worse off than customers in other countries, it is evident that more work needs to be done to determine viable solutions to this issue.

146. Similar to the concerns raised by Canadians, the incumbent telephone companies noted that 9-1-1 service is currently not universal. Telephone service operates in a number of towns and regions where local or regional governments do not provide 9-1-1 service. Callers in these areas need to know that they must call local numbers to obtain assistance in emergencies. If the caller dials 9-1-1, the call is not routed to any local emergency agency.[32]

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[27] Bell Aliant Regional Communications, Limited Partnership; Bell Canada; Bell Mobility Inc.; DMTS; KMTS; NorthernTel, Limited Partnership; Northwestel Inc.; and Télébec, Limited Partnership.

[28] Location of document: CRTC website

[29] The modification or alteration of the calling line ID.

[30] Swatting involves calling 9-1-1 and faking an emergency to draw a response from law enforcement agencies, usually a SWAT team.

[31] From comments prepared by Saskatchewan Telecommunications.

[32] From comments prepared by MTS Allstream.

V NEXT-GENERATION 9-1-1

A. The public switched telephone network is in transition

147. One of the key drivers for the implementation of an NG 9-1-1 system is the change in technology being used to deliver communications services. At the crest of the wave of change is a move towards IP technologies. This section of my report will briefly touch on the effect this move toward IP technology will have on the ubiquitous telephone network.

148. Just as wireless services grew in popularity, so too did Internet services, which were introduced on a large scale at the end of the 20th century. These services, and the associated networks used to support them, were developed using IP technologies. They also used different system identification resources, namely IP addresses, which are administered by neutral third parties rather than by any carrier.

149. As IP networks and technologies grow and gain importance, there is a corresponding reduction in the use of traditional technologies such as public switched telephone network (PSTN) switching equipment. The major equipment manufacturers are no longer supporting these 'legacy' products, and as equipment is eventually retired, its replacement is most often based on IP technologies.

150. Indeed, at the heart of most telephone company networks is an IP backbone. In addition, carriers are increasingly interconnecting their networks using IP technology. While much of the last-mile phone services (i.e. the connection to the customer) may still be provided using legacy equipment, the communication is often ultimately translated and carried over IP networks.

151. However, the challenges posed by migration to an all-IP architecture go beyond technical deployments and upgrades. The shift also opens questions as to the political and regulatory implications of such a move. In the United States, there are clear calls that, with a transition to all-IP networks, regulatory obligations imposed by the FCC should be lessened in terms of:

    a. Universality of service (ensuring that it is available to all);
    b. Interconnection and competitive availability (ensuring that all carriers can connect to one another);
    c. Network reliability (ensuring that the system can handle a range of problems and continue to deliver reliable service, e.g. during natural disasters); and
    d. Public safety (ensuring that services such as 9-1-1 are fully available over new infrastructures).

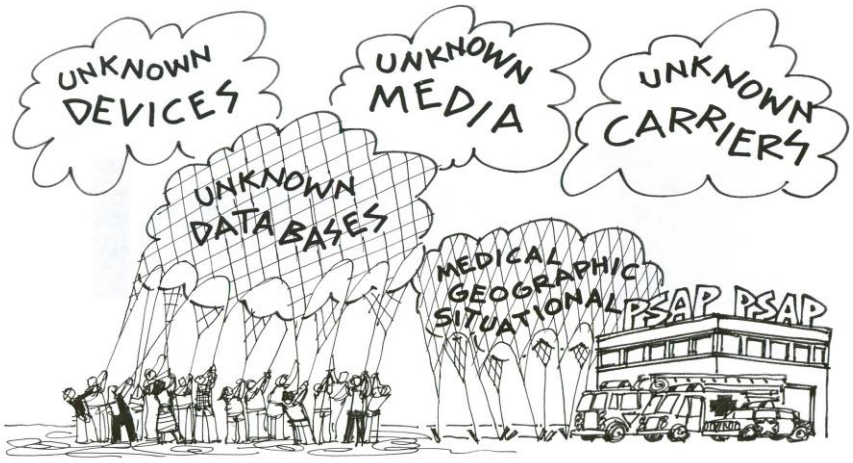
152. The Canadian regulatory environment does not completely mirror that of the United States, but we do nonetheless share these concerns. While the transition here in Canada is already largely happening absent heavy regulatory oversight, there are some aspects which have been explored in Canada to some degree. These include emergency service obligations related to VoIP services, examined by the Commission in 2005;[33] the question

[33] See Telecom Decision 2005-21.

of universality of service, examined by the Commission in 2011;[34] and network interconnection, which was examined in 2012.[35]

153. Despite the fact that there is no consensus on exactly when the PSTN will have fully migrated to IP, there are clear indications that much of the growth in communications is moving to IP platforms that offer far richer features, and the added benefit of mobility. These new features and mobility are precisely the reason there is a change in Canadians' expectations and, therefore, a need to talk about solutions to the issues that are being experienced now and will continue into the future, as the system moves to supporting 9-1-1 over IP-based networks.

Figure 4: Defining what NG 9-1-1 will mean is the main task ahead



B. Vision

154. As to the future, the principal problem being faced by PSAPs is the large and widening gap between what they can do and what people expect they can do.

155. In general, with NG 9-1-1, Canadians will be able to communicate with PSAPs in new ways, such as instant messaging and social media, or in new formats, such as picture and video. In addition, PSAPs will enjoy the benefits of other capabilities, such as accessing and relaying electronic building schematics. The negative side of this development is cost. I was informed by several PSAPs that for a time, the addition of IP capabilities will add to costs, such as investment in new equipment, procedures and training. PSAPs have referred to the widening gap between expectations and existing capabilities as 'unfunded liabilities.' In some of my interviews, PSAPs likened themselves to pushing against the door to hold back these new developments, because every innovation was going to make things worse, more complicated and more expensive, would involve more training and would generate new legal liabilities.

[34] See Telecom Regulatory Policy 2011-291.
[35] See Telecom Regulatory Policy 2012-24.

Figure 5: What technological change looks like to PSAPs

156. The unfunded expectations will need to be addressed either through cost-reducing efficiencies or an increase in direct funding. The transition to NG 9-1-1 will create new costs but will also provide opportunities for operational savings. In the United States, efficiencies have been introduced in some individual states that have taken a lead in rationalizing their 9-1-1 service, with a reduction in the number of PSAPs, particularly smaller PSAPs. There are also instances of smaller municipalities contracting out their PSAP requirements to larger municipalities or third parties. But for PSAPs and the authorities who pay for them, the onrush of technological change is a challenge, and there is as yet no comprehensive, high-level forum for collective discussion and consideration of what should be done.

C. Transition to NG 9-1-1

157. The path to NG 9-1-1 will be comprised of a series of newly implemented technologies that will transition how 9-1-1 calls are originated, carried and received. It will not be done at the flick of a switch or at the same time across all jurisdictions.

158. One could argue that the transition has already started with the rollout of a text messaging service for hearing- or speech-impaired persons. In addition, the incumbent telephone companies are in the process of planning the replacement of PSAP data circuits with IP technology to support the wireless text messaging to 9-1-1 service and the wireless in-call location update feature, and as a first step in preparation for NG 9-1-1.

159. NENA has developed its i3 roadmap for NG 9-1-1 standards and architecture. NENA i3 has a great deal of support in Canada. A number of Canadian companies have been involved in NENA's work to define and specify all the building blocks of an NG 9-1-1 system, from both a technical and an operational perspective.

160. However, based on the material gathered as part of this report, it is my belief that it is still too early to say that there is an industry consensus in Canada that NENA i3 is the way

forward. My impression is that some in the industry are of the view that NENA's work, while substantially United States-oriented, can and should be leveraged for designing a similar and fully interoperable architecture for Canada. Given the inherent differences in structures, regulations, infrastructures and size, some members of the industry believe that Canadian NG 9-1-1 can be achieved through a simplified solution tailored to Canadian needs.[36]

161. Other members of the industry warned that Canada should not risk implementing a Canadian-specific solution that isolates Canada's 9-1-1 system, increases costs and limits equipment solutions.[37]

D. Operations

162. The Canadian Interoperability Technology Interest Group (CITIG)[38] expressed the concern that the need to transfer data downstream (and the quantity of data) will increase significantly in the coming years, and that the digital assets that may go with a given call will put a strain on existing equipment and technical resources.

163. For example, if Canadians can submit videos, pictures or other digital assets in conjunction with 9-1-1 calls, the resources required to manage 9-1-1 calls will increase significantly. While in some cases videos or pictures may provide valuable information, too much information could be a danger. If multiple videos show up regarding a fire call or a major traffic accident, the PSAP may not have the time or resources to view all videos in a timely way.

164. In addition, the lack of resources to view multiple videos in real time may create legal liability for PSAPs, particularly in cases where serious injury or death occurs in the incident. If PSAPs accept the videos, they may very well be accepting the liability that goes with it. CITIG noted that provinces such as New Brunswick and Manitoba have created legislation that limits the liability of PSAPs in such situations, so that they cannot be sued for not having sufficient staff to view the number of videos that may come in on a given call.

165. CITIG also identified secondary impacts to the above, including: increased data storage requirements; an increase in PSAP technical resources to manage the increased storage and network demands; and the traumatic impacts on dispatchers who view graphic scenes (accidents, fires, suicides, etc.). In addition to the technological challenges of introducing NG 9-1-1, there will be operational challenges, such as increased call handling time, standard operating procedures, liability protection and perhaps even legal challenges. The flow of multimedia information between the public, PSAPs and first responders will put a strain on networks. These ideas and observations were broadly shared among respondents and interviewees who work in PSAPs.

[36] From joint comments prepared by the Bell companies.

[37] From comments prepared by Shaw.

[38] CITIG represents the Canadian Association of Chiefs of Police, the Canadian Association of Fire Chiefs and the Paramedic Chiefs of Canada.

E. Data collection

166. While most PSAPs, if not all, gather data and prepare reports, it seems that the input to these reports requires information collected by the PSAPs themselves and by the telephone companies that operate the underlying network.

167. However, it is evident from a number of the comments that currently, data collection capabilities in relation to 9-1-1 calls are limited. To my knowledge, we do not even know how many 9-1-1 calls are made in Canada each year. This is not an acceptable situation.

168. PSAPs may be equipped with call management systems capable of tracking the number and the timing of calls received, answered and/or sent into a queue. However, details beyond that, such as type of incident, type of device used, whether caller information and/or location was available, or the proportion of false 9-1-1 calls, do not seem to be available.

169. It should be noted that what is or is not measured always sends a clear signal to employees as to the relative importance of any task to be completed or service to be provided.[39] In other words, what is not measured does not matter.

F. Questions raised by participants about NG 9-1-1

170. In the course of this inquiry, various participants have raised with me a number of questions, to which I offer my initial reaction:

a. Can enhancements be introduced on an incremental basis without reducing the level of service provided to, or jeopardizing the safety of, any customers? My answer – not without more funding.
b. Are open industry standards required to ensure the interoperability of equipment from different vendors, prevent incorporation of proprietary elements as critical components of the overall service, and allow third-party vendors to develop their own ways of interfacing with NG 9-1-1 systems? My answer – yes.
c. Is there a need to provide increased liability protection for companies providing NG 9-1-1 services because of the challenge of operating IP-based systems at the same robust service levels expected from current 9-1-1 services? My answer – yes.
d. Should standards be adopted, as the United States has done, for address databases and addressing in general? My answer – yes.
e. How can the public's expectations be managed? My answer – through public education.
f. Given the increased data flow to the PSAPs under an NG 9-1-1 system, do there need to be increased privacy protections around what a PSAP can collect and what it can share with other agencies? My answer – privacy protectors must be factored in.
g. Does there need to be a consolidation of 9-1-1 rulings of the CRTC into a coherent body of rulings in the manner of the Civil Code of Quebec, as the Quebec association proposed? My answer – such a consolidation would be useful.

[39] Statement made by Mr. Ken Sluman.

171. Not all of these questions are matters that fall within the jurisdiction of the Commission under the *Telecommunications Act*. However, all of these questions are important and will need to be grappled with by the Commission, federal and provincial/territorial governments, PSAPs, first responders, the telecommunications industry and the Canadian public at large.

VI FINDINGS AND RECOMMENDATIONS

A. Findings

172. Today, the 9-1-1 system is working because first responders, PSAPs and telecommunications service providers make it work, not because the technology is flawless or its governance system adequate.

173. From my discussions with various individuals, groups and organizations involved in operating and maintaining the current 9-1-1 system, as well as the documented comments submitted to my inquiry, it is evident to me that there are a number of issues that need to be considered as we move forward.

There is a disconnect between Canadians' expectations and the reality of the 9-1-1 system

174. In an online survey conducted by Intrado Canada in May 2010,[40] there appeared to be a definite disconnect between what Canadians expect from 9-1-1 and what 9-1-1 can actually deliver. As a reminder, of the people surveyed at that time:

a. 98% knew about 9-1-1;
b. 76% believed the PSAP would know where they are calling from; and
c. 73% believed 9-1-1 technology had the ability to find them if they could not speak.

175. When asked whether it would be more important for a PSAP to receive text messages, receive pictures or pinpoint the caller's location, respondents overwhelmingly ranked pinpointing location as the most important.

176. Also, more recently in 2012, the Canadian Red Cross commissioned Ipsos Reid to explore how Canadians use social media and mobile technology during emergencies, and their expectations around the use of social media by emergency responders.[41] Based on the results:

a. 64% of Canadians said that they participate in online communities or social media networks, such as Facebook or Twitter;
b. 63% said emergency responders should be prepared to respond to calls for help posted on social media;
c. 55% thought that emergency responders currently monitor social media sites; and

[40] The survey conducted by Intrado was discussed in a 30 March 2012 report by Pomax Inc. on a feasibility study for a 9-1-1 and/or E9-1-1 system in the Province of Newfoundland and Labrador: A Final Report on A Feasibility Study for a 9-1-1 and/or Enhanced (E-9-1-1) System in the Province of Newfoundland and Labrador

[41] Social Media During Emergencies, Canadian Red Cross Factum

d. 35% thought that posting a call for help on social media would result in assistance from emergency services, of which 74% believed help would arrive within an hour.

177. From the results of the Canadian surveys set out above, it is clear to me that Canadians have a high degree of misperception about the current 9-1-1 system and its capabilities. These survey results and the information I have received in this inquiry demonstrate:

a. The public assumes that PSAPs automatically know their location when they call;
b. The public assumes that responders are qualified to handle their situation; and
c. The public assumes that PSAPs have the ability to accept multimedia information.

Education

178. There is no question that educating Canadians is vital. Standardized education would help the general public learn how 9-1-1 works and how the system deals with emergency calls.[42]

179. For example, pocket dials and misdials continue to strain resources because, for each call, the caller must be contacted to determine the nature of the emergency.[43] Public education initiatives could be used in an attempt to decrease the number of these types of calls.

180. One of the principal issues is that the public's perception of location accuracy is derived from television shows, which present a science-fictional portrayal of the degree of accuracy actually attained. Until technology improves, the public needs to be educated as to what they can expect with cellphone accuracy and what actions they can take to increase their chances of being located. Merely stepping outdoors can increase cellphone location accuracy significantly. People should be aware of these facts.

Best practices

181. Those responsible for providing 9-1-1 services across Canada do not share amongst themselves, at a national and perhaps even a provincial/territorial level, information that could be used to develop best practices. This is not necessarily because they don't want to, but rather, because there is no existing forum through which they could do so.

182. In the United States, the *ENHANCE 911 Act of 2004*[44] required, among other things, that a National E9-1-1 Implementation Coordination Office be created. Now simply referred to as "the National 9-1-1 Office," its responsibilities include improving coordination and communication among federal, state and local emergency communications systems, emergency personnel, public safety organizations, telecommunications carriers, and telecommunications equipment manufacturers and vendors.

183. Other responsibilities include development, collection and dissemination of information concerning practices, procedures and technology used in implementation of E9-1-1 services. A national 9-1-1 profile database was established that can be used to help accurately measure and depict the current status and planned capabilities of 9-1-1 systems across the United States.

Data collection about the 9-1-1 system can be significantly improved

[42] From comments submitted by Northern911.
[43] From comments submitted by the Toronto Police Service.
[44] 108th Congress Public Law 494 (U.S. Government Printing Office)

184. One of the most useful submissions the inquiry received was from Mr. Ken Sluman, a retired Peel Region policeman, PSAP manager and former member of the ESWG. His view was: "You cannot manage what you do not measure, and you cannot expect what you do not inspect."[45]

185. It should be possible to capture information such as call and incident type, location and duration, as well as resources allocated and agencies involved. While the availability of specific data will depend on many factors, including the capabilities of devices and networks, the point is that the absence of coherent national standards allows vital information to go unmeasured.

186. Depending on the ultimate solution, the collection of baseline data could be used to develop statistics for review on a national, provincial/territorial, regional or municipal level. There would be benefit in establishing a data collection system as a foundation for collecting and analyzing 9-1-1 operational information. Over time, the data could be used to identify trends and display hot spots of activities.

187. The nature of the data that could be collected will be a matter for further development in whatever policy body for 9-1-1 that may emerge. The automatic collection of data is not limited in its application to 9-1-1 systems, though this is justification enough. Every minute of time taken to reach a heart attack victim greatly affects the outcome. Performance metrics in 9-1-1 can save lives for sure, but the same system that collects relevant data for 9-1-1 can also be used to collect data in such a way that they can be useful for public security as well. The lack of feedback between data measurement and performance improvement is a notable feature of the current 9-1-1 system.

188. Further, under appropriate privacy safeguards, it is evident that some data can be collected and aggregated on a national basis. Provincial/territorial emergency response officials might not be concerned with some 9-1-1-related data, but might be concerned with others, while national authorities might need another layer of abstraction, or a slightly different set of indicators. The point is, for want of appropriate governance, we cannot currently define what needs to be measured, and if it could be defined, we need the technical means to carry it out. One of the major points of this report is that we need to consider how a new technical system, that goes under the name of NG 9-1-1, can be so configured that efficiencies in service delivery can be gained, while the same system can be used to measure things relevant for emergency management and disaster relief.

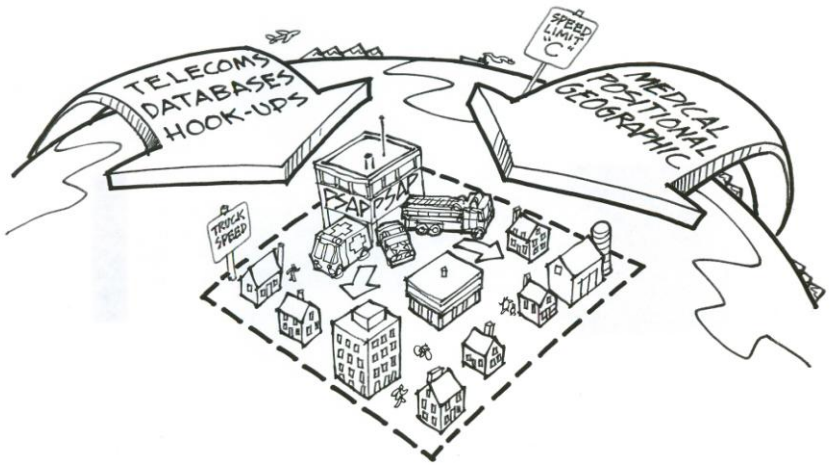
189. One of the really important ideas that emerged from my inquiry is that the collection and use of data generated from 9-1-1 presents governments at all levels, and society as a whole, with unparalleled opportunities. Think of the efficiencies that could be created through analysis of 9-1-1 information on a national or even a provincial/territorial basis. About a third of 9-1-1 calls result in a vehicle being dispatched, representing significant taxpayer expense. In 9-1-1 we have one of the most expensive, tax-absorbing complexes of capital and personnel deployed in modern society. Is it measured? It is scarcely measured at all, and if so, at a local level appropriate to the PSAPs' range of responsibility.

[45] Statement made by Mr. Ken Sluman.

Imagine, if you will, what data collection on a national scale could do. This is the realm of what has come to be called Big Data. California has been gathering comprehensive data on a statewide scale for many years.[46] My point is that in Canada, data is collected, if at all, on a small scale of the individual PSAP, and not on a provincial/territorial or national scale. Some provincial/territorial 9-1-1 authorities engage in limited performance measurement, but the kinds of data that could be collected from automated linked computers has, to my knowledge, scarcely begun to be explored. If no one is measuring, there can be no accountability for results.

190. Yet my point goes well beyond accountability, however worthy that objective is. A comprehensive national or provincial/territorial picture of 9-1-1 calls, suitably analyzed, would present decision-makers with a rich source of information on where trouble occurs, when, and what it takes to resolve it. More importantly, data thus gathered would provide a rich source of correlations, the uses of which cannot now be imagined, but which will be able to guide effective public policy. Emergency preparedness and disaster relief are only the most obvious examples. The integration of data collected by PSAPs on a provincial/territorial or national scale would be a useful beginning. Once again I am struck by the gap between the dispatch mode of 9-1-1, which is governed by driving distances, and the communications/database/policy level, which can work across time zones. There is no justification for the communications/database/policy level to be stuck in the early 20th century.

Figure 6: 9-1-1 dispatch is at driving distances; communications can be across time zones



The governance structure for 9-1-1 in Canada is fragmented and inconsistent

[46] Presentation of Public Safety Networks of Sacramento, California, to the inquiry by its owner, Kurt Warner.

191. In Canada, we deal with 9-1-1 in a fragmented and inconsistent manner. Why is there a fragmented approach? Simply put, because there is no single authority responsible for 9-1-1 on a national basis. 9-1-1 grew up locally, and is naturally a provincial/territorial responsibility. Driving distances are appropriate to its service delivery end, since service is predicated on driving times. By contrast, telecommunications and the databases that support 9-1-1 can be on a provincial/territorial or national scale.

192. As we look to the future, we should, at a minimum, discuss whether a different approach might result in delivery of this service to Canadians in a more efficient and effective manner.

193. The development of IP-based public emergency service networks will require considerable capital and maintenance funding, which may be burdensome for smaller PSAPs or agencies. Further, examination may be required to determine if there could be benefit to shared or consolidated facilities accessible to multiple agencies. A unified vision and approach to the implementation of NG 9-1-1 in Canada is required, and further discussion must occur at all levels to determine whether or what funding, governance models and migration planning are required. Such cross-agency multi-jurisdictional issues are best addressed in the multi-stakeholder forum I propose later in this document.

194. In my opinion, 9-1-1 has become the most vital point of contact between the citizen and the government. Viewed from inside government, jurisdiction over the system is divided. However, from the citizen's point of view, our jurisdictional issues are irrelevant.

195. Provincial, territorial and/or municipal governments are responsible for the service delivery portion (i.e. PSAP operations). The result is a difference in approach, depending on where you live. The extreme – in some locations, 9-1-1 is not available.

196. At the federal level, the telecommunications carriers that provide 9-1-1 dialing to their customers and the networks that deliver emergency calls to PSAPs fall within the Commission's jurisdiction, as do other telecommunications service providers that are required to provide arrangements to support 9-1-1 for their customers. We also have Public Safety Canada, which is responsible for national security and the safety of Canadians. While it is currently working on issues peripherally relevant to 9-1-1, in particular the creation of a situational awareness software system and redeployment of 700 MHz spectrum to create a national public safety broadband network (PSBN), it is not directly involved with other aspects of 9-1-1.

197. If I look within the Commission itself, we have not, to my knowledge, undertaken a detailed review of 9-1-1 until now. In contrast, the United States has been treating 9-1-1 issues with a commendable degree of resolution and energy for the past many years, which is attested to by a series of FCC inquiries, proceedings, legislation, reports to Congress and funding of initiatives out of the Department of Transport. The FCC's Public Safety and Homeland Security Bureau has about 134 people, of whom almost one third work on 9-1-1 issues at various times. David Furth, assistant Bureau Chief, responded to our inquiries as follows:

> "We have a group of about 6 people that work on core 911 and NG911 matters, but we also have other people that work on network resiliency and reliability issues that

are sometimes 911-specific (e.g., the Commission's recently initiated rulemaking on 911 reliability stemming from last year's Derecho Report) and are sometimes more general but still have important 911 implications. 911 issues also tend to receive more attention at the Bureau front office and Commission level than other matters that are more operational in nature."[47]

198. The Commission has, for the most part, dealt with 9-1-1 matters through the CISC ESWG. CISC was created by the Commission in the early stages of local competition in Canada. It was intended as a forum to bring participants of the industry together in working groups in order to develop the administrative and operational systems required to implement the Commission's mandated interconnection and number portability. Today, the ESWG includes representatives from telecommunications service providers and PSAPs, as well as some 9-1-1 industry specialists. The ESWG addresses issues that relate to the technical and operational implementation of 9-1-1 services, as assigned to it by the Commission or as requested by stakeholders.

199. The incumbent telephone companies and other telecommunications providers play a major role at ESWG. The incumbents are the 9-1-1 network providers with which the PSAPs interface. This is not necessarily by the incumbents' design. In general, the PSAPs' desire is to only connect to the incumbent, with other providers tying their networks into the incumbents' in order to provide 9-1-1 to their own customers.

200. The PSAPs and other first responders are in essentially the same position that monopoly subscribers were in before the introduction of competition. The representatives of the telephone companies are highly technically competent and remain in place for long periods of time; the PSAPs and first responder representatives are rotated through 9-1-1 at the pace set by their parent organizations, which can be two or three years. The incumbents hold the technical expertise; there is no basis for arguing basic technical decisions that they may make. If a circuit-switched box is to be replaced by a certain date by an IP-enabled box, then that is done, and the other side must adjust. However, timing and implementation can be argued, and the technical dominance of one side is not a barrier to cooperative and mutually beneficial relationships.

201. On the subject of NG 9-1-1 standards, the ESWG defers to NENA, primarily because most parties do not want a made-in-Canada solution. However, the result is that NG 9-1-1 standards and design architecture have been externalized to a large degree from Canada to a North American technical/business body with Canadian representation.

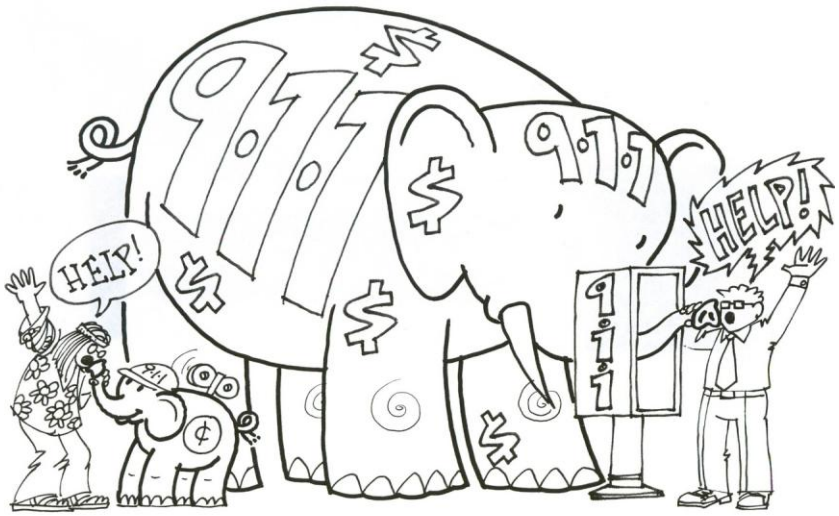
202. A former Chairman of ESWG observed that he was "astounded at the level of cooperation" between first responders and carriers within the Working Group. I hope that any reforms of the 9-1-1 policy process that emerge from this report – which I believe are needed – will leave that spirit of cooperation intact.

The funding of the 9-1-1 system in Canada is uneven and inadequately measured

[47] Email from David Furth to Richard Shockey of 20 May 2013, quoted with permission.

203. It is possible that the primary issue facing the 9-1-1 system across Canada is establishing consistent, equitable funding models that meet not only the demands presented by today's wireless world, but also the issues of tomorrow. However, without adequate existing data on what money is coming into the system and what that money is being spent on, it is impossible to determine with certainty whether and to what degree the current funding model is inadequate.

Figure 7: The 9-1-1 elephant has grown since its inception



Where does the money come from, and where does it go?

204. We have a fairly good understanding of what the incumbents collect to maintain and operate their networks, as well as what they collect and remit in the way of government levies. On a national level, this amounts to something in the area of $213 million annually, of which government levies account for $65 million. Tables 5 and 6 below provide an aggregated breakdown of these amounts.

Table 5: Incumbents – 9-1-1 revenues in 2012 ($M)

Funding	**Revenues (national)** **$M**
Collected from wireline customers	44
Collected from wireless customers	67

Collected through wholesale charges	37
Total	148

Table 6: Incumbents – Government levies in 2012 ($M)

Funding	**Government levies (national) $M**
Collected from wireline customers	45
Collected from wireless customers	20
Total	65

205. However, what we do not have a good handle on is how much it costs to run the PSAP operations. Table 7 provides the information that is currently available.

Table 7: Provincial governments – PSAP operating costs in 2012 ($M)

Saskatchewan	**Quebec**[48]	**New Brunswick**	**Nova Scotia**
9.37	37.1	5.3	4.20

206. Let us assume that the cost of running PSAPs in the other provinces is similar to the cost for those identified above, so that we can understand how much money we could be talking about nationally.

207. Taking the sum of the total operating costs above, divided by the sum of the 2012 populations for the four provinces,[49] the average annual cost per person required to operate PSAPs is approximately $5. Applying this to the sum of 2012 populations for Alberta, British Columbia, Manitoba, Newfoundland and Labrador, Ontario, and Prince

[48] From the Rapport d'activité 2012 published by l'Agence municipale de financement et de développement des centres d'urgence 9-1-1 du Québec (available in French only)
[49] Population by year, by province and territory (Statistics Canada)

Edward Island, it is possible that the total annual cost of operating PSAPs in these provinces would be in the order of $120 million.

208. For all 10 provinces combined, the annual cost of operating PSAPs could be $131 million. Combine this with the $148 million that the incumbents collect to maintain and operate their networks, we are talking about $279 million; *more than a quarter of a billion dollars annually is spent to provide 9-1-1*.

209. Regardless, the PSAPs have clearly indicated that funding is a concern today, and NG 9-1-1 will bring new challenges. Equipment will need to be replaced and/or upgraded, additional personnel could be required, new operational process developed, and training required.

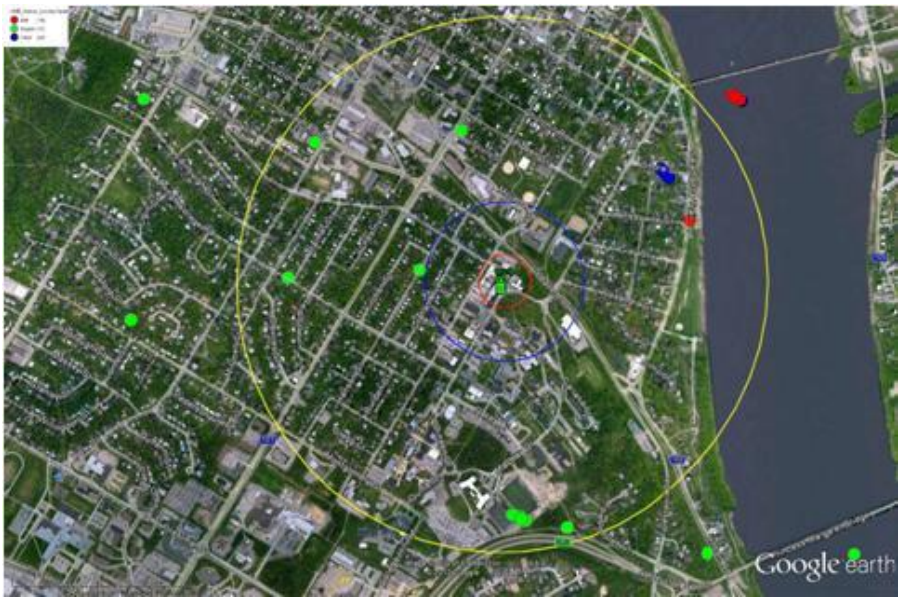
Wireless location accuracy remains a serious unresolved issue

210. Wireless location accuracy, or more to the point, the lack of accuracy or reliability, is a major issue for the PSAPs. Simply put, if they do not know where you are, they do not know where to send help. I note that the ESWG has indicated that ongoing work on this matter is underway, but at this stage, this issue does not appear to be a priority with the ESWG membership in light of other activities they are working on.

211. Location information is not provided for all wireless calls, and even when it is, we can be talking about search areas of 1 square kilometre or more for a significant portion of calls. Approximately 6 out of every 10 calls from cellphones have an accuracy radius given as being greater than 100 metres, which means they are very challenging in terms of locating people in many situations.[50]

212. As part of this process, TruePosition submitted a presentation regarding a testing initiative that they undertook in the Canadian marketplace to better understand the quality of information being received by PSAPs with respect to location accuracy in different Canadian cities. Roughly speaking, the methodology involved placing calls to selected PSAPs from outdoor and indoor locations, and using three different mobile providers in each region to validate data. Below is an illustration of the results from placing test calls from an indoor location in Fredericton. The different-coloured dots indicate the different carriers, and the three circles represent a 100-metre, 300-metre and 1,000-metre radius from the actual call location.

[50] From comments prepared by Mr. Ken Sluman.



213. Additionally, the test results that TruePosition gathered from the three tested PSAPs can be summarized in the following table:

Table 8: Accuracy of caller location

PSAP examined	Caller location info.	Accuracy of location for 33% of calls
Ottawa	Identified 70% of the time	Within 107m
New Brunswick	Identified 95% of the time	Within 856m
Calgary	Identified 100% of the time	Within 230m

214. TruePosition provided views on what it felt would be the ideal set of criteria when setting location accuracy standards. These included: establishing what percentage of call locations would be accurate within certain distances; identifying different standards for calls from indoor and outdoor locations; identifying the relevant geographic area over which performance standards would be measured; and establishing a high-yield (say 90% or 95%) factor.

215. Another vocal proponent for action on this subject in the course of my investigation was Mr. Ken Sluman, who provided extensive views on the challenges and technologies related to location accuracy. As part of his submission, Mr. Sluman provided extensive statistics regarding the operations of one particular PSAP in Canada (unnamed), meant to illustrate the quality of information related to the calls received. From the results shown, complete

location information was only received 41% of the time at a PSAP when a call was received from a wireless device.

216. With respect to the actual data that was received at the PSAP, below is a table reproduced from the submitted comments showing the reported 'radius of uncertainty' for the location information received. These ranges represent a 90% confidence interval that the caller's location will be within that range (i.e. 9 times out of 10, the caller would fall within the stated radius).

Table 9: Range of radius

Range of radius reported in ALI database	Percentage
0 to 99 metres	37.45
100 to 199 metres	5.95
200 to 299 metres	7.00
300 to 399 metres	4.80
400 to 499 metres	8.31
500 to 599 metres	6.97
600 to 699 metres	6.35
700 to 799 metres	5.00
800 to 899 metres	2.75
900 to 999 metres	1.69
1,000 metres or more	13.73

Figure 8: What 200 and 800 metres mean – An aerial overview of Parliament Hill

217. While 37% of calls were reporting a location within a 100-metre radius, results also indicated that nearly 14% of calls were reporting location information with a confidence interval with a radius of 1,000 metres or more.

218. By way of comparison, MTS Allstream, in its comments, submitted that for 70% of calls, the 90% confidence interval for the location is 50 metres or less – roughly the size of a football field – and for 8% of calls, the 90% confidence interval is one kilometre or greater. It further commented that the calls with larger areas originate, for the most part, from older devices which do not have GPS capability, or from devices lacking battery strength to obtain GPS data or which do not support the technology used to estimate the caller's distance from a cell tower. In contrast to this data, the Ontario Provincial Police (OPP) noted in its comments that only 33% of wireless calls are accurate to within 100 metres of the call origination.

219. Several parties, such as the Coalition pour le 9-1-1 au Québec, suggested that the Commission should play a more active role in ensuring that the situation improves with respect to determining caller locations.

220. In my opinion, there are a number of actions that could be taken to improve the situation with wireless location accuracy in Canada. Perhaps there is an opportunity for the Commission to hold hearings, examine the state of technology, see at what price and in what time frame reasonable improvements would be possible, and, where improvements are not likely or possible, what steps could be taken to at least make the public more aware of these challenges.

221. While the above information pertains specifically to caller location accuracy from wireless devices, it should be noted that the problem is even more complex when dealing with nomadic VoIP services, which provide no automatic location information. While the absolute proportion of calls originating from such services has not been determined in this investigation, it is nonetheless a growing phenomenon, which will undoubtedly become more worrisome as all communications converge to an all-IP architecture.

222. Similarly, to the extent that social media is contemplated as a way to contact PSAPs, there would be no call location provided now or into the foreseeable future.

Why is there no integration of information arising from 9-1-1 calling?

223. In the absence of appropriate institutions governing 9-1-1, which would link 9-1-1 with public security and public alerting, the technical possibilities are underdeveloped too.

224. The occurrence of many 9-1-1 calls in a pattern can signal to the government that emergencies are occurring on a scale that should summon forth a larger coordinated response, such as floods, fire or riots. 9-1-1 calling can and should be analyzed for what it tells emergency responders about the scale and scope of the trouble. There is, so far as I know, no large-scale integration of information arising from 9-1-1 calling. PSAPs function in relative isolation from one another, another legacy of their original purpose, which was to link to citizens – downwards and outwards – rather than be part of provincial/territorial or national networks of public safety.

What about ESWG itself?

225. The ESWG is an entirely voluntary organization. It is composed, in general, of first responder organizations (police, fire and ambulance) and the incumbent telephone companies, and other telecommunications provider representatives, occasional vendors of equipment to PSAPs. Occasionally, some technology entrepreneurs have participated.

226. Observation of the ESWG at work revealed the following facts and trends:

a. The absence of any funding sources means that it meets in places donated by the participants, or the Commission.
b. Absence of funding means the ESWG has no independent ability to establish mailing lists and websites. The publication of its minutes and proceedings takes place at a pace determined by the Commission's own Web hosting and updating schedules, which are slow. Its website is buried in the Commission's many pages, so that if you searched the web for Canadian 9-1-1-related sites, the ESWG does not readily appear at the top of the list. The ESWG's minutes and records of decisions are late, in some cases missing, and its notices of meeting are equally hard to find.
c. The carriers are represented by technologically informed people who have had years, some decades, of experience in telecommunications in general and 9-1-1 issues in particular. By contrast, representatives of the first responder side frequently rotate at a faster pace through the ESWG because their employers rotate them through 9-1-1 call centre work at that pace. This may be in part because the ESWG has a low profile and the importance of its work may not be sufficiently appreciated by governments, PSAP providers and other agencies. The result is a complete disparity between the technological capacities of the people involved.
d. In consequence, technological change is driven by what the carriers tell the PSAPs they are able or willing to deliver. If the incumbents say they are discontinuing datapac (an older circuit-switched) service and going to an IP platform, that is what happens. If the carriers determine that they are now only delivering service to the PSAP/incumbent demarcation point, rather than to the screens inside the PSAP, then that is what happens. PSAPs have to adjust to the pace of change, and the nature of change, that the incumbents are able and willing to deliver. This is not necessarily wrong, but it illustrates the broader issue that PSAPs are in the same monopoly customer situation that the rest of Canadian society was before competition was introduced.
e. The ESWG works by subject matters, called TIFs – Task Identification Forms. Each TIF is chaired by a volunteer member of the ESWG. However, if someone wishes to promote a particular technological solution, the promoter could become the chairperson of a TIF. The natural conflict of interest between promotion of a technological solution and chairing a volunteer committee could potentially lead to fractious workings in committee.
f. The length of time required to work an issue through the ESWG means that only the well-funded can play in the standards game.
g. The ESWG works well within its limits. It gathers the relevant players charged with actually carrying out day-to-day 9-1-1 work: the carriers and the first responders. Its response to the text-to-9-1-1 issue has generally been thought to be better than the

United States decision on the same subject.[51] Where consensus has been achieved, the ESWG allows for rapid and cooperative implementation of technical change.

NG 9-1-1 is not the solution to all of our problems

227. Will NG 9-1-1 address the issues that we are currently faced with? The short answer is no.

228. First, the problem we are currently faced with in relation to wireless location accuracy is not an NG 9-1-1 issue. That we do not have one single authority responsible for 9-1-1 is not an NG 9-1-1 issue either.

229. Canadians will expect to be able to call for help using whatever device is in their hand, in whatever manner they choose. PSAPs will want to maintain the single point of interface for all types of communications, and they will want to be able to determine exactly where a call is coming from.

230. NG 9-1-1 will allow Canadians to communicate with PSAPs in ways that will go well beyond simple voice communication. The infrastructure will support the transmission of a vast amount of information, and will also allow the collection of various data related to 9-1-1 calls.

231. There is no doubt in my mind that the final outcome will be based on industry standards, whatever they may be. That being said, though, without some serious discussion, it is not clear that the final solution will be based on the most efficient and effective system architecture. The incumbents are going forward with their own individual business and network modernization plans on the basis that all 9-1-1 functions currently located within them will continue to be located within them in the future as we transition to NG 9-1-1.

232. The computer communications portions of 9-1-1 are not driven to be as local as the fire station and the ambulance. Rather, they could be organized on the same scale and with the same scope as telephone systems, domain name systems and other Internet-based things upon which modern society relies. They could be as extensive as is consistent with effective Canadian control. Modern technologies allow portions of the communications of 9-1-1 to be organized more like the Internet and less like the old telephone system. Some back-office functions, such as databases linking personal addresses to telephone numbers, could be organized provincially/territorially or nationally.

233. 9-1-1 responders will always be relatively close to the points where they are needed, but the PSAPs, and in particular the databases that supply information to PSAPs, if any, do not have to be organized on an exclusively local basis. A system could be logically united but physically distributed. Thus, databases that supply location information to the PSAPs may achieve economies of scale if they are organized according to ideas and systems that govern the Internet's naming and addressing systems, for instance. However, for a number

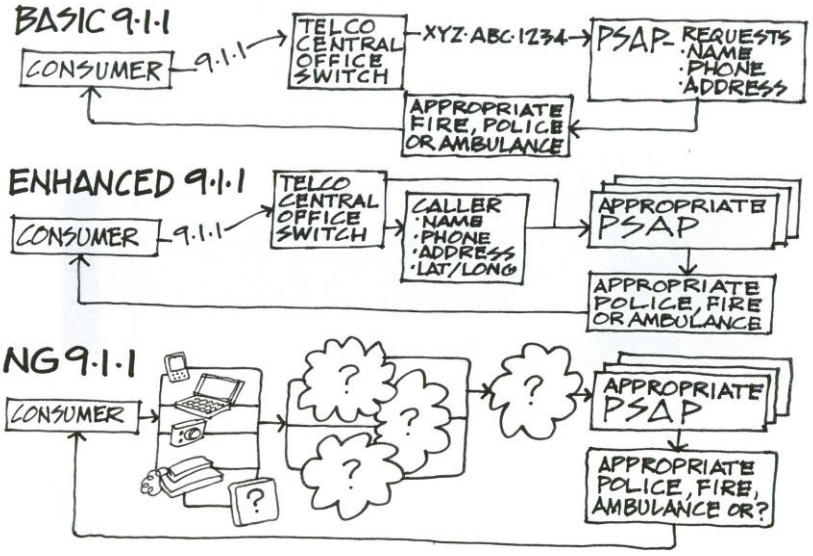
[51] The text messaging to 9-1-1 service in Canada is initiated by the subscriber dialling 9-1-1, the benefit of which is that the 9-1-1 caller's telephone number, wireless Phase II location and other information are provided to the PSAP. The implementation of text messaging to 9-1-1 in the United States varies, with it being either similar to the approach in Canada or initiated by texting directly to the PSAP, the downside of which is that some of the 9-1-1 caller's information and wireless Phase II location are not provided to the PSAP.

of reasons, we cannot yet optimize the back-office functions of 9-1-1 before we have the right institutions in place.

234. As discussed above, the incumbents currently own, operate and control the customer information and call routing databases.

235. One of the important design decisions that will be required as Canada moves to an IP-based 9-1-1 communications system is the placement and operation of databases. Databases of addresses and other useful information could be maintained by organizations other than the incumbents. Moreover, the databases could be maintained on a national scale, in the same way that domain names are, or on a province-wide or territory-wide basis. The money to be made in a new system may well reside in who holds the databases and how much can be charged for a “dip,” the term used for a machine looking into a database for information.

Figure 9: It is not clear what NG 9-1-1 will mean, or who will define it



236. For example, the telephone industry relies on various databases which allow telephone calls to be routed appropriately, when numbers no longer correspond to specific service providers. The Local Number Portability Consortium is a not-for-profit corporation recognized by the Commission and organized by the telephone industry. Similarly, the assignment of telephone numbers is handled by a consortium created by the telephone industry, whose status is recognized by the Commission. In the future, other organizations may be permitted to operate databases in the 9-1-1 space. There is no longer an essential rationality to assigning all 9-1-1 database functions exclusively to incumbent carriers in an Internet-based system. In the case of NG 9-1-1, who shall manage databases is an open question. The design of the databases; who will own the data; who will manage the look-ups, the rights to look-ups and the prices for doing so: these are not technical questions. It

will be important for the Commission, in making fundamental decisions about the shape of a future Internet-based 9-1-1 system, to treat the design of the system as a policy matter. There will be a tendency, absent this realization, to treat the design of the future system as merely a technical matter. A 9-1-1 policy body would gather appropriate stakeholders, which includes a broader set of actors than just the carriers and first responder organizations. Incumbents have an incentive to ensure that policy matters, including the nature and wording of future databases, appear as technical matters best left to their expertise.

237. It is one of the principal concerns of this report that an informed debate occur about the design of the future 9-1-1 system. It is my principal observation that the current machinery of discussion and policy formation is not adequate for this task, and that new institutions are needed to engender a discussion of sufficient depth involving a sufficient range of interested stakeholders.

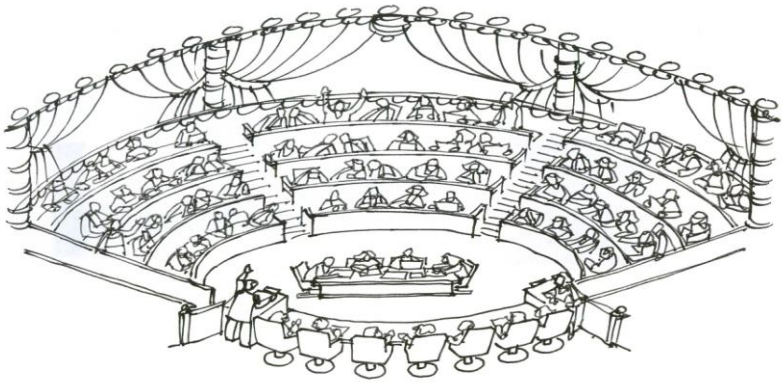
B. Recommendations

238. It was not feasible or appropriate within this inquiry to sort out the entire engineering architecture of NG 9-1-1, deal with technical aspects of location accuracy or address jurisdictional issues. Indeed, as can be seen from my findings, the vast majority of the issues which the Commission and Canada face with respect to NG 9-1-1 are not technical problems, but instead are problems of policy development, monitoring and implementation. What I offer below are five recommendations for the Commission's consideration, with regard to an approach that it could follow to address the issues that have been raised through this inquiry.

Recommendation #1: The CRTC needs to participate in the establishment of a national policy forum for 9-1-1

239. The basic problem with all of 9-1-1 in Canada at this time is institutional, not technical. 9-1-1 in Canada lacks a policy forum that gathers the appropriate people and agencies in a multi-stakeholder institution. Everyone grasps their part of the elephant, and even if they know intellectually that they are only grasping a part, the means of coming to grips with the whole of the beast is made impossible by the various silos in which everyone is forced to operate: the Commission, the provinces and territories, the PSAPs, the carriers, Public Safety Canada, the first responder organizations (police, fire and ambulance). That is just the public sector side. There are also the carriers and the suppliers of other equipment and services to PSAPs to consider. Some kind of multi-stakeholder institution where the relevant discussions can take place needs to be created.

Figure 10: A multi-stakeholder forum



240. The foremost recent example of a multi-stakeholder institution is ICANN, the Internet Corporation for Assigned Names and Numbers (www.icann.org). ICANN was established to deal with a comparable institutional problem. By the late 1990s, the Internet had grown too big for the United States government. The Internet's very success had made what was once a largely university-based data exchange network into a global phenomenon. The Internet has three main attributes: it is not constituted by states, though its policy management has residual relationships to the United States government; its carriers exchange traffic on a voluntary basis; and it has two central points of control or coordination, i.e., domain name policy and assignments, and IP address policy and assignments. The need for some form of debate, and decision-making, in relation to these two centralized points of control has necessitated the creation of an organization to do so.

241. ICANN maintains three mini-parliaments under the general supervision of a board of directors of a not-for-profit company. These parliaments concern themselves with: 1) address policy, 2) top-level domains (.com, .net, .org and their successors) and 3) country codes (.ca, .fr, .jp, etc.). Registrars of domain names, registries, intellectual property owners, businesses and governments each have special interest groups or ways of influencing the Board of Directors of ICANN. The organizational chart is set out at http://www.icann.org/en/groups/chart.

242. While I am not holding up ICANN's every detail as something to be emulated, I maintain that multi-stakeholder organizations for complex issues of governance, such as are found in 9-1-1, are completely normal in the Internet world.

What are the issues we face in 9-1-1?

243. We face:

- Multiple forms of expertise or communities of practice (telecommunications carriers, PSAPs and first responders);
- Many jurisdictions (federal, provincial, territorial, municipal);
- Siloed mandates within and between jurisdictions;

- Lack of accountability for, and inadequate data on, money flowing through the system;
- Lack of a policy forum for discussing fundamental questions, such as who shall run the databases, who measures what, where does the money go, how do we evolve coherent standards, and so forth;
- An oncoming rush of technological change, which, unless addressed intelligently, will be directed as incumbents see fit;
- New training requirements for PSAP operators in a new technological environment;
- A wide gap between what citizens expect the 9-1-1 system to be capable of handling and what it can actually handle;
- A balkanized system of PSAPs, with widely differing capabilities from rural areas to urban centres, and no sense that they could form part of a national or even province-wide/territory-wide system of emergency response;
- In the two largest provinces by population, British Columbia and Ontario, the absence of an agency charged with coordinated oversight of 9-1-1 policy and delivery at the provincial government level;
- For want of national standards, a fragmented market for equipment and services to PSAPs;
- A lack of any system of coordinated, agreed-upon metrics, including a lack of an institution that would decide upon the metrics and another system that would carry out the metrics for that institution; and
- A lack of money flowing directly into the institutions that engage in the governance of 9-1-1 in Canada.

244. The list could be readily extended.

What should a multi-stakeholder organization deal with?

245. The proposed organization is not intended to replace appropriate provincial/territorial or federal authorities. The problems it would be best suited to address concern the development of consensus and advice as to what provincial/territorial and federal authorities should do in relation to the problems set out in this report, those for which the ESWG or its successor are not the most appropriate forums.

- Training standards for PSAP operators.
- Technology standards for systems integration and interconnection.
- Monitoring money flows and the efficiency of various collection and distribution mechanisms.
- Devising performance metrics for carriers, databases, and other networked participants, including levels of service to PSAPs.
- Public education campaigns.
- Considering reports that the CRTC and other authorities might seek its advice on.
- Devising common standards for legal liabilities for carriers, PSAPs and first responders.
- Public alerting and emergency response issues, as may be appropriate.

- Other issues within the fields of 9-1-1, public safety and emergency response as the corporation may decide to advise on.
- Considering NG 9-1-1 issues and proposals, and advising governments on the order in which issues could be addressed.

246. The multi-stakeholder forum is an attempt to overcome the various silos that keep 9-1-1, public alerting, search and rescue, and emergency response separate and uncommunicative. It is not my desire to over-specify a solution at this stage, but to open up the possibilities of rational discussion on the basis of common perceived problems.

Why would a multi-stakeholder institution be appropriate for addressing this long list of issues?

247. There are at least two reasons: jurisdictions and expertise. We have ten provinces, three territories, and one federal government, each with a portion of the jurisdiction necessary to address the issues. Only a multi-stakeholder institution that gathers enough of the interests has the legitimacy to make the necessary systemic decisions. Such decisions cannot be made by coercion; they can only be made and implemented cooperatively. No one jurisdiction has the legal right to go beyond its jurisdiction and make changes in another's arrangements.

248. The second reason is just as fundamental. No one body combines all the expertise required to make the whole 9-1-1 system work. Carriers know their business very well; though of course they have no monopoly on technical knowledge. Suppliers of equipment to PSAPs have legitimate interests in standardization, consistency and being heard. First responders have different areas of expertise, and PSAPs have different areas of expertise yet again. Provinces and territories have responsibilities for money collection and 9-1-1 delivery policy, as well as emergency management. The Commission regulates networks and interconnection, and Public Safety Canada regulates public alerting and disaster response.

249. Then why could not the ESWG, or some successor as envisaged by this report, act as the multi-stakeholder agency? I see two reasons. The first is that technical advice limited to the Commission's telecommunications jurisdiction is but one part of a major cross-jurisdictional set of issues. The second is that the ESWG lacks representation at the right levels, and in many cases from the appropriate parties, that would engage provincial/territorial authorities in 9-1-1 policy. The ESWG is a technical body suitable for technical decisions. In that capacity, it might well turn into an advisory body incorporated into the overall 9-1-1 multi-stakeholder institution. The kinds of decisions that need to be made by the provinces and territories, the municipalities, and the federal government regarding 9-1-1 constitute policy decisions about the evolution of the whole system and cannot be made in an organization of the limited scope of the ESWG.

250. There will be resistance in some quarters to seeing the 9-1-1 system as a whole, let alone as one which is linked to emergency response and other related issues, such as search and rescue. Second, some participants in the current system will feel that new players and

greater attention to 9-1-1 are unwelcome intrusions into currently working arrangements. The thrust of this report has been that current arrangements are inadequate in relation to the importance and scope of 9-1-1, and to the evolution of 9-1-1 in the public interest.

Does a multi-stakeholder institution need to be created by the CRTC?

251. Not necessarily. Summoning into existence a pan-Canadian 9-1-1 policy organization, predicated on multiple stakeholders, will involve more players than the Commission itself.

252. The Commission has a large measure of choice in how it proceeds. In fact, the institution – let us call it "Canada911.ca" – is probably best formed by a collective decision on the part of most of the current stakeholders to proceed along these lines. In this situation, the Commission is a highly important stakeholder among several. The Commission has several important advantages, however. It is the one player with unquestioned authority over the networks that tie citizens to PSAPs, and it has comparable authority over how databases would be linked to a future 9-1-1 system. It can lead, it can encourage, it can cajole, and it can regulate telecommunications carriers and network interconnection. It can define access to 9-1-1 as a part of basic service. It can go further; it can define what 9-1-1 consists of, though it should act on appropriate advice in making this decision. It can act with a measure of independence as a regulatory agency, if it wants to and if the subject matter is within its jurisdiction.

253. Nor is the idea of recognizing and cooperating with an outside corporation an innovation in how the Commission conducts business. The pattern established in the past has been that the telecommunications industry established the corporation and the Commission recognized it, but each party acted in the reasonable expectation that the other would cooperate. The Canadian LNP Consortium, the Canadian Numbering Administration Consortium and the Commissioner for Complaints for Telecommunications Services were established at various times by portions of the telecommunications industry to govern various inter-carrier functions that are best handled cooperatively: interconnection among rival cellular carriers, telephone number assignment and allocation, and complaints against the industry.

254. Each of these arrangements has been blessed over time by the Commission as an effective vehicle for devolving important aspects of techno-policy to relevant players. The Commission has been more than a passive bystander in their creation; it continues to sanction the recommendations of the Canadian Numbering Administration Consortium about area code splits and overlays, for example.

Does the 9-1-1 multi-stakeholder organization (Canada911.ca) need to be a corporation?

255. It would be helpful. A corporation is the normal path for establishing an artificial legal personality capable of representing itself, of being governed by a board of directors, of disbursing money and of being accountable.

What steps should the CRTC take in relation to the proposal for a national 9-1-1 policy body?

256. The premise of the foregoing is that the first responder community, the provinces/territories or some other group will take the lead, but that the Commission can and should signal encouragement of the concept of a multi-stakeholder organization for 9-1-1 policy development. The Commission can signal to the other communities in the 9-1-1 world that it is aware that a number of policy considerations are engaged in 9-1-1. It can also indicate that it is aware that a multi-stakeholder organization is the most appropriate format for joining the relevant players. The exact form of consent that the Commission might give to this idea is an open question. The degree to which the Commission accepts the principal recommendations of this report, and the manner in which it pursues the issues raised here, is for the Commission to decide. There are many ways of saying yes.

257. Nevertheless, I am confident that the Commission has the means at its disposal to advance the way in which policy matters in 9-1-1 will be pursued, if it so chooses.

Recommendation #2: The Commission should focus more on matters related to 9-1-1 through a dedicated staff group

258. Here we address matters fully within the Commission's telecommunications jurisdiction. The Commission does not have a single individual who is dedicated solely to 9-1-1. Compare that to the situation in the United States.

259. As discussed previously, the FCC has a group of about six people dedicated to work on core 9-1-1 and NG 9-1-1 matters. The last PSHSB Chief before the current one was a retired United States Navy admiral, Jamie Barnett. The recently retired FCC Chairman, Julius Genachowski, placed considerable emphasis on 9-1-1 and the development of capacity in the Commission to address 9-1-1-related matters.

260. In my view, the Commission's policy-making on matters relating to the 9-1-1 emergency calling system could be enhanced by a dedicated staff group working on such matters.

261. Such a group could focus on:

- Understanding the policy implications of continuing to have the incumbent telephone companies manage parts of the 9-1-1 system (e.g. databases) versus having those elements of the 9-1-1 system managed elsewhere, in independent organizations, as would be consistent with Internet practices;
- Understanding the total money flows into and out of carriers for 9-1-1 services;
- Cooperating with other federal (in particular Public Safety Canada) and provincial/territorial entities, as appropriate, for the advancement of 9-1-1 capabilities;
- Devising a uniform code of 9-1-1 regulation and best practices so that the body of the Commission's regulation on the subject is found in one place and regularly updated;
- Publishing regular reports on 9-1-1 metrics;
- Devising suitable 9-1-1 metrics and holding parties to account for same;

- Devising and creating a better structure of advice giving; and
- Encouraging broad participation of first responder organizations and provincial/territorial 9-1-1 authorities in our advisory body or bodies.

262. This dedicated Commission staff group could also cooperate with other participants in the 9-1-1 system to enhance Canadian education on 9-1-1. Standardized education would help the general public learn how 9-1-1 works and how to deal with emergency calls. Further, the growing demand for use of mobile devices and social media in an emergency will require public education campaigns to educate the public on the capacities and limitations of the 9-1-1 emergency calling system.

263. In my view, work conducted by a dedicated group of Commission staff on the above-noted items could only serve to enhance the Commission's expertise and policy-making ability on 9-1-1 emergency call system matters that fall under the *Telecommunications Act*.

Recommendation #3: The Commission should assign a high priority to location accuracy work at the ESWG for both wireless and VoIP services

264. The ESWG currently has an active task dealing with wireless 9-1-1 location information in Canada. However, in my view, this task has not been given the priority that it should have received. Additionally, the problem of determining caller location when using VoIP technologies has not been widely examined to date, but no viable alternative to the existing approach has been found.

265. While the ESWG has indicated that there will be a renewed focus on this activity, I suggest that the Commission reinforce the importance of this work, possibly requesting completion by a specific date with periodic status updates.

***Recommendation #4: Reform of the ESWG is required, in the following ways*:**

266. It needs a budget

- For meeting places independent of carriers' facilities;
- For a web address separate from the Commission's, and the maintenance of a publicly visible website;
- To maintain discussion lists on e-mail; and
- For a secretariat to prepare minutes and records of decisions, to make announcements of meetings, to establish and reserve meeting places, and to maintain the appearance and substance of an open, participant-driven, citizen-oriented, advice-generating system for the Commission in 9-1-1 matters.

267. It needs neutral chairpersons of its subcommittees. Proponents of technological changes not emanating from the incumbents are forced, by the nature of who is or is not interested in technological change, to chair ESWG sub-committees, with the consequent conflict between the role of chairperson and the role of advocate for change. I recommend that

Commission staff act as chairpersons of ESWG subcommittees. It would demonstrate the seriousness with which the Commission is taking 9-1-1 matters.

268. The ESWG needs to be taken out of the CISC framework entirely. The 9-1-1 system is of sufficient importance that a steering committee of the ESWG would need to encompass a broader range of interests than carriers and the CRTC. Its steering committee should include first responder associations, PSAPs, provinces and territories, and others concerned with the evolution of 9-1-1. Its board of directors (steering committee) could be, in time, the multi-stakeholder organization proposed above. In any case, it will require little effort for the CRTC to take the ESWG out of its current framework and establish a steering committee for it on a broader basis, directed towards 9-1-1 systemic problems, and less dominated by the technical expertise of incumbent carriers.

Recommendation #5: For certain issues, the CRTC can create particular committees along the lines of the FCC's advisory structure

269. The FCC has had considerable success in using advisory committees based on the following:

- The Chairman of the CRTC would select the chairperson of the advisory committee, with input from staff;
- The advisory committee would be given a tightly defined mandate and time frame in which to work and report;
- The advisory committee would be composed of a broad range of practitioners, suppliers, interest groups and academics;
- Their work would be entirely voluntary; and
- They would report, and then the committee's existence would be terminated.

270. The success of this model has been predicated on the careful selection of a chairperson, his or her success in attracting interesting people, and the openness of the committee's membership, but most of all, on the committee not continuing for years. Membership would be unpaid.

C. Conclusion

271. My perspective changed in the course of this inquiry. I became persuaded that NG 9-1-1 is not a finished state but a series of actions that will replace some older equipment with more capable equipment. But that is akin to saying we will replace electric typewriters and telephones with computer networks receiving data from a blizzard of new devices. Every technical assumption of the old 9-1-1 is giving way. Moreover, the transition to NG 9-1-1 is the microcosm of the transition from the old telephone system, with its hundred years of obligations and rules, to an Internet-driven world.

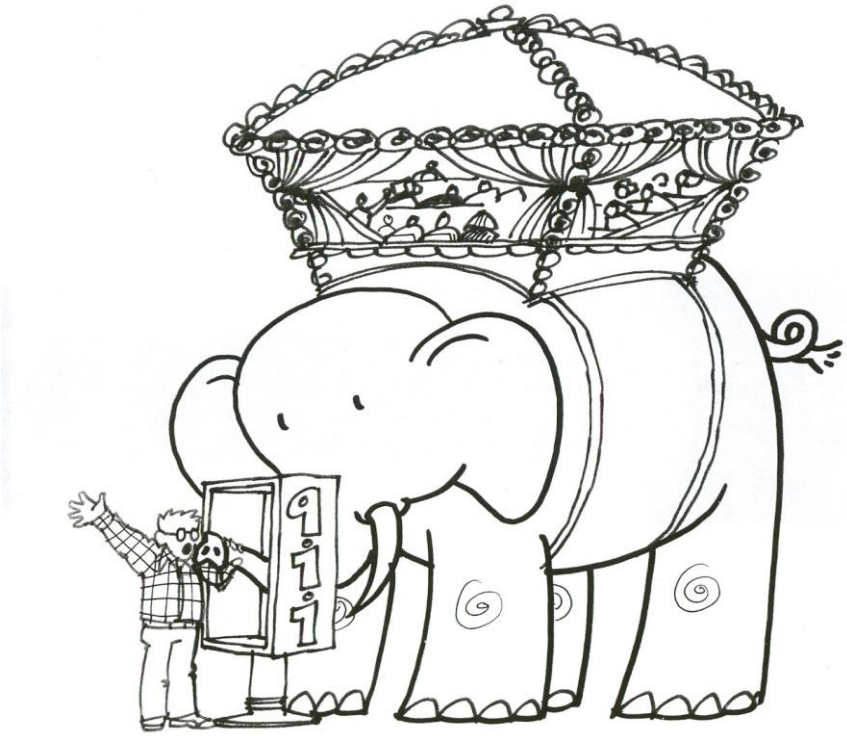
272. While it is my firm conviction that lawyers should not devise technologies, it is also true that engineers need to be able to explain why the particular systems they propose for 9-1-1 are

in the public interest. The transition to a computer-driven 9-1-1 system changes every technical assumption of the old telephone system. This is obviously the time and place for the public to concern itself with what they want out of public safety. The Commission can proceed, by way of a series of public hearings, to define the issues and gather evidence. This is a plausible course of action, but it should not be the exclusive way forward. It has been my experience as a Commissioner that the hearing format, for all its virtues in condensing arguments, may not gather a wide enough set of interests to be effective in this case, nor are Commissioners necessarily qualified to make the decisions that will be required without some outside help. Moreover, the kinds of decisions required may include both general policy decisions, of a kind only Commissioners can make, and a highly detail-oriented set of standards and implementation plans that engineers and technologists should be making. The length of time needed to argue through the various technological issues may require a measure of pre-digestion and prior agreement in a technical discussion forum. By the same token, the ESWG also fails several tests of inclusivity and openness, and is characterized by disparities of specialized technical knowledge among its participants. What is to be done?

273. My attempt at answering these questions is to encourage the creation of a multi-stakeholder organization that can begin to sort through the problems which cannot be addressed as effectively by the Commission or its technical advisory committee structure alone. Institutional innovation is required.[52]

Figure 11: The well-governed 9-1-1 elephant

[52] It is worthy to note that on 13 June 2013, during a presentation at the annual conference of the Paramedic Chiefs of Canada, CITIG announced a new initiative, "Action NG9-1-1," an outcome of its NG 9-1-1 national governance and coordination workshop that was held on 10 and 11 June 2013. Action NG9-1-1 will encompass a wide range of communications and marketing efforts, including a new website, with strategic resources such as a one-pager, briefing notes, sample presentation and FAQs. CITIG stated that it will also leverage social media, regional presentations and related communications efforts.


911

ACKNOWLEDGMENTS

My first obligation is to thank all the people who kindly consented to talk to me and to make helpful submissions. The names and positions of those to whom I managed to speak are given in the interview list. You made the report, and to all of you, I am deeply indebted. I fear that if I singled out everyone who spoke, the acknowledgments would take as long as the report itself.

The cooperation from the Federal Communications Commission and Laurie Flaherty of the United States Department of Transport was a model of U.S.-Canadian relations. I am above all thankful for the people at the Fairfax County PSAP – Roy Oliver, Cynthia Bird Shrout, Brenda Edmundson – for spending a good morning with us to explain the truth of the situation of PSAPs in a time of technological change and shrinking budgets. Brian Fontes and his staff at NENA took lots of time to help. Likewise a tip of the hat to Admiral Barnett, Dale Hatfield, Glenn Richards, George Heinrichs and others for sharing their valuable time with me.

In Canada, the report of Ken Sluman, formerly of Peel Regional Police, to the inquiry was comprehensive and invaluable. It was he who put his finger on the measurement problem. Provincial officials responsible for 9-1-1 and emergency management were as cooperative as could be asked. To the folks at ESWG, and particularly Chris Kellett, chairman, a debt of thanks is owed by me and the Canadian public for their good-natured cooperation in the dull business of making things work, and for letting me observe the committee in action. The cooperation of the major carriers was appreciated, for they make a major part of the system work reliably. In that regard, a tip of the hat to Fadi Dabliz of Bell and David Watt of Rogers for the straight talk.

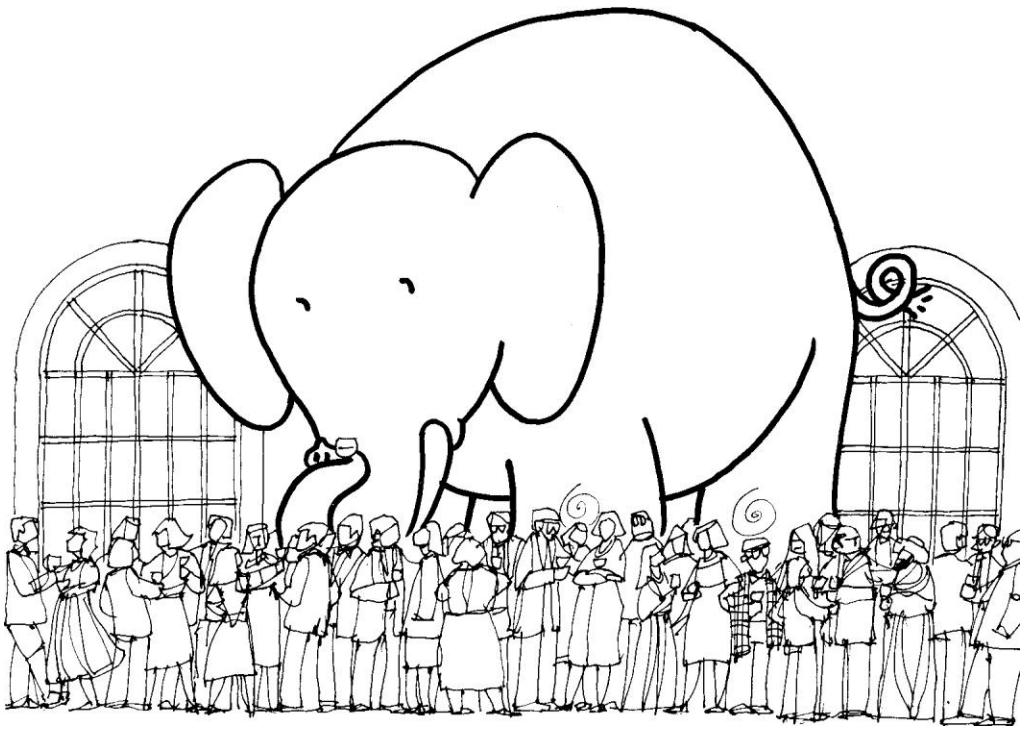
To my colleagues at Public Safety Canada, you have cooperated and been helpful throughout. To the Canadian first responder community, I come away impressed that such good people can be found to do the jobs they do. I am especially indebted to Mike Sullivan of the City of Ottawa and Lance Valcour of CITIG, and the Ottawa and Toronto PSAP people, for enlightening me in many dimensions of the work.

My staff at the CRTC were of great help. Without Bob Martin's great writing abilities, this report would not be the crisp read that it is. To Stephen Delaney, my advisor and guide, thank you for keeping me focused and for guiding me through bureaucratic thickets, and for being great company in our travels. Richard Shockey, our American consultant, opened doors everywhere in Washington. Stephan Meyer did a great job on location accuracy, and Brian Parkin's, Imen Arfaoui's, Kay Saicheua's, and James Ndirangu's briefings helped greatly. To my lawyers Mssrs. James Wilson, Joshua Dougherty and Daniel Finestone, you three kept me out of an unnecessary trouble.

To all of my staff, many thanks for your work, your advice, your interest, and your many kindnesses.

Finally, my thanks go to the Chairman and my fellow Commissioners for assigning me this task. I confer the report to your good hands.

Figure 12: The helpful unseen elephant



APPENDICES

Interviews for the 9-1-1 inquiry conducted by the Inquiry Officer

Organization	City of Ottawa
Date	14 November, 2012
People	Mike Sullivan, Program Director, Emergency and Protective Services
Coordinates	Michael.sullivan@ottawa.ca; 613 580-2424 ex. 15431

Organization	AT&T
Date	26 November 2012
People	Robert Quinn, EVP; Eric Loeb, Joseph Marx, Michael Goggin, Hank Hultquist, Frank Simone
Coordinates	Suite 1000 Washington, DC 20036 202-457-3821

Organization	Canadian Embassy in Washington
Date	27 November 2013
People	Eric Miller, Senior Policy Advisor, Canadian Department of Industry
Coordinates	Since taken a new job

Organization	Federal Communications Commission
Date	27 November 2013
People	Ajit Pai, Commissioner; Mathew Berry, Chief of Staff; Courtney Reinhard, Legal Advisor; David Furth, deputy director, Public Safety Bureau, FCC
Coordinates	445 12th Street NW, Washington DC, ajit.pai@fcc.gov; 202-418-2016

Organization	National Telecommunications Cooperative Association (NTCA – The Rural Broadband People)
Date	27 November 2012
People	Mike Romano, Jill Canfield, Joshua Seideman, Steve Pastorkovich and others
Coordinates	4121 Wilson Blvd, 10th Floor, Arlington, VA 22203,(703) 351-2016 www.ntca.org

Organization	True Position, Inc.
Date	27 November 2012
People	Michael Amarosa, Peter Barnes, in Washington DC
Coordinates	www.trueposition.com 1230 Avenue of the Americas, Suite 810, New York, NY

Organization	United States Department of Transport
Date	29 November, 2013
People	Laurie Flaherty, Coordinator, National 911 Program
Coordinates	202-366-2705, laurie.flaherty@dot.gov United States DOT / NHTSA Office of EMS,1200 New Jersey Avenue SE, NTI-140, Washington DC 20590

Organization	Neustar
Date	29 November2012
People	Tom McGarry, VP, Advanced Services, Richard Fruchterman, Associate4 General Counsel; Scott Harris, SVP and General Counsel; Scott Deutchman, Vice President, Legal and External Affairs
Coordinates	www.neustar.org, 1775 Pennsylvania Avenue, N.W.,4th Floor, Washington DC 20006, +1 (202) 533–2917

Organization	VON (Voice over Net) coalition
Date	28 November 2012
People	Glenn Richards, counsel, executive director
Coordinates	Glenn.richards@pillsburylaw.com, 202-663-8215

Organization	Federal Communications Commission
Date	29 November, 2012
People	Henning Schulzrinne, CTO, Walter Johnston, chief, electromagnetic compatibility division
Coordinates	445 12th Street, South West, Washington DC, 20554 Walter.johnston@fcc.gov, 202-418-0807 Schulzrinne - http://www.cs.columbia.edu/~hgs/ http://en.wikipedia.org/wiki/Henning_Schulzrinne

Organization	Federal Communications Commission
Date	29 November, 2012
People	David Turetsky, Chief, Public Safety and Homeland Security Division, David Furth, Deputy Chief
Coordinates	445 12th Street, South West, Washington DC, 20554 David.turetsky@fcc.gov; david.furth@fcc.gov, 202 418 0632

Organization	Federal Communications Commission
Date	29 November, 2012
People	Julie Veach, Chief, Wireline Competition Bureau, Travis Litman, legal advisor
Coordinates	445 12th Street, South West, Washington DC, 20554

Organization	National Emergency Numbering Association (NENA)
Date	30 November 2012
People	Brian Fontes, CEO, Trey Fogarty, Legal Counsel, Ron Bloom, Roger Hixson, Ty Wooten
Coordinates	202-466-4911 1700 Diagonal Road, Suite 500 Alexandria, Virginia 22314 Rick Galway Tel: 905-637-0072 Cell: 905-515-8306

Organization	Emergency Services Working Group
Date	3 December 2012, 11 February 2013, 19 March 2013
People	Chris Kellett, Chairman
Coordinates	1 780 720 5696, 1 250 869 0100, chris.kellett@eswg9-1-1.ca

Organization	IETF, Microsoft, Internet Architecture Board
Date	January 15, 2013
People	Bernard Aboba
Coordinates	http://aboba.drizzlehosting.com/

Organization	Public Safety Canada
Date	January 18, 2013
People	Serge Beaudoin, Emilie Brown, Jeff Boyczuk, Claudio Lucente, Richard Moreau, Tyler Andrews
Coordinates	269 Laurier Avenue, 17th floor; Beaudoin (later replaced by Pierre Trudel) 613- 991-2944, Emilie.brown@ps.gc.ca, 613 949 3995; jeff.boyczuk@ps.gc.ca, clucente@fiorel.com, 514 442 2357.

Organization	University of Colorado, Faculty of Engineering
Date	24 January 2013
People	Prof. Douglas Sicker, former CTO of the FCC
Coordinates	1 303 735 4949; http://spot.colorado.edu/~sicker/

Organization	NG9-1-1institute.org
Date	29 January 2013
People	Gregory Rohde
Coordinates	http://www.ng911institute.org/, 202 292 4603, 317 Massachusetts Ave., Suite 300, Washington DC 20002

Organization	CITIG Competitive Interoperability Technology Interest Group
Date	29 January 2013, 12 March 2013
People	Lance Valcour
Coordinates	613 371 7808; http://www.citig.ca/

Organization	University of Colorado
Date	30 January 2013
People	Professor Dale Hatfield
Coordinates	303 449 1706; http://lawweb.colorado.edu/profiles/profile.jsp?id=397

Organization	Carnegie Mellon University
Date	February 1, 2013
People	Professor Jon Peha, former CTO at the FCC
Coordinates	202 276 1245; peha@cmu.edu; http://users.ece.cmu.edu/~peha/

Organization	TELUS
Date	February 4, 2013
People	Ted Woodhead, VP Regulatory Affairs
Coordinates	613 597 8368;

Organization	Government of Alberta,
Date	February 5, 2013
People	Craig Mahovsky, Manager, Strategic Initiatives
Coordinates	780-415-4758

Organization	Government of New Brunswick
Date	February 6, 2013
People	Diane Pelletier, Director, Public Safety, NB-9-1-1 Bureau
Coordinates	(506) 453-5307, diane.b.pelletier@gnb.ca

Organization	Government of Nova Scotia, Department of Justice, Emergency Management Office
Date	February 7, 2013
People	Joan Mahoney, 911 Operations Manager
Coordinates	MAHONEJK@gov.ns.ca; 1-902-424-5539

Organization	Bell Canada
Date	11 February 2013
People	Philippe Gauvin
Coordinates	Philippe.gauvin@bell.ca

Organization	Venable LLP, former Bureau Chief, Public Safety and Homeland Security Division
Date	13 February 2013
People	Rear Admiral Jaimie Barnett, United States Navy, ret’d
Coordinates	http://www.venable.com/jamie-barnett/; 202.344.4695

Organization	Fairfax County, Virginia, Department of Public Safety Communications
Date	14 February, 2013
People	Roy Oliver, Cynthia Bird Shrout, Brenda Edmundson
Coordinates	1 571 350 1710

Organization	Public Safety Network, Inc.
Date	14 February 2013
People	Kurt Warner, Don Reich
Coordinates	kurt@publicsafetynetwork.com; 805 642 5267

Organization	Government of Manitoba, Emergency Measures Service,
Date	18 February, 2013
People	Don MacKinnon, Director of Planning
Coordinates	204 945 8855. Don.mackinnon@gov.mb.ca

Organization	Government of Canada, National Search and Rescue Secretariat,
Date	18 February 2013
People	Ron Kroeker, Michael Donald, Jae-Sang park, Major Geoff Lowe
Coordinates	www.nss.gc.ca, 275 Slater St. Ottawa 4th floor, 996-3590

Organization	Prince Edward Island
Date	21 February 2013
People	Pat Kelly, Provincial 9-1-1 Coordinator
Coordinates	(902) 894-0299, pjkelly@gov.pe.ca;http://www.gov.pe.ca/jps/csajp-info/dg.inc.php3

Organization	Barkwell Holland Group
Date	19 February 2013
People	Holly Barwell-Holland, consultant
Coordinates	905 852 1064; hbholland@bhgroup.ca;

Organization	Centre for Security Science
Date	22 February 2013, 1 March 2013
People	Philip Dawe, Portfolio Manager, Emergency Management
Coordinates	613 943 0745; Philip.dawe@drdc-rddc.gc.ca

Organization	Telecommunications Systems, Inc.
Date	25 February 2013
People	Bob Gojanovich, Sales Director Next Generation 9-1-1
Coordinates	bgojanovich@telecomsys.com, 610-438-4061

Organization	Agence Municipale de développement et du financement des systèmes 9-1-1 du Québec
Date	26 February, 2013
People	Serge Allen, executive Director
Coordinates	418 653 3911; http://www.agence911.org/en/theagency

Organization	Industry Canada
Date	25 February 2013
People	Marc Dupuis, Director General, Spectrum Engineering; Louis Lepage, Acting Director, Industry Framework Policy
Coordinates	Lepage.louis@ic.gc.ca; dupuis.marc@ic.gc.ca, 613 990 4820

Organization	Rogers Communications Inc.
Date	27 February 2013
People	Simon-Pierre Olivier, Director, Regulatory Affairs
Coordinates	514 350 6595

Organization	Office of the Privacy Commissioner
Date	28 February 2013
People	Dr. Tara Whalen, IT Research Analyst
Coordinates	Since moved to Google in San Mateo, Ca.

Organization	Canadian Internet Registration Authority
Date	1 March 2013
People	Alan MacGillivray, Policy Analyst
Coordinates	www.cira.ca,

Organization	E-Comm 9-1-1
Date	5 March 2013
People	Mike Webb, VP Technology
Coordinates	604-215-5003; mike.webb@ecomm911.ca

Organization	Public Safety Canada
Date	8 March 2013
People	Pierre Trudel, Emilie Brown, Bernard St. Laurent, Julie Cranton
Coordinates	269 Laurier Avenue, Ottawa; Trudel-613-991-7030

Organization	Ottawa Paramedic Service, City of Ottawa
Date	18 March, 2013
People	Greg Furlong, Strategic Initiatives Project Officer; Jennifer Bionda, Assistant Chief Communications
Coordinates	613-580-2424 x12995, greg.furlong@ottawa.ca; 613-580-2424x22450, Jennifer.bionda@ottawa.ca 2465 Don Reid Drive, Ottawa, Ontario K1H 1E2

Organization	Ottawa Fire Department, Dispatch Office
Date	18 March, 2013
People	Ruth King, Pauline Woolsey
Coordinates	1423 Randall Ave, Ottawa On K1h 7r5,Canada

Organization	Ottawa Police Service
Date	18 March 2013
People	Inspector Paul Gallant,9-1-1 Communications Centre; Eric Janus, Operations Manager, 9-1-1 Communications Centre, Sgt. Roch Lavigne
Coordinates	474 Elgin Street, Ottawa, Ontario 613-316-2258 x 5556 (Gallant)

Organization	Rogers Communications Inc.
Date	19 March 2013
People	David Watt, VP Regulatory Affairs, Telecom; Gerry Thompson, Senior Manager, CLEC Affairs; Simon-Pierre Olivier, Glen Freer, Sr. Manager, Intercarrier Relations
Coordinates	8200 Dixie Road Brampton, Ontario; david.watt@rci.rogers.com

Organization	City of Brandon
Date	19 March 2013
People	Ross Robinson, Director of Emergency Communications
Coordinates	r.robinson@brandon.ca; 204-729-2406

Organization	City of Winnipeg
Date	19 March 2013
People	Cindy Kirby
Coordinates	ckirby@winnipeg.ca, 204-226-2075

Organization	Bell Canada
Date	21 March 2013
People	Bruce Rodin, Vice President, Wireless Technology, Tony Hui, Senior Associate Director, Bell Mobility
Coordinates	5099 Creekbank Road, Mississauga, Ontario; tony.hui@bell.ca; bruce.rodin@bell.ca

Organization	Bell Canada
Date	21 March 2013
People	Fadi Dabliz, 9-1-1 subject matter expert; Guy Caron, 9-1-1 subject matter expert, Philippe Gauvin, Counsel
Coordinates	76 Adelaide Street West, Toronto; Dabliz- 416-709-9057, fadi.dabliz@bell.ca; Caron – 418-691-111, guy.caron@bell.ca

Organization	The Senate of Canada
Date	26 March 2013
People	Senator Vern White, former chief of police, Ottawa
Coordinates	(613) 996-7602, whitev@sen.parl.gc.ca

Organization	Intrado
Date	28 March 2013
People	George Heinrichs, President and CEO; Craig Donaldson, SVP, Regulatory and Government Affairs
Coordinates	georgeh@intrado.com, 720-494-6501; cdonaldson@intrado.com, 720-494-6506

Organization	Bell Canada
Date	2 April 2013
People	Philippe Gauvin
Coordinates	Philippe.gauvin@bell.ca

Organization	Toronto Police
Date	21 March 2013, 3 April 2013
People	Tracy Finn, 9-1-1 Emergency Services Voice Coordinator; Sandy Briell, Coordinator CAD/Integrated Field Services
Coordinates	tracy.finn@torontopolice.on.ca, 416-808-8899; sandy.briell@torontopolice.on.ca 416 808 8827

Organization	VOIP Solutions
Date	16 April 2013
People	Peter Woodford
Coordinates	902-488-7225; http://www.voips911.com/people.php

Organization	European Emergency Number Association
Date	16 and 17 April 2013
People	Garry Machado, Executive Director
Coordinates	gm@eena.org; 32 2 534 9789 Avenue de la Toison d'Or 79, 9th floor, 1060 Brussels, Belgium

Organization	European Emergency Number Association
Date	16 April 2013
People	Cristina Lumbreras, Technical Director
Coordinates	cl@eena.org, 32 02 534 97 89

Organization	European Emergency Numbering Association
Date	19 April 2013
People	Jerome Paris, membership services director
Coordinates	jp@eena.org, 011 32 2 644 0608

Organization	ANCOM, National Authority for Management and Regulation in Communications of Romania
Date	16 April 2013
People	Florin Dragomir, Head of Department, technical regulation
Coordinates	4 0372 845 313, florin.dragomir@ancom.org.ro

Organization	Cassidian Communications
Date	16 April 2013
People	David Warren, Director of Sales
Coordinates	David.warren@cassidiancommunications.com, 790 699 8849

Organization	Nokia Siemens and Internet Architecture Board
Date	18 April 2013
People	Hannes Tschofenig
Coordinates	Hannes.tschofenig@gmx.net, 011 358 50 4871 445

Organization	Mobile Arts (Sweden)
Date	18 April and 29 April
People	Dr. Paul Martlew, VP Channel Sales
Coordinates	011 44 77 99 640 190, paul.martles@mobilearts.com

Organization	Commonwealth of Massachusetts
Date	26 April 2013
People	Geoffrey Why, Commissioner, Department of Telecommunications and Cable
Coordinates	1 617 367 1109, Geoffrey.g.why@state.ma.gov

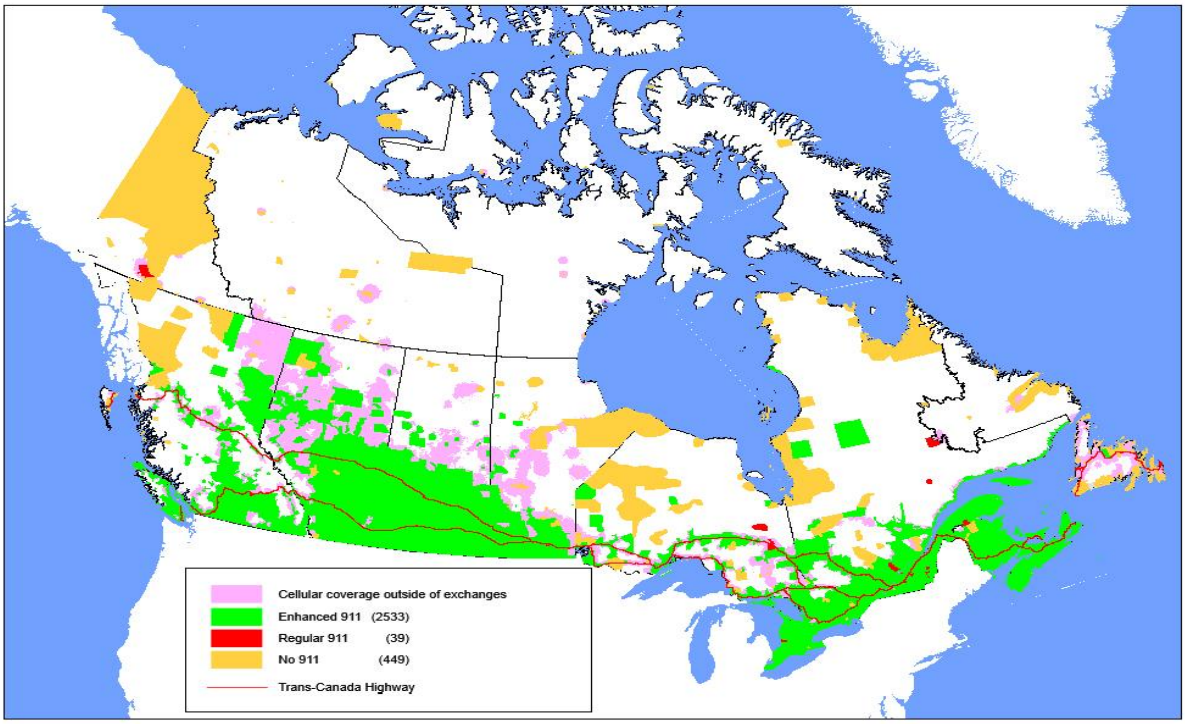
Organization	NENA and ESWG
Date	1 May 2013
People	Rock Galway, past president of NENA, past president of ESWG
Coordinates	Rick.galway@skylinc.net

Organization	Defence Research, Centre for Security Science
Date	7 May 2013
People	Dr. Mark Williamson, Director General; Chris Hough, Acting Deputy DG; Col.Lt. Colin Murray, Jack Pagotto; Andrew Dawe, John Neily
Coordinates	222 Nepean Street, 11th floor; mark.williamson@drdc-rddc.gc.ca, Philip.Dawe@drdc-rddc.gc.ca, 613 943 0745

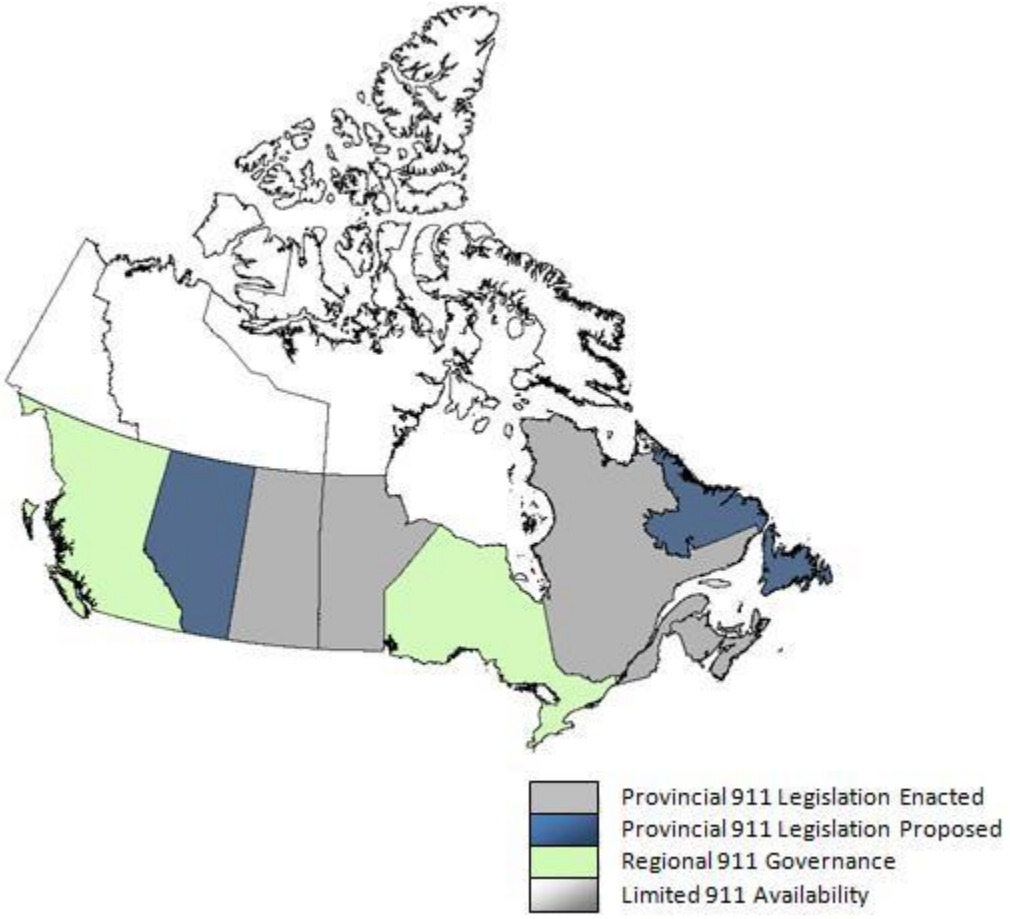
Organization	TELUS
Date	8 May 2013
People	Bob Collins, Sr. Product Manager; Juss Smith; Andy Brauer, director, product management; Eric Edora, director, regulatory affairs; Greg Howard
Coordinates	Eric Edora - 613 597 8313, eric.edora@telus.com; Bob.Collins@telus.com, 604 695 3275

Organization	NENA
Date	15 May 2013
People	Ty Wooten, Director of Education and Operational Issues
Coordinates	twooten@nena.org, 202 618 4408

9-1-1 coverage map



9-1-1 governance in Canada

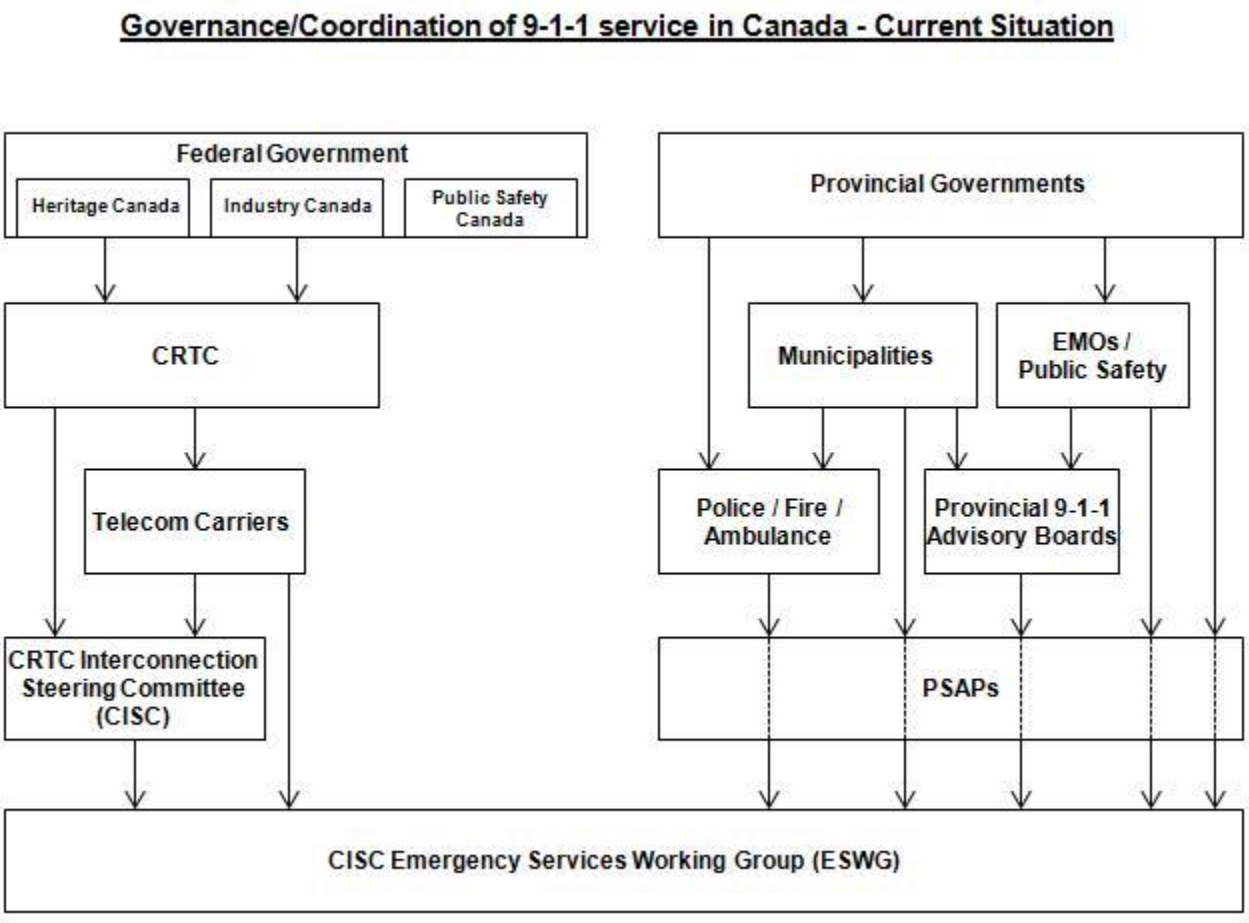


Provinces that have enacted Provincial 9-1-1 legislation

Province	Administration	Department	Legislation	Regulations	Scope	Funding
Saskatchewan	Office of the Fire Commissioner	Ministry of Government Relations	*The Emergency 911 System Act* *Saskatchewan Telecommunications Act*	The Public Safety Answering Point Regulations, 2011 Sask911 Fees Regulations, 2003 Saskatchewan Telecommunications Fees	Identifies PSAPs Limitations of liability	Rates set by Province Sask911 Account established
Manitoba	Manitoba Emergency Measures Organization	Manitoba Emergency Measures Organization	*The Emergency 911 Public Safety Answering Point*	Emergency 911 Public Safety Answering Point	Limitations of liability PSAP standards	Silent

					and procedures	
Quebec	Agence municipale de financement et de développement des centres d'urgence 911 du Québec	Municipal oversight	*Civil Protection Act* *An Act Respecting Municipal Taxation* *An Act Respecting the Exercise of Certain Municipal Powers in Certain Urban Agglomerations*	Regulation Respecting Standards, Specifications and Quality Criteria Applicable to 9-1-1 Emergency Centres and to Certain Secondary Emergency Centres Regulation Governing Municipal Tax for 9-1-1	PSAP standards and procedures Limitations of liability	Rates set by Province
New Brunswick	NB 9-1-1 Bureau	Department of Public Safety	*Emergency 911 Act*	NB 911 Service Fee Regulations	Limitations of liability PSAP standards and procedures	Rates set by Province NB 911 Service Fund established
Nova Scotia	Emergency Management Office	Department of Justice	*Emergency "911" Act*	Emergency 911 Cost Recovery Fee Regulations Rates set by Province	Limitations of liability	Rates set by Province E911 Cost Recovery Fund established Fund administered by E911 Cost Recovery Committee
Prince Edward Island	9-1-1 Administration Office	Department of Justice and Public Safety	*Emergency 911 Act*	General Regulations	Civic addressing PSAP boundaries Limitations of liability	Rates set by Province

Governance/coordination charts



List of acronyms

APCO - the Association of Public-Safety Communications Officials

CISC - the CRTC Interconnection Steering Committee

CSRIC - the Communications Security Reliability and Interoperability Council

ESWG - Emergency Services Working Group

ESInet - emergency services IP network

E9-1-1 - Enhanced 9-1-1

IP - Internet protocol

MASAS - multi-agency situational awareness system

NENA - the National Emergency Number Association

NG 9-1-1 - next-generation 9-1-1

PSAP - public safety answering point

PSBN - public safety broadband network

PSTN - public switched telephone network

SOREM - the Senior Officials Responsible for Emergency Management committee

TSP - telecommunications service provider

VoIP - voice over IP

9-1-1 Team

Timothy Denton, Commissioner, Inquiry Officer

Stephen Delaney, Advisor to the Chairman

Bob Martin, project manager

Imen Arfaoui, engineer

Stephan Meyer, engineer

James Ndirangu, technology analyst

Brian Parkin, analyst, Europe

Kay Saicheua, social policy

Richard Shockey, U.S. analyst

James Wilson, chief counsel

Joshua Dougherty, counsel

Daniel Finestone, counsel