



CRTC INTERCONNECTION STEERING COMMITTEE (CISC)

REPORT to the CRTC

by

Emergency Services (9-1-1) Working Group (ESWG)



Consensus Report ESRE0054a



9-1-1 Test Bed Interconnection Report

March 14, 2011

Version: 2.0

ISSUE HISTORY

Issue	Date	Editors
Final NTWG Version	December 15,10	Robert Sired, Peter Lang, Douglas Kwong
Final ESWG Version – updates as noted in Section 1 of the Report	March 14, 2011	Chris Kellett

Table of Contents

Issue History	2
1.0 Introduction and Purpose of Report	4
2.0 Scope.....	5
2.1 Task Objective	5
2.2 IP Operation	6
3.0 9-1-1 Testing.....	7
3.1 Current Industry Testing Process.....	7
3.2 Requirements Desired by Rogers.....	7
4.0 Demand Requirements.....	10
5.0 Technical Feasibility.....	11
5.1 The potential impact on ILEC networks.....	11
5.2 The potential impact on PSAP's.....	11
5.3 Respective roles of ILEC and Rogers networks	12
6.0 Public Safety	14
7.0 Residual Issues.....	15
7.1 Inter-working	15
7.2 PSAP Simulation	16
7.3 ALI Consideration	16
7.4 Deployment.....	17
8.0 NTWG Conclusion	18
9.0 Recommendation	19
Appendix A: List of Reference and Contributions	20

1.0 INTRODUCTION AND PURPOSE OF REPORT

In September 2009 Rogers filed a Part VII Application with the Commission, requesting that the Commission review the appropriateness of the ILEC's controlling the 9-1-1¹ system in a competitive environment. Amongst the issues raised by Rogers was the establishment of its own test bed to enable it to undertake regular testing of its own network facilities without always having to coordinate testing through the 9-1-1 Service provider (ILEC) and the affected PSAPs.

In a letter dated March 5, 2010, Commission staff requested that the CISC examine the technical feasibility of 9-1-1 test bed interconnection between ILEC's and competitors with the objective of determining the technical feasibility, demand forecast, and benefits of a test bed the same or similar to the capabilities of the ILEC test bed.

The ESWG initiated ESTF0063 (TIF63) to address this issue and due to the technical nature of the issues raised referred TIF63 to the NTWG.

This report presents the findings of the NTWG in relation to technical matters only.

The NTWG final version of this report was reviewed by ESWG members in the January to early March 2011 time period. The results of the ESWG review are detailed in two additional contributions from Bell (ESCO0377) and Rogers (ESCO0378). The Bell contribution proposed an alternative solution to a dedicated 9-1-1 test bed. This Report was updated by putting the previous NTWG Recommendation into a new Conclusion section, and adding the alternative solution proposal as the new consensus recommendation from ESWG.

2.0 SCOPE

2.1 Task Objective

From the outset, the NTWG realized that the objectives of the TIF could not be pursued as strictly as specified, since the ILEC's have not created dedicated end-to-end 9-1-1 test beds. ILEC 9-1-1 testing is carried out infrequently, and only as absolutely necessary using the live network, including the participation of PSAP's - coordinated in advanced and in accordance with the guidelines that govern their involvement in such test activities. Therefore, absent the existence of any dedicated end-to-end ILEC 9-1-1 test bed for use as a model, it was not possible to:

“...examine the technical feasibility of 9-1-1 test bed interconnection between ILEC's and competitors with the same or similar to the capabilities of the ILEC test bed.”

In the circumstances, it became obvious that the NTWG would need to obtain input from the non-ILEC carriers on their specific requirements for 9-1-1 testing capabilities. Through meeting discussions and answers to questions posed by the ILEC's, and subsequent contributions and clarifications, only Rogers revealed its specific needs.

Initially Rogers' requirements were defined in the context of its operations in Ontario, (i.e. in relation to that particular deployment of the Bell Canada PERS 9-1-1 system) with the expectation that adaptations could be readily identified for appropriate application to the other ILEC 9-1-1 systems, while recognising that such adaptations are most likely to differ between cases/scenarios. However, upon further discussions, it was realised that the adaptation of the Bell Canada scenario to other ILECs' territories is not likely trivial and discussions on other technical matters (e.g. wireless versus wireline requirements) could hinder the timely issuance of

the report. As a result, Rogers re-defined its requirements into near-term needs and longer-term needs.

Rogers' immediate requirement is to deploy in Bell Ontario territory starting with the Toronto 9-1-1 tandems for wireline purposes only. Interconnections with other Bell Canada's tandems, other Emergency Service Providers' networks, and wireless 9-1-1 test bed requirements will be addressed subsequently on a case by case basis.

At the time of this report writing, no other carrier has formally put forth any requirements. This report focuses only on Rogers' near term needs.

2.2 IP Operation

The Rogers concept for a 9-1-1 test bed is purely in the context of legacy (TDM) technology. Without input from other LEC's (e.g. VoIP Service Providers), and in view of the short time frame for delivery of the report, no consideration was given by the NTWG to the possible involvement of IP technology in a 9-1-1 test bed environment.

3.0 9-1-1 TESTING

3.1 Current Industry Testing Process

As mentioned earlier, the ILEC's have not deployed dedicated end-to-end 9-1-1 test beds. However, formal methods and procedures have been developed to permit thorough testing of 9-1-1 features and capabilities, suited to the specific ILEC environment, i.e. the existence of either Basic or Enhanced 9-1-1 systems, and the stage(s) of wireless evolution.

Such test processes are described in various documents, including the Inter-Carrier Test Plan for the implementation of wireless number portability: *Wireless Number Portability Implementation: Inter-carrier Testing – Test Plan: Jan.16th 2007, Section 4.4*. Pertinent information is also available from the Carrier Services Groups of the ILEC's.

3.2 Requirements Desired by Rogers

Rogers' functional requirements have been documented in ESCO0344, ESCO0355 and ESCO370.

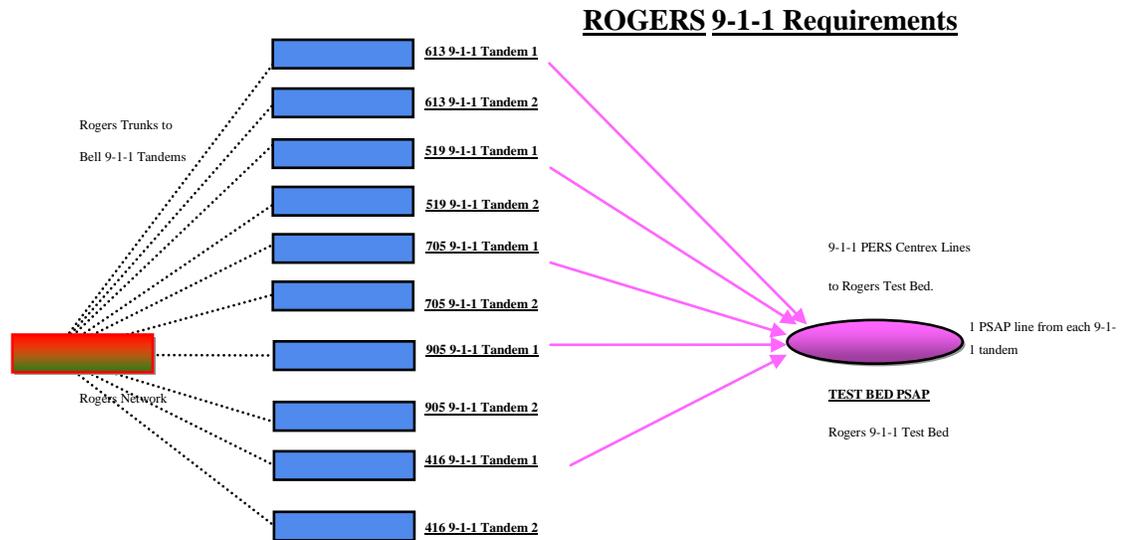
The principal motivation for the Rogers requirement is to achieve flexibility in conducting tests as warranted by Rogers, and without the involvement of other parties (i.e. ILEC or PSAP) on a 24/7 basis. Towards that end, the following key capabilities are envisioned:

- (a) The Test bed will emulate a PSAP, using Centrex (voice) lines, which are employed for PSAP purpose, for connection to all ILEC 9-1-1 Tandems;
- (b) Primary testing objectives will include verification of Rogers switch E9-1-1 translations, transport continuity, PSAP line features and voice quality;
- (c) Test cases will encompass only wireline call origination;

-
- (d) Test calls will originate from wireline devices which are assigned special test numbers, and be directed from end offices on the Rogers network to the targeted ILEC 9-1-1 Tandems via existing in-service 9-1-1 trunk facilities, for subsequent delivery to the Test bed PSAP ;
 - (e) The Test bed PSAP will be centrally located (on the basis of the proposed Rogers Test bed architecture), and the PSAP lines (Centrex voice lines) will be arranged and configured by Rogers to radiate from the centralized location to the ILEC's 9-1-1 systems; and
 - (f) Except for the initial establishment of connectivity between the Rogers and ILEC networks (e.g. implementation and testing), and the possible attention to subsequent requests for configuration changes and trouble shooting, ILEC personnel are not deemed likely to be involved in the operation of the Rogers 9-1-1 Test bed.

The following depicts the Rogers' test bed interconnection architecture using Ontario as example:

Figure 1: Test Bed Interconnection Architecture (Ontario Example)



NOTES:

- Rogers Switches terminate to one of Bell’s ten 9-1-1 Tandems. Tandem numbers are for references purposes only.
- The new routes required are the lines in pink from the 9-1-1 tandems to the test bed PSAP.
- There will be a test number for every Rogers originating end office connecting to a Bell 9-1-1 tandem.

With respect to the trunk groups between end offices and the ILEC’s 9-1-1 tandems, it was envisioned that existing 9-1-1 trunk groups, augmented to accommodate additional test traffic if required, would be used for test bed purposes.

4.0 DEMAND REQUIREMENTS

Since the introduction of the task, the CLEC/WSP communities were canvassed to determine their interest in establishing a test bed of their own. Besides the Rogers' requirement, only Videotron has described a need for 9-1-1 testing capabilities; its proposal was presented in a high-level contribution which was delivered to the NTWG just prior to the final review of the report. Consequently, given the time constraint for delivery of the report, the NTWG was not able to examine that requirement for the inclusion of pertinent comments here.

Rogers maintains that, based on the initial requirements, ILEC's personnel are generally not expected to be involved in the testing process other than the initial set up of the test bed and infrequent reconfigurations that may arise. This kind of involvement (e.g. translation work) would follow the standard ordering processes.

5.0 TECHNICAL FEASIBILITY

The concept, as advanced by Rogers is, feasible from a purely technical perspective. It remains to be determined, however, whether the anticipated impacts of implementation are justifiable vis-à-vis the overall benefits. A number of issues will undoubtedly need to be addressed and resolved, probably through business arrangements between Rogers and the ILEC's, including possible deployment of long Centrex loops, and measures for mitigating potential cross impacts of the test environment on the 'live' 9-1-1 network.

5.1 The potential impact on ILEC networks

Test environments are typically established as stand-alone environments, with significant separation from the 'live' network. The nature of their use can give rise to malfunctioning, albeit controlled; nevertheless, undesirable from the perspective of normal operation. Hence the need for adoption of separation practices.

The Rogers proposal seeks to employ the ILEC's principal (and sole) 9-1-1 switching and routing engine as the central feature between a Rogers access arrangement for originating 9-1-1 test calls and a Rogers PSAP Test bed for terminating these test calls. It is reasonable, therefore, to expect the ILEC's to consider the adoption of measures to mitigate potential disturbances to their 'live' networks. This will entail technical discussions and negotiations.

5.2 The potential impact on PSAP's

Crucial to the proper handling of emergency calls by the ILEC 9-1-1 infrastructure is the availability of ANI information representing the origin of the call. The ANI data is used for

routing the call selectively, to the pre-assigned PSAP for the particular area, and for identifying the location of the caller – all aimed at expeditious dispatch of vital emergency assistance.

Proper ANI information is sometimes not available (e.g. no ANI or invalid ANI). However, in such cases, a Default Routing practice is employed by the ILEC's Tandem 9-1-1 switch to deliver the call to a target PSAP – not necessarily the pre-assigned one.

If a Rogers 9-1-1 test call arrives at the ILEC's 9-1-1 Tandem switch without proper ANI information it is likely that Default Routing could result in that test call being delivered to a live PSAP – unless ILECs and Rogers are able to take steps to mitigate such eventuality. This will require technical discussions and negotiations between the parties.

5.3 Respective roles of ILEC and Rogers networks

The stated objective of the Rogers Test bed is to test the functions of the Rogers network for 9-1-1 calls. However, according to the proposal, only the originating phase of a 9-1-1 call would traverse the Rogers network. A 9-1-1 call from a fixed device (which is assigned a special test number) would be directed from a Rogers end office to the targeted ILEC 9-1-1 Tandem switch. Thenceforth, the switching of the call, its subsequent delivery to the assigned Primary PSAP (simulated) would all be handled by the pertinent ILEC network, in particular, the 9-1-1 Tandems.

In describing the proposal for a 9-1-1 Test bed, the Rogers Requirement document states that -

“This initiative would enable Rogers and other CLECs to establish their own test bed to enable them to undertake regular testing of their own 9-1-1 network facilities without always having to coordinate testing through the 9-1-1 Service provider (ILEC) and the PSAPs serving the affected area.”

Further, in its declaration of the purpose of the 9-1-1 testing, the Rogers Requirement document states that –

“Test calls would be placed over existing production trunks between the CLEC network and the ILEC 9-1-1 tandem switches to:

-
- a. *Verify production Trunking between the CLEC network (Rogers switches) and the ILEC 9-1-1 tandems.*
 - b. *Test voice quality to all primary and secondary PSAP routes for all DSO's.*
 - c. *Test and verify that all PSAP line features are working to specifications for one DSO."*

It is arguable that since items (b) and (c) above fall within the domain and responsibility of the ILEC's network, the only real purpose that can be satisfied by the proposed 9-1-1 Test bed, in the context of verification of proper functioning of the Rogers 9-1-1 network facilities, is item (a) above. In other words, assuming proper, normal operation of the ILEC's network, if the Rogers network facilities are generally engineered for satisfactory handling of all voice traffic, the only obstacle to 9-1-1 traffic would be malfunctioning of the 9-1-1 trunks between the Rogers end office and the respective ILEC 9-1-1 tandem switches. However, it is noted that any malfunctioning of the production 9-1-1 trunks would normally have been recognized by normal inter-carrier operation or trouble reporting processes which will result in maintenance actions.

Rogers acknowledges that a component of items b) and c) above fall within the ILEC network, however voice quality and features could be impacted by any changes within Rogers network. Consequently, beyond the need for verification of production trunks as expressed in (a) above, testing also needs to be conducted for ensuring that no adverse effects from changes on the Rogers network (e.g. software updates, new network components, etc.) are likely to impede proper functioning of 9-1-1 calls, in general.

6.0 PUBLIC SAFETY

Absent any appreciation of the types and frequencies of problems currently experienced by Rogers on its 9-1-1 network facilities, it is not possible for the NTWG to identify and gauge the potential benefits that could accrue from the availability of such test capabilities in the context of public safety.

7.0 RESIDUAL ISSUES

This report focuses primarily on technical issues. Matters related to policy, tariff modifications, contractual obligations, economics, and PSAP implications from Default Routing due to ANI failure in 9-1-1 test calls are considered outside the mandate of the NTWG, and, therefore, outside of the scope of this report.

However, the following issues are identified for consideration elsewhere, possibly in discussions between Rogers and the respective ILEC(s).

7.1 Inter-working

As pointed out earlier, the Rogers Test bed essentially aims to utilize the combined *live* networks of Rogers and ILECs and Rogers test facilities. Therefore, it is reasonable to expect that the ILEC may wish to adopt internal measures which it deems necessary to safeguard its *live* network from adverse effects due to possible, yet inadvertent, malfunctioning by the Rogers test facilities. The measures could be based on information gleaned from detailed discussions of such matters as, but not limited to:

- nature and frequency of testing,
- estimated test traffic load,
- test pass-fail criteria,
- respective roles for possible diagnosis of test failures,
- process for attending to failures and applying corrections.

Technical discussions will be required between the two parties as part of bilateral negotiations towards a business arrangement.

7.2 PSAP Simulation

Unless the test bed is set up and configured exactly as the PSAP in question (e.g. various Centrex options such as ACD and IBN lines, different vintages and makes of PBXs, various ISDN accesses, etc.), any testing results may not be completely applicable to the production PSAP or the solution to the trouble shooting exercise may not resolve the problem in question.

The Rogers' Requirement Document should also indicate the attributes of its Test PSAP in technical terms (e.g. type of terminating equipment, number of stations, etc.) for discussions with the ILEC.

7.3 ALI Consideration

Although the Rogers concept does not directly involve the ILEC's ALI computer system, there could be some impacts.

For normal 9-1-1 operation, data links are employed to connect the ALI computer system to the 9-1-1 Tandems, and also to the PSAP. This is in support of a set of procedures which ensure that pertinent location information for the origin of a particular 9-1-1 call is requested by the 9-1-1 Tandem switch, and delivered appropriately by the ALI computer system to the console of the attendant within the PSAP who received the corresponding 9-1-1 voice call, following identification of that recipient's position/console by the PSAP to the ALI computer. In essence, a 9-1-1 voice call typically gives rise to a three-part data communications session amongst the 9-1-1 Tandem, the PSAP and the ALI computer system.

For its 9-1-1 Test configuration, Rogers has declared that no physical interconnection will be established between its PSAP Test bed and the ILEC's ALI computer system. Consequently, in

response to a Rogers 9-1-1 test call, the ALI computer system could be in a situation where it has retrieved location information and is unable to deliver it. This may necessitate the adoption of some form(s) of mitigation.

7.4 Deployment

The possible need for use of abnormally-long Centrex loops was recognized. However, that was not considered an impediment to deployment of the Rogers 9-1-1 Test bed, merely a possible restriction on the extent of the deployment. The long Centrex loops could have implications on voice quality. As a result, proper transmission equipment may need to be configured and deployed (e.g. loop extension technology, echo control devices, etc.). That, too, will need to be examined in greater detail during technical discussions between the two parties.

8.0 NTWG CONCLUSION

In consideration of the objectives of TIF 63, the task of the NTWG is considered completed. The facts are that dedicated end-to-end 9-1-1 Test beds do not exist, and 9-1-1 testing is conducted *'live'* in accordance with accepted methods and procedures that have been duly documented. Therefore, there is no baseline which can be used by the NTWG for recommending a 9-1-1 Test bed that would afford competitors similar capabilities to those of the ILEC's.

The need expressed by Rogers for deploying a 9-1-1 Test bed to test certain 9-1-1 service functionality, is unique in the sense that only one other CLEC has, to date, expressed a similar requirement. Moreover, no ILEC has developed such a test bed. The normal practice for conducting 9-1-1 tests is to orchestrate the activity for execution on the *'live'* network in concert with all parties involved, and especially in accordance with established PSAP schedules.

Nevertheless, the NTWG considers the high-level proposal identified by Rogers to be technically feasible but it may present some challenges for the introduction and use of mitigation schemes. The extent of the mitigation remains to be determined. However, it is the view of the NTWG that significant discussions (technical, operational and business) will need to be held for arriving at suitable arrangements between Rogers on the one hand, and individual ILEC's on the other hand.

What has been the topic of much deliberation is a special requirement pursued by two competitors for inter-working with one ILEC, and to facilitate testing for only wireline-originated 9-1-1 calls. Therefore, NTWG recommends that bilateral discussions should take place between the parties in an attempt to arrive at a business arrangement.

9.0 RECOMMENDATION

Having reviewed the findings and conclusion detailed in Sections 1 to 8 of this Report, it is the consensus recommendation of the ESWG that the Alternative Approach proposed by Bell in ESCO0377 (summarized below) be approved by the Commission:

In order to overcome the issues of timelines, continuity and feasibility Bell proposes the following alternative to test bed development as a short-medium term solution. In order to address a long term viable solution, Bell recommends that 9-1-1 testing be included as a requirement during the TIF 69 NG9-1-1 considerations and report.

The alternative proposal suggests making use of the provincial 9-1-1 test labs to enable LEC testing:

- Provincial 9-1-1 labs in ON/QC can be configured to act as a PPSAP/SPSAP whereby all 9-1-1 features can be tested (Bell will function as the PSAP)
- Pre configuration can be completed as per previous discussions (manual modification of ESRD on LEC test line or manual update by LEC). This is required in order to direct the 9-1-1 tandems to route the LEC test line to the 9-1-1 lab when 9-1-1 is dialled by the LEC tester.

APPENDIX A: LIST OF REFERENCE AND CONTRIBUTIONS

1. ESTF0063 E9-1-1 Test Bed Interconnection for CLECs and WSPs
2. Contributions:

ESCO0343	Questions to the CLECs re Test Bed Interconnect Requirements - Bell Aliant, Bell Canada, SaskTel
ESCO0344	E-9-1-1 Test Bed Interconnection Requirements - Rogers
ESCO0354	Trunking into 9-1-1 Tandems and Default Routing - TELUS
ESCO0355	E-9-1-1 Test Bed Interconnection Supplement - Rogers
ESCO0357	Test Bed interconnection - Bell, SaskTel
ESCO0358	E-9-1-1 Test Bed Interconnection Requirements - Rogers
ESCO0360	Test Bed interconnection - MTS Allstream
ESCO0363	Technical Requirements and Approach to be followed - Bell
ESCO0369	Call Flow - Rogers
ESCO0370	Functional Requirements for 9-1-1 Test Bed - Rogers
ESCO0372	E9-1-1 Test Bed Interconnection for CLECs and WSPs - Videotron
ESCO0377	ESWG Considerations and Analysis - Bell
ESCO0378	Clarification of Analysis by Bell in ESCO0377 - Rogers