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**Emergent Locations:
Implementing wireless 9-1-1
in Texas, Virginia, and Ontario**

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Introduction

In both the United States and Canada, regulatory efforts are underway to incorporate wireless systems into the existing emergency response framework. From a technological perspective this requires that wireless providers find a way to communicate to public safety personnel the geographic location of a cell phone with some degree of accuracy. Wireless companies, equipment manufacturers, emergency response providers, individual citizens and civil liberties groups have all contributed to the policy discussions about how this can best be implemented. In both countries, implementation of what is termed “wireless enhanced 9-1-1” is very much in progress.¹

The particular method of implementation has specific privacy implications, including whether or not the disclosure of locational information is limited to 9-1-1 calls, whether anonymous 9-1-1 calls are possible, and whether locational data, once disclosed to 9-1-1, are subject to secondary use. A host of inter-related concerns inform implementation decisions, and so structure the privacy environment. For example, differences in the source of funding for 9-1-1 infrastructure changes may affect the degree to which wireless service providers depend on secondary uses of locational information. Infrastructure decisions, such as how a caller’s location is determined, where databases are stored, what entities maintain them, and who has access to them, are influenced by many factors, including regional geography, population density, and technical compatibility with legacy wireless protocols and legacy 9-1-1 systems. The specific regional competitive environment may promote conflicts or alliances among wireless carriers, incumbent local exchange carriers (ILECs), and Public Safety Answering Points (PSAPs).

The US and Canada have, so far, taken divergent regulatory approaches to the enhanced 9-1-1 problem. A mandate by the Federal Communications Commissioner (FCC) is contrasted with a less interventionist approach by the Canadian Radio-Television and Communications Commission (CRTC).² In the US, the FCC took the lead in putting the

¹ This paper is part of a larger project, funded by the National Science Foundation in the USA (*Grant Nos. SES-0083271, SES-0083348*), which attempts to gain an analytical understanding of the implementation of personal identification in geographically coded information systems, and an appreciation of the effect that identification practices have on individual privacy, sociability, trust, and risk. This will involve, in part, locating and clarifying contradictions and ambiguities in common notions of identification and privacy, conceptually systematizing practices of identification, and theorizing the effects of these practices on social equity amongst individuals and on the individual’s relation to political and economic communities. The research project analyses particular types of geographic information systems, and performs a series of comparative case studies - in the USA, Canada and Europe - of the processes by which identification practice is incorporated within those systems.

² Colin Bennett and Priscilla M. Regan, “What Happens When You Make a 911 Call? Privacy and the Regulation of Cellular Technology in the United States and Canada,” Presented at the 2002 Canadian Political Science Association, University of Toronto, May 30, 2002

issue of wireless E9-1-1 on the agenda, initiated policy alternatives, and provided an incentive and a forum for industry and public safety representatives to cooperate. In Canada, federal governmental agencies have so far stepped back to allow the affected parties to cooperate, under the auspices of the Canadian Wireless Telecommunications Association (CWTA), to perform trials and hopefully to develop a workable solution without regulatory intervention. The question for this paper is whether these policy differences make any difference to the actual implementation of cellular 9-1-1 systems ‘on the ground’, especially as they related to the implications for personal privacy. In this paper, we analyze the implementation of E9-1-1 in three regions – rural Texas, Virginia and Ontario -- and outline the roles played by the various public and private sector actors. These cases permit comparison across several axes. Privacy laws, “sunshine” laws, and telecommunication policy mechanisms vary from state to state and between Canada and the U.S. The corporate interests and industry structures of the ILECs and wireless carriers can be compared, as well as corporate linkages among those entities and PSAPs. Data for this analysis includes interviews with representatives from PSAPs, ILECs, and wireless carriers, as well as trade and popular press reports and public records.

Because implementation of wireless E9-1-1 is still in its early stages and because implementation has spawned new players and new relationships among players, we are examining privacy issues at a somewhat awkward but nevertheless important time. Although privacy is not always explicitly on the agenda we will see that the implementation processes and frameworks may affect privacy in some important and enduring ways.

Common Contexts

Several factors are common across all three cases. First, they share a legacy technical configuration of emergency call processing. Also, implementation both in the U.S. and Canada are influenced, to a greater or lesser degree, by the FCC’s E9-1-1 mandates. These contexts are discussed below before the examination of individual cases.

The Technical Configuration of the E9-1-1 System

Since the 1980’s, a relatively stable configuration has been in place for determining the location of the source of an emergency call, and routing that call to the appropriate response center. However, this configuration was designed only for wired line telephones. At the heart of this system are Automatic Number Identification (ANI) and Automatic Location Identification (ALI). It is therefore sometimes known as the ANI/ALI system.

ANI has been a feature of wired phone systems since the 1980’s. In addition to the voice signal, phone calls carry a data signal which usually includes the number of the phone originating the call. This data signal makes features such as caller-ID possible. ALI is essentially a database which links phone numbers to physical addresses. Unlike ANI, it is used only in the E9-1-1 system. Historically, it has been populated from the LEC’s service records.

A simplified version of the routing of a typical 9-1-1 call from a wired line goes something like this:

A customer dials “911” from a wired line. The Local Exchange Carrier (LEC) recognizes the call as an emergency call and forwards it to a tandem switch. The switch splits the call into a voice portion and a data portion. The call’s ANI is analyzed to determine the Public Service Answering Point (PSAP) serving the region associated with that phone number, and the voice portion of the call is forwarded, via a special purpose selective router, to that PSAP. The ANI is also sent, along a separate path, to the PSAP. The ANI is displayed when the PSAP operator answers the call. Simultaneously, the PSAP sends the ANI along a dedicated circuit to the ALI database, which returns to the PSAP the address associated with the caller’s phone number. The PSAP operator is then in possession of a voice connection with the emergency caller, the caller’s location, and a call back number in case the voice connection fails. The operator then determines the appropriate response to the call, and dispatches emergency services as necessary.

This degree of functionality, known as “Phase 0 E9-1-1,” was developed when wired phone systems operated by near-monopoly LECs were overwhelmingly the norm. The emergence of wireless telephony and telecommunications competition have necessitated several changes to this technical paradigm. With the advent of telecommunications competition, issues of inter-industry competitive strategy intervene in and complicate efforts to establish efficient, equitable and cooperative methods of access to and control of the tandem switches, selective routers, and databases that comprise the 9-1-1 system. Mobile telephony radically complicates the maintenance of the ALI database. Since phone numbers can no longer be statically linked with their location, the ALI database must be reconfigured to permit dynamic updates. Moreover, LEC service records are no longer sufficient to provide the data to populate the ALI database. Other means of determining the location of wireless calls must be found.

“Phase 1 E9-1-1” constitutes the first attempt to update the ANI/ALI system to accommodate wireless telephony. Functionally, to be Phase 1 compliant, the ANI/ALI system must deliver to the PSAP a call back number as well as the location of the cell tower from which a wireless 9-1-1 call originates. In practice, Phase 1 compliance is implemented by dynamically updating the ANI/ALI database with the location of the calling cell tower before the PSAP queries the database. Each cell tower is assigned a unique Emergency Service Routing Key (ESRK), and the ANI/ALI database has records for each ESRK. When a wireless caller dials 911, the call goes first to the nearest cell tower, then to the mobile company’s Mobile Telephone Switching Office (MTSO). The MTSO handles all switching for the wireless system. The MTSO recognizes the call as a 9-1-1 call, and queries a database for the ESRK of the cell site handling the call, and the PSAP which handles calls for that that ESRK. The MTSO splits the call into a voice path and a data path, and sends the voice path and the ESRK, via the selective router, to the PSAP. The MTSO also updates the ESRK’s record in the ANI/ALI database with the caller’s call back number and the address of the cell site handling the 911 call. When the voice call and the ESRK arrive at the PSAP, the PSAP queries the ANI/ALI database

with the ESRK. The database then returns the call back number and the cell site location to the PSAP.

“Phase 2 E-9-1-1” requires that mobile telephony operators deliver the coordinates of the caller to the PSAP. This entails much more radical infrastructure changes than Phase 1 does, including, at the very least, techniques for determining those coordinates. Phase 2 deployment is still in the experimental stage, and no standard configuration has been agreed upon.

Phase 0 ANI/ALI is common across North America. It is the technical legacy upon which all of the cases studied below depend. Phase 1 implementation is fairly standard in the U.S., though our cases will show how the contexts of its implementation in Texas and Virginia have had different implications for privacy and surveillance. ~~Phase 1 is less standardized in Canada.~~ These same distinctions between Phase I and Phase 2 implementation have been adopted in Canada, though at a different pace and, as we shall see, under different regulatory conditions.

The FCC and the regulatory context of E-9-1-1

In the U.S., FCC mandates have been the driving force behind E9-1-1 deployment. In 1996 the FCC adopted rules and a framework to including wireless calls in the E-911 system.³ The FCC has moved into this area because of its responsibility under the Communications Act of 1934 to promote “safety of life and property through the use of wire and radio communication.”⁴ In its documents and press releases, the FCC defines its role not as one of compelling or directing, but as one of “promoting cooperative efforts,” “prompting the accelerated delivery,” and “making sure that ongoing processes are in place.”⁵

The goal of the FCC was to provide wireless callers with the same level of access to 911 services that is available to wireline callers. The FCC’s 1996 final rules were divided into two phases. Phase I rules require carriers to provide PSAPs with the telephone number of the 911 caller, the location of the cell site or base station receiving the cell phone, and call back capability. Reflecting the interests of the public safety organizations, the FCC gave the carriers a year to comply with Phase I rules. Phase II rules require wireless carriers to provide more precise location information, with the relay of Automatic Location Information (ALI) within 125 meters or about 410 feet of the call’s origination. The FCC established a four-year schedule for its Phase II requirements beginning October 1, 2001 and ending December 31, 2005.⁶

³ Federal Communications Commission, *Report and Order and Further Notice of Proposed Rulemaking*.

⁴ Section 1 of the Communications Act, 47 U.S.C. sect. 151.

⁵ FCC 96-264.

⁶ The FCC’s *E-911 Fact Sheet* provides additional information on the specific conditions and schedules of Phase I and II.

Much of the FCC's time has gone to considering waivers by wireless carriers regarding the Phase I and Phase II deadlines for compliance. The first deadline, October 1, 2001, witnessed a number of waiver requests by five nationwide wireless carriers -- Nextel, Sprint PCS, Verizon, Cingular, and AT&T.⁷ On October 19th the FCC also provided guidance to small and mid-size carriers seeking relief from Phase I ALI rules. Without question implementation of the FCC rules has not proceeded smoothly.

In the Wireless Communications and Public Safety Act of 1999⁸ (PL 106-81) (WCPSA), Congress supported the FCC actions to designate 911 as the universal emergency phone number for wireless and wireline calls and required the FCC, states, and local governments to coordinate wireless E-911. Section 4 of the law gave wireless carriers, users, providers and PSAPs the same liability protection regardless of whether a call originated from a wireless or wireline phone. Section 5 of WCPSA amended Section 222 of the Communications Act of 1934 to require a customer to give prior authorization for any disclosure of call location information for a purpose other than the delivery of emergency services.

These FCC and Congressional actions have had a direct bearing on Canadian telecommunication policy, because in many respects Canadian stakeholders have tried to grapple with these similar issues without having to resort to direct intervention from the Canadian Radio and Telecommunications Commission (CRTC). Indeed, direct observation of US events prompted the Canadian PSAPs, wireless industry and the ILECs to seek a more cooperative and consensual approach. Moreover, the development of E-911 policy in Canada cannot, of course, be separated from a relatively dependent economic relationship, shaped in part by US-dominated corporate actors in the telecommunications industry. With this brief exposition of the common technical and political contexts of Canadian and U.S. E9-1-1 systems, we turn to specific cases.

The Implementation of Wireless E9-1-1 in Texas

Three environmental factors have affected the privacy implications of E9-1-1 implementation in Texas. These are the consolidation of rural emergency operations into a state-wide system, a legislative commitment to telecommunications industry competition, and a legislative commitment to data sharing across state operations. Administration of the E9-1-1 system in Texas is shared among three bodies – home rule cities, Emergency Communication Districts (ECDs), and regional Councils of Government (COGs). Home rule cities and ECDs are those municipalities and regions whose emergency response systems (ERSs) predate state initiatives, and so are grandfathered out of state regulation. The grandfathered systems tend to coincide with

⁷ See: *Fact Sheet: E-911 Phase II Decisions* (October 2001). Unofficial announcement of the Commission's actions. Found at <http://www.fcc.gov>.

⁸ The Wireless Communications and Public Safety Act of 1999 was introduced as S. 800 on April 14, 1999 by Senator John McCain (R-AZ), Chairman of the Committee on Commerce, Science, and Transportation, and Senator Conrad Burns (R-MT), Chairman of the Subcommittee on Communications. The bill was signed into law on October 26, 1999.

the most densely populated regions of the state. The state Legislature established the Commission on State Emergency Communications (CSEC) in 1985 to coordinate ERS in the remaining, predominantly rural, areas of the state. CSEC's purview extends over 2/3 of the Texas land mass, but only 1/3 of its population⁹. This research concerns only those regions under CSEC's jurisdiction – that is, rural Texas.

CSEC controls the state budget for emergency communication systems, and so has enormous influence on the implantation of those systems. Formally, all decisions regarding the implementation of emergency communications fall to the local government at the level of either municipality or county. However, coordination of many state initiatives, including 9-1-1 initiatives, occurs at the level of the regional Council of Government, or COG. COGs are formally voluntary associations of local governments with no regulatory power or other authority. Decisions of COGs are not binding on member governments. However, in order to receive state funding for 9-1-1 programs, local governments must cooperate in a regional plan through their COG. The COGs, in turn, report to CSEC. If the regional plans adhere to standards promulgated by CSEC, they will be eligible for funding.¹⁰

CSEC is funded by three types of surcharges on wired and wireless phone lines, including 9-1-1 service fees, 9-1-1 equalization surcharges, and wireless communication fees. These fees are set by the state legislature and are applied immediately to the state's general fund. The legislature then appropriates funds to CSEC. Historically, these fees have generated more revenue than is appropriated to CSEC.¹¹ Also, within each COG, funds collected from urban areas subsidize ERS in rural areas. At least one urban region under CSEC purview, Corpus Christi, has bridled at subsidizing other regions, and has withdrawn from the CSEC program to become a Home Rule City.¹² Home Rule Cities may set their own surcharge rates and spend the revenues as they wish.

By statute, CSEC revenue can only be used for activities associated with the delivery of a 9-1-1 call. These include network, database, mapping, addressing, and PSAP equipment costs. While they may include some PSAP administrative personnel costs, they do not include costs associated with PSAP operators or with the provision of emergency services.

⁹ Interview with Rob Huggins, Texas Commission on State Emergency Communications, Austin, TX, July 2, 2002.

¹⁰ Texas Commission on State Emergency Communications Rule 251.1; Senate Committee on Economic Development, Subcommittee on State E-9-1-1 Emergency Communications, Interim Report to the 77th Texas Legislature [hereinafter Interim Report], p 5; Texas Association of Regional Councils, Regional Councils in Texas, <http://www.txregionalcouncil.org/what.htm>, accessed June 26, 2002)

¹¹ Interim Report, p 5.

¹² Mary Moreno, "City will drop from state E-9-1-1 program," Corpus Christi Caller-Times March 29, 2002, Pg. B1

This structure of 9-1-1 funding and coordination has two corollaries. First, the state E9-1-1 mandate funds general state operations. This is a significant source of revenue in a state which devoutly eschews income taxes. Second, by harnessing the purchasing power of rural PSAPs through CSEC, the Texas legislature has created a significantly powerful market actor in the E9-1-1 communications industry. As will be explored in the following section, this has had important implications for the shape of the locational surveillance industry in general.

In 1997, the Texas legislature, disturbed by inadequacies in the local ILEC's handling of the E9-1-1 system, solicited competitive bids for managing the state wireline and wireless 9-1-1 ALI database. The contract was awarded to SCC, Inc, which has since changed its name to Intrado. Intrado's core business had been in inter-industry billing management among competitive local exchange carriers (CLECs), long distance carriers, and wireless operators. Since the breakup of the AT&T monopoly these issues had been complicated by number portability, local service unbundling and resale. The Texas 9-1-1 ALI contract was a significant tactical step in parlaying this expertise into the market for location-based services. The Texas contract is for database services only; Intrado does not route or deliver 9-1-1 calls in Texas. Instead, they populate the ANI/ALI database and send routing directions to the selective routers still run, for the most part, by ILECs.

However, while the Texas state contract is only for database services, it is a significant step toward parlaying Intrado's core database and inter-industry network expertise into more general commercial LBS applications. Specifically, the contract has allowed Intrado to develop in two ways. Intrado has incorporated geographic elements into its database and routing systems, and has established itself as a player in the ERS community. These have been leveraged into emergency notification systems, which are in turn leveraged into "location-based telecommunications services, telematics and permission-based mobile messaging."¹³ This shift in Intrado's strategic industry position can be seen in the rhetoric of its corporate reports. In 2000, these reports referred to Intrado's core offering as "SafetyNet". In 2001, this had become "Informed Response."¹⁴

Intrado's entry as an industrial player in the 9-1-1 infrastructure could not have been possible without regulatory intervention. Intrado's contract was conditional on a successful test of their system in the Greater Harris County 9-1-1 Emergency Network (GHCEN), the ECD serving the Houston area. Southwestern Bell (SWB) was (and is) the Houston area ILEC. They had also been the incumbent provider of 9-1-1 services, including both the ANI/ALI database and the selective routers used for emergency call delivery. In 1999, Intrado attempted to connect their new ALI database to SWB's tandem switching network. SWB refused to interconnect, claiming, among other things, that Intrado's system was incompatible with SWB's switches, and that interconnection posed a threat to the reliability of the existing 9-1-1 network. CSEC, GHCEN, and Intrado filed a complaint with the Texas Public Utilities Commission, which ordered SWB to unbundle tariffs for 9-1-1 databases and 9-1-1 call delivery. In the face of this

13 2001 Annual Report, Intrado Informed Response, p 4

14 "9-1-1 SafetyNet..."; "Access the Facts, Investor Fact Sheet Q1 – 2002", Intrado Informed Response.

order, SWB also agreed to a timetable and technical specifications for interconnection with their selective routers.¹⁵ The TX PUC 9-1-1 tariff unbundling rules were some of the first in the nation.

Successful emergency services depend on actually getting personnel to a particular place rapidly. Standardized addressing and standardized maps are an essential part of the system. While Texas law gives counties and municipalities the authority to standardize rural addressing within their jurisdictions¹⁶, CSEC administers state funds for local addressing programs. To receive these funds, counties must meet standard vetting criteria. Thus, as with other 9-1-1 services, addressing is officially controlled by local authorities, but actually standardized through a state agency.¹⁷

Even after standardized statewide procedures were established, addressing has been a notoriously difficult process. Establishing what constitutes a road, a parcel, or a dwelling has been an interpretive nightmare. Moreover, there has been local opposition to addressing projects. This resistance is sometimes because residents oppose standardized addresses in principle, but more often residents simply resist changing their established address.¹⁸

Addressing projects are usually performed in conjunction with mapping projects. Most, but not all, maps generated in conjunction with addressing projects are digital. However, some localities still use paper plat maps.¹⁹ Digital base maps are obtained from a private mapping vendor, a public utility, or the Texas Department of Information Resources. To this base map are added “attribute data, such as structure locations, road names, and the identification of political boundaries. Customer location information on these maps may be obtained from the USPS, a local government, telephone companies, an electric, gas or water utility, a county appraisal district, public school district, or other public entity.”²⁰ Mapping is an expensive proposition. For example, Hays County was mapped in 1987 at a cost of \$78,000. However, information held by state and county agencies is subject to

15 Emergency Petition of the Advisory Commission on State Emergency Communications and the Greater Harris County 9-1-1 Emergency Network for Declaratory Rulings Ordering Southwestern Bell Telephone Company to Unbundle its 9-1-1 Network and 9-1-1 Database Management System, Texas PUC Docket No. 20334, SOAH Docket No. 473-99-0155; Draft Preliminary Order, Emergency Petition of the Advisory Commission on State Emergency Communications and the Greater Harris County 9-1-1 Emergency Network for Declaratory Rulings Ordering Southwestern Bell Telephone Company to Unbundle its 9-1-1 Network and 9-1-1 Database Management System, PUC Docket No. 20334, SOAH Docket No. 473-99-0155, at 4 (rel. March 18, 1999).

16 County Road and Bridge Act (as enacted in Senate Bill 1091 in 1989)

17 Advisory Commission on State Emergency Communications, “9-1-1 Programs, Policies and Procedures,” February 1999, § 2.02.

18 Interview with Patsy Greiner, Texas Commission on State Emergency Communications, Austin, TX, July 2, 2002.

19 Interview with Rob Huggins, Texas Commission on State Emergency Communications, Austin, TX, July 2, 2002.

20 Cornyn, John. Letter to James D. Goerke dated August 16, 1999. Open Records Decision No. 661 http://www.csec.state.tx.us/pdf/ord_661.pdf; June 2, 2002

public disclosure. Once the mapping occurs with public funds, private citizens or companies can and do obtain the maps for only the cost of copying them. Map publishers regularly buy subsidized maps from counties, and use them as the raw material for consumer market products.²¹

State law makes certain information exempt from disclosure requirements.²² Personal information, including names and phone numbers, is redacted from maps before they are released to the public.²³ The cost of redaction of maps is borne by the requestor and determined on a case by case basis.²⁴ However, state confidentiality law applies only to release to the public. COGs may release E9-1-1 addressing information to county agencies “for the purpose of sending tax notices and voter registration notices.” In fact, such a sharing of information among governmental bodies is encouraged “in the interest of the efficient and economical administration of statutory duties.”²⁵

In summary, Texas 9-1-1 implementation has had several far reaching implications. Firstly, a significant national market actor – CSEC – was created by consolidating the purchasing power of many small operators throughout a vast region. Secondly, CSEC’s actions in the 9-1-1 arena have supported not only new market actors, but entirely new markets, notably the markets for third party location databases and third party location delivery networks. This was encouraged by an explicit legislative agenda promoting competition in the Texas telecommunications industry. Thirdly, Texas state funding of 9-1-1 addressing and mapping programs, and the structure of Texas privacy and freedom of information laws have had significant market and governmental repercussions. State agencies, including police and tax authorities, have ready access to personal information gathered in these addressing and mapping projects. The projects also make base maps, with personal information redacted, available to any private entity at relatively low cost.

The Implementation of Wireless 9-1-1 in Virginia

Administration of 9-1-1 in Virginia has traditionally been the province of the county-level public service answering points (PSAPs), which dispatch calls to police, fire and ambulance for response, and the local phone companies. The heart of the E9-1-1 operations has been, and continues to be, the dispatch centers which receive all 9-1-1 calls, identify the location and person making the call, and send the appropriate response team. With the introduction of Enhanced 9-1-1 (E9-1-1), the technological sophistication of the ERS operation, the jurisdictional boundaries involved in responding to a 9-1-1-call, and the number of players have all become more complex. The dispatch center is heavily dependent on computer and communications technologies not just for receiving and

21 Interview with Patsy Greiner, Texas Commission on State Emergency Communications, Austin, TX, July 2, 2002.

22 TX Health and Safety Code Section 771.061

23 Advisory Commission on State Emergency Communications, “9-1-1 Programs, Policies and Procedures,” February 1999, § 1.06, Source: May 5, 1998 letter to regional council

24 Cornyn, John. Letter to James D. Goerke dated August 16, 1999. Open Records Decision No. 661 http://www.csec.state.tx.us/pdf/ord_661.pdf; June 2, 2002 (Cornyn, John. 2002)

25 *Id.*

relaying calls but also for identifying where a call is coming from and where rescue personnel are located.²⁶ Real time mapping displayed on computer-assisted terminals (CADs) are the most visible component in an E9-1-1 dispatch center. Indeed the sophistication and timeliness of the maps is a primary distinction between traditional 9-1-1, enhanced 9-1-1, and now wireless E9-1-1. And with the move to wireless E9-1-1, the number of stakeholders and organizational complexity required for implementation increases.

In Virginia the implementation of wireless E9-1-1 is taking place in three phases:

- Phase 0 – a PSAP directly receives all wireless calls made within their jurisdiction at their communications center rather than at the respective State police district headquarters. All PSAPs that were E9-1-1 capable by July 1, 2000 are required by the General Assembly to start receiving wireless calls by July 1, 2002. All other PSAPs must start receiving wireless calls by July 1, 2003.
- Phase I – PSAP receives a caller’s Call Back Number or ANI (automatic number identification), the identity of the wireless provider, and the location of the cell antenna receiving the call.
- Phase II – PSAP receives the actual location of the caller by longitude and latitude (ALI), as well as the ANI.

The organizational complexity involved in these implementation phases is well illustrated by the “Scope of Work” for one of the wireless workgroups in Virginia.²⁷ For Phase I, implementation requires that the operations of three entities – the ILECs, the wireless service providers (WSPs), and the PSAPs -- are managed and coordinated. The 9-1-1 service provider (local exchange carrier – ILEC -- Verizon) must have ready the 9-1-1 selective router and the ALI database. The WSPs – numerous and not uniform throughout the state -- need to provide maps showing all cell sector addresses and routing information for all the PSAPs that they serve. The PSAPs must install wireless 9-1-1 trunks, upgrades to their communications equipment, and upgrades in the dispatch center.

The memorandum of understanding (MOU) between AT&T Wireless (AWS) and Fairfax County specifies a similar but more detailed division of responsibilities for Phase I E9-1-1 implementation. AWS is responsible for: the design, installation, operation, maintenance and provision of all network elements; for interconnecting the MSC (the switch that controls the wireless calls) to the Selective Router/E9-1-1 Tandems and for interconnecting the SCP (Intrado-type services) to the ALI database; for working with Vendors on performance measures; and for negotiating with the LEC, in cooperation with the PSAP, for appropriate interconnection agreements. The MOU notes that ALI

²⁶ Interview with staff, Public Safety Communications Center, Fairfax County Police Department, July 29, 2002.

²⁷ “Scope of Work for Tri-cities Wireless Workgroup,” (5/31/02). Available at: http://www.9-1-1.state.va.us/resource_info.htm

Database functions lie outside the responsibility of AWS. The PSAPs are responsible for: validating and updating PSAP Jurisdiction Area Boundary Maps; providing and verifying needed data about each PSAP's existing infrastructure; and, identifying appropriate Routing Codes; informing third party vendors, such as Computer Aided Dispatch (CAD) providers of data to be delivered with 9-1-1 calls for coordination with PSAP premise-based systems. The MOU also recognizes, but does not specify the responsibilities of, several third parties including the 9-1-1 provider/LEC, the host ALI provider, and the SCP software developers and hardware providers.

To cover the costs of implementing Phase I and Phase II, PSAPs can apply to the Wireless E9-1-1 Services Board for funds to install necessary equipment upgrades and the wireless service providers can apply for funds to support the PSAP requests. In 1998, the General Assembly passed legislation that placed a \$0.75 surcharge on every wireless telephone billed by a wireless service provider in Virginia. It also created a seven-member (three from local government, three from the telecommunications industry, and the state Comptroller as chair) Wireless E9-1-1 Services Board to administer the fund. In 2000, the size of the Board was increased to fourteen to allow representation from the police chiefs, fire chiefs, EMS chiefs, sheriffs, State Police, and emergency management.

By the end of FY2001, the Wireless E9-1-1 Fund generated approximately \$1.8 million each month and had a balance of about \$38 million at the end of FY2001. In FY 2001, \$6.7 million was paid to the PSAPs and \$2.4 million was paid to the wireless service providers. The annual PSAP costs of statewide implementation of Phase I of wireless E9-1-1 is estimated at \$11.5 million. Accurate estimates of Phase II costs are not available; however, it appears that Phase II costs are primarily non-recurring while Phase I costs will continue into Phase II.²⁸

In a memo to all emergency communications coordinators in Virginia the Coordinator of Public Safety Communications points out that one factor that has proven important to the success of Phase I implementation is if PSAPs initiate implementation as a regional group.²⁹ Most of the PSAPs in Virginia have formed such regional groups.

Implementation of both Phase I and Phase II in Virginia is complicated by the number of wireless service providers. These include: Alltel; AT&T Wireless; Cingular; Devon; Cellular One; Nextel; Ntelos; Shenandoah Cellular; Sprint PCS; Triton PCS; U.S. Cellular; Verizon; and Virginia Cellular. As of the end of FY 2001, AT&T Wireless were the only national providers to complete a Phase I deployment in Virginia; Verizon has also implemented Phase I in several parts of Virginia.

²⁸ Wireless E9-1-1 Services Board, *FY2001 Annual Report* (Prepared by the Department of Technology Planning, Division of Public Safety Communications) (October 2001), p. 8. Available online: <http://www.va9-1-1.org>.

²⁹ *Virginia Wireless E9-1-1 Implementation Guide* (Revised 12/2001). Available at: http://www.9-1-1.state.va.us/resource_info.htm

According to the *FY2001 Annual Report*³⁰ of the Wireless E9-1-1 Services Board, the implementation of wireless E9-1-1 Phase I, which requires that the PSAP be provided with the caller's phone number and the address of the cell site receiving the call, has "progressed, though not quickly." The *Report* notes that some providers have been aggressive in their implementation but that technical problems and corporate issues have slowed other providers. The localities were not blamed with the lack of progress, instead it was the lack of preparedness by the wireless service providers and the local exchange carriers.³¹ The *Memorandum of Understanding*³² between AT&T Wireless (AWS) and Fairfax County illustrates the complexity and detail of the process.

For E9-1-1 the ALI database that Verizon maintains is not map-based but instead is a tabular, text-based system.³³ The PSAP is responsible for geo-coding the address. Counties all have invested local resources in the creation of their own GIS systems. In some cases the PSAP geo-coding is well synchronized with the ALI information and in other cases it is not. Many PSAPs have taken the county GIS map, included it as part of their CAD system, and maintain it separately from the county GIS map. In wireless E9-1-1, the PSAP believes that it is querying Verizon (ILEC) for the ALI information. The ALI database recognizes that it is a cell phone and pass the number on to a third party, often Intrado or TCS, to get the mapping coordinates that it needs.

Phase II implementation, requiring that PSAPs be provided with the actual location of the caller by longitude and latitude, has been delayed by waivers in Virginia as it has throughout the country. According to the *Annual Report*, "the primary difference between Phase I and Phase II is the addition of mapping within the PSAP. To provide this, the Board has included funding for the creation of mapping data for the locality and for the mapping display system to be used by the E9-1-1 call takers."³⁴ Instead of an incremental approach involving funding for each locality, the Commonwealth and the Board have decided on a statewide approach, involving a partnership with the Virginia Geographic Information Network (VGIN). VGIN had previously sought funding for a project of this nature but until the wireless E9-1-1 mandate there had not been a compelling need for such mapping. There are three elements to the state-based mapping project: 1) a digital orthophotography, which was conducted by aerial photography of the state; 2) centerline street location, for which the – Virginia Department of Transportation provided most reliable and updated information; and, 3) addressing, which was derived from local public and private sector entities.

³⁰ Wireless E9-1-1 Services Board, *FY2001 Annual Report* (Prepared by the Department of Technology Planning, Division of Public Safety Communications) (October 2001), p. 1. Available online: <http://www.va9-1-1.org>.

³¹ *FY2001 Annual Report*, p. 9.

³² *AT&T Wireless Services (AWS) Memorandum of Understanding Re. E9-1-1 Phase I Service with Fairfax County, Virginia*. (2001). Available online: http://www.9-1-1.state.va.us/sample_documents.htm

³³ Interview with staff, Public Safety Communications, Commonwealth of Virginia, Sept. 3, 2002.

³⁴ Wireless E9-1-1 Services Board, *FY2001 Annual Report* (October 2001), p. 7. Available at: http://www.9-1-1.state.va.us/resource_info.htm

According to Guidelines of the Wireless E9-1-1 Services Board, the PASP can implement the mapping display system as part of the CPE equipment, computer-aided dispatch (CAD) system, or as a separate stand-alone system.³⁵ The Wireless E9-1-1 Services Board estimates that Phase II costs will be as follows:

- Statewide Base Mapping (Imagery) \$10 million
- Statewide Base Mapping (street centerline) \$10 million
- PSAP Mapping Display systems \$ 5 million
- Wireless Provider Phase II Cost (non-recurring) \$10 million

The General Assembly recognized the revenue generating potential of the VGIN project and exempted it from FOIA requirements. Private sector companies may license VGIN maps but may not resell and must abide by the use terms of the license agreement. Any public entity (federal, state or local) may get access to VGIN maps but may not sell the information.

The implementation of Virginia's Wireless E-9-1-1 has begun in a largely cooperative manner, particularly on the part of the public sector actors. The Wireless E-9-1-1 Services Board has provided a focus not only for funding decisions but also for generating cooperative regional arrangements and sharing experiences and learning. As has been true in Texas, implementation has spawned new market actors and new market opportunities for third party location databases and location delivery networks. Implementation has also provided an opportunity to develop a statewide mapping project for which there had previously been interest but not sufficient need and support. With implementation of Phase II questions about privacy and access to information generated for and in the Wireless E-9-1-1 environment may become more apparent.

The Implementation of Wireless 9-1-1 in Ontario

On the face of it, the implementation of wireless E9-1-1 in Ontario, as well as in other parts of Canada, stands in stark contrast to the Texan and Virginian experiences outlined above. The differences are rooted in the historical emergence of a standardized platform for the routing of 9-1-1 calls, which has made the implementation of wireless enhanced emergency service in Canada somewhat less complicated than in the United States. Canada has a similar system of primary and secondary Public Service Answering Points (PSAPs) funded by provincial and municipal governments. Primary PSAPs serve to screen calls and to route them to the appropriate secondary PSAPs operated by the respective fire, police and ambulance services.³⁶ Provincial E9-1-1 service provides for the transport of all customer dialed 9-1-1 calls to the appropriate local 9-1-1 PSAP. So when a customer dials 9-1-1, the wired carrier being used, transports the call to the

³⁵ Virginia Wireless E9-1-1 Services Board, *Guidelines for the Submission of PSAP Cost Estimates for the Fiscal year beginning July 1, 2002 and ending June 30, 2003*. (Adopted August 8, 2001 and Revised December 12, 2002), p. 4. Available at: http://www.9-1-1.state.va.us/resource_info.htm

³⁶ In many municipalities, one department will play the role of both primary and secondary PSAP. Thus, in Toronto, the Toronto police department operates the primary PSAP for the entire city.

dedicated switch operated by the Incumbent Local Exchange Carrier (ILEC).³⁷ The call is then transferred to the appropriate police, fire or ambulance dispatch centre. As in the US, the original 9-1-1 system was designed as a simple voice connection to an operator who would verify location verbally and dispatch the appropriate service. This kind of basic service has been in existence in Canada since the mid-1970s, although the pace of development has varied from region to region.

As more sophisticated telecommunications services developed, a second generation of 9-1-1 service emerged in the mid-1980s. The so-called “Enhanced 9-1-1” service permits the transfer of Automatic Number Identification (ANI) and Automatic Location Identification (ALI) to the PSAPs. With call-back number and location information in hand, emergency operators can still assist the caller where verbal communication was impossible, or connection was terminated. Over time, ANI data was matched against street addresses in the ALI database, and emergency personnel directed to the exact location from which the call originated. Until the 1980s, therefore, it appeared that there was a good deal of convergence between the Canadian and American systems. The ANI/ALI system had become “the benchmark feature of E9-1-1 across North America.”³⁸

In the Ontario context, as elsewhere in Canada, however, the implementation of the ANI/ALI system was not without difficulty. In every region, there were “underlaps” and “overlaps” caused by the wide variety of addressing systems used by local communities, and the fact that these systems rarely conformed with the addressing and billing information held by the respective ILEC.³⁹ Thus, some addresses fell through the gaps and had no access to 9-1-1 service. Other addresses fell into more than one 9-1-1 region, causing confusion as to the closest emergency dispatch center. Moreover, the cost for 9-1-1 had always come from the property tax base of local communities. The extra expense of administering an enhanced 9-1-1 system meant that the cost had to be passed along to subscribers, raising the question for the ILEC of who to bill when the telephone exchanges and municipal boundaries were not consonant.

A third generation of E9-1-1 emerged, therefore, as a result of the need to standardize the addressing system for emergency response services. The Public Emergency Reporting Service (PERS) is a cooperative effort by the ILECs and local municipalities. In Ontario, local governments essentially apply to the ILEC (Bell Canada) to be included in the 9-1-1-PERS system. In return, Bell requires that all streets are numbered in a consistent and accurate format. The system requires that every household shall have an address, and every street a name. Therefore, the address, rather than the phone number, drives the PERS system. Of course, as a result of historical accident, municipal reorganization, or

³⁷ The main ILEC’s are Bell (operating in Ontario and Quebec), and Telus (for BC and Alberta). UP until the late 1990s, all incumbent local exchange carriers were represented by a common trade association, known as Stentor.

³⁸ Gordon Gow, “Territorial Boundary Crossing and Regulatory Crossroads: The Case of Wireless Enhanced Emergency (9-1-1) Service in Canada,” Paper delivered to the Third Wireless World Conference, University of Surrey, July 17-18, 2002.

³⁹ Interview, Judy Tottman, Regional Manager 9-1-1 Service, Bell Canada, August 16, 2002.

amalgamation, there may be duplicate street addresses in some communities. So, as we saw in Texas, some municipalities have been undertaking quite extensive efforts at renumbering, and are having to convince residents that the changes are worthwhile.⁴⁰

Once the municipalities have drawn new maps based on a standardized street address, they then add the location of emergency response dispatch centers. These maps may arrive with Bell's 9-1-1 Service office in a variety of digitized, or non-digitized, forms. Bell then digitizes in standard format, and overlays the telephone number, and an Emergency Service Number (ESN) that is associated with a clear Emergency Service Zone. Thus there should be far less confusion about the location of the closest emergency dispatch center, as the ANI/ALI database has been standardized, and supplemented with vital information about the location of emergency response services. A 9-1-1 PERS platform has now been established in every province except Saskatchewan and Newfoundland. In Ontario, over 90% of households are now part of this system.⁴¹

These three stages of enhanced 9-1-1 service have progressed in Canada regardless of the problems associated with making 9-1-1 calls from a cellular phone. Yet, as is the United States, the E9-1-1 system quickly exposed the distinction between wireline calls with ANI/ALI capability, and wireless calls which had no enhanced capability at all. The policy problem in Canada is neatly expressed by this advice leaflet from the Canadian Wireless Telecommunications Association (CWTA):

When you call 9-1-1 on your home telephone, your call is sent to the nearest emergency response centre. In many locations, the E9-1-1 network also passes along your telephone number and address so a 9-1-1 operator can call you back, if necessary, and help can be sent immediately to your exact location. Unlike your home telephone, mobile phones generally do not pass along the telephone number or any other customer information when you make a call. This means that, when you call 9-1-1, you have to give your complete number to the E9-1-1 operator – including your mobile phone area code. This is important because the operator may have to call you back if you are disconnected. In addition, you have to tell the operator, as best you can, exactly where you are. Remember, your mobile phone can be used anywhere service is available. Only you can provide your precise location or the location of the emergency.⁴²

⁴⁰ See for instance, the efforts by the City of Kingston to convince residents of the benefits of 9-1-1-PERS: "Therefore, in order to proceed with the application to improve emergency services for the Kingston community, 131 civic addresses have been identified to be changed to reflect numbering standards acceptable to Bell Canada. The City of Kingston is prepared to offer as much support and clerical assistance as possible to ensure this transition a smooth one. If your address is affected by the this you will receive a "change in address" package that includes a voucher towards the purchase of new civic address numbers for your home and other helpful information to get you started, such as most frequently asked questions, change in address forms and contact information for some of the common government agencies, organizations and household service providers."

<http://www.city.kingston.on.ca/residents/emergency/9-1-1/index.asp>.

⁴¹ Interview, Judy Tottman, Bell Canada, August 30, 2002.

⁴² "E9-1-1 Health and Safety Issues" at: <http://www.cwta.ca/safety/E9-1-1/health-9-1-1.php3>.

This problem with wireless calls was recognized from the genesis of the 9-1-1 PERS network. Only in the mid-1990s, however, did the Canadian PSAPs, who are less well organized than their American counterparts, voice strong concerns. Although the problem was initially debated within the CRTC's Canadian Industry Steering Committee (CISC), the CRTC was unwilling to take the kind of strong interventionist stance as did the FCC in the United States. So the issue migrated to the trade association of the wireless industry, the CWTA. Since 1997, an E9-1-1 Working Group has been working under the auspices of CWTA. This group includes membership from the four major cellular providers in Canada (Bell Mobility, Microcell, Telus Mobility, Rogers Wireless), from York and Toronto police departments, and from other representatives of the PSAP community. A member of the CRTC maintains a watching brief.

The main approach of this committee has been to organize and monitor trials. The first occurred in Calgary, Alberta from October 1999 to April 2000, largely as a result of a technical proposal submitted by Telus, the ILEC in the West. Four wireless service providers participated in the trial, which tested the interconnection between the provincial 9-1-1 platform, operated by Telus, the wireless carriers and the PSAPs. This enabled the delivery of information relating to the location of the wireless antenna receiving a 9-1-1 call, as well as the 10-digit telephone number of the mobile subscriber placing the call. This functionality is equivalent to what the FCC established as part of its Phase I requirements. The final report of this trial indicated that participants were generally satisfied that accurate information on call-back number and station location was provided to the E9-1-1 operators.⁴³ The results also demonstrated that the technical solutions could be applied in any other province with a similar E9-1-1 PERS delivery platform. However, the limited trial area and the involvement of only one PSAP meant that the delivery of call-back numbers to secondary PSAPs, and the associated routing issues, could not be properly examined. A second trial was therefore initiated in Toronto and North York in Ontario, a potentially more complex urban environment, involving more than one primary PSAP.⁴⁴ An examination of how this trial was conducted will demonstrate how wireless E9-1-1 is likely to be implemented in the rest of Ontario.

The trial participants were Toronto and York region PSAPs, Bell Canada, and the four wireless carriers (Bell Mobility, Rogers Wireless, Microcell and Telus Mobility). The goals were to interconnect wireless carriers to the existing 9-1-1 PERS platform, to display the 10-digit wireless Call Back number and cell site/sector identification, and to transfer information to secondary PSAPs. Technically, this process required the establishment of a separate, routable and non-dialable Emergency Service Routing Digit (ESRD) which assigns a ten-digit number to each cell-site/sector. The ESRD is then delivered to the ALI database where it is cross-referenced with street address. So when a customer dialed 9-1-1 on a wireless phone, the PSAP received both the wireless customer's 10-digit call-back number, as well as the 10-digit ESRD. The display of the

⁴³ Alberta E9-1-1 Advisory Association, *Alberta Wireless 9-1-1 Trial Report* at: <http://www.cwta.ca/safety/E9-1-1>

⁴⁴ There has also been a smaller and more limited trial in Nova Scotia.

ESRD, and the associated cell site sector address, is then used by the emergency personnel to identify the location of the originating cell site or sector where the 9-1-1 call entered the wireless network, using the existing ANI/ALI display terminal.⁴⁵

During the trial period, each of the major participants was required to undertake certain responsibilities. The participating wireless carriers were expected to establish a contact point to investigate and respond to PSAP queries, and to define and establish a process for assigning an ESRD to cell site locations. PSAPS were expected to begin staff training and to set up a pre-trial validation. And Bell Canada had to make upgrades to the hardware and software associated with its tandem switches. The trial enabled the assessment of the viability of the technology and architecture and allowed participants to test whether the routing of wireless 9-1-1 calls had improved, whether the default routing arrangements were appropriate in a wireless context, whether overflow calls were processed and routed properly, whether certain “call-management” features were compatible, whether the calls were successfully routed to the appropriate secondary PSAPs (for fire, police and ambulance), and whether existing PSAP display terminals could accurately display both call back number and the ESRD.

The trial exposed some technical complications relating to the existing voice, data and database technology and architecture and particularly the signaling arrangements between different switching technologies. The trial found that the routing of wireless 9-1-1 calls had improved, but not without some problems associated with the misrouting of calls to the wrong PSAP. False call-back numbers from unsubscribed handsets also continued to plague the system. But these are difficulties inherent in the mobile character of the technology. Callers may travel between several cell sites by the time the call is initially made, and the emergency dispatch is initiated. Moreover, the call sector may not necessarily be the nearest to where you are when the call is made; calls are rerouted when one sector is very busy. On the positive side, there was clear evidence that the combination of cellsite address, call-back number and other information allowed emergency response teams more accurately to pinpoint location and, in some instances, to save lives. The system also allowed PSAPs to identify abusive, frivolous or mistaken callers more effectively.⁴⁶

As a result of the success of this trial, Wireless E9-1-1 is now available as a commercial tariff in Ontario, as well as in Alberta and BC. But implementation is dependent on the commercial decisions of the WSPs. So far all the wireless carriers, with the exception of Rogers AT&T Wireless have begun to offer enhanced 9-1-1 services, in conformity with a CRTC decision in 2001 that allowed Bell Canada to charge all WSPs a monthly rate of \$0.02 for each of its wireless working telephone numbers equipped with outward calling, so that they might access Bell’s 9-1-1 Public Emergency Reporting Service (9-1-1 PERS) network.⁴⁷ In March 2001, Microcell also asked the CRTC to order all phone companies

⁴⁵ Gordon Gow, “Territorial Boundary Crossing and Regulatory Crossroads,” p. 9.

⁴⁶ Ontario 9-1-1 Advisory Board Wireless Enhanced 9-1-1 Trial Report at: <http://www.cwta.ca/safety/E9-1-1/>

⁴⁷ Order CRTC 2001-902 at: <http://www.crtc.gc.ca/archive/ENG/Orders/2001/o2001-902.htm>

(especially the ILECs in other provinces, such as Manitoba Telecom Services Inc. and Sasktel) to provide 9-1-1 network access services to wireless carriers. The CRTC is expected to rule on this issue in September 2002.⁴⁸

No doubt implementation would be speedier if the PSAPs and the wireless carriers could have resolved a contentious dispute over the provision of subscriber records. Public safety agencies have sought wireless subscriber records, and want the ALI database to include the home or business address of all wireless customers. The wireless carriers believe that the ESRD solution is the only feasible locational information that can be transferred at this stage. They have also protested that such subscriber information is going to be very misleading in ascertaining the location of a wireless caller. Subscriber records are also notoriously unreliable given that many cellular phone customers buy prepaid packages, and have no incentive to provide accurate names and addresses for billing purposes. In one of its only interventions on E9-1-1 questions, the CRTC has ruled, in a decision regarding Microcell, that in an emergency, subscriber records could be of value to PSAPs.⁴⁹ But there has been no general ruling that these records should be provided as a matter of course. This position contrasts, therefore, with the requirements established under Section 5 of the US WCPSA of 1999.

Discussions about Phase II implementation and the technologically, economically and politically controversial questions of how to transmit exact location coordinates to PSAPs have only just begun. The Toronto trial exposed the obvious limitations of Phase I implementation, and the complexities of integrating mobile networks with existing publicly switched networks.. No doubt there will be extensive debates about the relative merits of most effective locational solution; through a handset-based GPS chip, or a triangulation method, or a combination of both. Phase Two implementation will no doubt bring many benefits for the emergency response communities. On the other hand, the investment in infrastructure by the PSAPs is likely to be enormous. So far, Phase One implementation has had a minimal impact on the existing technical equipment of the PSAPs.

So, for now, the mood in Ontario, which seems the most advanced province, is that the cellular industry has yet to be convinced that comprehensive Phase One implementation is in their commercial interests. And no doubt there will be continued pressure from the emergency response community for a more assertive role to be played by the CRTC. Nevertheless, in contrast to the US states discussed above, the common PERS platform, operated by a single ILEC in each province, reduces the burden and cost on municipal and provincial governments. It also renders unnecessary the kinds of functions performed by 9-1-1 call delivery companies. Moreover, with fewer WSPs, there is a greater likelihood that the industry can proceed in a more uniform way, and project a

⁴⁸ "CRTC to rule on 9-1-1 Wireless Ability," *Globe and Mail*, August 19, 2002

⁴⁹ CRTC Order 2000-831, September 8, 2000 at: <http://www.crtc.gc.ca/archive/ENG/Orders/2000/O2000-831.htm>. This exhortation was repeated in Public Notice CRTC 2001-110 of October 31, 2001, which seeks comments on this and related issues: <http://www.crtc.gc.ca/archive/ENG/Notices/2001/pt2001-110.htm>.

more united position through its trade association, the CWTA. In short, the number of actors involved, even in a complicated urban environment like Toronto, is considerably lower than in most US states. In consequence, the chances of finding a cooperative and concerted solution to the challenging technical and regulatory problems are far higher than they are south of the 49th parallel.

Discussion and Conclusions

From a legal perspective, US and Canadian policies on cellular phone privacy are somewhat different at this point, although in both countries privacy policies are still evolving. We will first briefly review those policies but are more concerned in our discussion here with examining how the “on the ground” implementation of wireless E9-1-1 affects the possibilities for privacy. Policies may point in one direction, while technological developments and organizational relationships may point in a different direction.

U.S. law places very tight restrictions on the information collected during a 911 call. Section 5 of the Wireless Communications and Public Safety Act (WCPSA) of 1999 amended Section 222 of the Communications Act of 1934 to require a customer to give prior authorization for any disclosure of call location information for a purpose other than the delivery of emergency services. In addition, however, several other laws including the Electronic Communications Privacy Act (ECPA), the Communications Assistance for Law Enforcement Act (CALEA), and most recently the USA PATRIOT Act all may speak to aspects of wireless location information. The next several years promise to provide lawyers for the telecommunications carriers with interesting litigation as these issues are sorted out.

Wireless privacy questions have to this point been debated far more actively in the US than in Canada. In other information privacy areas, Canadian policy is generally more protective of privacy than is that in the US. A more comprehensive network of public and private sector legislation in Canada, overseen by federal and provincial privacy commissioners, normally means that privacy issues are articulated earlier and with more force than in the US. But so far there has been very little public debate⁵⁰ and virtually no involvement from the federal or provincial privacy commissioners.⁵¹ Moreover, the CWTA has yet to articulate a public position on privacy, let alone produce a code of practice for its members, something associations in other sectors have done. A newly enacted federal law for the protection of personal information in the private sector certainly regulates how wireless service providers collect, use and disclose personal information. But to date, there has been little, if any, analysis of how this legislation applies to the locational data generated through mobile phone usage.⁵²

⁵⁰ Only one CBC story in May 1998 has focussed on this question.

⁵¹ One brief paper on mobile phone privacy issues was published by the Ontario Information and Privacy Commissioner: Ann Cavoukian and Mike Gurski, *Privacy in a Wireless World* at: <http://www.ipc.on.ca/english/pubpres/ext-pub/wireless.htm>

⁵² The Protection of Personal Information and Electronic Documents Act (2000), applied in January 2001 to the “federally regulated” private sector, including telecommunications companies. Among other things, it establishes the conditions under which personal information might be used for ‘secondary

Whether or not national legislation speaks to the privacy implications of E9-1-1, they have received little to no attention in the actual “on the ground” implementation of Phase I and Phase II in the US and Canada. Instead state regulators, PSAP administrators, Wireless Service Providers, and Local Exchange Carriers are beleaguered with questions of funding, technology, and coordination. In the US and Canada, the goal is to provide effective responses to wireless 9-1-1 calls and to enhance public safety. In the world of those administering these systems, privacy has been of only marginal and intermittent interest.

A comparative analysis of the three jurisdictions reveals several trends that are likely to push technologies or organizational configurations in ways that might not be hospitable for privacy protection. This is an area where “following the money” proves beneficial to teasing out the potential privacy implications.

The first trend is that wireless E9-1-1 is pushing local governments to cooperate in larger, often regional, bodies. This is true for PSAP administration, funding, and mapping. Emergency response functions have traditionally been the responsibility of local governments – local police, fire, and ambulance services which often knew the geography and people in their jurisdictions through long day-to-day experience. Although there have been previous trends to centralization at the county or provincial levels, the local PSAPs were still granted autonomy to act in a way that best served their local communities. Such autonomy is less possible in a wireless environment. Cell phones and cell sites do not recognize the geographic boundaries and necessitate more cooperation among neighboring jurisdictions.

Additionally, the complexity of wireless mapping, locational database, and routing systems and the need to have these uniform for interfaces with ILECS and wireless service providers limits the real choices that local units are able to make. More and more of the PSAP operations have become standardized and, at least in the United States, are interconnected with more private sector telecom providers and third party vendors.

We saw that the two American jurisdictions have created organizations that are designed to provide more coordination and cooperation in the implementation of wireline and/ or wireless E-911. In Texas, the Commission on State Emergency Communications (CSEC) was established in 1985 to coordinate ERS throughout the state. In Virginia, the Wireless E9-1-1 Services Board was created within the Public Safety Communications Division of the State Department of Technology Planning to coordinate wireless E9-1-1. The public safety community is also increasingly developing concerted positions through the National Emergency Number Association (NENA). The same need for coordination among local municipalities is, of course, observed in Canada. The difference, however, is that the system of ILECs, which enjoy province-wide monopolies, provide a natural

purposes.’ In a nutshell, any ‘sensitive information’ can only be disclosed with the express and positive consent of the person concerned. Non-sensitive information might be transferred using ‘implied consent’ provisions (such as opt-out boxes). Whether locational information is sensitive or non-sensitive information will be a matter for the Federal Privacy Commissioner to decide.

arena to coordinate the mapping and call-routing functions. Moreover, the PERS network provided a standardized platform for the routing of 9-1-1 calls, before the wireless problem emerged.

These larger trends towards the coordination of 9-1-1 implementation, in both the US and Canada, could have some conflicting implications for privacy protection. On the one hand, cooperation may lead to greater demands for the sharing of subscriber and locational information; the pressure from the Canadian PSAPs to integrate wireless subscriber records into the ANI/ALI system is evidence of such a trend. Conversely, however, institutional coordination can provide arenas for at least the consideration of common privacy problems, and perhaps for the articulation of a common position on privacy protection. An extensive fragmentation of E9-1-1 implementation is likely to be mirrored by a concomitant diversity of positions and practices about the treatment of personal information. In this respect, it is probable that the smaller number of stakeholders in the Canadian context, as well as a more developed statutory framework than in the US, would militate in favour of the development of a concerted position on the protection of personal information.

The second trend is that, at least in the US, wireless E9-1-1 is creating a new revenue source at the state level. Funding of wireless E9-1-1 has become an important source of revenue for public and private actors. In both Texas and Virginia more funds are being generated by the fees and surcharges than are being currently used in implementation of Phase I and Phase II implementation. In Texas these funds go into the general revenue and are then appropriated by the legislature back to public safety or to other state needs. In Virginia, the funds go directly to the Wireless Board. In Virginia, we would expect that the implementation process would be less political. In both Virginia and Texas, implementation of wireless E9-1-1 has generated more regional cooperation and establishment of regional PSAPs or regional working groups. This has occurred because cell phones do not recognize the geographic boundaries in which they operate. Cell sites may receive calls on the border of PSAPs and need to be able to determine which of the neighboring PSAP is the correct one to relay assistance.

The new funding for wireless E9-1-1 is enabling a redistribution of funds to less wealthy parts of the state. In both states, some parts of the state subsidize other areas of the state. In Texas urban areas subsidize rural areas. In Virginia, areas with high cell phone penetration, which is likely to be urban and suburban areas, subsidize areas with less cell phone use.

To a certain extent, this redistributive effect is felt in the Canadian context, at least in large provinces like Ontario. But in the absence of a government mandate to develop wireless E-911, market considerations are currently driving the behaviour of both ILECs and WSPs. Thus, to date, the major costs of 9-1-1 service is passed from the ILEC, through the WSPs to the consumer, in accordance with CRTC tariff rulings. And Phase One implementation has so far involved quite limited infrastructure modification for the PSAPs. Phase Two implementation, as in the US, is a very different story.

Third, wireless E9-1-1 has created new markets and new market actors. The PSAPs have become more prominent and influential market actors in the communications industry with their need to purchase maps, databases, and display formats to enable them to comply with wireless E9-1-1. In Texas centralization in the CSEC has created one actor. In Virginia, there has been somewhat less centralization except in the development of maps.

Market changes have not just been limited to the activities of state actors. Wireless carriers are under federal mandate to deliver locational data to PSAPs if the PSAP requests such a service. Wireless carriers have had to install both the means of locating calls and the means of transferring that location to the E9-1-1 network. They have usually outsourced both of these. While the integration of these location determining systems has been an economic and technical challenge, it is also fraught with profit making potential.

For example, Verizon Wireless and AT&T Wireless are, respectively, the 1st and 3rd most dominant wireless carriers in the U.S. national market.⁵³ Both have chosen Allen Telecom's Geometrix as their locational technology.⁵⁴ The system's centerpiece is the Geometrix Geolocation Control System. Located at a wireless operator's mobile switching center, it obtains data from Geometrix Wireless Location Sensors at base stations, performs location determination calculations, and reports location coordinates to Mobile Positioning Centers (MPCs). The E9-1-1 ANI/ALI databases are updated by querying these MPCs. Geometrix touts the system's ability to support and enhance value-added wireless location services. It also includes planning tools that can accurately predict the wireless service providers' network needs by using a combination of propagation models, terrain and morphology data, and location algorithms. Many other cal location firms are competing to establish E9-1-1 services as the toe hold from which other location-based market offerings can be launched.⁵⁵

Likewise, companies offering E9-1-1 call routing and delivery systems are positioned to expand their products and services. For example, call routing networks are central to Intrado's expansion strategy. Intrado markets a service called "9-1-1 SafetyNet", a "[single purpose] overlay network that accepts emergency calls from all access networks, determines the appropriate PSAP routing, passes the call to the PSAP, and provides appropriate subscriber information to the call taker."⁵⁶ This is designed to be a flexible, adaptable system interacting with the current and future data handling capabilities of both end-user devices (such as PDAs, pagers, computers, and IP phones), and transmission

53 "What Ails Wireless?" Business Week, April 1, 2002, p 60.

54 "Allen Telecom's Grayson Wireless Division to Supply 9-1-1 Caller Location Systems to AT&T Wireless," January 16, 2002; <http://www.geometrix9-1-1.com/newsrm/020116.html>, accessed June 11, 2002

55 www.cell-loc.com, www.triangulation.com, www.globallocate.com

56 "9-1-1 SafetyNet: The next-generation Public Safety COmmunications Network, SCC Communications Corp., Boulder, CO, p 2.

networks (such as private IP, wireless voice, PDA, and IP telephony). Specifically, Intrado envisions SafetyNet automatically receiving and routing Automatic Crash Notification information, and linking ALI to “subscriber-specific” information, such as medical records or emergency contact information.⁵⁷

Intrado is also moving into the market for telephone notification services. These enable the client to quickly send identical messages to a large target population. This service combines a “highly accurate outbound calling database” with a high capacity calling platform. The calling database is set of geo-coded telephone numbers managed by Intrado. Clients may specify either a geographic region or a list of individuals as the target. For public safety clients, the database starts with an extract of 9-1-1 data. Private sector target notification uses the client’s existing database, which will also be geo-coded. Public safety clients have included the Salt Lake City Winter Olympics, and public safety organizations covering 50% of Colorado’s population.⁵⁸

Telephone industry deregulation has thus been an essential economic context for the growth of the LBS industry. For example, Intrado’s initial business model (inter-industry billing management) was possible only in a competitive telecommunications market. To remain competitive within that business model, they had to interface with mobile telephone networks, bringing a geographic component into their databases. Further regulatory action introducing competition into 9-1-1 services has been necessary before Intrado could effectively parlay its inter-industry database and networking expertise into the public safety market. Intrado’s competencies in geographically enhanced telephone databases and its familiarity with the public safety sector have been leveraged into emergency notification systems. These systems are identical to commercial notification systems, except in the source of their databases.

The fourth, and overlooked, trend is that the increasing obscurity of the language by which telecommunications issues are framed. The debates about wireless E9-1-1 are replete with technological jargon and acronyms. All reports on the subject have lengthy glossaries, and all people working in the area comment on the need to know these acronyms. Although this may appear at first to be a somewhat trite observation, several key information privacy protection principles rely upon individuals being able to understand the environment in which their information is being collected, used, exchanged, and manipulated. One key obligation within Canada’s private sector privacy law, for instance, is “transparency” both in terms of personal information practices, and

57 “9-1-1-SafetyNet...” p 5

58 “Intrado notification offerings” <http://www.intrado.com/offerings/intellicast.asp>, “Intrado notification offerings” <http://www.intrado.com/offerings/targetnotification.asp>, accessed July 3, 2002; “Intrado notification offerings” <http://www.intrado.com/offerings/publicsafety.asp>, accessed July 3, 2002; “Intrado notification offerings” <http://www.intrado.com/offerings/privatesector.asp>, accessed July 3, 2002; “Intrado Signs Eagle County as Intellicast Notification Services Customer” 1 April 02, <http://www.intrado.com/news/04012002.asp>, accessed July 3, 2002; “intrado Partners with Summit County, Utah, to provide Safety for 2002 Olympic Winter Games, January 10, 2002, <http://www.intrado.com/news/01102002.asp>, accessed July 3, 2002; “Intrado notification offerings” <http://www.intrado.com/offerings/callist.asp>, accessed July 3, 2002.

organizational policies. But in the environment of wireless E9-1-1, the discourse is non-transparent to the lay person and, most likely, to political oversight bodies. The technological jargon and the acronyms camouflage the real-world meaning and implications.

We believe that these four trends contribute to two over-arching privacy implications. *First*, wireless E9-1-1 has produced an environment with evolving technologies, market actors, business models, and governance structures that is less sensitive to the privacy concerns of individuals and more attuned to surveillance of populations and centralization of functions. This is seen in the creation of more sophisticated and detailed maps, the invention of new location identifying devices, the development of new database managing companies, and the consolidation of local government activities. These market and governmental changes – all with the goal of realizing public safety – are not without other, and in this case most often, unintended consequences. In general all of these systems make the ‘monitoring of everyday life’ (Lyon, 2001) more of a reality. In this environment “notice and consent”, or the full package of data protection principles, does not begin to provide any meaningful policy response. These are systems, not just in a technological sense, but also in the broader political economic sense.

The *second* privacy implication is analogous to Lessig and Reidenberg’s⁵⁹ insights regarding the importance of “code” and system architecture in communications systems. The architecture of the ERS systems contains detailed maps, databases, and routing systems – as well as inter-operability among Local Exchange Carriers, Wireless Service Providers, PSAPS, and third party vendors. This architecture will dictate the privacy possibilities. And at this time privacy is not consciously being considered as a factor in the design of these systems. If it is not initially part of the planning, then privacy will be an afterthought and its protection will never be as secure as it needs to be. Furthermore, if the system architecture and the computer code itself regulates the potential for capturing personal information, then the differences we have seen between the implementation of wireless 9-1-1 in Canada and the United States are likely to be rendered less relevant over time.

⁵⁹ Lawrence Lessig, (1999), *Code and Other Laws of Cyberspace*, Basic Books, New York. Reidenberg, J. (1998), ‘Lex Informatica: The Formulation of Information Policy Rules Through Technology’, *Texas Law Review*, vol. 76, pp. 552-593.