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NG9-1-1 Transition Issues Report

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Introduction

A key outcome of the U.S. Department of Transportation (USDOT) Next Generation 9-1-1 (NG9-1-1) Initiative is the identification of well-supported options and crucial transition issues for migrating from today's 9-1-1 system to a NG9-1-1 system across the country. The following analysis documents and summarizes many of the issues facing government, industry, and the general public as the Nation plans for future NG9-1-1 implementation. The scope and breadth of the transition issues characterized here are intentionally broad and includes issues that need to be addressed at the national, state, regional, and local levels to implement NG9-1-1. Based on stakeholder input and existing research, this analysis explores several of the key issues that need to be addressed for successful transition to the NG9-1-1 environment by posing the following questions:

- What are the key questions that need to be answered and what needs to be decided?
- What is the impact of each issue on NG9-1-1 transition activities?
- Who is affected by the issues and how?
- How will varying deployment scenarios change the nature of an issue?
- What are the assumptions or constraints for each issue?

This analysis recognizes that each issue may affect transition to NG9-1-1 and its stakeholders in different ways. Similarly, the priority of the key issues is also expected to vary over time and by location. Therefore, this analysis presents a list of transition issues that is ordered for ease of reference, not in order of priority. Lastly, as highlighted in this analysis, the answers to these critical questions acknowledge that the migration path chosen by a state, regional, or local 9-1-1 Authority[1] may lessen or exacerbate the importance or impact of these transition issues.

Deployment Framework

As defined by the NG9-1-1 Initiative, the NG9-1-1 System is expected to be an interconnected system of local and regional emergency services networks ("system of systems")[2]. However, the boundaries of emergency service networks may vary, depending on local requirements and organizational frameworks. Consequently, although the architecture and underlying requirements of NG9-1-1 will be consistent, it is expected that there will be several paths to implementation of NG9-1-1—all with merit. In some cases, the path to NG9-1-1 implementation will depend on the underlying infrastructure and state of the Public Service Answering Points (PSAP) and 9-1-1 Authorities. Regardless of where PSAPs and 9-1-1 Authorities begin, the majority of NG9-1-1 implementation paths will likely be characterized by some variation of the two deployment frameworks discussed below and in Table 1:

[1] A 9-1-1 authority has jurisdiction over and/or supports a particular 9-1-1 system or PSAP. The 9-1-1 authority could be a county/parish or city government, a special 9-1-1 or Emergency Communications district, a Council of Governments, an individual PSAP, a statewide agency, or other similar body.

[2] USDOT ITS JPO, *Next Generation 9-1-1 (NG9-1-1) System Initiative: Concept of Operations*, April 2007, available at http://www.its.dot.gov/ng911/pdf/NG911ConOps_April07.pdf

- **Independent Deployment:** Building out NG9-1-1 in a piecemeal or "stand-alone" approach that local 9-1-1 Authorities (e.g., townships, counties, parishes, cities) could pursue by deploying NG9-1-1 capabilities without wider coordination or interconnecting guidance and planning. These local 9-1-1 Authorities would have the flexibility to determine how and when to implement the NG9-1-1 requirements and standards. Potentially, different PSAPs would continue to have inconsistent or incomplete 9-1-1 capabilities and functionality, and the opportunity for sharing costs, infrastructure and services with other 9-1-1 authorities on a larger scale would be limited.

- **Coordinated Deployment:** Building out NG9-1-1 in a uniformed, guided approach by regional or state 9-1-1 Authorities to upgrade identified PSAPs to meet a consistent set of nationally accepted NG9-1-1 requirements and standards. PSAPs would have coordinated functions and interconnection. To reach large-scale deployment, 9-1-1 Authorities could employ several different transition paths, including upgrading individual PSAPs, upgrading PSAPs within a region or state, providing functionally specialized PSAPs, consolidating PSAPs, and/or phased approaches based on size or resource availability—but all would involve guidance and coordination through appropriate regional, state, and national mechanisms.

Table 1: Summary of Deployment Frameworks

	Independent	Coordinated
Summary	Customized set of capabilities reflecting conditions, needs, and priorities at the local level	Consistent, guided standardized capabilities and technology platforms at the regional or state level
How	▸ Independent upgrade of individual PSAPs or some PSAPs within a local jurisdiction (e.g., township, county, parish, city) ▸ Inconsistent capabilities	▸ Centrally planned and coordinated upgrade of individual PSAPs, PSAPs within a region, or PSAPs within a state ▸ Coordinated phased approach to upgrade the PSAPs (e.g., based on size of population served and/or availability of resources) ▸ Consistent capabilities
Who Defines	▸ Individual 9-1-1 Authorities	▸ Coordinated 9-1-1 Authorities
Advantages	▸ Enables migration to NG9-1-1 based upon local conditions, needs, and priorities	▸ Promotes consistent and coordinated adoption of NG9-1-1 capabilities and functions ▸ Potentially enables ubiquitous NG9-1-1 capability throughout the regions and states involved
Disadvantages	▸ Limits the opportunity for cost and resource sharing, as well as for consistent large-scale service delivery ▸ Promotes a fractured community further dividing "haves" and "have nots" ▸ Creates limits in realizing full benefit of NG9-1-1 capabilities	▸ Requires a high level of coordination, cooperation, and planning among the state, regional, and local 9-1-1 Authorities involved ▸ May encounter limited support from state or regional entities in some instances

NG9-1-1 Transition Issues

Issue: Current funding, budgeting, and cost recovery policies may not be able to support the implementation and sustainment of NG9-1-1

Impact on NG9-1-1: This may create an inconsistent nationwide footprint of NG9-1-1 by furthering the disparity among PSAPs (e.g., between the "haves" and "have nots"), as well as delay the implementation of NG9-1-1 throughout the Nation. Inconsistent application of NG9-1-1 features will allow persistent misconception by end users who currently expect that the same level and quality of service is available throughout the Nation.

Stakeholder(s) Affected: Funding issues will affect a variety of stakeholders, including 9-1-1 Authorities, state and local governments. 9-1-1 Authorities require sufficient financial resources to upgrade to and maintain the NG9-1-1 system. State and local government agencies may need to determine how to adapt the 9-1-1 surcharge model to accommodate how 9-1-1 will work in tomorrow's environment to ensure that sufficient funds are collected to maintain the 9-1-1 services. In addition, states and local entities that are expecting to use funds designated for 9-1-1, may continue to face funding shortfalls if such funds are redirected to other programs.

Background and Description: The current and prevailing 9-1-1 funding model is to assess subscriber fees on wireline, wireless, and some Voice over Internet Protocol (VoIP) telephone services, which are collected by service providers and then transferred to government agencies to support 9-1-1 services. There is little consistency among and within states on 9-1-1 surcharge rates, which often differ based on the service type (e.g., wireless, wireline, or VoIP) or the location in which the fee is being collected. 9-1-1 Authorities at every level are already experiencing a decline in wireline surcharge revenues as consumers abandon their wireline services and move to using wireless and IP-based technologies (e.g., VoIP) for their primary voice communications. Furthermore, many states and local governments are continuing to divert 9-1-1 funds for non-9-1-1 uses such as balancing state budgets or funding other initiatives. The current funding allocation and cost recovery mechanisms may be insufficient to ensure sustainable funding for future 9-1-1 services, and raises issues of fairness and equitability. For example, there may be new types of equipment that may generate additional costs, such as devices for IP routing and automatic call distribution (ACD) that could be shared among State and local jurisdictions and are not eligible for payment by the funding allocation and cost recovery mechanisms. In addition, sharing the NG9-1-1 backbone network among many state and local jurisdictions will make it difficult to determine how much each jurisdiction must contribute to total network costs.

Assumptions/Considerations: The analysis of this issue assumes funding shortfalls are generally contingent on the continued trend and transition away from traditional wireline service and toward wireless and VoIP services. In addition, it is assumed that there is a failure of state legislatures to take remedial measures to update state laws.

Issue: Security controls for the NG9-1-1 system and emergency data need to be defined and properly managed and maintained

Impact on NG9-1-1: The NG9-1-1 network, like other networks, will continually encounter attempts at illegal access including concerted attacks (e.g., denial of service). If the NG9-1-1 network is compromised by security breaches, it is possible that there will be a disruption in delivering a 9-1-1 call from the public to a PSAP, resulting in delayed or complete interruption of public safety response to emergencies.

Stakeholder(s) Affected: Security is an overarching concern for the entire NG9-1-1 system and will affect 9-1-1 stakeholders, including service providers, equipment providers, 9-1-1 Authorities, and PSAPs. For example, service providers may be responsible for ensuring that the location databases (e.g., Location Information Server [LIS], Location-to-Service Translation [LoST]) and access networks they maintain are secure against threats. 9-1-1 Authorities, on the other hand, may be responsible for ensuring that all connection points to the PSAPs from the NG9-1-1 network meet or exceed the security controls needed to protect the system from hackers. PSAPs are increasingly putting their public safety systems on a shared city or county network, further exposing their systems to attacks from outside sources.

Background and Description: Security control issues for the NG9-1-1 network can affect several different areas of the network, including connection or gateway points to the PSAPs, to the IP access network, to the Internet, and to other public networks via the Emergency Services Network (ESNet), and to external databases potentially managed by other entities. The NG9-1-1 network architecture is designed to interface with various legacy and next generation access and emergency service networks to provide a seamless, interconnected delivery and response environment. The network connection or gateway points between the NG9-1-1 network and other networks or external databases may be exposed to security vulnerabilities, including denial of service attacks, spoofing, and malformed messages that can disrupt 9-1-1 services (e.g., flooding the NG9-1-1 system with fake information and preventing real 9-1-1 calls from being completed). In addition, interfaces may be created with other networks, including public safety entities, third party service providers, and public Internet, which may expose the NG9-1-1 Network to viruses or hacker attacks. Likewise, databases used by the NG9-1-1 network and managed by other entities need to be secured to prevent hackers from potentially manipulating the information in the database. To ensure the NG9-1-1 system of systems is secure, it is crucial that security controls are established to mitigate security risks throughout the NG9-1-1 network. Security controls throughout the NG9-1-1 network may need to be tailored for each network connection because security needs may vary.

Assumptions/Considerations: The analysis of this issue assumes that NG9-1-1 implementations will incorporate industry-leading best practices for security measures to prevent, detect, and mitigate such attacks while continuing to provide seamless and efficient service to legitimate callers. However, security measures should not become an impeding factor for establishing end-to-end emergency calls over IP networks.

Issue: Responsibility for the acquisition and delivery of location information and the mechanism to obtain and verify the location data needs to be defined

Impact on NG9-1-1: Automatic location information is essential in an NG9-1-1 environment to route the 9-1-1 call to the appropriate PSAP, dispatch emergency responders to the right location, and allow for future 9-1-1 capabilities. To continue the current level of 9-1-1 service that provides location information automatically and to allow other 9-1-1 features (e.g., accepting 9-1-1 text messages), location information must be obtained and delivered automatically with an NG9-1-1 call for wireline, wireless, VoIP and other IP-based devices, and any future devices.

Stakeholder(s) Affected: Issues related to the acquisition and delivery of location information will affect service providers (such as infrastructure and access service providers), PSAPs, public safety entities, and the Federal Government. All 9-1-1 service providers, including next generation infrastructure and access providers, have responsibility for helping determine and deliver location information. As for PSAPs and first responders, location information is vital in responding to an emergency. Lastly, a national mandate may be necessary to require service providers to obtain and provide accurate location information for VoIP and other IP device calls.

Background and Description: Caller's location information, whether civic or geospatial in nature, is needed to route emergency calls to the most appropriate PSAP, as well as to ensure responder agencies are dispatched to the correct location. With the transition to NG9-1-1, several location data acquisition, conveyance, and determination issues arise, including—

- Obtaining and verifying caller location information despite the increased mobility and nomadic nature of the general public
- Ensuring that communications devices or systems are capable of delivering location information
- Accurately converting between civic and geospatial information
- Standardizing the location data structures and types received and provided to the PSAPs.

To date, the responsibility to obtain and verify location information for wireline and wireless 9-1-1 calls has been assigned to the common carriers. However, as in the case of 9-1-1 calls from IP-enabled devices using WiFi or WiMax hotspots, the responsible party has not been identified because such service involves not only a service provider (providing the WiFi service hotspot), but an access provider as well (providing the IP/Internet Service). As such, the responsibility could rest with the service and/or the access provider. Before accurate location information can be obtained, the responsible party must be identified and a mechanism that associates and verifies the location data or reference of the caller needs to be developed and deployed.

Assumptions/Considerations: The analysis of this issue assumes that PSAPs will be able to receive 9-1-1 calls from IP-based devices that ultimately connect to an emergency communication network. There may be a variety of 9-1-1 call originating sources public or

private that may connect to NG9-1-1 (e.g., WiFi Hotspot, enterprise local area network). This issue also assumes that E9-1-1 is the baseline of 9-1-1 services available at many PSAPs.

Issue: With the increase of personally identifiable information available with a NG9-1-1 call, existing laws may not be sufficient to protect the privacy of a 9-1-1 caller

Impact on NG9-1-1: For public safety to respond to 9-1-1 calls, personal and identifiable information must be obtained both automatically (e.g., location and telephone number) and directly from the caller or from call stream data. The ability to positively identify the location of a caller, coupled with the ability to automatically identify other personal information that may contribute to effective emergency response, but poses privacy concerns that are certainly present today, and will increase in the NG9-1-1 environment. To further compound privacy concerns, NG9-1-1 offers the ability to interconnect other systems or databases to provide supplemental information such as medical and health data that are currently not widely available to PSAPs and public safety agencies in an automated or electronic fashion. This raises issues of legal privacy and the need for NG systems to adequately address user access and data rights management and the ability to respond to compromised access.

Stakeholder(s) Affected: The confidentiality of 9-1-1 call information can be required by state legislation and regulation, and maintained by adequate system controls and mechanisms. State governments are responsible for developing appropriate legislation and regulation allowing or denying the release of 9-1-1 call records (e.g., voice recording, electronic or printed data, or transcriptions) to ensure the caller's privacy. System service and infrastructure providers may be responsible for ensuring that the mechanisms are in place to adequately control user access and manage the rights to data and information.

Background and Description: Data privacy involves safeguarding personally identifiable information (PII) which can be used to uniquely identify or locate a single person. With the implementation of wireless E9-1-1, many privacy advocates raised concerns that the E9-1-1 technology allowed a wireless service provider to determine the location of the caller based on the cellular telephone. Privacy advocates feared that cellular telephones would become tracking devices for the benefit of both the government and private industry[3]. For example, in the NG9-1-1 environment, service providers could implement a solution that positively identifies the location of a 9-1-1 caller using a mobile IP-based device. In addition to tracking location, the NG9-1-1 system will allow digital transmission and storage of a variety of new types of personal information, such as medical and telematics data, photos of victims, and other visual images. The range of PII that can be collected and transmitted may raise concerns from the many interest groups tracking privacy issues because the quantity and quality of information NG9-1-1 will make accessible to the PSAPs and public safety agencies is well beyond what is currently available. Today's patchwork of privacy legislation from federal, state and local governments make it impossible to identify a lowest common denominator for privacy regulations. The challenge will be to develop legislation, proper system controls and capabilities (e.g., who has

[3] Duke Law and Technology Review, *Enhanced 9-1-1 Technology and Privacy Concerns: How Has the Balance Changed Since September 11?*, October 26, 2001, available at http://www.law.duke.edu/journals/dltr/articles/pdf/2001DLTR0038.pdf

access), and business processes (e.g., how often is information provided, what information is provided) to minimize privacy concerns while balancing the need for data access against the right for privacy.

Assumptions/Considerations: The analysis of this issue assumes that service providers (e.g., infrastructure and/or access) will automatically obtain and provide location information for callers. In addition, it assumes that some states do not have appropriate privacy laws to protect against the illegal access to and use of a caller's identity and information. Finally, this analysis assumes that external, third-party databases or systems will be accessible to NG9-1-1 to provide supplemental data such as medical information and crash data associated with a 9-1-1 call.

Issue: Routing and prioritization in the NG9-1-1 environment is more complex with the ability to dynamically route calls based on factors beyond location of the caller

Impact on NG9-1-1: Call routing, a core component of the NG9-1-1 system, is critical to the functionality of the system. With the IP open architecture, the NG9-1-1 System will enable the ability to route 9-1-1 calls throughout the Nation instead of being limited to a specific area as in today's 9-1-1. Location-to-Service Translation (LoST) servers and a national PSAP uniform resource locator (URL) registry must be developed to support the ability to route NG9-1-1 calls at a national level. LoST servers contents the necessary information (e.g., map service identifiers, geospatial or civic location information) to take the caller's location and determine the routing path to the appropriate NG9-1-1 PSAP based on the PSAP's URL. Without appropriate routing, 9-1-1 calls on the NG9-1-1 system may not reach their destination—the PSAPs. If 9-1-1 calls do not reach the PSAPs, it is possible that they may go unanswered.

Stakeholder(s) Affected: Issues related to routing and prioritizing 9-1-1 calls will affect PSAPs, and are beginning to be addressed by Standards Development Organizations (SDOs). Without defined call treatment protocols and a corresponding PSAP URL registry, 9-1-1 calls may be routed to an inappropriate or unavailable PSAP, affecting the ability of the PSAPs to answer 9-1-1 calls in a timely manner, and may not take full advantage of the routing and treatment capabilities of NG9-1-1. It may require PSAPs to re-route or transfer the 9-1-1 call to another PSAP within the jurisdiction that is capable of answering 9-1-1 calls from specific devices. While SDOs are currently in the process of developing standards or protocols that will allow 9-1-1 calls to be prioritized as emergency calls and routed appropriately within call origination networks, additional work is necessary to add other call treatment features including the application of business rules addressing factors like calling devices, PSAP jurisdiction, and others.

Background and Description: PSAPs typically serve a well-defined, but local geographic region and vary in 9-1-1 capabilities ranging from basic (i.e., landline three-digit dialing, circuit-based transmission) to Wireless Phase II 9-1-1 (e.g., receives wireless 9-1-1 calls and automatically identifies caller location). To date, 9-1-1 calls, for the most part, are routed based on a single factor—location of the caller. However, as NG9-1-1 capabilities are phased into the current 9-1-1 capabilities, it is crucial that a call treatment protocol is created to determine how 9-1-1 calls are routed over an IP network to the appropriate PSAP based on the location of the

caller, the capability of the PSAP, and business rules. Business rules describe the operational definitions and constraints that can be applied to the system to dynamically specify how the system should react under different circumstances. As an example, if a deaf or hearing impaired caller calls 9-1-1 and potentially requires relay services, business rules must be developed determine how the call will be routed to a PSAP that can automatically conference in an interpreting service.

Assumptions/Considerations: The analysis of this issue assumes that if NG9-1-1 is implemented in a phased approach nationwide, not all PSAPs will have NG9-1-1 capabilities simultaneously. It is also important to note that NG9-1-1 system routing will also depend on establishment of the appropriate regulations, protocols, and databases to support nationwide PSAP call routing and the provision of caller location.

Issue: Mechanisms need to be developed to certify and authenticate service and infrastructure providers to allow access to NG9-1-1

Impact on NG9-1-1: Telecommunications services and the access to 9-1-1 by such services are potentially much more complex in the NG environment. The actual services themselves, whether they are the delivery of a 9-1-1 call, or an enhancement to the treatment of that call, could be provided by third party service providers separate from those that provide access to such services. Consequently, mechanisms to regulate, certify, and authenticate service providers of all types critical to emergency communications must be defined to ensure consistent, authorized, and standard contributions to the process and NG9-1-1 PSAPs can receive data-related to 9-1-1 calls.

Stakeholder(s) Affected: The regulation, certification, and authentication of all types of service providers that need to gain access to the NG9-1-1 network will affect service providers and the federal and state government. Without mechanisms to connect to the NG9-1-1 network, service providers will not be able to provide the necessary data and service capabilities. Currently no mandate exists that identifies prerequisites that service providers would be required to meet (e.g., security and standards requirements) to be allowed to directly connect to the NG9-1-1 system as the Local Exchange Carriers (LEC) do to the current system.

Background and Description: To date, LECs serving as 9-1-1 service providers are regulated through the Federal Communications Commission (FCC) and individual state regulatory commissions, and are the only entities with direct access to the 9-1-1 functions. To access the 9-1-1 functions, wireless and VoIP providers must access to the Public Switched Telephone Network (PSTN) through such providers. The FCC requires LECs to allow access to the 9-1-1 network through the PSTN to wireless and VoIP providers. However, this method of connecting to the 9-1-1 network can only handle voice 9-1-1 calls. To ensure that only reputable service providers have access to the NG9-1-1 system, certification and authentication mechanisms must be developed to identify and determine which service providers are allowed to access the NG9-1-1 network in a prescribed and standardized manner. The mechanisms may outline service providers' prerequisites, standards, and requirements to protect the security and promote an open architecture of the NG9-1-1 network.

Assumptions/Considerations: The analysis of this issue assumes that callers will use IP-based device capabilities such as instant messaging, multimedia messaging services, and photo functions to call 9-1-1 in addition to the traditional voice 9-1-1 call.

Issue: NG9-1-1 allows for a level of coordination and resource sharing that does not currently exist in today's 9-1-1 environment

Impact on NG9-1-1: The nature of NG9-1-1 system allows for the sharing of services and resources, including infrastructure and applications. Without establishing an agreed upon framework (institutional arrangement) among PSAPs, 9-1-1 Authorities, and other entities (e.g., public safety dispatch, service providers, etc.), the benefits of sharing resources and services will not be fully realized. This may prevent the realization of potential cost savings by a region or state that has multiple PSAPs and other entities.

Stakeholder(s) Affected: NG9-1-1 enables interconnection of a variety of services and resources not currently used by PSAPs and 9-1-1 Authorities. Cooperation and collaboration with multiple new partners is necessary to realize the full benefit of NG capabilities. The sharing of service and resources will involve PSAPs, 9-1-1 Authorities, and service providers. The PSAPs and 9-1-1 Authorities will need to establish a framework to manage and coordinate sharing relationships. In addition, service providers may be responsible for managing and maintaining some of the shared resources involved. Lack of coordination has consequences at all levels. Local jurisdictions may be unprepared to upgrade their PSAPs for IP-based communications because of a lack of coordination by state and local stakeholders, both public and private, and may be unable to take full advantage NG9-1-1 features like re-routing and call overflow management. The Nation as a whole may also be unable to gain the benefits of a national interconnected emergency number system without stakeholder coordination at the national, state, regional and local levels including potential economies of scale, and more consistent application of NG9-1-1 across the country.

Background and Description: Currently, many PSAPs are individually managed and upgraded, while in some areas PSAP services and upgrades are coordinated through higher level regional or state authorities. Regardless, the current circuit-based dedicated 9-1-1 system architecture does not promote or support the sharing of resources and services among the PSAPs. However, the NG9-1-1 system is based on an open IP architecture. This allows any PSAP to manage and share resources and services to potentially reduce the cost of upgrading and maintaining NG9-1-1 services. It is important that the PSAPs develop and agree upon terms and conditions that identify what will be shared and who will be responsible for operation and maintenance issues. In addition to establishing institutional arrangements among PSAPs, service providers should be involved because they may be responsible for managing and maintaining infrastructure or databases that will be used by the PSAPs. For example, components of the NG9-1-1 system for which responsibility may be shared between public (e.g., PSAPs) and private (e.g., service providers) entities include the PSAP URL registry and routing databases (e.g., LoST). The service providers may be responsible for managing and maintaining the databases, while the PSAPs may be responsible for updating the database based on their jurisdictional boundaries and capabilities. These opportunities for sharing need to be identified and codified to determine who

will be responsible for the resource and how the resource will be managed, maintained, and staffed.

Assumptions/Considerations: The analysis of this issue assumes that in an NG9-1-1 environment, the roles of the PSAPs, responders, and related entities are expected to expand beyond traditional 9-1-1 services with higher levels of interaction, managed situational intelligence, enhanced capabilities, and more comprehensive communication and coordinated response services.

Issue: Industry may be reluctant to develop and adopt open standards which could limit the availability of interoperable NG9-1-1 services and equipment

Impact on NG9-1-1: Lack of support from service providers and equipment manufacturers in developing and adopting open standards will limit the availability of interoperable services and equipment. This will have an impact on the ability of the NG9-1-1 system to interconnect and achieve the NG9-1-1 vision to provide ubiquitous, interconnected NG9-1-1 services across the Nation.

Stakeholder(s) Affected: The availability of open, nonproprietary standards and technology will affect PSAPs and 9-1-1 Authorities procuring equipment and services to upgrade to NG9-1-1. For entities choosing to take an independent approach to NG9-1-1 implementation, the risk of implementing proprietary solutions that do not interoperate with other 9-1-1 and NG9-1-1 systems increases. Some PSAPs will face difficult decisions about which technology to embrace when there are competing proprietary platforms to choose from and not fully realize the ramifications of that decision until a later time when their network cannot be integrated into NG9-1-1.

Background and Description: Open architecture allows for the ability of system architects and maintainers to incorporate new components, install upgrades, or swap one manufacturer's device for another's without being restricted by proprietary constraints. However, given the relatively small market for 9-1-1 equipment compared with business and consumer electronics, and/or the lack of timely and effective open standards, service and equipment providers may choose to move forward by offering proprietary solutions to prospective buyers. Furthermore, to upgrade to new open architecture hardware and software for a small market such as 9-1-1 may make it difficult for service and equipment providers to meet profit margin goals because the cost associated with upgrading may out weight the revenues realized. Similarly, first responder agencies are facing challenges in getting manufacturers to adopt standards for private land mobile radio systems in order to promote interoperability among federal, state, and local emergency responders. Lack of support from service providers and equipment manufacturers in adopting open standards will limit the availability of interoperable services and equipment.

Assumptions/Considerations: The analysis of this issue assumes that the NG9-1-1 system architecture is based on open, non-proprietary standards and technology. In addition, it assumes that implementers of NG9-1-1 solutions will use open architecture to promote interoperability among disparate systems.

Issue: Liability protection or parity needs to be extended to protect stakeholders involved in NG9-1-1

Impact on NG9-1-1: Experience in the deployment of E9-1-1 has shown that a lack of legal clarity on the issue of liability parity can lead to delays in the provisioning of E9-1-1 service. NG9-1-1 will potentially promote a more complex service delivery environment, which will further complicate how liability protection is appropriately provided for new and future services.

Stakeholder(s) Affected: In the current system, 9-1-1 wireless and wireline service providers are afforded protection from liability by legislative action. With the transition to NG9-1-1, new types of service providers will be entering the system. Their standing with respect to liability has not been defined by law. This may prevent the entry of new parties and the provision of data that could speed the delivery of more effective emergency response services.

Background and Description: Within NG9-1-1, a call may include multimedia information containing essential information about the emergency situation that may be necessary to appropriately route the call. The NG9-1-1 call stream could also contain supportive or supplemental data (e.g., weather, traffic information, medical data) obtained through free or paid services. These third-party sources traditionally make their information available to the public or to a limited set of subscribers with access to sensitive information, such as PSAPs. Many of the third-party information sources from which the services will be built are only now being developed. The providers of these data should be aware of the potential for use of their services by PSAP call takers, public safety dispatchers, and first responders. Examples of such information include map displays and other integrated geospatial data, such as those that are becoming available that integrate maps, three-dimensional images, and detailed information about a particular location of the caller. Another example is vehicle telematics crash data that could be used to make dispatch decisions about the quantity and type of responders, and the triage of crash victims to the appropriate medical facility.

Assumptions/Considerations: The analysis of this issue assumes that some 9-1-1 Authorities will be reluctant, or even refuse, to complete VoIP emergency calls because they lack the legal safeguards that protect them from liability which exist today for wireline and wireless emergency calls.

Issue: New capabilities and services enabled by NG9-1-1 could impact PSAP operations and training for both PSAP administrators and call takers

Impact on NG9-1-1: As implementation of the NG9-1-1 occurs, 9-1-1 Authorities and PSAP directors will have to determine how to modify existing PSAP practices and procedures (e.g., standard operating procedures [SOP] and training) and resources (e.g., human machine interface [HMI] solutions for existing customer premises equipment [CPE]) to accommodate NG9-1-1 services. Currently, neither nationwide SOPs nor a training curriculum fully exist NG9-1-1 system operation.

Stakeholder(s) Affected: It is anticipated that the demands on PSAP call takers are likely to increase with the complexity of call taking functions caused by new types of multimedia data. Likewise, 9-1-1 Authorities and PSAPs directors will face the challenge of configuring systems and training call takers to accept and process this new NG9-1-1 data.

Background and Description: As a result of the introduction of the NG9-1-1, PSAP operations will face new challenges associated with the increase in real-time multimedia information—text, still images, or video in addition to voice—passing between a person needing assistance and the call taker. While NG9-1-1 will provide new and enhanced tools to deal with such complexity, the increased quantity of multimedia data will complicate existing call taking functions. Receipt of calls from IP-based communication devices, in addition to conventional wireline calls, could test call takers' ability to maintain their quick and accurate response to emergency situations. In addition, the NG9-1-1 environment will influence how 9-1-1 Authorities and PSAP directors support PSAP operations (e.g., including configuring business rules and systems to limit transmission of extraneous data transactions that can slow response times). Within the NG9-1-1 system, once a call is answered, the PSAP call takers may face increased stress and workloads because of the wide range of information types that could be delivered in each 9-1-1 call.[4] Moreover, the increase in multimedia data may make call records management[5] more challenging because NG9-1-1 will present new information types and formats to archive, such as audio, video, text, still imagery, and other data types[6].

Assumptions/Considerations: The analysis of this issue assumes that responsibilities of 9-1-1 Authorities will likely expand, particularly with regard to configuring the NG9-1-1 system for their PSAP. While the PSAP director's responsibilities will also likely increase, it is assumed that they will be more focused on the daily operations of their specific PSAP and training of call takers to ensure that their PSAP meets the requirements set forth by their 9-1-1 Authority. It also assumes that even though it is anticipated that the NG9-1-1 system will include HMI solutions to assist call takers in answering and processing call data, they may still need to analyze and make decisions regarding what information should be transferred to the dispatchers and first responder agencies based on their training and experience.

[4] In addition to essential information that is necessary to route the call appropriately, call takers (at most PSAPs) may receive a wide range of additional information that is categorized as supportive or supplemental. Supportive data is call data that may support call handling and dispatch beyond essential data (e.g., ACN data). Supplemental data is call data that may complement, but is not necessary for, call handling and dispatch or emergency response (e.g., allergies to certain medications).

[5] Call records management involves creating, logging, archiving, retrieving, and transmitting call records. A call record is the complete, end-to-end record of a call and includes the voice recording, text communications, and essential and supplemental data associated with a call, as well as information added by the call taker.

[6] An NG9-1-1 call will potentially also include considerably more call stream data than is provided in traditional E9-1-1 (which is basically a 10-digit telephone number or, in the case of some wireless 9-1-1 setups, a 20-digit number).

Conclusion

The USDOT has identified potential transition issues to be addressed at the national, state, regional, and local levels before and during the implementation of NG9-1-1. As noted earlier, the level of impact and priority of each issue depends on the implementation pathway employed by the state, regional, or local 9-1-1 Authorities. These deployment scenarios will be further evaluated in the NG9-1-1 Transition Plan to identify strategies that can be adapted and used by the 9-1-1 community in implementing NG9-1-1 across the country. Collectively, the analysis of the issues and the NG9-1-1 Transition Plan will provide a foundation for local and state 9-1-1 Authorities in planning and deploying NG9-1-1.

Appendix A—Definition of NG9-1-1 Stakeholders

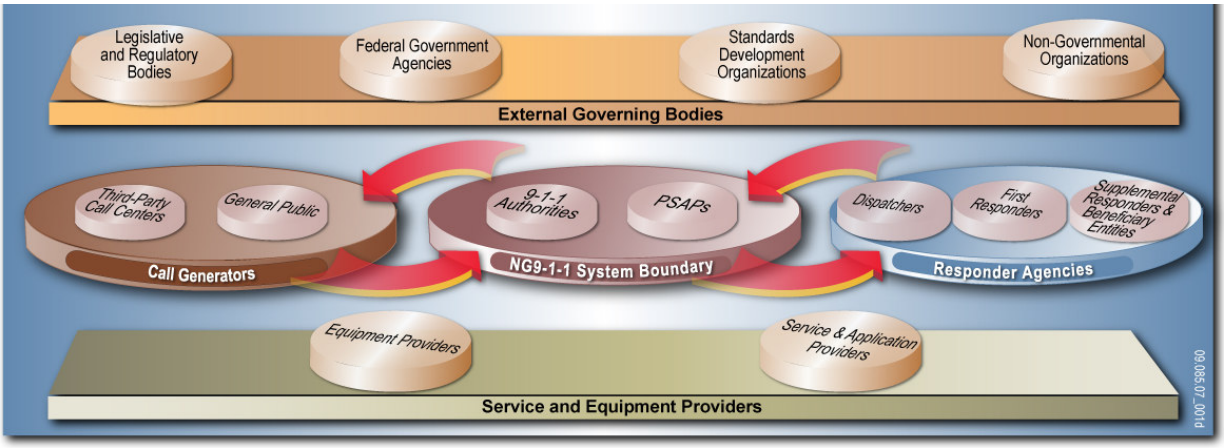

Figure A-1. NG9-1-1 Stakeholder Relationships

Stakeholder roles may change in the transition from today's 9-1-1 environment to the NG9-1-1 environment; however, the extent of change will vary among the types of stakeholders. In this context, "type of stakeholder" refers to an entire stakeholder category rather than individual entities within that category (e.g., responder agencies versus individual first responders). To better understand the fundamental roles and functions of each 9-1-1 stakeholder, the following subsections provide a high-level description of each stakeholder type.

Service and Equipment Providers

Service and equipment providers are responsible for developing, supplying, and sometimes maintaining the hardware, software, and other equipment used by PSAPs in transferring 9-1-1 calls; providing public access to 9-1-1 services, physical and network access, and telecommunications and IT equipment; and helping to maintain the data and information necessary to route and deliver emergency calls. Types of service and equipment providers include 9-1-1 service providers, service access providers, service application providers, and equipment suppliers.

Third-Party Call Center

Third-party call centers receive voice, video, text, images, and other data originating from the public via various services, such as automobile telematics, relay services, medical alert, poison control hotlines, and satellite telecommunications services. These call centers intercede between the general public and 9-1-1 services for a growing number of emergency calls to help support the delivery and processing of the calls involved.

9-1-1 Authority

A 9-1-1 authority has jurisdiction over and/or supports a particular 9-1-1 system. The 9-1-1 authority could be a county/parish or city government, a special 9-1-1 or Emergency Communications district, a Council of Governments, an individual PSAP, a statewide agency, or

other similar body. The 9-1-1 authority generally manages human resource requirements and activities, oversees service delivery, performs high-level database management and support functions, oversees funding and procurement of supporting infrastructure and services, establishes SOPs and operational policies, and is responsible for security at the PSAPs.

Public Safety Answering Point

A PSAP is the generic name for an emergency communications center agency that receives, processes, and transfers 9-1-1 calls. Some PSAPs also direct or dispatch 9-1-1 or other emergency calls to appropriate police, fire, and emergency medical services (EMS). PSAPs throughout the Nation have different levels of capabilities and functions and are typically categorized as follows: "Greenfield" 9-1-1, Basic 9-1-1, E9-1-1, or Wireless E9-1-1.[7]

PSAP Call Taker

A PSAP call taker is a person who receives emergency and non-emergency calls, determines the nature of caller situations, elicits the location of the emergency and other necessary information, and relays essential information to dispatchers, staff, and other agencies as needed, using telephony and computer equipment. In some instances, the call taker may also be the dispatcher, and in that case, the call taker/dispatcher communicates directly with the responders. In other cases, the call taker may provide emergency instructions to the caller prior to the arrival of first responders.

Responder Agencies

Responder agencies—dispatch entities, law enforcement, fire and rescue, EMS, supplemental responders, and beneficiary entities—have a legal or consensual obligation to respond to or obtain information from emergency calls to support comprehensive incident management.

Legislative and Regulatory Bodies

Legislative bodies exist at the federal, state, and local levels to draft and pass legislation for the welfare and benefit of the public. Of interest to this report is legislation related to the 9-1-1 services. To ensure that the provisions of the legislation are implemented and enforced, regulatory bodies at each level of government may write draft regulations that are open to public comment, but binding on the public once promulgated in final form. The regulatory body itself or a court having the appropriate jurisdiction may impose sanctions for regulatory infractions. For example, revising tariffs, mandating a nationwide IP-enabled emergency network, enforcing IP security standards to ensure privacy of information transmitted on the NG9-1-1 System, and regulating how 9-1-1 fees are collected can be completed in a way that is consonant with the entire policy context for 9-1-1. Examples of legislative and regulatory bodies include state legislatures, Public Utility Commissions (PUCs), and the FCC.

Federal Government Agencies

Federal Government agencies are responsible for establishing policies and funding, providing leadership, and promoting coordination and communications between agencies and organizations

[7] "Greenfield" 9-1-1 refers to PSAPs that lack a call center and only provides 9-1-1 service through remote call forwarding. See Appendix A, p. A-1 for definitions of the PSAP categories.

involved with 9-1-1 services. The Federal Government also provides a framework for state and local governments to transition from the current 9-1-1 system to the NG9-1-1 System. The most prominent government organizations involved in 9-1-1 include the USDOT Intelligent Transportation Systems Joint Program Office, Department of Homeland Security, USDOT National Highway Traffic Safety Administration–National Telecommunications and Information Administration National 9-1-1 Implementation and Coordination Office, Department of Justice, FCC, and Department of Health and Human Services.

Non-Governmental Organizations

Non-governmental organizations include those agencies and organizations that are considered part of the private sector. Non-governmental organizations play a critical role in the implementation of the NG9-1-1 System because of their involvement in identifying the needs of their membership, thereby shaping the products and services used by consumers and PSAPs who use the NG9-1-1 System. Examples of non-governmental organizations include SDOs, professional and industry associations, citizen and special interest advocacy organizations, private emergency response and recovery organizations, and research and academia.

General Public

The general public relies heavily on the ability to access 9-1-1 service with full functionality through any communications device during an emergency. The public expects a timely response from the emergency responder agencies once a call is made to 9-1-1 and determines the success of the 9-1-1 service based on the response time. To date, the general public can make 9-1-1 calls through wireline telephone, wireless telephone, teletype/telecommunications device for the deaf (TTY/TDD) over wireline, and VoIP, and indirectly through third-party call centers associated with telematics and relay services.

Appendix B—Acronym List

ACD	Automatic Call Distribution
CPE	Customer Premises Equipment
E9-1-1	Enhanced 9-1-1
EMS	Emergency Medical Services
ESNet	Emergency Services Network
FCC	Federal Communications Commission
HMI	Human Machine Interface
IP	Internet Protocol
LEC	Local Exchange Carrier
LIS	Location Information Server
LoST	Location-to-Service Translation
NG9-1-1	Next Generation 9-1-1
PII	Personally Identifiable Information
PSAP	Public Service Answering Point
PSTN	Public Switched Telephone Network
PUC	Public Utility Commission
SDO	Standards Development Organization
SOP	Standard Operating Procedure
TTY/TDD	Teletype/Telecommunications Device for the Deaf
USDOT	U.S. Department of Transportation
VoIP	Voice over Internet Protocol
WiFi	Wireless Fidelity