NENA Technical Information Document on Future 9-1-1 Models

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TECHNICAL INFORMATION DOCUMENT

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NENA's Technical Committee has developed this document. Recommendations for change to this document may be submitted to:

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Acknowledgments:

The National Emergency Number Association (NENA) Future Models Working Group has developed this document.

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1 Executive Overview

1.1 Purpose and Scope of Document

1.1.1 Purpose: To develop models of 9-1-1 systems that will provide the features and functionalities that the public safety organizations need to do their job of responding to 9-1-1 calls. The models have been developed with a view to the future in that each model represents either a view of what currently exists or what is expected to exist at a pre-defined point in the future.

1.1.2 Scope: The scope of this document is limited to which a function or feature meets at least one of the following criteria:

1.1.2.1 Provides information about the person or source of the 9-1-1 call.

1.1.2.2 Provides the caller's location

1.1.2.3 Identifies the emergency, including allowing for interfaces to receive that emergency data from specific systems.

1.1.2.4 Provides the telecommunicator with information on what and how to dispatch.

1.1.2.5 Describes equipment performance features

1.1.3. Caveat: These models do not represent component design, but provide the framework within which the other NENA committees can design and develop recommendations and standards.

1.2 Reason for Issue

These Models serve to provide functions and features to:

1.2.1. Vendors to inform them as to what products and services they should be planning.

1.2.2. Customers to inform them as to what the equipment that they order or plan to order should be capable of performing.

1.2.3. NENA Committees to provide guidance on what recommended standards should be developed.

1.3 Reason for Reissue

NENA reserves the right to modify this document. Whenever it is reissued, the reason(s) will be provided in this paragraph. This reissue has been done to reflect changes in features available since the previous reissue was published.

1.4 Recommendation for Standards Development work

No. While the “near term” and “five-year horizon” features in this document may require Standards Development Work in the future, it is not the intent of this document to define that work.

1.5 Costs Factors

Not Applicable.

1.6 Acronyms/Abbreviations

This is not a glossary! See NENA 01-002 - NENA Master Glossary of 9-1-1 Terminology located on the NENA web site for a complete listing of terms used in NENA documents.

The following Acronyms are used in this document:	
ACN	Automatic Collision Notification
ALI	Automatic Location Identification
ANI	Automatic Number Identification
ASCII	American Standard Code for Information Interchange
CAD	Computer-Aided Dispatch
CAMA	Centralized Automatic Message Accounting
CML	Abbreviation for company name “CML Emergency Services”
CPE	Customer Premises Equipment
TDD/TTY	Telecommunication Device for the Deaf/Teletypewriter
DTMF	Dual Tone Multi-Frequency
EPROM	Erasable Programmable Read-Only Memory
ESRD	Emergency Services Routing Digit
ESRK	Emergency Services Routing Key
GP	Geographical Portability
GSM	*Groupe Speciale Mobile* / Global System for Mobile Communications
IETF	Internet Engineering Task Force
IP	Internet Protocol
LNP	Local Number Portability
MDT	Mobile Data Terminal
MSA	Metropolitan Statistical Area
NXX	Telephone numbering code for Exchange Code
pANI	pseudo-Automatic Number Identification
PAS	Priority Access Service
PBX	Private Branch Exchange
PCS	Personal Communications Service
PDE	Position Determining Entity
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
SS7	Signaling System 7
TSP	Telephone Service Priority
VoIP	Voice over Internet Protocol
XML	eXtensible Markup Language

2 Technical Description

2.1 Overview

2.1.1. Driving concept: For decision makers to plan, they need to not only know what exists and what is coming in the future, but also to know when a certain feature or function will arrive. Thus this Technical Information Document consists of models by timeline. That is, it shows what is currently available for purchase, then in subsequent models what members of the Future Model Study Group (that created this report) expect will or should be provided for purchase at later dates.

2.1.2 Caution: Although a feature may be available for purchase by a vendor, this does not imply that it may be available by the vendor (including 9-1-1 Service System Provider) that serves a particular PSAP. Additionally, state PUC regulations in one state may not allow a feature or service that is available in another state. An example is that some states will allow overflow calls to be routed to a back-up PSAP, while other states require that the caller receive a busy signal.

2.1.3 Basis for the models: The basis for all the models is a "Master Model" that lists all current and likely future features and functions. From this Master Model was created a "Current Model" selecting just those features and functions that are currently available. Then from the Master Model are taken those features and functions that are expected to be available in the coming 12 months and have created the "Coming This Year" model, and so on for each of the subsequent models.

2.1.3.1 Color Coding: Because it is important to be able to see from the Master Model where each timeline model took its features and functions, the appropriate text is color coded. The timeline models are listed below. The colors assigned are those used in the Master Model to show which feature/function belong in which model. Where a category is split into sub-sections, the category heading takes the color of the sub-section that is soonest on the event horizon. The Master Model is the section labeled "2.2."

2.1.3.2. Current Model – A list of all currently available, standard features. This provides a basic understanding of what a typical 9-1-1 system could have as a feature. Only one vendor need have this feature available in order for it to be classified in the Current Model. Thus, it may not be available to a particular PSAP or carrier. This is the section labeled "2.3."

Assigned color for Current Model: black.

2.1.3.3. Coming This Year – A model of what new features are new within the last few months and are either just available for purchase or are being rolled out for sale within the next 12 months. The concept here is to provide a list of "What I should plan to consider for purchase" for potential customer use. Of course, vendors may use this to ensure they are keeping up with the competition. This is the section labeled "2.4."

Coming This Year – red (as in "red indicates action now")

2.1.3.4. Near Term – A model of what is expected to be available within the next three years. This will guide product managers and market planners. This is labeled "2.5."

Near Term – green (a good readable color that is between red and blue)

2.1.3.5. Five-Year Horizon – A model of what may be available in five or more years. This should be used by strategic planners and design engineers to develop solutions to meet these concepts. This is labeled "2.6."

Five-Year Horizon – **blue** (as in "blue sky idea")

Parenthetical notes have been inserted in some entries to explain its context or why a specific time was selected. These notes are in black italics.

NOTE TO READERS: Please feel free to comment on this document. I would appreciate knowing of any changes in availability of functions and features by any vendor or E9-1-1 System Service Provider. Commercial press releases are welcome. I would like to stay current with industry changes as this document is updated three times a year.

Also, if a reader would like a little more understanding of an item, please contact me.

Send your emails to Russ Russell, CM, ENP, PMP, at "Russ911911@comcast.net."

2.2 Master 9-1-1 Model

This model is color-coded to show to which current or future model each feature or function belongs. See paragraph 1.3.3 above for codes. The following are features and functions of the Master 9-1-1 Model:

2.2.1. System is accessed via "9-1-1" dialed by caller.

2.2.1.1. Should be touch tone-generated numbers (i.e., DTMF).

2.2.1.2. No other numbers should be used to access 9-1-1 services (e.g., *9, 7-digit) as determined by the *Wireless Communications and Public Safety Act of 1999*.

2.2.2. 9-1-1 Network

2.2.2.1. Calls are processed by a 9-1-1 Network that has special features required to allow routing based on pre-established criteria provided by the appropriate 9-1-1 Public Safety Agency and controlled by the 9-1-1 Service System Provider. *This does not pre-suppose that it is a CAMA-type, ISDN or Internet network, just states the concept. The first rule of call management is to keep calls within the network where known features can be used to manage the calls.*

2.2.2.2. Calls from non-public emergency response systems, including alarm system organizations, at the option of the 9-1-1 authority, arrive on the system with full capability of call management equal to that of a dialed 9-1-1 call. *Canada already has this for Operator Services.*

2.2.3. Enable TTY/TDD communication.

2.2.3.1 Be able to pass voice and Baudot tones.

2.2.3.2 Be able to process ASCII TTY/TDD.

2.2.3.3 Be able to pass typed messages via faster, more sophisticated method (next generation).

2.2.4 Transfer 9-1-1 calls to a PSAP that is responsible for the caller's location where the call will be answered.

2.2.5. Provide information describing the caller's location in industry-approved format:

2.2.5.1 For landline calls, including users behind PBXs, the street address must be provided.

2.2.5.2 For wireless calls (where the phone is mobile) the accuracy is defined in meters. *This means only in most general terms such as Wireless 9-1-1 Phase I and Phase II.*

2.2.5.3 For wireless calls that have some connectivity to a fixed geographical location (such as wireless local loop), the street address is required.

2.2.5.4 Enable the network to identify the location of an IP connections so that a 9-1-1 call placed from this connection would be routed to the appropriate PSAP. *There are two Internet Engineering Task Force (IETF) location recommendations: One is providing location based on street address, the other location based on latitude, longitude and height above mean sea level.*

2.2.6. Ability to send personal information over the phone (A caller's data would be available based on some user identification such as social security number or SmartCard ID.) *This is only the ability to send, a different aspect than a PSAP call taker's ability to retrieve. This concept does not preclude the possibility that a PSAP call taker would have the ability to block that information if the call taker did not need it.*

2.2.6.1. via Wireless

2.2.6.2. via VoIP

2.2.6.3 via Public Switched Telephone Network

2.2.7. Call Delivery Time

2.2.7.1. For landline calls, the ability to connect the call to the appropriate PSAP within 1.2 seconds of the last digit being dialed.

2.2.7.2. For wireless calls

2.2.7.2.1. Phase I Routing (including air interface time of 1.5 seconds) within 2.5 seconds.

2.2.7.2.2. Phase II Routing (There is no time recommendation at this time as we need more info, although the FCC's OET 71 requires location to be delivered with 30 seconds when that location's accuracy is being tested [page 4]). A provider to *St. Clair County, IL, currently routes some calls based on Phase II location data. However, often the Phase II location arrives too late for routing, so that routing is done via Phase I. An effort to standardize this is currently underway in TR45.2. GSM networks could do better than Phase I, but this would be a very non-standard solution. Issue is the ability of the system to deliver the lat/long sufficiently fast (within five seconds) for routing.*

2.2.8. Enable transfers of the call with ALI to:

2.2.8.1 Another position within the PSAP

2.2.8.2 A different PSAP connected to the same selective router

2.2.8.3 A different PSAP connected via:

2.2.8.3.1 Non-traditional selective routing, such as via Intelligent Network. PSAP-to-PSAP ALI transfers are accomplished thru transfer of the original caller's ANI from the station that originally took the call to the alternate PSAP. Use of the inter-tandem trunk groups are used to accomplish tandem-to-tandem PSAP transfers. Once the ANI is received at the receiving PSAP, another query is sent to the ALI database providing the final destination PSAP with the ALI of the original caller. *Being done in Vermont via SS7.*

2.2.8.3.2 A different selective router (supposing a common interface protocol so that all selective routers, regardless of manufacturer, would be able to transmit and receive the information, preferably via the PSTN) that is served by the same ALI database. This transfers the ANI, but still requires the second PSAP to dip for the ALI, which would be available to that PSAP.

2.2.8.4 Interface a Computer-Aided Dispatch and/or Record Management System

2.2.8.5 Interface a mobile data terminal

2.2.8.6 Interface other emergency services, such as a poison control center. *This is currently done in Texas.*

2.2.8.7 A PSAP that is out of local area (e.g., across country, to Canada, to Mexico, to the world)

2.2.9. Have the following ALI features: This is for "automatically" delivered info only. There is a separate section for Location Information that is recommended as discretionary.

2.2.9.1 ALI record is based on the subscriber's telephone number or profile number

2.2.9.2 NENA company ID code

2.2.9.3 Line category:

2.2.9.3.1 Class of Service code (whether residential, business, etc.)

2.2.9.3.2 Whether Foreign Exchange or Wireless

2.2.9.4 Address/Location Information:

2.2.9.4.1 For landline, provide:

2.2.9.4.1.1 Street address with sub-location (floor and room/cubicle, etc.) where necessary to direct response without delay.

2.2.9.4.1.2 Latitude, longitude and **altitude (above mean sea level [MSL]) or elevation (above ground level [AGL])**.

2.2.9.4.1.3 Map Grid coordinates (for PSAPs that use local maps for dispatch). *There is some discussion that this should not be automatically provided as some locations generate this locally.*

2.2.9.4.1.4 Person's secondary number, such as a cellular phone as a lookup

2.2.9.4.2 For VoIP, provide:

2.2.9.4.2.1 Street address with sub-location (floor and room/cubicle, etc.) where necessary to direct response without delay.

2.2.9.4.2.2 Latitude, longitude, **uncertainty, confidence factor** *(for confidence factor, this would be with IP phones that could be moved [It is realized that confidence factor is available with Wireless E9-1-1 Phase II, but this section deals only with landline services.])* and **altitude (above mean sea level [MSL]) or elevation (above ground level [AGL])**.

2.2.9.4.2.3 A secondary telephone number to location of the IP port address can be added to the ALI database. Could be combination of the MAC address of the closest router and the port number. *When a call is being made from one of these ports, there would be two telephone numbers: One, which is the number of the subscriber, Two, the number associated with the IP port.*

2.2.9.4.3 For cellular wireless (including PCS and GSM) where the mobile phone is not restricted in movement, provide:

2.2.9.4.3.1 Cell Tower's latitude, longitude, address and description of cell sector radio coverage.

2.2.9.4.3.2 Dynamic update of information on the cell sector that has the call so that if the caller moves to another sector, this can be updated to always be current. *PDE obtains the location periodically and automatically makes it available for delivery to the PSAP (versus pull requests). This may involve providing a flag to the call taker that a location update is available, if the PSAP doesn't want the update automatically displayed*

2.2.9.4.3.3 Mobile Phone's:

2.2.9.4.3.3.1 latitude, longitude, confidence factor, uncertainty and **altitude (above sea level) or elevation (above ground)**.

2.2.9.4.3.3.2 **velocity and direction**.

2.2.9.4.3.3.3 map grid coordinates (for PSAPs that use local maps for dispatch). *There is some discussion that this should not be automatically provided as some locations generate this locally.*

2.2.9.4.3.4 Subscriber's address (but with obvious designation that this is a "home" [i.e., the subscriber's billing] address, not the location from which the call is being made.)

2.2.9.4.3.5 Location updated on demand by the PSAP.

2.2.9.4.4 For wireless calls that are restricted in movement (e.g., wireless local loop):

2.2.9.4.4.1 The above list for wireless (less ALI location update if caller moves)

2.2.9.4.4.2 Address information that informs the call taker that the phone is restricted to a geographic location or area (e.g., wireless local loop). *Western Wireless is doing this.*

2.2.9.5 Have a lookup capability to a supplementary database that provides the logical addresses of each record thus defining the telecommunications service provider and ALI database service provider. This would enable PSAPs to determine the source of a record with an error where those company IDs are not available from the ALI display. It could be used for ALI Steering and to determine if the number has been ported. *The "function of R" in the Intrado database in Texas functions, but it is not fully implemented.*

2.2.9.6 Ability to do ALI Steering with the following:

2.2.9.6.1 The routing of an ALI request from an PSAP to the appropriate ALI database service company based on the ANI, pANI, ESRD or ESRK that is received. *This is sometimes known as a "pull" of ALI.*

2.2.9.6.2 Predetermining the PSAP to which an ALI should be delivered and pushing that ALI to the PSAP, without waiting for a request. *This is sometimes known as a "push" of ALI.*

2.2.9.6.3 The exchange of 9-1-1 ALI database information among Competitive Database Providers. *This is becoming critical as Local Number Portability (LNP) expands into the next set of Metropolitan Statistical Areas (MSAs) and we move toward Geographic Portability (GP).*

2.2.9.7 Specific call tag, unique to an incident, that would allow all data related to that incident to be associated. This would enable retrieving all associated data when doing an incident report. *This does exist for CAD systems, however, the intent of this is for the 9-1-1 system itself to assign the call tag for the universe of data that arrives, such as ACN, 9-1-1 call, police officer's MDT report.*

2.2.10 Call Information On-Demand. Establish PSAP and 9-1-1 Network capabilities to know what additional information is available about the 9-1-1 caller and the emergency, so that at the PSAP call-taker's command, this information would be retrieved. *This is the pre-established data path from a telematics service provider to a PSAP to provide this information, not the verbally communicated data which is currently available.*

2.2.10.1 Automatic Collision Notification data: *This is available today only verbally.*

2.2.10.1.1 Location information by latitude, longitude and street address. *Note: Dispatchers are concerned that if a specific address is generated from a lat/long and that address does not exist or because of the uncertainty factor, may be wrong, that they should not rely on such a street address. Pilot is currently underway in Greater Houston County, Texas, by the county, Ford Motor Company and Intrado.*

2.2.10.1.2 Airbag deployment

2.2.10.1.3 Automatic opening of a microphone and receiver in the vehicle to allow two-way conversation with either PSAP or third-party service provider that could patch call to the appropriate PSAP.

2.2.10.1.4 Number of passengers in vehicle and each person's weight by seat occupied

2.2.10.1.5 Data previously provided by the vehicle owner(s) for storage with the telematics company to be made available when necessary.

2.2.10.1.6 Delta (i.e., change in) velocity and principal direction of force.

2.2.10.1.7 Orientation of vehicle at time of collision and after collision, and whether the vehicle rolled.

2.2.10.2 Health Monitors that report condition of patient

2.2.10.3 Highway Condition information to keep map displays current

2.2.10.4 Personal Health data from insurance companies or person's doctor. May be just the location of the person's medical records.

2.2.10.5 The driver's "smart card." A smart card would have a person's personal data that is recorded on an EPROM or magnetic strip. The driver would insert his smart card into a read slot in the vehicle. Should the vehicle become involved in a collision, this would enable pertinent medical data to be sent to the telematics center, which could then forward it to emergency medical personnel.

2.2.11 Seamlessly integrate external data with ALI. System automatically takes information from outside the 9-1-1 system and provides hyperlink-type integration (See new Internet XML format.). *This refers to the automated transmission of the data, not the providing of it via a person at the telematics (Automatic Collision Notification (ACN)) center talking to a PSAP call-taker.*

2.2.11.1 Automatic Collision Notification data. *See 2.2.10.1 for list.*

2.2.11.2 Health Monitors that report condition of patient

2.2.11.3 Highway condition information to keep map displays current

2.2.12 Ability of the alarm company connectivity to enable the PSAP call-taker to speak back through the alarm company's circuits/radio path to the scene of the emergency. *By eliminating the need for an alarm company representative to relay messages, the ability of the PSAP to send the most appropriate help faster is improved.*

2.2.13 Allow for creation and update of ALI with inputs from:

2.2.13.1 Wireline carriers to database management system to PSAP ALI controller

2.2.13.2 Wireless carriers to database management system or local PSAP ALI controller

2.2.13.3 PSAP administrators (and authorized telecomunicators)

2.2.13.4 PBX service providers, where the PBX provides enhanced 9-1-1.

2.2.14 Map display of the caller's location.

2.2.14.1 Basic initial information about the caller's location:

2.2.14.1.1 Appropriate symbol to mark the location (perhaps a circle that defines the circular error probability)

2.2.14.1.2 Velocity and direction, if system requests it

2.2.14.1.3 Add company code of the local street map publisher to the map for those Emergency Response Units that do not have a map display in their vehicle.

2.2.14.2 Update abilities:

2.2.14.2.1 Update upon manual request

2.2.14.2.2 Periodic update based on time set by call-taker (e.g., update every 10 seconds, every minute, every five minutes)

2.2.15 Call history maintained for follow-up and employee development

2.2.15.1 Time and date of last few calls

2.2.15.2 Incident

2.2.15.3 Call taker's ID

2.2.15.4 Results of call

2.2.16 Ability to know a third party that should be notified concerning the 9-1-1 caller's emergency. *This third party could be a parent, a spouse, an organization, etc.*

2.2.17 PSAP Position Mobility.

2.2.17.1 Remote Access: Enable a set of telecommunications equipment (that comprises a PSAP or PSAP position) to be set up almost anywhere and dial into a port to enable the PSAP to operate away from a fixed location.

2.2.17.2 Wireless PSAP: Have the positions communicate via standardized wireless protocol. This would use radio for the full range of equipment and systems used by a Telecommunicator at a PSAP: voice, ANI, ALI, CAD, etc. *CML's Command Post can communicate via wireless*.

2.2.18 Data Transfer. Ability to transfer categories of info, such as name, address, remarks section, call history, **latitude, longitude, personal profile, building floor plans, site images**, etc., from one PSAP to another.

2.2.19 PSAP Automation:

2.2.19.1 Dynamic PSAP. Enable additional PSAP positions to be activated when required upon supervisor's request. Example: Call takers who are working on admin lines at a PSAP position or at home could be contacted and requested to come online as an additional PSAP position.

2.2.19.2 Robotic PSAP. Enable basic or initial PSAP functions, such as call-answering with ALI display to be handled in an automated process. Perhaps use voice recognition to do some tasks.

2.2.20 Dynamic congestion control of 9-1-1 trunks:

2.2.20.1 Establish congestion control that can be set and changed by (examples: Spike Masking, dynamic call volume capacity and simulated facility groups (SFGs)): *Technically, this is possible now, but the issue of liability blocks this from being implemented.*

2.2.20.1.1 PSAP

2.2.20.1.2 9-1-1 Service Provider

2.2.20.2 Provide automatic notification to PSAP when congestion control has been enabled (i.e., calls are being blocked)

2.2.20.3 Enable manual changing of congestion choke points by PSAP. *This is listed for the five-year model owing to the need to resolve liability issues.*

2.2.20.4 Provide for dynamic management of congestion control via a graphic interface that impacts all carriers providing service in geographic zones.

2.2.20.5 Provide automatic notification to a back-up PSAP (beyond use of Flashing ANI) that it is now taking overflow calls originally meant for another PSAP. *This is required for digital transmission such as via the TCAP parameter.*

2.2.21 Have alternate routing for calls blocked by full trunks or trunk failures. Have a catastrophe procedure to divert all 9-1-1 calls should a PSAP fail.

2.2.22 9-1-1 Priority: Where 9-1-1 calls are not transported over a dedicated network (such as a mobile radio system) the system would have a priority handling capability for the 9-1-1 calls.

2.2.22.1 For IP calls being placed from within an IP-capable PBX, a 9-1-1 call would receive priority among calls leaving the PBX. XXXX to red

2.2.22.2 Integrate with other priority programs, such as Priority Access Service (PAS) and Telephone Service Priority (which is a service restoral priority versus call-delivery).

2.2.23 Provide real-time messaging between positions at a PSAP. Examples of use: maintenance, instructions to call takers from shift supervisors.

2.2.24 Allow 9-1-1 call takers to accept non-9-1-1 calls: administrative calls, 3-1-1 calls (transferred from 3-1-1 call taker), TTY relay services, identify test calls, etc.

2.2.25 Enable administrative calls (i.e., calls received on the admin number and inter-telecommunicator calls) to be transferred with data, including notes entered by the call taker. *The reverse is available to 9-1-1 systems (i.e., in an ACD system, the 9-1-1 calls can be routed to the non-emergency queue when all 9-1-1 call takers are busy. The ALI is also transferred. This can be done via CAD systems serving both, but this is to be done via the telephony CPE.)*

2.2.26 Third Party, Private Emergency Notification: Where there are Automatic Collision Notification, panic alarms, health monitor alarms, etc., enable them to automatically provide emergency notification to the PSAP. Allow PSAPs to receive calls and data sent by automatic collision notification systems and other private monitoring services, although this may have to go through a service bureau first. *One problem is legal: State and municipal laws prohibit automatic 9-1-1 calling.*

2.2.26.1 Provide prior to call answer

2.2.26.2 Provide subsequent to call answer upon command from PSAP call taker

2.2.27 Establish dedicated NXX for PSAPs (e.g., 9-1-1) so that calls could be transferred out of the area to a PSAP via public switched telephone network. *5-1-1 and 7-1-1 are being used in some locations.*

2.2.28 Call Hold and Ringback (Canadian and New Jersey requirement for wireline)

2.2.29 Abandoned call treatment: Enable the PSAP to capture information about calls attempted.

2.2.30 PSAP to have alternate telephone numbers so that outside official parties can contact them, such as would be the case where 9-1-1 calls are transferred from out of the region. These circuits would allow the receipt of data with the voice call.

2.2.31 Dynamic ALI Updates: Enable all certificated telecommunications carriers to provide real-time updates to the Database Management System to reach the ALI database, when a person signs up for service.

2.2.32 Secure IP Network: Have a dedicated secure (i.e., point-to-point) network as the IP network for carriers. Would enable a PSAP to request private information about a carrier's subscriber to assist in emergency response. Example: Home or billing address, name of next of kin.

- - - END OF MASTER MODEL - - -

Current 9-1-1 Model

2.3.1 System is accessed via "9-1-1" dialed by caller

2.3.1.1 Should be touch tone-generated numbers (i.e., DTMF).

2.3.1.2 No other numbers should be used to access 9-1-1 services (e.g., *9, 7-digit) as determined by the *Wireless Communications and Public Safety Act of 1999*.

2.3.2. 9-1-1 Network

2.3.2.1. Calls are processed by a 9-1-1 Network that has special features required to allow routing based on pre-established criteria provided by the appropriate 9-1-1 Public Safety Agency and controlled by the 9-1-1 Service System Provider. *This does not pre-suppose that it is a CAMA-type, ISDN or Internet network, just states the concept. The first rule of call management is to keep calls within the network where known features can be used to manage the calls.*

2.3.2.2. Calls from non-public emergency response systems, including alarm system organizations, at the option of the 9-1-1 authority, arrive on the system with full capability of call management equal to that of a dialed 9-1-1 call. *Canada already has this for Operator Services.*

2.3.3 Enable TTY/TDD communication

2.3.3.1 Be able to pass voice and Baudot tones.

2.3.3.2 Be able to process ASCII TTY/TDD.

2.3.4 Transfer 9-1-1 calls to a PSAP that is responsible for the caller's location where the call will be answered.

2.3.5 Provide information describing the caller's location in industry-approved format to an accuracy defined in meters:

2.3.5.1 For landline calls, include users behind PBXs (including street address and/or location relevant to the PBX)

2.3.5.2 For wireless calls (where the phone is mobile). *This means only in most general terms such as Wireless 9-1-1 Phase I and II.*

2.3.5.3 For wireless calls that have some connectivity to a fixed geographical location (such as wireless local loop)

2.3.6 Call Delivery Time

2.3.6.1 For landline calls, the ability to connect the call to the appropriate PSAP within 1.2 seconds of the last digit being dialed.

2.3.6.2 For wireless calls

2.3.6.2.1 Phase I Routing (including air interface time of 1.5 seconds) within 2.5 seconds.

2.3.6.2.2 Phase II Routing (no recommendation at this time as we await results of trials). A provider to *St. Clair County, IL, current routes some calls based on Phase II location data. However, often the Phase II location arrives too late for routing, so that routing is done via Phase I. An effort to standardize this is currently underway in TR45.2. GSM networks could do better than Phase I, but this would be a very non-standard solution. Issue is the ability of the system to deliver the lat/long sufficiently fast (within five seconds) for routing.*

2.3.7 Enable transfers of the call with ALI to:

2.3.7.1 Another position within the PSAP

2.3.7.2 A different PSAP connected to the same selective router

2.3.7.3 A different PSAP connected via:

2.3.7.3.1 Non-traditional selective routing, such as via Intelligent Network. PSAP-to- PSAP ALI transfers are accomplished thru transfer of the original caller's ANI from the station that originally took the call to the alternate PSAP. Use of the inter-tandem trunk groups are used to accomplish tandem-to-tandem PSAP transfers. Once the ANI is received at the receiving PSAP, another query is rendered of the ALISA database providing the final destination PSAP with the ALI of the original caller. *Being done in Vermont via SS7.*

2.3.7.3.2 A different selective router (supposing a common interface protocol so that all selective routers, regardless of manufacturer, would be able to transmit and receive the information, preferably via the PSTN) that is served by the same ALI database. This transfers the ANI, but still requires the second PSAP to dip for the ALI, which would be available to that PSAP.

2.3.7.4 Interface a Computer-Aided Dispatch and/or Record Management System

2.3.7.5 Interface a mobile data terminal

2.3.7.6 Interface other emergency services, such as a poison control center. *This is currently done in Texas.*

2.3.8 Have the following ALI features: This is for "automatically" delivered info only. There is a separate section for Location Information that is recommended as discretionary.

2.3.8.1 ALI record is based on the subscriber's telephone number or profile number

2.3.8.2 NENA company ID code

2.3.8.3 Line category:

2.3.8.3.1 Class of Service code (whether residential, business, etc.)

2.3.8.3.2 Whether Foreign Exchange or Wireless

2.3.8.4 Address/location information:

2.3.8.4.1 For landline, provide:

2.3.8.4.1.1 Street address with sub-location (floor and room/cubicle, etc.) where necessary to direct response without delay.

2.3.8.4.1.2 Latitude and longitude

2.3.8.4.1.3 Map Grid coordinates (for PSAPs that use local maps for dispatch). *There is some discussion that this should not be automatically provided as some locations generate this locally.*

2.3.8.4.1.4 Person's secondary number, such as a cellular phone as a lookup

2.3.8.4.2 For cellular wireless (including PCS and GSM) where the mobile phone is not restricted in movement (i.e., must stay within a short distance of its sole dedicated base station), provide:

2.3.8.4.2.1 Cell Tower's latitude, longitude, address and description of cell sector radio coverage.

2.3.8.4.2.2 Mobile Phone's:

2.3.8.4.2.2.1 Latitude and longitude, confidence factor and uncertainty.

2.3.8.4.2.2.2 Map grid coordinates (for PSAPs that use local maps for dispatch). *There is some discussion that this should not be automatically provided as some locations generate this locally.*

2.3.8.4.2.3 Location updated on demand by the PSAP.

2.3.8.4.3 For wireless calls that are restricted in movement (e.g., wireless local loop):

2.3.8.4.3.1 The above list for wireless (less ALI location update if caller moves),

2.3.8.4.3.2 Address information that informs the call taker that the phone is restricted to geographic location or area (e.g., wireless local loop). *Western Wireless is doing.*

2.3.8.5 Have a lookup capability to a supplementary database that provides the logical addresses of each record thus defining the telecommunications service provider and ALI database service provider. This would enable PSAPs to determine the source of a record with an error where those company IDs are not available from the ALI display. It could be used for ALI Steering and to determine if the number has been ported. *The "function of R" in the Intrado database in Texas functions, but it is not fully implemented.*

2.3.8.6 Ability to do ALI Steering with the following:

2.3.8.6.1 The routing of an ALI request from an PSAP to the appropriate ALI database service company based on the ANI, pANI, ESRD or ESRK that is received.

2.3.8.6.2 Predetermining the PSAP to which an ALI should be delivered and pushing that ALI to the PSAP, without waiting for a request.

2.3.8.6.3 The exchange of 9-1-1 ALI database information among Competitive Database Providers. *This is becoming critical as Local Number Portability (LNP) expands into the next set of Metropolitan Statistical Areas (MSAs) and we move toward Geographic Portability (GP).*

2.3.9 Call Information On-Demand. Establish PSAP and 9-1-1 Network capabilities to know what additional information is available about the 9-1-1 caller and the emergency, so that at the PSAP call-taker's command, this information would be retrieved. *This is the pre-established data path from a telematics service provider to a PSAP to provide this information, not the verbally communicated data which is currently available.*

2.3.9.1 Automatic opening of a microphone and receiver in the vehicle to allow two-way conversation with either PSAP or third-party service provider that could patch call to the appropriate PSAP.

2.3.9.2 Highway Condition information to keep map displays current

2.3.10 Ability of the alarm company connectivity to enable the PSAP call-taker to speak back through the alarm company's circuits/radio path to the scene of the emergency. *By eliminating the need for an alarm company representative to relay messages, the ability of the PSAP to send the most appropriate help faster is improved.*

2.3.11 Allow for creation and update of ALI with inputs from:

2.3.11.1 Wireline carriers to Database Management System (DMS) to PSAP ALI controller

2.3.11.2 Wireless carriers to DMS or local PSAP ALI controller

2.3.11.3 PSAP administrators (and authorized telecommunicators)

2.3.11.4 PBX service providers, where the PBX provides enhanced 9-1-1.

2.3.12 Map display of the caller's location.

2.3.12.1 Basic initial information about the caller's location:

2.3.12.1.1 Appropriate symbol to mark the location (perhaps a circle that defines the circular error probability)

2.3.12.1.2 Add company code of the local street map publisher to the map for those Emergency Response Units that do not have a map display in their vehicle.

2.3.12.2 Update abilities:

2.3.12.2.1 Update upon manual request

2.3.12.2.2 Periodic update based on time set by call-taker (e.g., update every 10 seconds, every minute, every five minutes)

2.3.13 Call history maintained for follow-up and employee development

2.3.13.1 Time and date of last few calls

2.3.13.2 Incident

2.3.13.3 Call taker's ID

2.3.13.4 Results of call

2.3.14 Ability to know a third party that should be notified concerning the 9-1-1 caller's emergency. *This third party could be a parent, a spouse, an organization, etc.*

2.3.15 PSAP Position Mobility.

2.3.15.1 Remote Access: Enable a set of telecommunications equipment (that comprises a PSAP or PSAP position) to be set up almost anywhere and dial into a port to enable the PSAP to operate away from a fixed location.

2.3.15.2 Wireless PSAP: Have the positions communicate via standardized wireless protocol. This would use radio for the full range of equipment and systems used by a Telecommunicator at a PSAP: voice, ANI, ALI, CAD, etc. *CML's Command Post can communicate via wireless*.

2.3.16 Data Transfer. Ability to transfer categories of info, such as name, address, remarks section and call history, etc., from one PSAP to another.

2.3.17 PSAP Automation

2.3.17.1 Dynamic PSAP. Enable additional PSAP positions to be activated when required upon supervisor's request. Example: Call takers who are working on admin lines at a PSAP position or at home could be contacted and requested to come online as an additional PSAP position.

2.3.18 Have alternate routing for calls blocked by full trunks or trunk failures. Have a catastrophe procedure to divert all 9-1-1 calls should a PSAP fail.

2.3.19 Provide real-time messaging between positions at a PSAP. Examples of use: maintenance, instructions to call takers from shift supervisors.

2.3.20 Allow 9-1-1 call takers to accept non-9-1-1 calls: administrative calls, 3-1-1 calls (transferred from a 3-1-1 call taker), TTY relay services, identify test calls, etc.

2.3.21 Enable administrative calls (i.e., calls received on the admin number and inter-telecommunicator calls) to be transferred with data, including notes entered by the call taker. *The reverse is available to 9-1-1 systems (i.e., in an ACD system, the 9-1-1 calls can be routed to the non-emergency queue when all 9-1-1 call takers are busy. The ALI is also transferred. This can be done via CAD systems serving both, but this is to be done via the telephony CPE.)*

2.3.22 Establish dedicated NXX for PSAPs (e.g., 9-1-1) so that calls could be transferred out of the area to a PSAP via public switched telephone network. *5-1-1 and 7-1-1 are being used in some locations.*

2.3.23 Call Hold and Ringback (Canadian and New Jersey requirement for wireline)

2.3.24 Abandoned call treatment: Enable the PSAP to capture information about calls attempted.

2.3.25 PSAP to have alternate telephone numbers so that outside official parties can contact them, such as would be the case where 9-1-1 calls are transferred from out of the region. These circuits would allow the receipt of data with the voice call.

- - - - end of Current Model - - - -

2.3 Coming this Year 9-1-1 Model

Color of text	Meaning
Black	Master 9-1-1 Model to show hierarchy in which the new features are located.
Red	**New features and functions expected to be available within 12 months.**

Table 1

The numbering sequence follows that of the Master Model, but listing only those items expected within a year (in red) or the hierarchy to connect it upwards (which if it is expected sooner than a year is in black.

2.4.1 Address/Location Information:

2.4.1.2 For VoIP, provide:

2.4.1.2.1 Street address with sub-location (floor and room/cubicle, etc.) where necessary to direct response without delay.

2.4.2 Call Information On-Demand. Establish PSAP and 9-1-1 Network capabilities to know what additional information is available about the 9-1-1 caller and the emergency, so that at the PSAP call-taker's command, this information would be retrieved. *This is the pre-established data path from a telematics service provider to a PSAP to provide this information, not the verbally communicated data which is currently available.*

2.4.2.1 Automatic Collision Notification data: *This is available today only verbally.*

2.4.2.1.1 Location information by latitude, longitude and street address. *Note: Dispatchers are concerned that if a specific address is generated from a lat/long and that address does not exist or because of the uncertainty factor, may be wrong, that they should not rely on such a street address. Pilot is currently underway in Greater Houston County, Texas, by the county, Ford Motor Company and Intrado.*

2.4.3 Seamlessly integrate external data with ALI. System automatically takes information from outside the 9-1-1 system and provides hyperlink-type integration (See new Internet XML format.). *This refers to the automated transmission of the data, not the providing of it via a person at the telematics (Automatic Collision Notification (ACN)) center talking to a PSAP call-taker.*

2.4.3.1 Highway condition information to keep map displays current

2.4.4 Data Transfer. Ability to transfer categories of info, such as name, address, remarks section, call history, **latitude, longitude, personal profile, building floor plans,** site images, etc., from one PSAP to another.

2.4.5 Have the following ALI features

2.4.5.1 Address/Location information:

2.4.5.1.1 For landline, provide:

2.4.5.1.1.1 uncertainty, confidence factors *(for confidence factor, this would be with IP phones that could be moved)*

2.4.6 9-1-1 Priority: Where 9-1-1 calls are not transported over a dedicated network (such as a mobile radio system) the system would have a priority handling capability for the 9-1-1 calls.

2.4.6.1 For IP calls being placed from within an IP-capable PBX, a 9-1-1 call would receive priority among calls leaving the PBX. XXXX to red

2.4.7 Secure IP Network: Have a dedicated secure (i.e., point-to-point) network as the IP network for carriers. Would enable a PSAP to request private information about a carrier's subscriber to assist in emergency response. Example: Home or billing address, name of next of kin

2.4.8 Call Information On-Demand. Establish PSAP and 9-1-1 Network capabilities to know what additional information is available about the 9-1-1 caller and the emergency, so that at the PSAP call-taker's command, this information would be retrieved. *This is the pre-established data path from a telematics service provider to a PSAP to provide this information, not the verbally communicated data which is currently available.*

2.4.8.1 Automatic Collision Notification data. *This is available today only verbally.*

2.4.8.1.1 Location information by latitude, longitude and street address. *Note: Dispatchers are concerned that if a specific address is generated from a lat/long and that address does not exist or because of the uncertainty factor, may be wrong, that they should not rely on such a street address. Pilot is currently underway in Greater Houston County, Texas, by the county, Ford Motor Company and Intrado.*

2.4.9 Seamlessly integrate external data with ALI. System automatically takes information from outside the 9-1-1 system and provides hyperlink-type integration (See new Internet XML format.). *This refers to the automated transmission of the data, not the providing of it via a person at the Automatic Collision Notification (ACN) center talking to a PSAP call-taker.*

2.4.9.1 Highway condition information to keep map displays current

2.4.10 Dynamic congestion control of 9-1-1 trunks:

2.4.10.1 Establish congestion control that can be set and changed by (examples: Spike Masking, dynamic call volume capacity and simulated facility groups (SFGs)): *Technically, this is possible now, but the issue of liability blocks this from being implemented.*

2.4.10.1.1 PSAP

2.4.10.1.2 9-1-1 Service Provider

2.4.10.2 Provide for dynamic management of congestion control via a graphic interface that impacts all carriers providing service in geographic zones.

- - - End of One-Year Model - - -

2.4 Near Term (Within Three-Years) 9-1-1 Model

Color of text	Meaning
Black	Master 9-1-1 Model to show hierarchy in which the new features are located.
Green	**New features and functions expected in the three-to-five year term.**

Table 2

The numbering sequence follows that of the Master Model, but listing only those items expected within three years (in green) or the hierarchy to connect it upwards (which if it is expected sooner than three years is in black.

2.5.1 Enable TTY/TDD communication

2.5.1.1 Be able to pass typed messages via faster, more sophisticated method (next generation).

2.5.2 Provide information describing the caller's location in industry-approved format:

2.5.2.1 Enable the network to identify the location of an IP connections so that a 9-1-1 call placed from this connection would be routed to the appropriate PSAP. *There are two Internet Engineering Task Force (IETF) location recommendations: One is providing location based on street address, the other location based on latitude, longitude and height above mean sea level.*

2.5.3 Enable transfers of the call with ALI to:

2.5.3.1 A PSAP that is out of local area (e.g., across country, to Canada)

2.5.4 Have the following ALI features: *This is for "automatically" delivered info only. There is a separate section for Location Information that is recommended as discretionary.*

2.5.4.1 Address/Location Information

2.5.4.1.1 For landline, provide:

2.5.4.1.1.1 Latitude, longitude **and altitude (above sea level)**

2.5.4.1.2 For VoIP, provide:

2.5.4.1.2.1 Latitude, longitude, **uncertainty, confidence factor** *(for confidence factor, this would be with IP phones that could be moved [It is realized that confidence factor is*

available with Wireless E9-1-1 Phase II, but this section deals only with landline services.]) and **altitude (above mean sea level [MSL]) or elevation (above ground level [AGL])**.

2.5.4.1.2.2 A secondary telephone number to location of the IP port address can be added to the ALI database. Could be combination of the MAC address of the closest router and the port number. *When a call is being made from one of these ports, there would be two telephone numbers: One, which is the number of the subscriber, Two, the number associated with the IP port.*

2.5.4.1.3 For cellular wireless (including PCS and GSM) where the mobile phone is not restricted in movement, provide:

2.5.4.1.3.1 Dynamic update of information on the cell sector that has the call so that if the caller moves to another sector, this can be updated to always be current. *PDE obtains the location periodically and automatically makes it available for delivery to the PSAP (versus pull requests). This may involve providing a flag to the call taker that a location update is available, if the PSAP doesn't want the update automatically displayed*

2.5.4.1.4 Mobile Phone's:

2.5.4.1.4.1 **altitude (above sea level)**

2.5.4.2 Specific call tag, unique to an incident, that would allow all data related to that incident to be associated. This would enable retrieving all associated data when doing an incident report. *This does exist for CAD systems, however, the intent of this is for the 9-1-1 system itself to assign the call tag for the universe of data that arrives, such as ACN, 9-1-1 call, police officer's MDT report.*

2.5.5 Call Information On-Demand. Establish PSAP and 9-1-1 Network capabilities to know what additional information is available about the 9-1-1 caller and the emergency, so that at the PSAP call-taker's command, this information would be retrieved. *This is the pre-established data path to provide this information, not the verbally communicated data, which is currently available.*

2.5.5.1 Automatic Collision Notification data: *This is available today only verbally.*

2.5.5.1.1 Airbag deployment

2.5.5.1.2 Number of passengers in vehicle and each person's weight by seat occupied

2.5.5.1.3 Data previously provided by the vehicle owner(s) for storage with the ACN company to be made available when necessary.

2.5.5.1.4 Delta (i.e., change in) velocity and principal direction of force.

2.5.5.1.5 Orientation of vehicle at time of collision and after collision, and whether the vehicle rolled.

2.5.5.2 Health Monitors that report condition of patient

2.5.5.3 Personal Health data from insurance companies or person's doctor. May be just the location of the person's medical records.

2.5.6 Seamlessly integrate external data with ALI. System automatically takes information from outside the 9-1-1 system and provides hyperlink-type integration. (See new Internet XML format.). *This refers to the automated transmission of the data, not the providing of it via a person at the Automatic Collision Notification (ACN) center talking to a PSAP call-taker.*

2.5.6.1 Automatic Collision Notification data (See 2.5.6.1 for list.)

2.5.7 Data Transfer. Ability to transfer categories of info, such as name, address, remarks section, call history, **site images**, etc., from one PSAP to another.

2.5.8 PSAP Automation:

2.5.8.1 Robotic PSAP. Enable basic or initial PSAP functions, such as call-answering with ALI display to be handled in an automated process. Perhaps use voice recognition to do some tasks.

2.5.9 Dynamic Congestion control of 9-1-1 trunks.

2.5.9.1 Establish congestion control that can be set and changed by (examples: Spike Masking, dynamic call volume capacity and simulated facility groups (SFGs)): *Technically, this is possible now, but the issue of liability blocks this from being implemented.*

2.5.9.1.1 PSAP

2.5.9.1.2 9-1-1 Service Provider

2.5.9.2 Provide automatic notification to PSAP when congestion control has been enabled (i.e., calls are being blocked)

2.5.9.3 Provide for dynamic management of congestion control via a graphic interface that impacts all carriers providing service in geographic zones.

2.5.10 9-1-1 Priority: Where 9-1-1 calls are not transported over a dedicated network (such as a mobile radio system) the system would have a priority handling capability for the 9-1-1 calls.

2.5.10.1 Integrate with other priority programs, such as Priority Access Service (PAS) and Telephone Service Priority (which is a service restoral priority versus call-delivery).

2.5.11 Third Party, Private Emergency Notification: Where there are Automatic Collision Notification, panic alarms, health monitor alarms, etc., enable them to automatically provide emergency notification to the PSAP. Allow PSAPs to receive calls and data sent by automatic collision notification systems and other private monitoring services, although this may have to go through a service bureau first.
One problem is legal: State and municipal laws prohibit automatic 9-1-1 calling.

2.5.11.1 Provide prior to call answer

2.5.11.2 Provide subsequent to call answer upon command from PSAP call taker

- - - End of Three-Year Model - - -

2.5 Five-Year 9-1-1 Model

Color of text	Meaning
Black	Master 9-1-1 Model to show hierarchy in which the new features are located.
Blue	**New features and functions expected in five years or later.**

Table 3

The numbering sequence follows that of the Master Model, but listing only those items expected five years or later (in blue) or the hierarchy to connect it upwards (which if it is expected sooner than five years is in black.

2.6.1 Ability to send personal information over the phone (A caller's data would be available based on some user identification such as social security number or SmartCard ID.) *This is only the ability to send, a different aspect than a PSAP call taker's ability to retrieve. This concept does not preclude the possibility that a PSAP call taker would have the ability to block that information if the call taker did not need it.*

2.6.1.1. via Wireless

2.6.1.2. via VoIP

2.6.1.3. via Public Switched Telephone Network

2.6.2 Enable transfers of the call with ALI to:

2.6.2.1 A PSAP that is out of the local area (e.g., across country, to Canada, to Mexico, to the world)

2.6.3 Have the following ALI features: *This is for "automatically" delivered info only. There is a separate section for Location Information that is recommended as discretionary.*

2.6.3.1 Address/Location information:

2.6.3.1.1 For landline, provide

2.6.3.1.1.1 Latitude, longitude and altitude (above sea level) and altitude **or elevation (above ground level [AGL]).**

2.6.3.1.2 For mobile phones where the mobile phone is not restricted in movement (i.e., must stay within a short distance of its sole dedicated base station), provide:

2.6.3.1.2.1 Mobile Phone's

2.6.3.1.2.1.1 latitude, longitude and altitude **or elevation (above ground level [AGL]) .**

2.6.3.1.2.1.2 velocity and direction

2.6.3.1.2.2 Subscriber's address (but with obvious designation that this is a "home" [i.e., the subscriber's billing] address, not the location from which the call is being made.)

2.6.4 Call Information On-Demand. Establish PSAP and 9-1-1 Network capabilities to know what additional information is available about the 9-1-1 caller and the emergency, so that at the PSAP call-taker's command, this information would be retrieved. *This is the pre-established data path to provide this information, not the verbally communicated data, which is currently available.*

2.6.4.1 The driver's "smart card." A smart card would have a person's personal data that is recorded on an EPROM or magnetic strip. The driver would insert his smart card into a read slot in the vehicle. Should the vehicle become involved in a collision, this would enable pertinent medical data to be sent to the telematics center, which could then forward it to emergency medical personnel.

2.6.5 Seamlessly integrate external data with ALI. System automatically takes information from outside the 9-1-1 system and provides hyperlink-type integration (See new Internet XML format.). *This refers to the automated transmission of the data, not the providing of it via a person at the Automatic Collision Notification (ACN) center talking to a PSAP call-taker.*

2.6.5.1 Health Monitors that report condition of patient

2.6.6 Map display of the caller's location.

2.6.6.1 Basic initial information about the caller's location:

2.6.6.1.2 Velocity and direction, if system requests it

2.6.7 Dynamic Congestion control of 9-1-1 trunks.

2.6.7.1 Enable manual changing of congestion choke points by PSAP *This is listed for the five-year model owing to the need to resolve liability issues.*

2.6.8 Dynamic ALI Updates: Enable all certificated telecommunications carriers to provide real-time updates to the Database Management System to reach the ALI database, when a person signs up for service.

- - - End of Five-Year Model - - -

3 References

There is no reference as the information herein comes from the members' work in the 9-1-1 industry and reflects their understanding and views.