By now, nearly all local government GIS or 9-1-1 stakeholders have started assessing their GIS data readiness capability to support the upcoming overhaul replacement of public safety communications. That next phase, Next Generation 9-1-1 (NG9-1-1), replaces the legacy “cabinets and wires” of the 9-1-1 system, while also radically altering the process for determining which 9-1-1 center will send help to a 9-1-1 caller.

The snail-like pace of standards development rarely keeps pace with technology advances, leaving many in the NG9-1-1 GIS sphere wondering how they will determine whether their data is ready to support NG9-1-1. The truth is, there are no set metrics for data readiness for NG9-1-1 today, leaving stakeholders relying on outdated standards for E9-1-1 systems, including synchronization of the Master Street Address Guide (MSAG) and Automatic Location Information (ALI) to GIS data.

This reliance on outdated standards makes it impossible to address all the data quality requirements for NG9-1-1. All stakeholders, therefore, must understand that the multi-step process that results in 98 percent synchronization accuracy in the NENA standards for MSAG and the ALI databases is NOT enough for NG9-1-1. Significant gaps in data quality are overlooked by only focusing on MSAG/ALI synchronization; the requirements for the Next Generation Core Services (NGCS) require more in-depth spatial comparisons.

The NG9-1-1 requirements that are missed by not going beyond the 98 percent synchronization accuracy rate include the following:

- Public Safety Answering Point (PSAP) boundary gaps and overlaps.
- Required road centerline breaks.
- No duplication of address points.

The result of not looking for these errors may be a delay in the 9-1-1 call routing or the call being routed to the wrong PSAP. These are life-critical decisions that rely upon precise GIS data quality that cannot be achieved by comparing tabular datasets.

**RELEVANT GIS DATA STANDARDS**

The specific steps 9-1-1 or GIS stakeholders must take to ensure their data is NG9-1-1 ready are not well defined. Multiple standards address the minimum data quality requirements for the GIS data that needs to be provisioned into the ESInet. The standards require that the source GIS data must meet certain criteria:

- It cannot contain unintended gaps and overlaps between service boundaries (PSAP and Emergency Services Boundaries).
- It must check for unintended discrepancies between address-ranged road centerline layers and corresponding site/structure address points or polygons.
- It must be capable of validating GIS feature attributes against the required data model to ensure the minimum essential data values are present.

Other standards emphasize the importance of synchronizing the MSAG and ALI tabular databases with the GIS data to a 98% match rate. While there is no single metric that can confirm the accuracy of the data, the DATAMARK® technical team has developed a unique process that results in the following:

- Quality GIS data layers that support the NGCS and other 9-1-1 systems (CAD, CAD Mapping, AVL, Call Taking, and others).
- Logical steps that reduce the time it takes to analyze and reconcile GIS data issues.

**UNDERSTAND HOW GIS DATA IS USED IN NG9-1-1**

Before looking at how GIS data is used in NG9-1-1, it is critical to be familiar with two other processes that require GIS data. These are the Emergency Call Routing Function (ECRF) and the Location Validation Function (LVF). These two systems “behave” differently from each other, and their data-quality requirements can vary.

**ECRF**

The ECRF recommends to which PSAP the 9-1-1 caller should be routed. It also sends information about who is the “first due” agency for fire, police and EMS. The ECRF accepts queries containing location information and asking the question of the location data (GIS), “Where do I route this emergency call?”

The response input location may be a coordinate-based location (for example, 37.488998, -122.2298912) or a civic address location (such as 555 County Center, Redwood City, CA). Whether the caller can be associated with a civic address, or is represented by a coordinate, the ECRF must relate this location in the GIS database and intersect it with service area boundaries.

**LVF**

An LVF validates civic locations of a potential endpoint (something that can transmit a 9-1-1 call). This is done prior to accepting the endpoint into the Location Information Service (LIS). This process speeds up the 9-1-1 call routing by storing information about the service agency with the civic location.
The process is similar to existing practices whereby access networks (including internet service providers, phone service providers and others) must validate a new service address prior to setting up a new account with the MSAG. The LVF provides a similar function that requires the GIS location data to “answer” the same questions an MSAG would.

To be LVF “valid,” a civic location must map to a location in the GIS database provisioned to the LVF, such as a single address point, a single parcel/sub-parcel/building/floor/room polygon, or single point derived from an address-ranged road centerline layer. LVF requires Road Centerlines and/or Address Points datasets.

**PROPOSED PURPOSEFUL ORDER**

**How do PSAPs and others achieve NG9-1-1 “readiness?”**

NG9-1-1 adds GIS and other local government enterprise departments (public works, planning, elected officials) to the list of public safety stakeholders and requires that first responders become GIS data stewards. This is due to the complex requirements that GIS location data and the corresponding PSAP/emergency services boundary files have a specific spatial relationship that must be able to produce the same answers the MSAG currently does. To do this correctly, public safety stakeholders must provide input on where the boundaries fall because the NGCS system will decide to which PSAP the call is routed, and which fire, police and EMS agencies are flagged as having primary responsibility for that call.

DATAMARK offers a unique approach for meeting NG9-1-1 data requirements. The DATAMARK team uses a data-forward strategy that includes planning, technical services and solutions, and produces a system-agnostic deliverable. This approach is critical for two reasons:

- The locally maintained GIS data must support the call routing process and be configurable for any NGCS solution.
- It is no longer optional for this same data to be the foundation for all other PSAP systems (call taking, CAD, CAD mapping, AVL and others), thus these data requirements must be addressed and met.

GIS is not an inherent technology supported by a 9-1-1 authority. Therefore, it is critical to design and execute a plan that achieves gold-standard end-state data. DATAMARK’s position is that before discussing technical services or products, a 9-1-1 authority should conduct a two-phase gap analysis and needs assessment.

**CALL TO ACTION**

The time to begin this process is now. Those who have completed the data clean-up process should review the questions below to see if the data have gone beyond the 98% GIS data match rate.

- Who are all the GIS data providers that will support data needs for the PSAP?
- Is the location data synchronized (addresses and roads) rather than just the MSAG and ALI?
- Can all of your 9-1-1 systems accept updates of this source data in near real-time fashion similar to the NGCS?
- Will the GIS solution purchased support the data needs of all your 9-1-1 systems?
- Has a data maintenance workflow and policy been set both interagency and with neighboring PSAPs?

9-1-1 authorities that are unable to answer some or all of these questions likely have GIS data that is not yet ready for NG9-1-1.

**PURPOSEFUL ORDER (5 STEPS)**

1. **MSAG – CENTERLINE COMPARISON**
   - Compare these datasets first and correcting true errors in both.
   - Adding address points where the centerline can not support the location validation requirements.

2. **BOUNDARY CREATION/UPDATES**
   - For NGCS, the requirement is born in the relationship between the location data (address points and centerlines) and the boundary files.
   - The location data in relationship to the boundaries need to answer the same question as the MSAG.
   - This includes ensuring roads are broken at the needed boundary changes and address points fall in the right boundaries.

3. **LOCATION DATA NORMALIZATION**
   - Making sure that associated address points and centerlines have synchronized information.
   - This has benefits to all 9-1-1 systems that use GIS.

4. **ALI – GIS COMPARISON**
   - The emphasis is ensuring that there are as few no-match ALI records and possibly identifying missing address points.
   - By doing this last, it reduces introducing new errors into the location data.

5. **DATA MAINTENANCE**
   - Address and road data can change frequently or accidentally be changed to support a non-public safety system.
   - Data must be re-evaluated for data quality on a purposeful cycle to ensure no errors are introduced and that new data was entered properly.

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