

The Power to Respond

A Roadmap for Centralized Mapping

May 2004

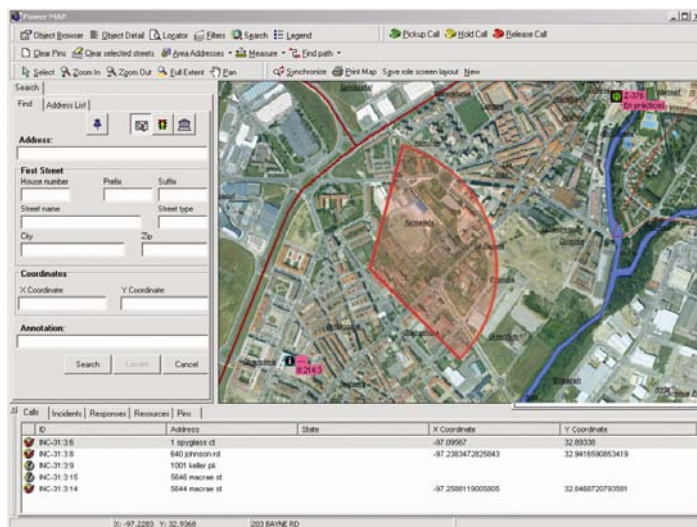


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Introduction

“A picture is worth a thousand words.” In public safety, a picture can be worth much more than a thousand words – it can help save a life.

Electronic map displays are enabling Public Safety Answering Points (PSAPs) to locate callers faster and manage dispatching tasks better. The phenomenal growth of wireless callers and the pace of technological progress are changing the landscape of what mapping in the PSAP means. Today there are many mapping choices available to a PSAP and making the right call on which system to choose can be difficult.

An effective approach to addressing the mapping needs of PSAPs is the implementation of a centralized mapping solution. Under this approach, a central authority is responsible for creating and maintaining a baseline map, selecting a mapping solution and making it available to many PSAPs covered by the central authority, such as the county or state. An enhancement to this approach is to have the central authority automatically push map data updates to each PSAP.

This document examines the benefits of implementing a centralized mapping solution and provides a roadmap for successful implementation.

The Changing Face of 9-1-1

Prior to the advent of mobile telephony, the vast majority of 9-1-1 calls came with the Automatic Location Information (ALI) record of where the caller was. This allowed the 9-1-1 call taker to receive the address of the caller on their screen and dispatching stations to direct aid to the emergency.

As the number of wireless callers grew, the Federal Communications Commission (FCC) recognized that wireless callers were receiving a lower quality of service than fixed callers were. In response, the FCC, in 1994, began issuing a series of orders aimed at improving the quality and reliability of 9-1-1 emergency response for wireless phone users.

The FCC adopted a phased approach to enable PSAPs to locate and provide assistance to wireless phone users. In summary, these phases were:

Phase 0	Route the wireless call to the appropriate PSAP
Phase I	Provide PSAPs with the wireless caller's call back number and the location of the cell site or base station receiving the 9-1-1 call
Phase II	Provide PSAPs Phase I information plus the caller's latitude and longitude coordinates, accurate to specified distances

Reasons for a Centralized Mapping Solution

Making the decision to implement a centralized mapping solution requires an understanding of the value of mapping at the PSAP and the benefits that a centralized solution can offer.

Mapping in the PSAP – A Smart Move

Mapping in the PSAP has a proven record of improving the level of service that a PSAP delivers to its community.

Electronic mapping at PSAPs often originated as Computer Aided Dispatch (CAD) or Automatic Vehicle Location (AVL) systems, displaying the incident and resource locations. Frequently these systems are proprietary and independent of 9-1-1 call handling equipment.

When PSAPs started implementing mapping for 9-1-1 service, they often found that their legacy mapping systems could not accommodate their needs. Sometimes the reason was that the map system could not technically perform the required operation while at other times the upgrade needed was prohibitively expensive or affected bundled applications, such as the CAD system.

Today's mapping system must be able to support all the services performed by the PSAP, including locating wireless and land based callers. Additionally, all positions benefit from having a mapping system, which increases the level of service to your community.

In order to understand where these benefits come from, it is necessary to understand some of the key drivers for mapping in the PSAP before examining the benefits that a centralized mapping solution can offer.

Processing wireless call information is easier via an electronic map display. For example, an intelligent mapping system can overlay a cell sector's coverage area on a map. This permits the call taker to visually assess and narrow down the exact location of a caller thereby improving response to that caller. Another example is Phase II calls, which provide decimal-degree latitude and longitude coordinates for the caller. An electronic mapping system can automatically zoom to those specific coordinates thereby aiding the call taker in knowing the approximate location of the caller.

A centralized mapping solution is more able to respond to changes in the wireless ALI delivery method and format than separate entities. Statewide wireless location information can be maintained more easily than relying on individual agencies that need to meet disparate schedules.

Easing the Call Taker's Job

A mapping system provides faster location of callers, especially wireless callers, with less reliance on verbal location description. This also provides increased satisfaction by getting aid out to callers faster and saving lives and property.

Better Up-to-Date Map Data

Typically, not every PSAP has access to the GIS resources available at a higher level. This includes completeness of data, quality of data and the ability to maintain the data in a timely fashion.

A centralized agency is more able to have a more accurate and complete baseline GIS data set for use by all subscribing PSAPs.

A logical approach is to establish a GIS data clearinghouse from various GIS entities, such as county groups (as Emergency Response often does not drop off at county lines). With Homeland Security initiatives, there is funding for shared data projects.

Keeping GIS data up-to-date is also a critical function of the GIS data provider. As new addresses come about, building permits are issued, new streets are paved or address problems uncovered, someone needs to keep all the GIS data accurate and consistent. A constant flow of information is moving between GIS agencies and the PSAP.

Mapping in More Agencies

Many PSAPs within a region may not have the technical or financial resources needed to implement a mapping solution on their own. A centralized mapping solution allows these resources to come from a central pool and provides a uniform level of expertise available to each PSAP.

A centralized mapping solution also provides a holistic approach to data that may not otherwise be readily obtainable. Examples of this are statewide fire-districts, statewide utility distribution infrastructure and flood/earthquake areas that span several counties. A centralized mapping authority is more able to provide this critical information.

Better Prepared for Future Technologies

A centralized authority has, by its nature, better contacts with state and national organizations, which means it is better suited for responding to new location technologies such as CNS, VoIP or Amber Alert sighting plotting. This advantage can result in better preparation and guidance of future technologies for downstream introduction at the PSAP level. This in turn converts the promise of the new technology into a reality.

Single Point of Contact

Having a single vendor provide the entire solution ensures that there will be no integration issues and that all problems will be resolved by one team dedicated to the customer's satisfaction.

Increased Return on Investment

A centralized mapping solution enjoys an increased return on investment given the larger size of the investment.

- A centralized purchasing authority results in economies of scale in purchase price
- Maintenance costs are reduced
- Support costs are lower as there is a single point of contact

Undesirable Characteristics

The following are undesirable characteristics that legacy systems, and even some current generation systems, possess:

Limited access to 9-1-1 data	Legacy-mapping systems often do not have complete access to the ANI/ALI information provided by the phone equipment. This limits the mapping system's ability to process all available information.
Closed GIS data	Avoid systems that do not allow you to add all the GIS layers you want or have. The data requirements for 9-1-1 mapping are unique and the system should permit you to have whatever data you feel will help your operations.
Proprietary GIS data formats	Systems that are not open with respect to GIS data will limit the ability to keep the map data up-to-date, and are usually much more expensive to maintain.

Bundled mapping

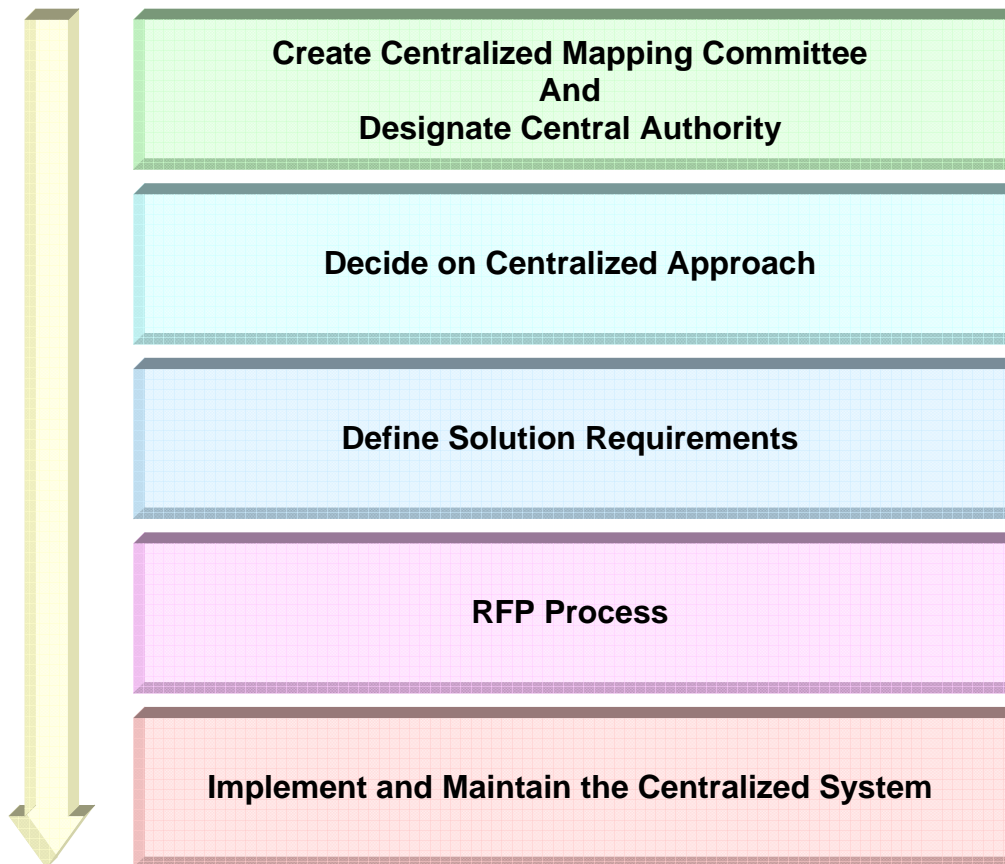
Mapping solutions that are a module bundled with other applications may not offer all the features that you need. Additionally, application upgrades usually rely on the main application, which can delay the introduction of new features or fixes, or induce extra cost or delay to get the update.

Positions without mapping

The mapping solution should be available at all positions, not just dispatching stations.

Roadmap Overview

Using a top-down approach, the following are the major milestones in a successful centralized mapping implementation:



Centralized Committee and Central Authority

Customers who have enjoyed the greatest levels of success in implementing centralized mapping solutions rely on a committee with a designated central authority.

The committee is comprised of the following members:

- GIS (Geographic Information Systems) personnel
- IT (Information Technology) personnel
- PSAP Representatives
- Financial personnel

While each of the above areas of expertise is important to the success of the project, particular attention is required for PSAP Representation. These participants are best positioned to know what is required, as the desired end-result is a solution that meets their operational needs.

To ensure success, the committee also needs a designated central authority with final decision-making responsibility.

Elements of a Successful Centralized Solution

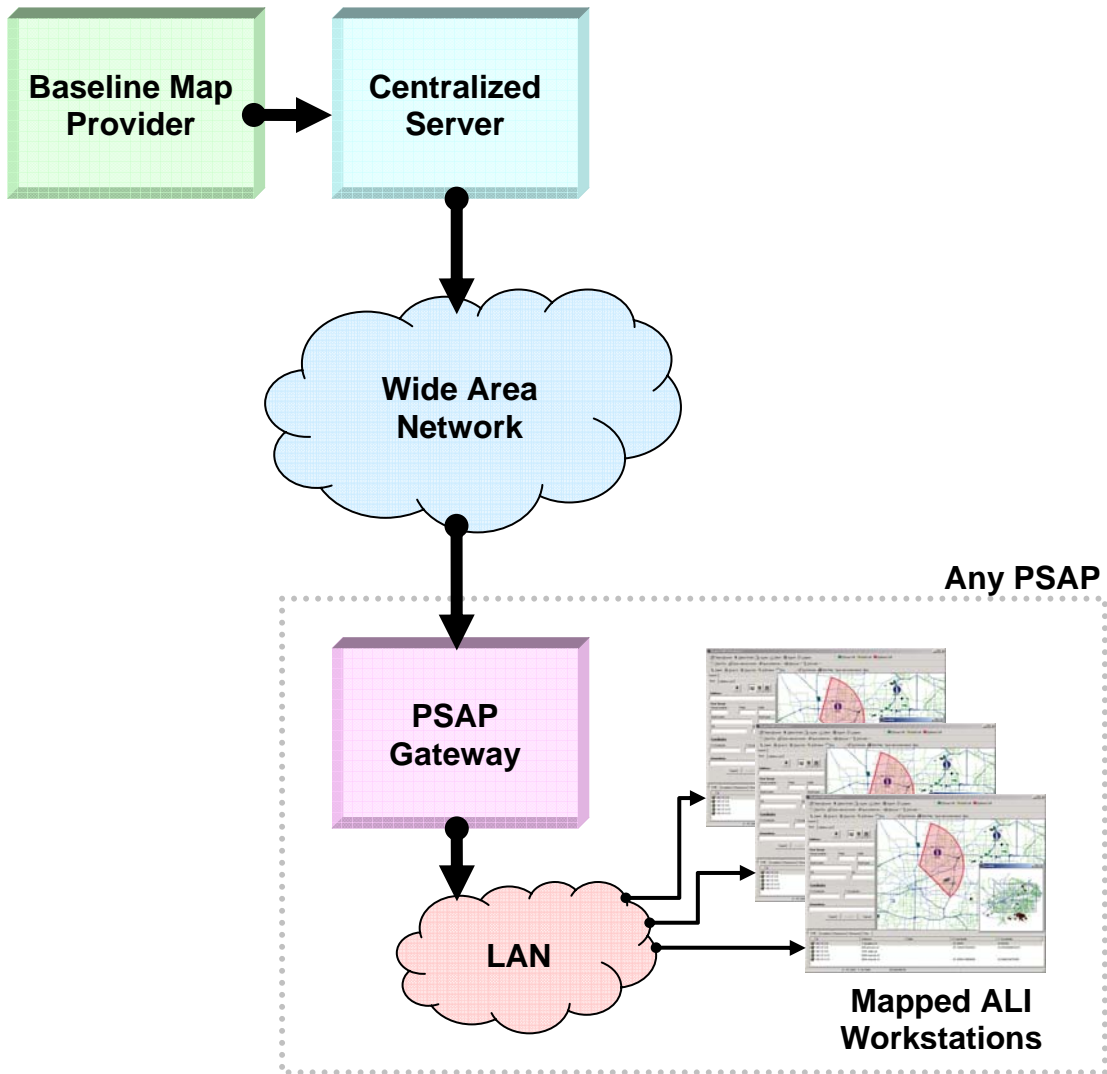
The typical centralized mapping solution is comprised of the following elements:

Baseline Map Provider	An entity designated as the provider of the centralized GIS data. This entity is responsible for building the complete map data set from available sources and keeping that data set up to date over time.
Centralized Server	A server (or group of servers) that manages the definition of which data to update and the scheduling of which PSAPs get the update and when. The server compresses the map data updates and sends the information via Wide Area Network (WAN) to the designated PSAPs.
WAN	A WAN is used to distribute GIS data and updates to all PSAP. Again, map data updates should be compressed for most efficient use of WAN bandwidth. WAN bandwidth should also be sized for future needs.
PSAP Gateway	Each PSAP on the centralized network has a PSAP Gateway that interfaces to the WAN and receives map data updates broadcast by the Centralized Server. The gateway then pushes the updates to the Mapped All Workstations throughout the PSAP via Local Area Network (LAN) at the PSAP.

Mapped ALI Workstations Each workstation stores its own copy of the map data and any received updates. Updated GIS data is activated between logins as follows: Current data is backed up and new data is loaded. This should occur transparently, without the need for user intervention at the workstation.

Discrepancy Tracking A mechanism that tracks location errors in ALI and/or GIS data. The Mapped ALI workstations should provide a tool for capturing information pertinent to the errors.

Centralized Mapping System Components



Request for Proposal (RFP) Process

Once the solution requirements are ready, the next step is to issue a Request for Proposal (RFP).

Positron Public Safety Systems has made available generic RFP specifications for the mapped ALI viewer sections to help you prepare your specific RFP (available from your Positron Regional Manager). Since each customer has widely diverse requirements for centralized GIS data management, Positron can also assist in defining the specific package of services required in the RFP.

From all the RFP responses, create a short list of bidders. From the short list, request in-depth demonstrations and perform reference checks. You can then arrive at a final score resulting in the selection of the best solution provider.

Implementation & Maintenance of a Centralized Solution

System implementation follows the selection of the solution provider. The first step is to create a plan that outlines when the centralized site and the PSAPs are to come online. It may be appropriate to deploy the PSAP in phases, depending on such elements as geographical distribution and PSAP sizes.

Implementation tasks include (at both central and local PSAP levels) such items as equipment installation, user training, acceptance testing and cut-to-operation.

System maintenance is an ongoing process that includes the following:

- Ongoing updates to and distribution of the central GIS data set.
- Ongoing corrections to GIS and ALI data as captured via the Discrepancy Tracking process.

Periodic updates to the mapped ALI Viewer application (to ensure the latest features are available to your users as products evolves). This is included in the form of an Evergreen or Software Maintenance Agreement.

Getting the Power to Respond

Power MAP is a dedicated public safety map viewer providing automatic display and management of calls, incidents, responses and resources, along with built-in support for Automatic Vehicle Location (AVL).

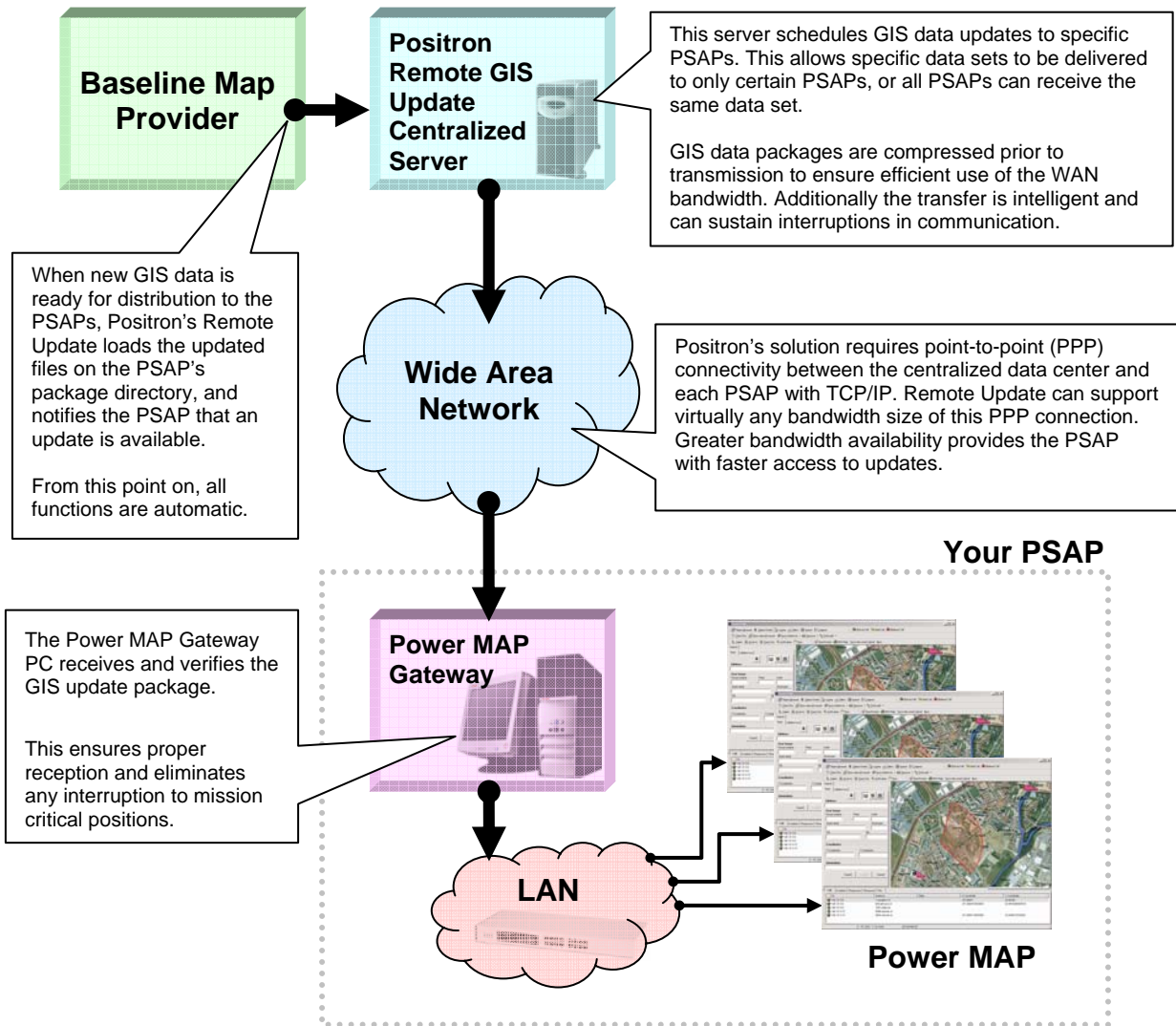
Power MAP's blend of sophisticated engineering and simplified operation allows agency personnel to locate callers and direct emergency responses quickly and accurately. Power MAP provides beneficial features and functionality to every aspect of PSAP operation.

The balance of this paper describes the specific benefits of Power MAP and guides you in determining what to look for in your mapping solution.

Centralized Mapping the Positron Way

Positron Public Safety Systems has a proven centralized mapping solution. Designed for the strict demands of public safety, it offers unprecedented ease-of-operation, flexibility and reliability.

Positron Centralized Mapping System Components



Power MAP and Wireless E911 calls

Power MAP provides the richest Wireless E911 call handling experience available. Advanced features automatically react to the call, presenting you with the information and tools required to locate wireless callers quickly and accurately. Power MAP can:

- Distinguish the wireless provider and class of service and perform specific actions based on any combination of data. This allows you to accommodate different data formats from wireless providers and specify individual cell sector layers for each.
- Display phase I calls with a different icon so that the user is immediately aware that it is a phase I call.
- Display phase II calls with a different icon so that the user is immediately aware that it is a phase II call.
- Display cell sector as a tower point, derived cellular coverage or actual RF coverage. This allows you to work with the best data available from each wireless provider and accommodate whatever standard operating procedures you have setup for wireless call processing.
- Support repeat ALI requests. Power MAP will automatically update the location of phase II call upon receipt of new coordinates.
- Provide tools to aid in locating callers. Power MAP offers features that aid in locating phase I callers, such as its Find Near feature. If the GIS data has such information, a user can search for common places, such as restaurants, within a specified radius of the cell tower.
- Load your wireless phase I information into your GIS data. Power MAP is open with respect to GIS data and allows you full control over adding additional wireless layers yourself, or with help from Positron.

Power MAP works the way you want

It is critical that the mapping system work the way the way you want and not the other way around. Power MAP has an intuitive user interface that permits the user to concentrate on responding to the emergency and not on the mapping system. Power MAP provides:

Easy searching – Power MAP provides a single, free-form entry field to perform manual searches. This allows the user easily to search for an address, a street, an intersection or a commonplace name from one simple field.

Power MAP supports the use of Streets Aliases – A Street Alias is an alternate name for a street. Street Aliases can be geocoded and searched in the same manner as Street Names. The attributes table must include a separate field for aliases.

Coordinate system conversion on the fly – Power MAP allows the user to switch between decimal degrees and degree-minute-second coordinate systems on the fly. This is especially useful to allow the user to provide resources that require DMS when the call has decimal degree coordinates. Conversely, it allows the user to enter in DMS from callers with handheld GPS units.

Geo-decoding on the fly – Power MAP continuously displays a full geo-decoded address in the status bar as the mouse moves over the map in addition to the latitude-longitude. This permits the user to know the address or coordinates of any spot on the map at a glance.

Locator map – Power MAP provides a locator map.

Custom map views – Power MAP allows the PSAP to define views of high risk/activity areas, such as airports and hazardous materials locations, ahead of time and recall them to the screen rapidly. This saves time for directing aid to these hot zones.

Layer control – All GIS layers have default zoom levels where they are automatically visible or hidden. In addition, Power MAP can provide full manual control over what layers are visible or hidden.

Multiple map windows – Power MAP allows the user to open as many map windows as desired. This permits the user to have a secondary map open for non-emergency tasks, such as pre-planning activities, while the main map will automatically center on the next 9-1-1 call answered. Once the emergency is complete, the user can then resume the pre-planning activities without resetting the map display.

Fax or Email the map and event details - Faxes and emails include the comments field, date and time. Power MAP also provides the ability to print the map to a remote printer (print to agency).

More tools – Power MAP provides a completely customizable approach to presenting supplementary information such as call details, GIS attributes and other premise information such as photographs or other site notes.

Meeting Your Agency's Needs

Power Map will meet the needs of each of these groups in your agency.

Meeting the PSAP Director's Needs

Power MAP is very cost-effective. The initial investment is affordable and while Positron recommends a turnkey approach, you have choices with respect to sourcing the PC hardware. In addition, Positron offers Software Evergreen to maximize your return on investment.

Software Evergreen is a maintenance service for Positron software products. Software Evergreen is an annual subscription fee that provides access to all software enhancements during the subscription period and allows you to plan your technology spending more accurately. Subscription fees are a one-time yearly investment, regardless of how many upgrades you receive.

Meeting the PSAP Supervisor's Needs

PSAP supervisors and managers know how their agencies need to operate. Some prefer to allow users greater access to system features, while others want to limit it. Power MAP provides complete control over what individual users can do.

Power MAP also allows each user to have multiple roles. This means that the user only has to remember one password, but can perform whatever they need to with Power MAP. For example, a user can log in as a call taker one shift, and only be able to view the calls answered at their position. At the next shift, they can log on as a supervisor and see all calls in progress.

Meeting the GIS Administrators' Needs

Power MAP is very GIS friendly. Power MAP natively supports ESRI shape files, ArcInfo coverage files and a wide range of raster image types, including MrSID.

In addition, Power MAP allows each layer to be in any ESRI recognized coordinate system, with each layer independent of each other. If you receive layers from other sources that are in a different coordinate system, there is no longer any need to convert them before using them.

Power MAP offers optional centralized updating. Simply by copying updated files to a centralized location, Power MAP can automatically distribute them and make them active at the next user login.

Meeting the Information Technology Department's Needs

Power MAP is an open and modular map. This means it can run as a standalone application or as a fully integrated extension of Positron's call handling and dispatching suite of applications. This architecture provides the best in class of features and benefits with the flexibility of a dedicated mapping viewer.

Power MAP runs on Windows NT/2000/XP on standard PCs. Power MAP runs on a distributed network and does not normally require a dedicated server. All GIS data is stored locally, and you make all configuration changes centrally.

Positron's Centralized GIS Update architecture runs on any point-to-point (PPP) network and requires a minimum of bandwidth. Positron's solution also employs advanced controls to ensure the quality of transmission and ensures that WAN disruptions are tolerated seamlessly.

Power MAP AVL Support

Automatic Vehicle Location (AVL) is a technology that allows dispatchers, supervisors, managers, politicians and even the public to see the current position and status of vehicles from remote locations on computer-displayed maps. Benefits such as increased fleet efficiency, improved public and driver safety, better emergency response time, enhanced fleet control and good public relations result through the proper implementation of an AVL system.

Public safety organizations (Fire, Police, EMS) have been among the strongest proponents of AVL. Dispatch centers can have up to the minute location and status of their fleets allowing for improved dispatching and higher levels of safety for those living in the area and those public safety personnel who may be in harm's way. It is not always possible for a public safety dispatcher to have intimate knowledge of the city and status of the fleet. AVL answers the questions of who is available and who is closest (not necessarily the same vehicle).

Power MAP provides the following AVL functionality...

Vehicle Direction of Travel	Vehicle direction of travel is displayed on the vehicle icon via an arrow. The arrow's visual appearance is configurable.
Position Latency	Position Latency is the elapsed time since an icon's position last update. Latency is shown as a bar next to each vehicle icon (the bar's scale is configurable).
Tracking Mode	Tracking Mode, in addition to regular display of vehicles, adds automatic Pan and Zoom that ensures tracked vehicles are always in view. Tracking is available for Individual Vehicles, Vehicles of a specific Type and Vehicles having a specific status.
Playback	The Playback feature allows a user to "replay" the AVL Database data via a Playback window within which vehicle movements are recreated. Vehicles included in the playback are user-specified. The Playback mode provides controls for Play, Pause, Stop, Rewind and Fast Forward functions and Playback speed is adjustable. In addition, any number of playbacks can run concurrently.
Tracing	Used in Playback mode only, the Tracing feature displays the path used by a vehicle. The color of the tracing line is configurable.