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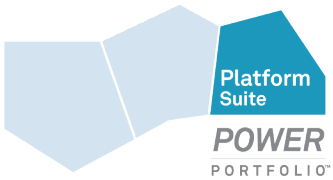

GEOMEDIA® SMART CLIENT

A SMARTER WAY TO ENABLE YOUR WORLD

White Paper
November 26, 2014

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Executive Summary

GeoMedia® Smart Client provides an answer to a problem that is almost as old as GIS itself, "How can you provide simple-to-use geospatial business workflows to non-GIS experts that are both cost-effective and manageable?"

Traditional desktop GIS provides the ultimate in geospatial capabilities and flexibility, but its complexity and cost (both in terms of licensing and support) makes it unsuitable for wide deployment across the enterprise. Web mapping applications provide a better fit for general users based on their simpler operation and lower cost, but they do not support functions required by many enterprise business workflows, such as accurate and reliable vector data editing. This leaves a large community of latent spatial users whose needs are not met by desktop or web mapping applications.

Recognizing these limitations, Hexagon Geospatial developed GeoMedia Smart Client. To address enterprise space, Smart Client supports a number of core functions that enable organizations to:

- Use workflow configuration and rules definition tools to implement highly focused and efficient workflows without the need of developing and maintaining extensive and expensive custom code.
- Reduce training overhead while increasing productivity and data quality with Smart Client's task-driven user interface, workflows, and built-in data validation.
- Increase information sharing and re-use with Smart Client's controlled and coordinated user access, data models, and workflows while avoiding the inefficiencies, errors, and risks that arise when departments work in data silos.
- Remove the cost of installing and administering desktop (even browser-based) software by offering self-configuring web deployment and the option to deliver technical applications via SaaS (Software as a Service) and the Cloud.

These capabilities are the key factors behind more than 200 successful customer implementations that collectively support more than 25,000 users.

This white paper describes the logic behind GeoMedia Smart Client and explains how this solution fulfills the core requirements listed above.

Harnessing an Untapped Resource

The Need for Enterprise Geospatial Workflows

It is often stated that the majority of organizations' data include spatial content or references. A paper by Mathys, Cumming, and Jerome[1] set the level at 80 percent for municipal government, while other sources present higher figures. Logically, it follows that organizations will benefit from making wider use of this aspect of their data to capture, analyze, and manage information records. This creates a spatial information paradox: why are such valuable and universally beneficial resources exploited by so few employees? The answer lies in how geospatial products are structured.

Traditional desktop GIS products offer the ultimate in technical capabilities and flexibility, but are too complex for non-expert users to operate. In addition, they do not address the data management and user access control requirements necessary for broad enterprisewide deployment. The cost of licensing and supporting specialist desktop applications also precludes their general rollout across an organization.

Web mapping products are easier for users to learn and offer a lower cost per seat. However, their technical limitations make them unable to support high-end functionality that many enterprise workflows require (e.g., clean and accurate vector data editing or true-scale/large-format printing of map-based content).

Both desktop GIS and web mapping products provide generic geospatial capabilities, but an enterprise resource needs to deliver focused, geospatial workflows that automate the daily operational processes of the business. One response is to automate tasks by developing custom code on top of generic desktop or web platforms. This can be effective for selected, high-value workflows, but the cost and time required makes coding impractical as a solution for wider deployment. This leaves significant numbers of potential users of geospatial information and processes without access to suitable tools.

Response

Hexagon Geospatial developed GeoMedia Smart Client specifically to meet the latent needs of enterprise geospatial deployments by filling the gap between desktop and web mapping platforms.

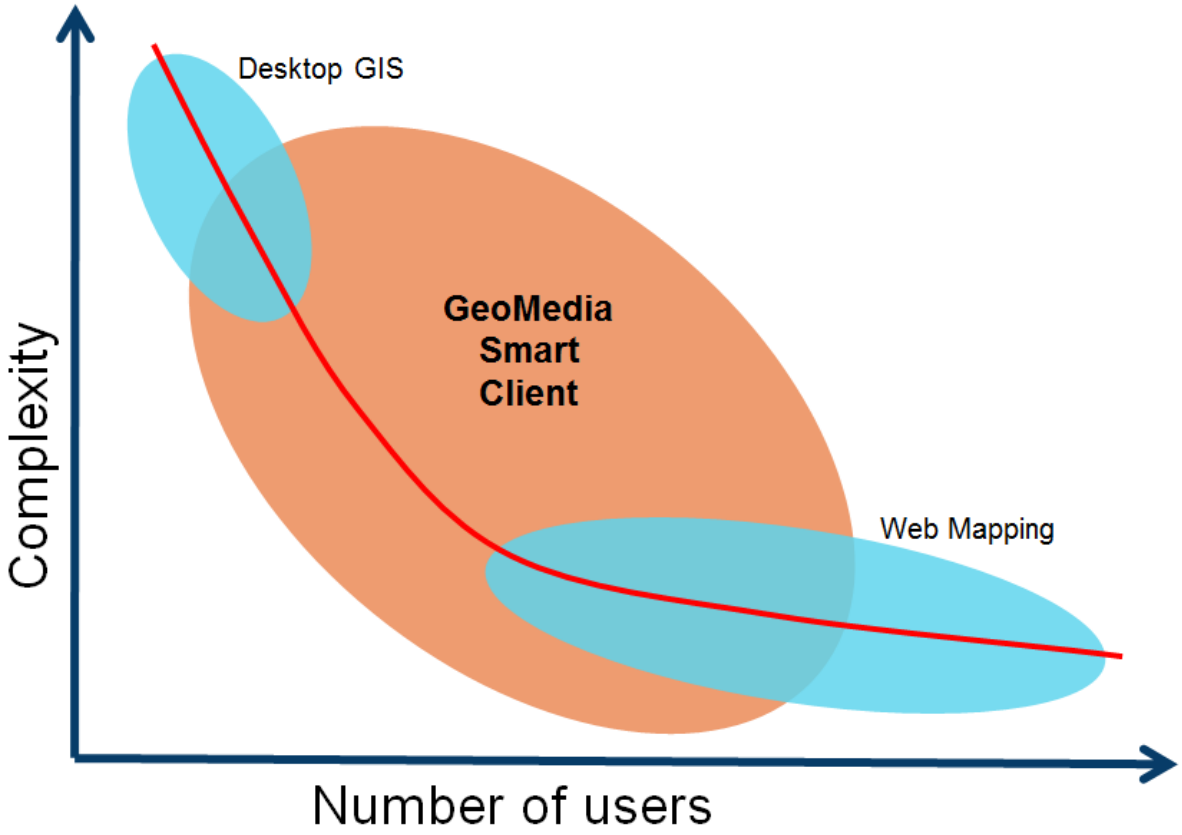
What is a Smart Client?

Smart client applications can be created using different technologies. The client uses web protocols and standards for communications (e.g., HHTP, SOAP, etc.), but it is entirely separate and does not need to run in web browsers. Smart client features include the following:

- Delivery of applications over a web http connection
- Independently free of installation (does not provide automated installation and updates)
- Automatic updates without user action
- Look and feel of a desktop application

The chart on the following page displays the ability of a smart client application to deliver highly technical geospatial capabilities to large numbers of non-GIS users.

[1] (Mathys T, Cumming M, Jerome J, 2003, UK GEMINI: A Geo-spatial Metadata Interoperability Initiative 2003-2004)



GeoMedia Smart client does not replace desktop or web solutions. It fills the platform gap that exists for delivering high-end technical geospatial capabilities to large groups of non-GIS users.

Enterprise Geospatial Capabilities, Not Enterprise GIS

An enterprise-IT tool's success is largely determined by its ability to reflect the organization's operational processes, adapt to these as they change, and provide an interface that matches the needs and abilities of its employees. Of course, the implementation must also be cost-effective and sustainable.

In developing GeoMedia Smart Client, Hexagon Geospatial recognized that a different approach was needed for enterprise geospatial deployments. While advanced geospatial capabilities are essential prerequisites, the focus of an enterprise platform must be on making these capabilities easy to integrate within the business. To achieve this, GeoMedia Smart Client provides a number of enterprise enablement components:

- **User administration and data access control** – Essential for multi-disciplinary systems, these functions combine with the Smart Client user interface (UI) and enterprise workflow tools to control who sees what data at which stage of a process or data life cycle, and determines which functions or tools each user can apply to them.
- **Smart client technology** – This technology provides the geospatial foundation and user interface (UI). Its deployment characteristics address issues for delivering, updating, and supporting technical applications for a large user base. The UI is easier to use than an equivalent desktop GIS, but it is the combination of the UI with the workflow, enterprise user, and data access administration tools that transforms GeoMedia Smart Client into a true enterprise geospatial engine.

- **Workflow and process control** – This component enables the user interface to be driven by the business process. It enables the organization's business processes and data life cycles to be modeled, including interaction with other business systems and external users.

- **Agility** – Essentially, the implementation and maintenance of these capabilities have to be agile and cost effective. Customization of Smart Client was engineered to exploit configuration rather than custom code development.

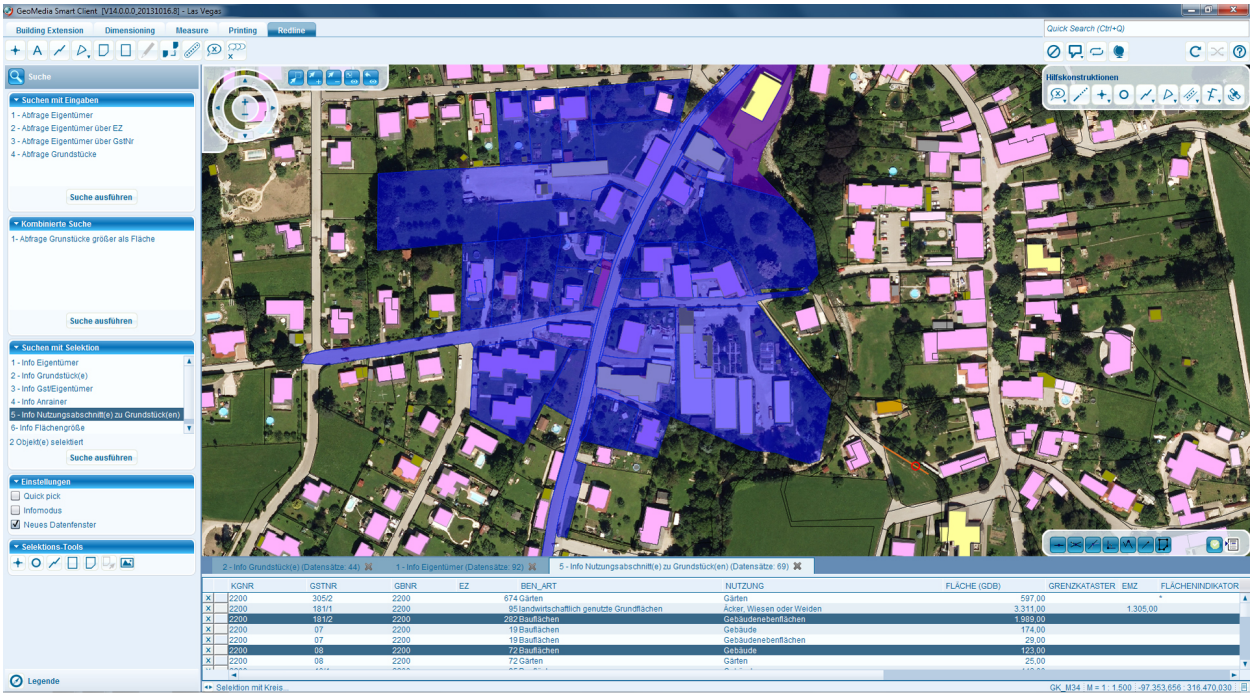
Enabling True Enterprise Geospatial Workflows

The following sections provide an overview of the key aspects of GeoMedia Smart Client that enable it to fulfill enterprise requirements.

Enabling Non-expert Users to Exploit Powerful Geospatial Tools

GeoMedia Smart Client enables the vast majority of employees who are not GIS experts to apply advanced spatial tools and functions to their day-to-day work. It is able to achieve this by guiding you step-by-step through your business workflows. At each stage, your interface can change to show only the information and tools relevant to the immediate process step, while built-in validation ensures all necessary data (both graphic and attributive) are captured at a sufficient level of quality and accuracy.

The immediate usability of this workflow-driven interaction reduces training and internal application support overheads while increasing productivity and improving data quality and consistency.



This is a screen shot from a data capture workflow. The left-hand toolbar automatically changes to display only the functions relevant to the immediate process step. In this case, the toolbar reflects new polygon, merge polygon, new line, merge lines, update line, and delete.

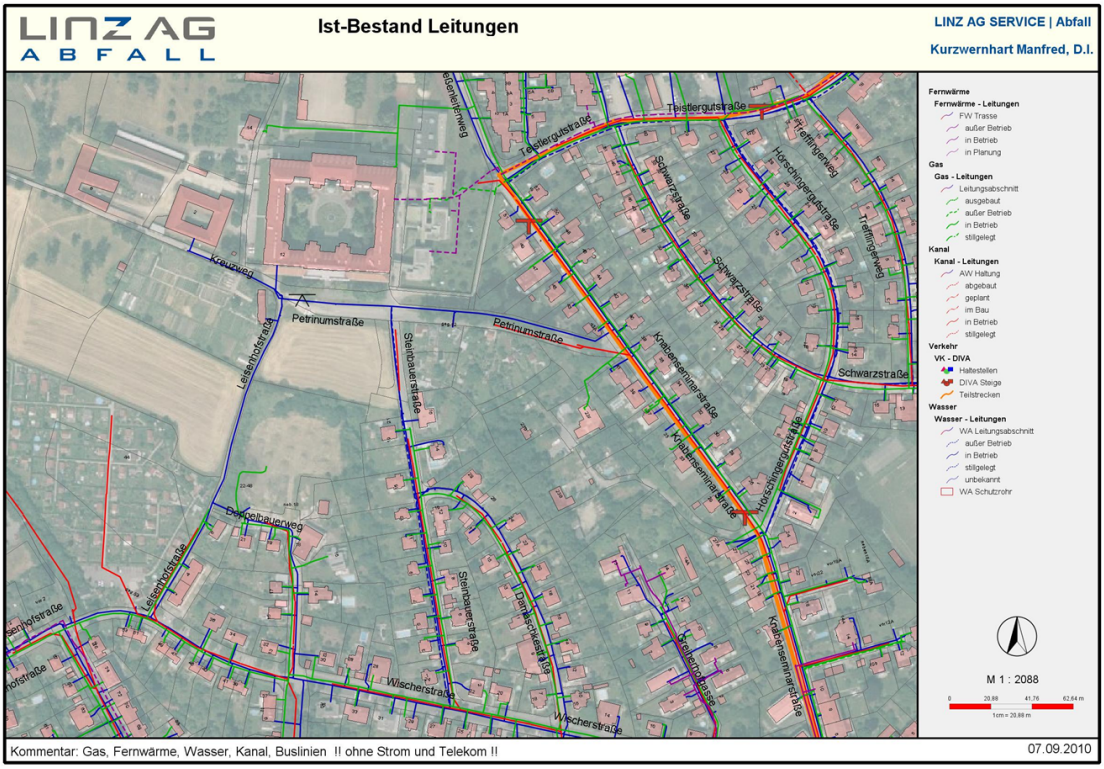
Responding to the Needs of the Enterprise

The scope of enterprise workflows and data are not limited to single users or data themes. Even if you limit consideration to those actions undertaken with an organization (e.g., ignoring interactions with

partners or customers), the fulfillment of a process (be it processing an application for permission to construct a new building or managing the repair of a buried utility asset) usually involves multiple departments or business functions. Each business function has its own specific information needs and uses data in different ways, but the information they capture and process all relate to the same event, location, asset, customer, or combinations of these.

Failure to coordinate the information and processes leads to considerable inefficiency, delays, duplicated work, conflicts, and costly errors. Conversely, organizations are able to make significant improvements in cost, time, resource requirements, and quality of service when they link the information and process flows between the various functions.

The combination of GeoMedia Smart Client's workflow engine, user management, and data access control enables organizations to support the complex interactions and interdependencies (both of data and processes) that exist in the real world. This includes asynchronous communication with other business systems and interaction with users outside of the immediate organization (e.g., citizens, service delivery partners, and contractors). See Figure 3 for an example of coordinating work across functions.



This is a plot showing both installed infrastructure and planned works across different asset groups from an application that coordinates work activities in the city of Linz, Austria.

Process Audit Trails

An increasingly important aspect of enterprise information management is audit trail, especially in public administration where organizations are called on to explain or justify decisions or courses of action. For example, municipalities are often asked to show (possibly even in court) that no impropriety has occurred during public consultations for new construction applications. Applying a workflow not only ensures the correct process was followed, but also captures critical information used to demonstrate compliance. The same data also provides a rich source of input for performance studies.

Agile Development

The ease of creating and modifying workflows is critical to success. When defining workflows, an organization's business processes and operational structure can drive GeoMedia Smart Client implementation, rather than the organization bending its working practice to fit around the software.

An organization's operational processes are subject to constant change (e.g., changes in legislation, business opportunities, or IT); therefore, workflow development needs to be agile to ensure the long-term viability of the solution. GeoMedia Smart Client's graphical workflow editor sketches out workflow logic and configures step actions in XML. This configuration process is far quicker than programming, and still enables you to fully control the process, as well as the following:

- The sequence of process steps (validation, branching, and loops)
- The user interface and operation, including defining forms (e.g., with domain lists and built-in validation) and determining what geospatial tools are available to you
- The accompanying map display, including which features are displayed and the symbology applied
- Asynchronous interaction with external applications

Linking data and processes across functional silos, such as those disconnected in terms of data, processes, and IT, requires a deep understanding of an organization's operation, particularly when identifying and rationalizing data requirements and dependencies.

Experience shows that organizations often struggle to correctly define their process requirements upfront, so the ability to work in an iterative development methodology reduces project risk. Adopting a rapid prototyping approach keeps members and implementation teams engaged, thus enabling customer feedback to guide implementation while you gain understanding of the organization's processes and interdependencies. The speed at which workflows and user interfaces are modified makes GeoMedia Smart Client ideal for this development model.

Simplified Application Deployment and IT Support

Rolling out and supporting a technical application for a large number of users usually generate substantial overheads, particularly when managing compatibility issues, delivering updates, and configuring custom applications for different functional groups of users.

Using a smart client technology platform removes most of these issues. GeoMedia Smart Client is a pure Java application that communicates with the application server using web services over SOAP (simple object access protocol). It is self-installing, both from a URL or Java WebStart. The application is configured automatically based on your profile and product updates and changes to configurations are applied automatically. IT support is even simpler than that of browser-based applications. Because GeoMedia Smart Client does not use a plug-in or a web browser, there are no version or browser compatibility issues to resolve.

The Municipal Data Center Niederrhein (KRZN) in northern Germany provides geospatial applications to approximately 8,000 users in a group of 42 local government authorities. All users have access to full geospatial functionality delivered by a centrally managed web-based architecture using GeoMedia Smart Client solutions. The software KRZN delivers runs regardless of which operating system and web browser you prefer. This makes the system much easier to administer than a browser-based platform that would require each of the 8,000 machines to have its own operating system, browser, internet options, and security settings configured individually.

GeoMedia Smart Client's only requirement is that it must run Java and have a screen resolution of at least 600x800. This means the client application is able to run on any platform that supports Java, including Windows®, Linux, MAC, etc., and is also compatible with terminal server and Citrix.

Enhanced Map Performance Using Intelligent Geo-caching

GeoMedia Smart Client's intelligent caching process for spatial data enables specified data themes (vector and raster) to be cached on the server, the LAN, and the client. This can provide substantial performance gains – reading directly from the cache bypasses the need for the map server to retrieve and render the data and also reduces the volume of data transferred around the network.

The cache is updated automatically based on timestamps without the need for any user intervention. The cache uses intelligent tiling to optimize performance and minimize the processing needed to keep the cache current. Cache parameters can be tuned for each cached feature class to optimize overall performance:

- Tiling ensures the system only delivers data capable of being viewed on the client (i.e., it cuts network traffic caused by the transfer of unnecessary or redundant data).
- Tiling aids in fast image display and reduces memory overheads.
- Tiling can be optimized to get the most from the available infrastructure (e.g., reflecting client equipment characteristics, server capacity, data characteristics, network bandwidth, etc.).
- Administrators can optimize tiling by varying tile sizes to reflect spatial variations in the density of map data features within a theme or its view-scale ranges.
- The cache has an optimized publishing process that only needs to regenerate tiles that cover areas with modifications in the source data.

Offline Working and Field Data Capture

The built-in data caching technology allows GeoMedia Smart Client to run in disconnected mode and automatically resynchronizes when reconnected to the server. This means GeoMedia Smart Client can support mobile or field editing workflows. In such deployments, transaction management requirements (e.g., record locking, version control, etc.) can be implemented using the workflow module.

Foundation Geospatial Capabilities

This section provides a high-level overview of the scope of geospatial functionality supported by GeoMedia Smart Client.

Data Capture, Editing, and Redline

GeoMedia Smart Client supports high-end data capture tools with construction aids that enhance productivity and ensure data quality. It provides a comprehensive set of snap functions (e.g., end-point, mid-point, on-vertex, intersection, perpendicular, etc.) and construction aids (e.g., keyed-in distance, angle, etc.). GeoMedia Smart Client uses the same "smart cursor" technology originally developed for GeoMedia. The smart cursor detects existing map features where the cursor is passing and simultaneously displays possible snap options – enabling you to select the appropriate snap function without interrupting your work to change tools or settings.

The client supports topological editing. For example, when modifying the boundary of a land parcel, the system can apply the changes to coincident vertices of adjoining parcels. GeoMedia Smart Client also

supports labeling, including the advanced dimensioning options commonly required for cadastral or utility systems. Data can be captured into feature classes or redline layers, and all edit functions support undo/redo operations.

Query and Searching

Queries can be constructed ad-hoc (using a query wizard) or chosen from lists of pre-defined queries set-up by the administrator. They can include combinations of spatial and attribute-based criteria. GeoMedia Smart Client supports this query segmentation, as well as standard SQL-based queries.

GeoMedia Smart Client displays query results in the map window and a linked data window. Records can be highlighted in the data window and copied and pasted into other business applications, such as Microsoft® Excel®.

GeoMedia Smart Client also provides a set of distance and area measurement tools. Selection of measurements points can make use of digitizing snaps, for example, to ensure a distance is perpendicular to an existing line.

Map Control – Symbology and Navigation

Content of the map window (where features and their symbology are displayed) is controlled by the legend. This operates in the same way as GeoMedia and enables you to set the appearance and properties of each data theme or query result including style (line styles, color, weight, fill, font, pattern, etc.), translucency, display priority, scale display ranges, and more.

Administrators can define standard symbology for specific feature classes, users, or applications and determine if other users can override these settings. Authorized users and administrators can also save the current view settings, including any combination of view extent, scale, active features, and symbology to a library of saved views. Selecting a saved view automatically zooms to the associated location with the appropriate map features and symbology.

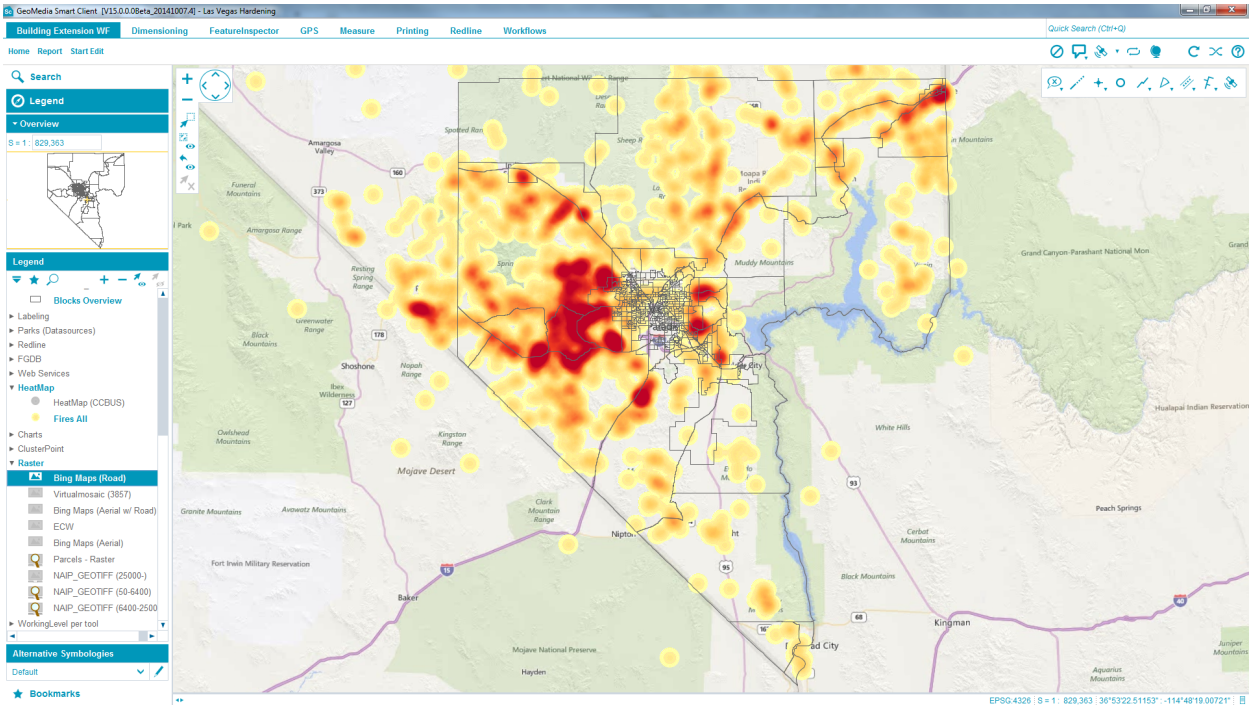
To aid familiarity, navigation follows the concept of a consumer mapping application (e.g., supporting zooming with the scroll wheel and proving a pan and zoom control in the map window). An overview control displays the current map window extent in context of the overall data holding or project area. If you move the map extent in the overview window, it moves the window area in the map window.

Plotting and Printing

GeoMedia Smart Client supports advanced map printing, including large format sheets, such as European A0 size paper, rotated printing at any angle, and true-scale printing. The print preview function allows you to adjust the map extents. You can define standard plot layouts and marginalia and apply them to prints.

Business Graphics

Gain even deeper insights from sophisticated analyses in **GeoMedia Smart Client** by presenting as pie charts, bar graphs, heat maps and symbol clustering. These types of illustrations are in high demand from professionals who need to extract relevant business knowledge from rich GIS data, ultimately increasing their visibility and understanding.



This map represents an analysis of commercial store locations in Las Vegas, illustrating intensity via a HeatMap

A Smarter Way to Enable Your World

GeoMedia Smart Client was engineered to fill a gap in the geospatial platforms market. Today, GeoMedia Smart Client supports more than 25,000 users across 200 customer systems.

Organizations have chosen GeoMedia Smart Client because it enables them to implement geospatial business workflows (unsupported by out-of-the-box products) across their enterprise in a way that is easy and sustainable. With Smart Client, you can:

- Develop highly-focused and efficient workflows without the cost and time needed to develop custom code by using the workflow and rules definition configuration tools
- Reduce training overheads while increasing productivity and data quality by guiding you step-by-step through recognizable workflows with task-specific forms and tools with built-in data validation.
- Increase information sharing and re-use while avoiding the inefficiencies, errors, and risks that arise when multiple departments work with coordinated access, data models, and workflows
- Avoid the cost of installing and administering a technical software application for a large user base by delivering applications using a smart client platform that includes support for SaaS and the Cloud.

About Hexagon Geospatial

Hexagon Geospatial helps you make sense of the dynamically changing world. Known globally as a maker of leading-edge technology, we enable our customers to easily transform their data into actionable information, shortening the lifecycle from the moment of change to action. Hexagon Geospatial provides the software products and platforms to a large variety of customers through direct sales, channel partners, and Hexagon businesses, including the underlying geospatial technology to drive Intergraph® Security, Government & Infrastructure (SG&I) industry solutions. Hexagon Geospatial is a division of Intergraph® Corporation. For more information, visit www.hexagongeospatial.com.

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