∴ DSLR/1421/2022-B7

SCOPING SHEET FOR WEB APPLICATION

Based on the pre-bid meeting held on 21/12/2022 for the tender for selecting "CERT-**IN EMPANELLED INFORMATION SECURITY AUDITING ORGANISATIONS**" for the Department , we are hear by publishing the web applications scoping sheets and architecture as clarification arises.

For Director

ജി.ആർ. പുഷ്പ
ഡെപ്യൂട്ടി ഡയറക്ടർ
സർവ്വെയും ഭൂരേഖയും വകുപ്പ്
ഡയറക്ടറുടെ കാര്യാലയം
തിരുവനന്തപുരം-14

Sheet1

Web Application Scoping Sheet for Security Assessment		
S.No.	**Web Application Assessment Details**	**Description**
1	Web Application Name & Description	https://staging.entebhoomi.kerala.gov.in
2	Type of application Web/Application/ Mob/Rest / Thick / Thin instance to assesses & number of Application (s)	Web application
3	How many login systems to assesses?	3
4	How many static pages to assesses? (Approximate)	0
5	How many dynamic pages to assesses? (Approximate)	75
6	Do you need want role-based testing performed against this application?	Yes
7	Do you need want credentialed scans of web applications performed?	Yes
8	Back-end Database (MS-SQL Server, PostgreSQL, Oracle, etc.)	PostgreSQL
9	Authorization No. of roles & types of privileges for the different roles	Roles - 23 Privileges – 120
10	Whether the application contains any content management module (CMS) (If yes then which?) If its is Portal do mention please	No
11	Is it a hybrid application?	No
12	Whether the application was security audited earlier? If so, please mention details.	Yes

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13	Front-end Tool [Server side Scripts] (i.e. c++, J2eee, ASP, Asp.NET, JSP, PHP, etc.) – PHP	Java
14	Operating System Details (i.e.Windows-2003, Linux, AIX, Solaris, etc.)	Linux
15	Application Server with Version (i.e. IIS 5.0.Apache, Tomcat, etc.)	Apache + Spring boot 2.6
16	Total No. (Approximate) of Input Forms	500
17	Total No. of input field	1200
18	Total No. of login modules	2
19	Number of Web Services, if any	1
20	Number of methods in all web services ?	12
21	Number of URL's require to assesses ?	https://staging.entebhoomi.kerala.gov.in
22	Is this REST /SOAP based Application	Web Application
23	Is it Thick or Thin Client Application	Web Application
24	Is this Applications is ERP/ Enterprised based App	No
25	Does the application has or proposed to have payment gateway integration? Please specify	No
26	Is Application hosted in Cloud ? If yes which under cloud provider private & others (Govt SDC)	SDC

	Web Application Scoping Sheet for Security Assessment	
S.No.	**Web Application Assessment Details**	**Description**
1	Web Application Name & Description	**M.app Enterprises & A cloud platform for creating geospatial apps for your organization**
2	Type of application Web/Application/ Mob/Rest / Thick / Thin instance to assesses & number of Application (s)	thin and web
3	How many login systems to assesses?	
4	How many static pages to assesses? (Approximate)	
5	How many dynamic pages to assesses? (Approximate)	10
6	Do you need want role-based testing performed against this application?	
7	Do you need want credentialed scans of web applications performed?	
8	Back-end Database (MS-SQL Server, PostgreSQL, Oracle, etc.)	**Postgres Sql**
9	Authorization No. of roles & types of privileges for the different roles	As of now only two were there
10	Whether the application contains any content management module (CMS) (If yes then which?) If its is Portal do mention please	**Yes https://staging.entebhoomigis.kerala.gov.in/management**
11	Is it a hybrid application?	
12	Whether the application was security audited earlier? If so, please mention details.	**NO**
13	Front-end Tool [Server side Scripts] (i.e. c++, J2eee, ASP, Asp.NET, JSP, PHP, etc.) – PHP	
14	Operating System Details (i.e.Windows-2003, Linux, AIX, Solaris, etc.)	**2019 windows server**
15	Application Server with Version (i.e. IIS 5.0.Apache, Tomcat, etc.)	
16	Total No. (Approximate) of Input Forms	
17	Total No. of input field	
18	Total No. of login modules	Multiple
19	Number of Web Services, if any	
20	Number of methods in all web services ?	RESTful web services
21	Number of URL's require to assesses ?	https://staging.entebhoomigis.kerala.gov.in/Apps/?tenant=infinity_tenant
22	Is this REST /SOAP based Application	Rest
23	Is it Thick or Thin Client Application	Thin

24	Is this Applications is ERP/ Enterprised based App	Enterprised based app
25	Does the application has or proposed to have payment gateway integration? Please specify	no
26	Is Application hosted in Cloud ? If yes which under cloud provider private & others (Govt SDC)	Yes & SDC

S. No.	Required service information	Description
1	What services do you expose to the internet? (Examples: Web, database, FTP, SSH, etc.)	Web
2	What type of authentication do you use for your web services? (Examples: PubCookie, Windows Integrated, htaccess, etc.)	
3	What languages do you use for your web services? (Examples: PHP, Perl, Ruby, ASP, etc.)	
4	What antivirus application (s) do you use?	
5	Is your antivirus application implemented using a "managed" client/server architecture, or in a stand-alone configuration?	
6	What Enterprise Resource Planning (ERP/MIS) application (s) does your organization use? (Examples – SAP, Peoplesoft, Oracle, JD Edwards), Any Other Vender Applications.	
7	Please include a brief description of each.	
8	What E-commerce application (s) does your organization use? Please include a brief description of each.	
9	What database technologies does your organization use? (Examples – Oracle, Microsoft SQL, IBM DB2, MySQL) . Please include a brief description of the purpose for each.	
10	What services do you expose to the end users in internet?	

M.App Enterprise 2023

Product description

4 October 2022

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Contents

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Introduction

M.App Enterprise is a game changer compared to other enterprise GIS software solutions currently available in the market. Historically, enterprise GIS systems contained static maps, which were made by GIS experts in the late 20th and early 21st centuries. Today's rapidly changing IT environments, easy to implement demand and user-based functionality requires highly configurable, dynamic enterprise systems that cater to GIS professionals and non-professionals.

M.App Enterprise provides a unified geospatial enterprise platform that enables users to create applications that suit the business-specific needs and requirements of all enterprise users, from top-level managers to GIS experts and field workers. M.App Enterprise caters to large-scale deployments and features an architecture that uses a centralized GIS for all stakeholders to work collaboratively.

M.App Enterprise combines the best of breed capabilities available from Hexagon's geospatial server products (e.g., optimized delivery services for imagery and vector data, workflow services and geoprocessing services) with the enhanced user experience from Hexagon Smart M.Apps.

Smart M.Apps are simple-to-use, lightweight map applications that solve real business problems. They provide answers and present information in a visual and compelling way. Smart M.Apps revolutionize the way we envision, experience and communicate geographic information. These targeted information services combine fresh geospatial content and workflows to deliver an interactive experience that includes a map and a dashboard of insightful analytics alongside it. These information dashboards allow decision-makers to make smarter, more informed decisions faster from anywhere, at any time using standard computers, tablets or mobile devices.

Smart M.Apps are publicly available as cloud-based apps through the M.App Exchange – the Smart M.App storefront. On the other hand, M.App Enterprise delivers a privately-hosted Smart M.App solution for organizations that want to realize the value of a Smart M.App deployment while staying within the confines of their enterprise network. With M.App Enterprise, you can access Smart M.Apps anywhere within your organization's network for real-time answers, whenever you need them, wherever you need them.

M.App Enterprise can be hosted on-premises or in the cloud. It provides an extensive development platform for third parties and system integrators to deliver innovative and industry-specific solutions, allowing the combination of multi-source imagery from free and commercial imagery content providers with large vector datasets stored in standard enterprise geospatial databases such as Oracle Spatial, SQL Server Spatial or PostGIS.

M.App Enterprise is available in three different licensing models:

- Usage: based on a packages of hours
- Subscription
- Permanent

The licensing models are designed to offer flexibility and adaptability to different business models and budget orientations of customers (CAPEX vs OPEX). Its licensing models can adapt from small to super large projects and does not introduce any limitations on the number of users, hardware specifications (number of cores or number of servers) or SaaS usage.
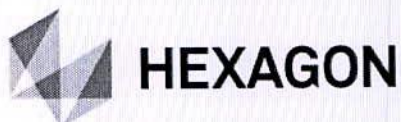
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M.App Enterprise components

M.App Enterprise consists of the following components:
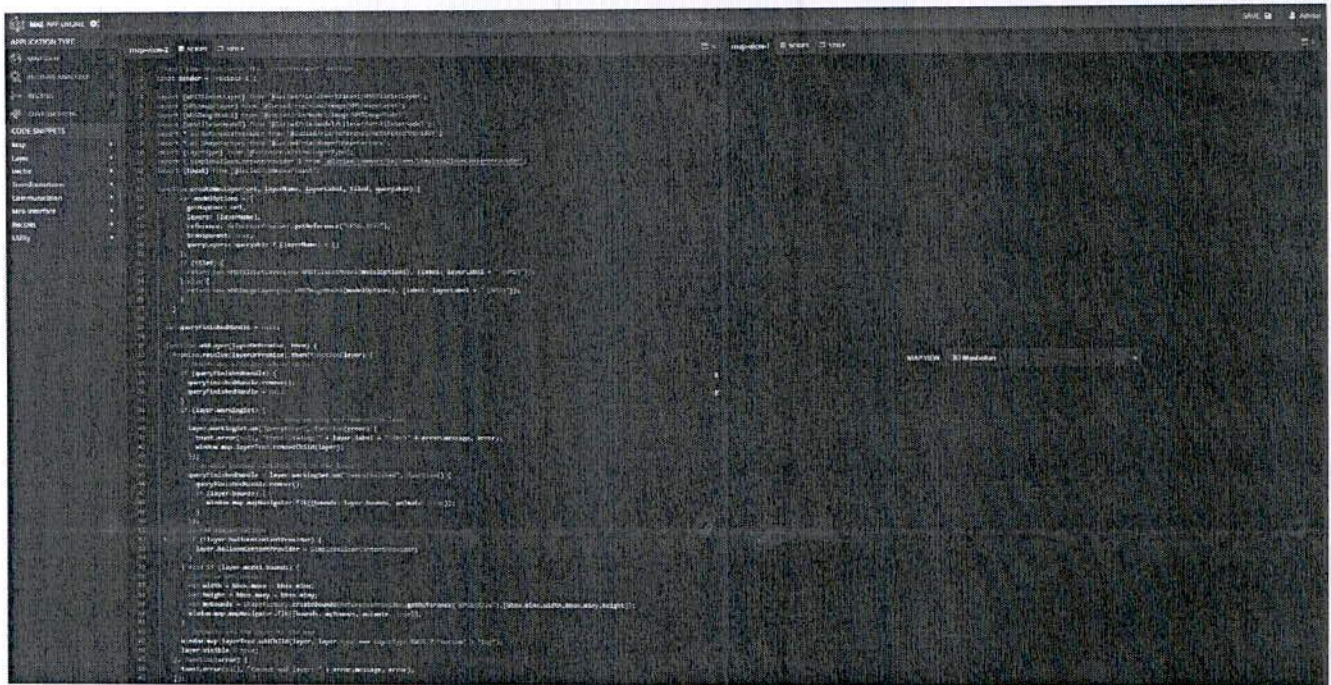
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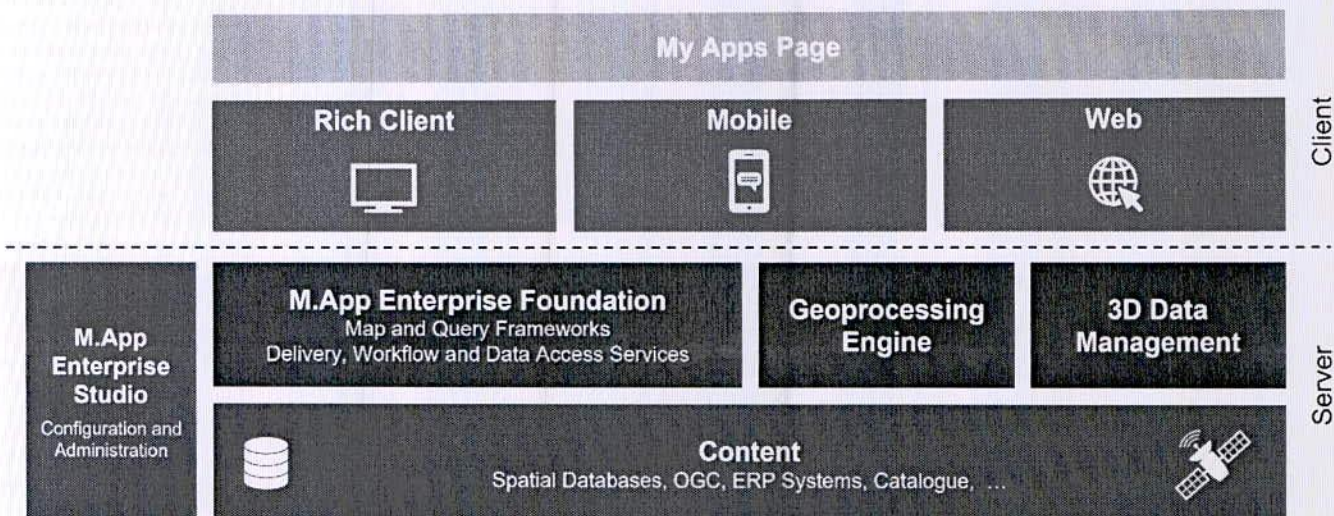
M.App Enterprise Studio

M.App Enterprise Studio is an on-premises, web-based development environment where application developers and builders can design, configure and administer their enterprise Smart M.Apps, including:

- Definition of enterprise security concept, including users and role management
- Configuration and administration of access permissions to apps
- Design application layout (using predefined templates)
- Connect your content to apps (raster and vector datasets, geospatial web services, etc.)
- Define complex and scale-dependent map styles using powerful style editor fully compliant with OGC Symbology Encoding (SE) standard
- Configure your analytics (using predefined business intelligence (BI) widgets, etc.)
- Model business processes to control the flow of the information using spatially enabled workflows via a graphical web-based editor (Workflow Editor)
- Create geoprocessing services using a web-based graphical spatial model editor (Spatial Workshop)
- Configure print layouts:

M.App Enterprise Studio

M.App Enterprise Studio offers an embedded M.App Editor, allowing app builders to define the layout template for the browser app (single or multiple panels), and the type of content for each panel (Map, BI Map, Workflow, Spatial Recipe or custom). Additional easy-to-use graphical editors are available to define map styles (Style Editor), workflows (Workflow Editor), spatial recipes (Spatial Workbench) and a BI Wizard for configuring widgets and building geospatial dashboard type of apps.

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M.App Enterprise Studio designing the layout of browser apps

Content

Hexagon Smart M.Apps created with M.App Enterprise can be fuelled using different sources of content by enabling connections to different types of internal and external providers. The following content types are currently supported:

- **Imagery**: Internal imagery datasets available for apps
- **Vector Data**: Internal vector data available from direct connections to an Oracle, Microsoft SQL Server or PostGIS database
- **GeoServices**: OGC WMS, WMTS and WFS Services created from internal content available in any of the supported enterprise spatial databases; external OGC WMS, WMTS and WFS Services; and base mapping services (OpenStreetMaps and HERE Maps), which can be made available for your app

M.App Enterprise Foundation

M.App Enterprise's Foundation layer provides the Map and Query Frameworks, as well as the core Delivery, Workflow and Data Access Services.

Map Framework

M.App Enterprise is designed and implemented as a high-performance geospatial platform by using state-of-the-art development patterns, map rendering optimization techniques and continuous performance tests that are based on over 20 years of experience in this area. Specifically, the Map Framework includes the latest caching technologies for vector data, combining techniques such as Quadtree caching, automatic geometry simplification and vector sets.
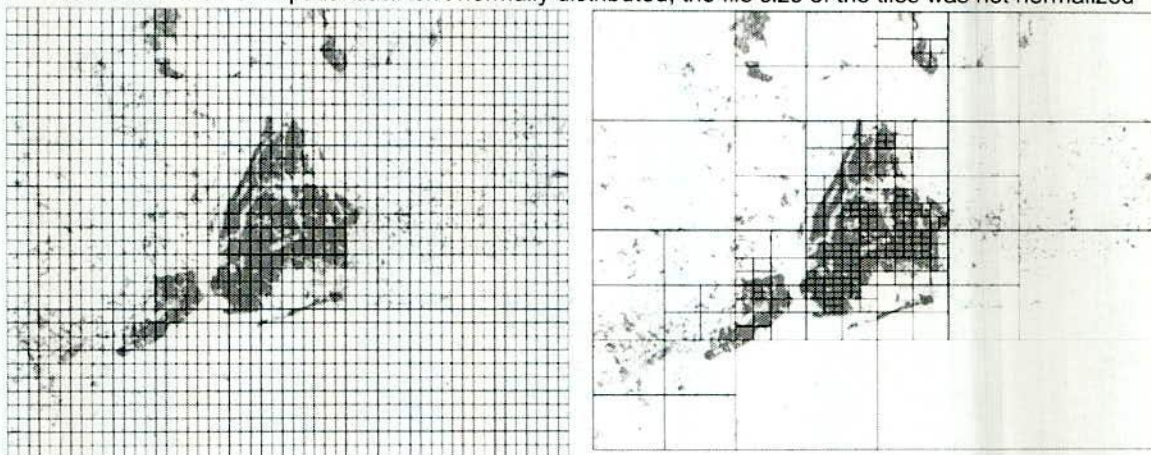
Quadtree vector caching

Hexagon is a pioneer in vector caching techniques, which are being used and have been incrementally improved upon in our products since 2001. The original concept was to tile the area of interest in a

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homogenous grid (see picture below). Despite the performance improvements of using cached vector data instead of reading the original data directly from the database, this technique has revealed some limitations:
- Inefficient usage of storage and still a high payload against the database to build the cache
- Extensive I/O operations to load high-resolution grids, causing performance issues
- Trial and error to identify the best cache grid size
- Because most of the spatial data isn't normally distributed, the file size of the tiles was not normalized

The latest innovations introduced in vector caching in the Map Framework include the usage of Quadtree data structures to optimize (minimize) cache size, publish times and number of tiles, the introduction of SQLite databases to store and access tiles faster, and the use of Google's state-of-the-art Protocol Buffers to serialize and read/write structured data streams. These combined techniques addressed all problems mentioned above and resulted in significant benefits:
- Reduced I/O operations by the introduction of SQLite databases to store and access tiles
- Guaranteed file sizes and consistent distribution:
  - Each node of the Quadtree structure has exactly four children
  - Each node has a maximum capacity. When file size is reached, the bucket automatically splits
- Significant performance gains in tile production
- Since the number of tiles has been reduced, the payload against the data source to read data and generate the tile is also minimized
- Use of Google Protocol Buffers allow the introduction of a highly efficient binary format, minimizing the overall storage size and data transfer
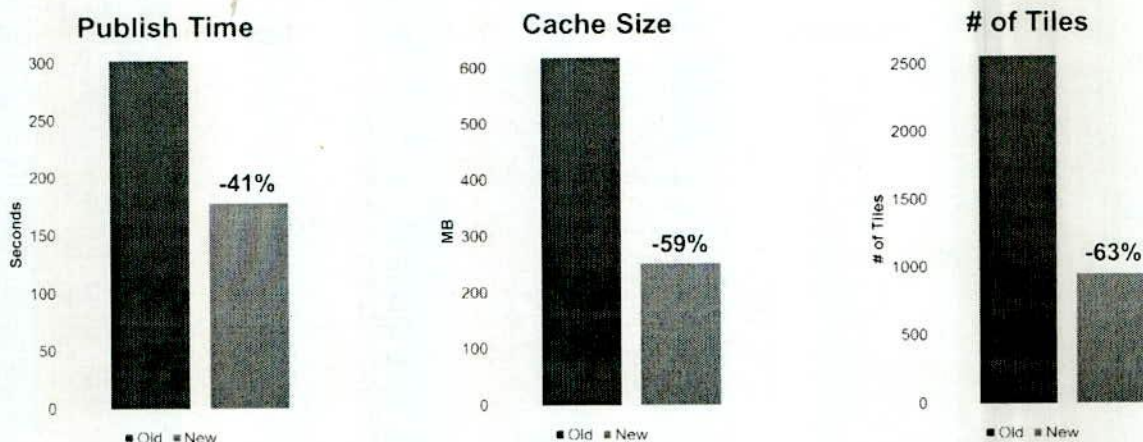

Reference system: CPU 1 Core 2.3 GHz, 6 GB RAM, Windows® Server 2012, PostgreSQL / PostGIS
Project Content: New York Open Data, 45 feature classes, 3 100 000 features

Quadtree vector caching - Detailed charts of performance improvements

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Vector sets

Vector sets are an innovation in M.App Enterprise that improves the handling of vector data. Vector sets are especially suited for static datasets or those with low-frequency update rates that are typically used as vector backdrops (e.g., topographic maps). Vector sets merge a selected number of layers from the database into a single optimized cached layer.
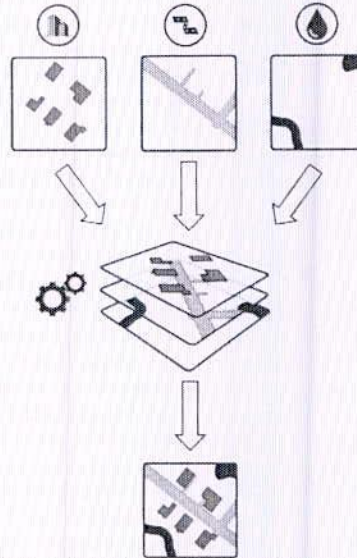
Vector sets – single optimized vector backdrop layer from multiple vector layers

The vector set cache is automatically built from a combination of techniques: zoom level-dependent vector cache versions, quadtree data structures and automatic geometry simplification, which are depicted in the illustration below. As the zoom level increases, the quadtree expands as necessary, according to the spatial distribution of data. Automatic geometry simplification algorithms are applied to reach the maximum capacity of each node.

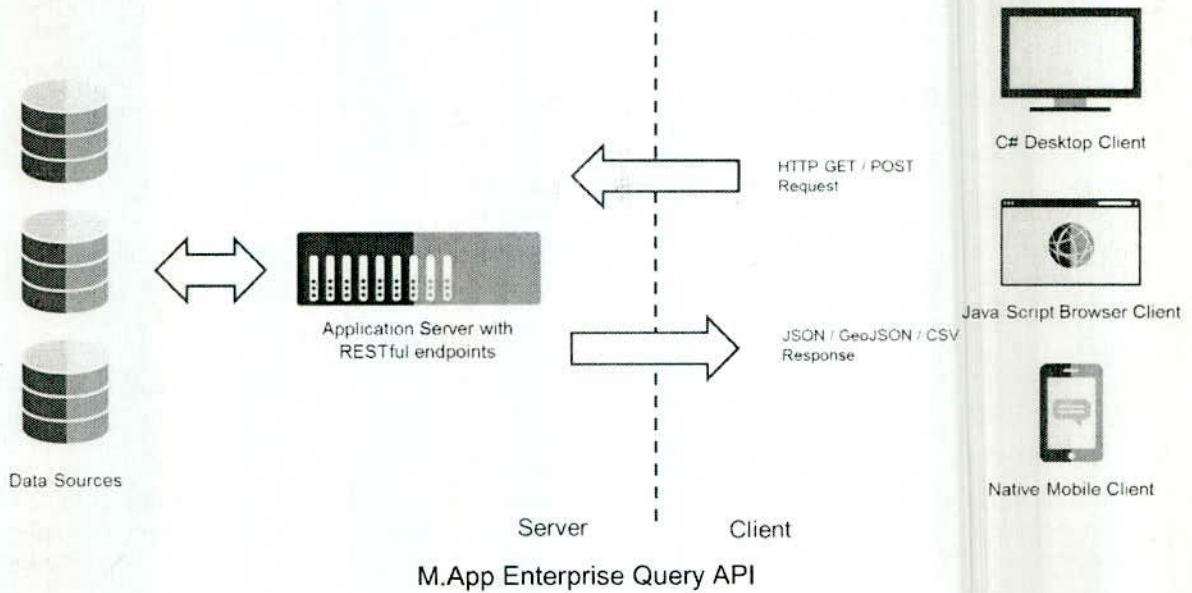1 : 1 500 000

1 : 300 000

1 : 65 000

1 : 15 000
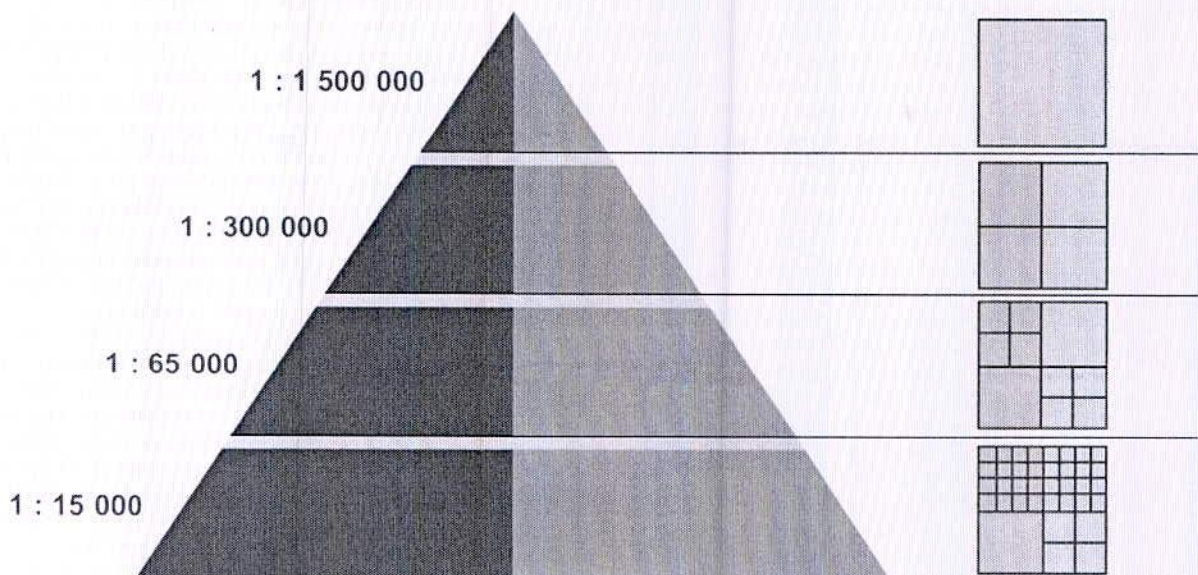
As a result, vector sets reduce the number of requests to the map server, reduce the cache file and improve access and rendering speed while preserving full legend control capability (i.e., show hide individual layers).

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Query framework

The M.App Enterprise Query framework offers a highly flexible approach for querying data because it is not bound to a predefined set of queries typically found in other commercial solutions. The M.App Enterprise Query framework provides a powerful and easily understandable API to query attributive and spatial data, based on RESTful web services open to all programming languages.

The query definition is constructed at the client-side source code based on user inputs and transformed into standard SQL syntax, which is then sent to the application server through HTTP GET/Post Requests. Multiple formats are supported for the response to be displayed at the client side, including attributive tabular data in standard JSON and CSV formats, as well as spatial data in GeoJSON format.

Data Sources

Application Server with RESTful endpoints

HTTP GET / POST Request

JSON / GeoJSON / CSV Response

C# Desktop Client

Java Script Browser Client

Native Mobile Client

Server | Client
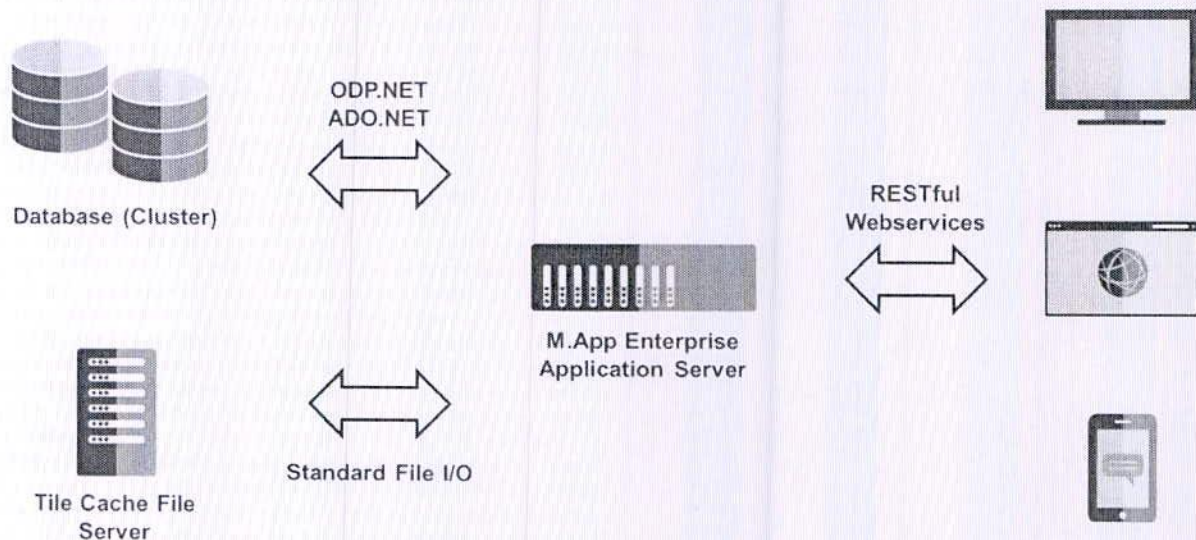
M.App Enterprise Query API

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Delivery and Data Access Services

Data Access Services to databases from M.App Enterprise Foundation is performed using ADO.NET and ODP.NET. Access to Tile Cache File server is supported on standard File I/O.

Regarding delivery mechanisms of spatial data, M.App Enterprise Foundation provides RESTful web services.

Workflow Engine

M.App Enterprise includes highly configurable rules and a Workflow Engine that enables organizations to implement lifecycle workflows, feature-level access control, data validation and behavior and integration into other systems.

- **Workflow Manager**

    - Process experts' predefined report, form and plot layouts
    - Configure geospatial processes (i.e., "workflow trees") based on XML files
    - Define automatic validation and conditions for each workflow node
    - Drive (remote control) the different clients (map content, area, scale, functions)
    - Define task-specific forms (for queries, analysis, editing, reports, etc.) using XML files including text boxes, checkboxes, drop-down lists and context-based help
    - Integrate external applications on the server-side
    - Define workflow steps and forms based on user and rights management, including connection to Active Directory or LDAP
    - Define disconnected workflows and forms, which enable end users to capture and edit attributive and spatial data while offline

        - A synchronization process enables posting edits back when the client reconnects
        - Project-based conflict handling can be added via workflow definitions

    - Triggering of server processes by user workflows using XML workflow triggers

- **Graphical Workflow Designer (available from M.App Enterprise Studio)**

    - Create your unique workflow with a modern and easy-to-use graphical interface
    - Easily extend and customize your workflow
    - Enables domain experts to define their day-to-day business workflows
    - Respond faster to business requirement changes
   - Reduce time to market

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Geoprocessing engine

The architecture behind the geoprocessing engine consists of several key constructs: operators, spatial models and web services.

An operator is responsible for encapsulating a computational element that performs calculations, processes data, fuses information, analyzes or visualizes a large variety of data formats. Operators exist as components to be used by a spatial modeling tool (Spatial Workshop) and are primarily built using C++.

Each operator includes ports that describe the inputs, outputs and parameters of the function. These ports dictate required and optional inputs and prerequisites, ensuring that all necessary information is available prior to executing the operator. Operators are linked together using these ports.
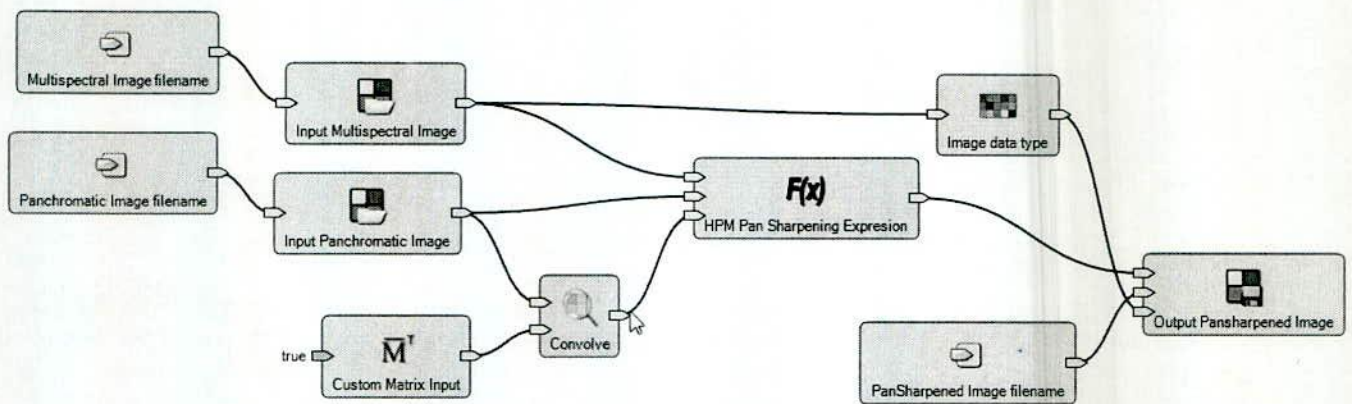

Example of operators assembled as a spatial model

M.App Enterprise comes with a full complement of operators to support a wide range of geospatial processes. However, if an organization has requirements that cannot be met with the existing set, new operators can be developed. The Spatial Modeler Software Development Kit (SMSDK) allows for the creation of new operators using a C++ development environment. This can be used to create operators that incorporate third-party algorithms, allowing for very powerful and seamless integration with the rest of the geospatial operators.

Using the Spatial Workshop web-based authoring environment integrated into M.App Enterprise Studio, operators are assembled into spatial models that execute specified geospatial workflows by defining relationships to data sources and other operators and models. Models may perform combinations of raster, vector and point cloud operations. Models assemble sets of operators into more complex algorithms and relate to datasets and inputs and generate results. Existing models can be customized so that organizations can create important variations of them for specific purposes or create entirely new models.

These models and the services created when they are published can be strung together in sequence, nested and reorganized in many ways to support specific workflows. They can be tested step by step during development and results viewed in real time, thereby accelerating the authoring cycle. Finally, these models are published as a RESTful web service, making them consumable by everyone across the enterprise.

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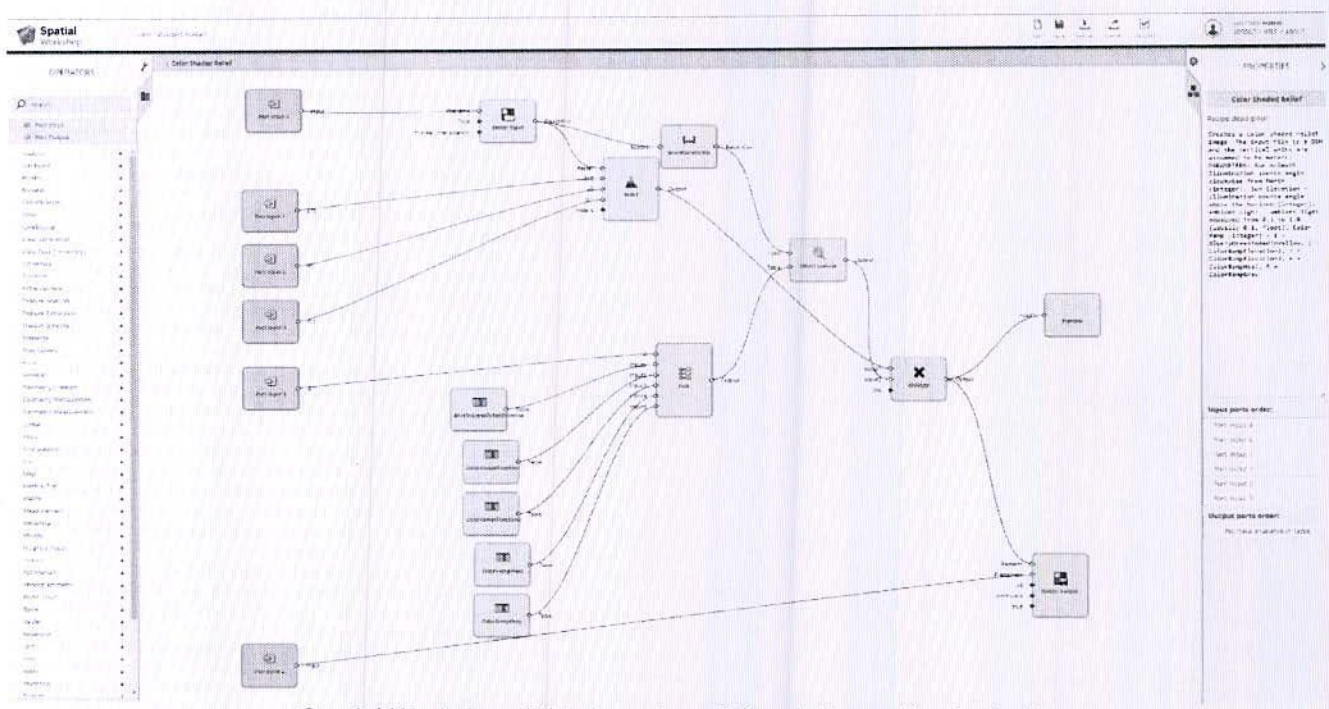
Spatial Workshop: Web-based spatial modeling authoring tool

Through this approach, specialists and subject matter experts develop methods and algorithms, author and authenticate the models and then publish them as web services. End users may then execute these approved geospatial web services in a reliable and consistent manner. This mechanism provides great flexibility for taking best-of-breed algorithms from different sources (e.g., government, academia and industry) and assembling them into services for broader use. This is a powerful force multiplier since these subject matter experts now have a mechanism to easily share their knowledge and expertise with an unlimited number of users.

Some examples of geospatial spatial model-based web services include:
- Terrain analysis: Line of Sight, Helicopter Landing Zones, Slope Analysis, Terrain Differencing, Terrain Shading, Rough and Finished Contours, Automatic Terrain Generation
- On-demand map generation: Execute cartographic web services (CWS): Create GeoTIFF from CWS, Create Geospatial PDF from CWS
- Elevation processing: Smooth Elevation Values, Remove Elevation Spikes, Flatten Terrain, Detect Vertical Obstructions

Once these operators have been assembled into models published as services, the next critical step is to integrate them into stand-alone targeted applications, essentially creating very intuitive interfaces for accessing and executing these geospatial web services. These applications, which have been coined as Hexagon Smart M.Apps, relate one or more models/services with specific data sources. They provide a graphical user interface (GUI) and perform other processes.

Hexagon Smart M.Apps are more intuitive and focus on user-specific requirements and workflows pertaining to the organization and apply geospatial processing as an underlying infrastructure, enabling a broader set of "geospatially-enabled" applications.
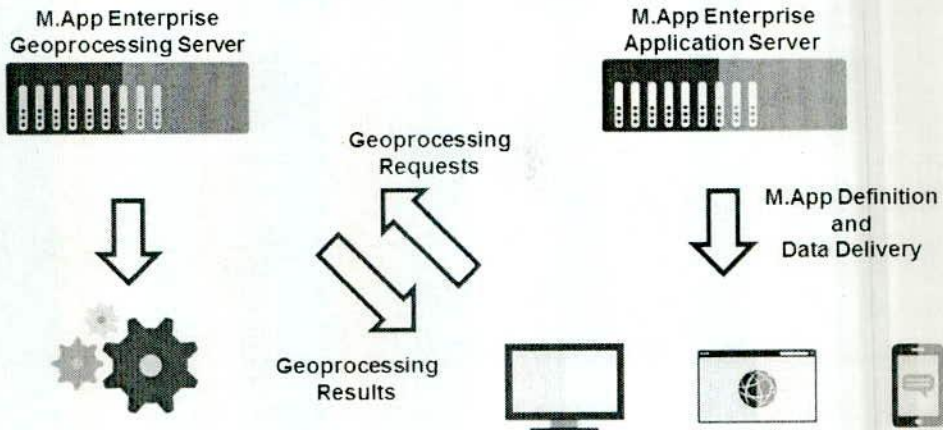
Creating applications in this manner provides an important layer of abstraction between the user interface and the algorithms responsible for geospatial processing. This flexibility allows for an unlimited amount of applications to then be developed; an important factor when we acknowledge support for a range of end-user devices and form factors, such as laptops, tablets, smartphones, and even smartwatches. This approach also allows companies and organizations to brand the end-user applications as their own and make them available via an enterprise or public marketplace. Features like these allow for organization and mission-specific

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graphics and terminology to be incorporated into the user interface, thereby making for an even more intuitive user interaction.

It is important to note that while geospatial processes use, for example, imagery, terrain models and maps, some applications may purposely be designed not to provide a display of any of these items. Rather, the user interface may be a streamlined view into statistical results of a geospatial process, or some other summary-level information viewable from a dashboard on a smartphone.

In M.App Enterprise, the geoprocessing engine is separated from M.App Enterprise Foundation layer to ensure maximum application performance and protection of other application instances from geoprocessing tasks computational demand.
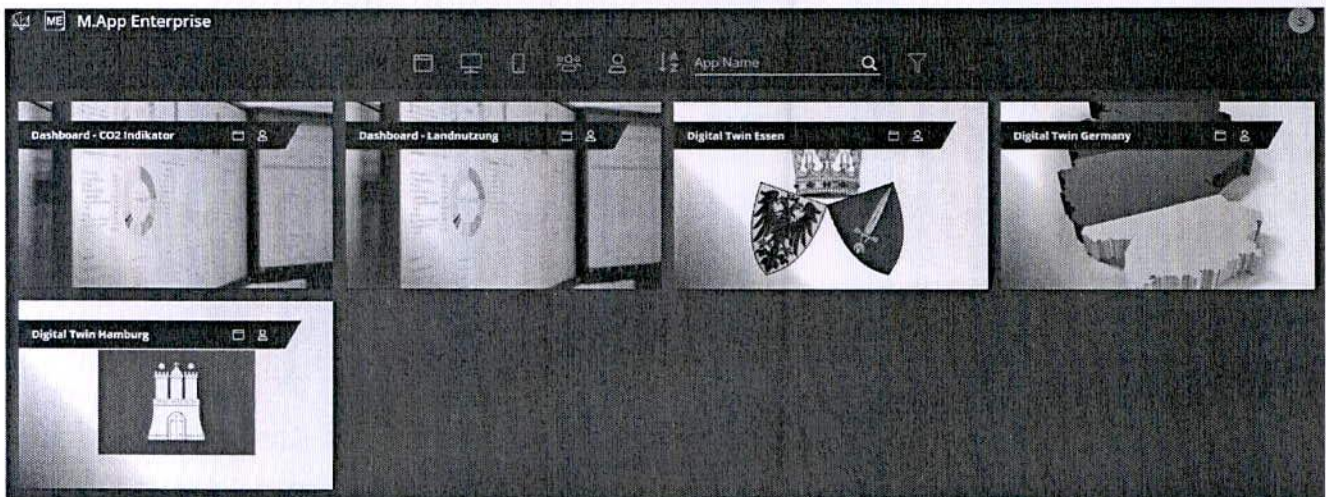
M.App Enterprise
Geoprocessing Server

M.App Enterprise
Application Server

Geoprocessing
Requests

M.App Definition
and
Data Delivery

Geoprocessing
Results

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My Apps page

The My Apps page provides centralized access to all the apps that are assigned to a user, independent of app type. Without a log in, this page will show all publicly available apps and once logged in, each user will only have access to the apps that are assigned to his or her role.

M.App Enterprise allows users to build different types of client applications, including:
- Desktop client provides a full set of GIS functionality designed for semi-professional users
- The browser client offers easy to use access to geospatial data in 2D and 3D
- Native apps to access from mobile devices (iOS and Android)

Details of main features provided by each of these types of apps are provided in the sections below.

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Desktop client

The Rich Client is a Java application running on the client side. Deployment is based on standard Java Web Start technology, and it runs as a self-configuring and updating client. The client uses web protocols and standards for communications, but it is entirely separate and does not need to run in web browsers.

Rich Client main features includes the following:

- One-click start-up for a user to get working with the client
- Application configures automatically based on user profile
- Automatic updates without user action
- Look, feel and performance of a desktop application
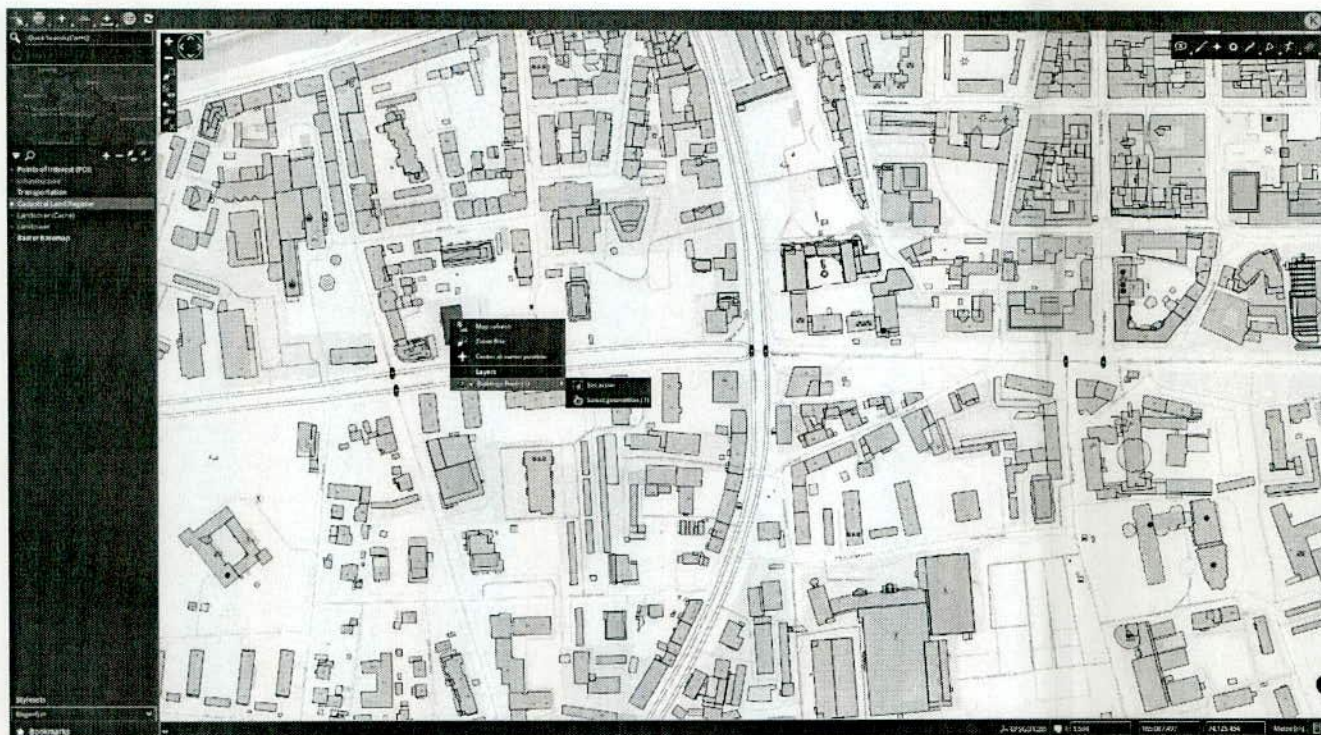
High-level cartographic map display

- Extended style capabilities based on OGC standard SE
- Definition of very complex and scale-dependent styles
- Coordinate system support

    - Including support for geographic (Lat/Lon) and custom coordinate systems within the primary database (ORACLE and Microsoft SQL Server)

- Use of SVG icons to style points, line strings, and area fills
- Support of Rich Text Format (rtf) and halo effects
- Style Editor
- Raster backdrop supported by file-based image formats and web services

    - Raster format support for TIFF, JPG and PNG
    - Client-side integration of WMTS including on the fly coordinate transformation
    - Client-side Bing Maps (street maps, imagery and imagery with labels) integration including coordinate transformation on the fly

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- Client-side ECWP integration
- Imagery is scaled and delivered on the fly (no need for pre-cached tile set)

Measurement

Includes various commands to perform point, linear, circle and area measurements on features. The measure results are represented in the client as a working level.

- **Create and delete the following measurements:**

    - Point (coordinates)
    - Line (angle and length)
    - Cumulative distance (segment length, angle and polyline length)
    - Circle (radius, perimeter and area)
    - Polygon (side length, perimeter, area and angles)

Dimensioning

Includes various commands to dimension features on the map. The dimensioning results are stored in the database and represented in the client as a working level.

- Utilize snapping with any dimensioning function
- **Simple Dimensioning**: Allows users to depict the distance between two points of a feature
- **Orthogonal Dimensioning**: Allows users to depict the distance between two points of a feature, drawing the line orthogonally displaced from the existing line feature
- **Free Dimensioning**: Dimensioning line can be placed "free" regarding the vertical orientation
- **Radial Dimensioning**: Allows users to create radial dimensions for circle and arc features
- **Chain Dimensioning**: Includes Orthogonal Chain Dimensioning, Chain Absolute Dimensioning and Chain Difference Dimensioning
- Edit/delete dimensioning text and position

Redlining

Enables drawing new graphics on the map such as points, polylines, polygons, buffers or text. The graphics can be stored in the database or in the local cache directory and represented in the client as a working level. Redlining commands include:

- Draw text features, polylines, polygons, rectangles, buffers
- Edit existing redline features
- Copy existing features to the redline working level
- Delete existing feature(s)

Feature selection

Enables selecting features on the map, which is essential for conducting queries. Features can be selected by clicking on the map or may be based on spatial fences represented by geometric objects such as circle or polygons.

- Select active features by:

    - Point, circular, polyline, rectangular, polygonal fence
    - Map window extent
    - Click on the map

Attribute and spatial queries

Enables filtering geographic objects based on specified attributive and spatial constraints. Results of the query can be observed in the corresponding data window while objects are highlighted in the map. Results can also be sorted and exported to Microsoft Excel, for example:

- **Search with attributive input ("Input-Query")**: Allows users to execute queries based on attributive constraints
- **Search with map selection ("Selection-Query")**: Allows users to conduct queries based on a spatial map selection; the selection could be created by clicking on objects or by defining spatial fences
- **Combined search**: Allows users to run an "Input-Query" on already pre-selected objects

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Snapping tools

Enables accurate creation, editing, measurement, or dimensioning of features by snapping to existing vertices, midpoints, endpoints, intersections, and tangents. Most tools are also supported by assigned F keys.
- **Midpoint snapping:** Allows users to snap to the midpoint of a line segment
- **Intersection snapping**: Allows users to snap to the intersection point of two or more feature line segments
- **Tangent snapping**: Allows users to snap to tangent points of a circle or arc
- **Perpendicular snapping**: Allows users to snap one feature line to another whereat the two lines are exactly perpendicular (right-angle)
- **Vertex snapping**: Allows users to snap to single points of a feature
- **Endpoint snapping**: Allows users to snap to the end point of a feature
- **Detail settings**: Set snapping tolerance and feature class selection and deactivate smart snapping

Advanced geo-caching

Use intelligent geospatial data caching for raster and vector data, supporting high performance and disconnected mobile editing.
- Raster and vector data cached either on the server in the LAN or on the client
- Client caches kept current through a fully automated process using timestamps, without any need for user intervention
- Manually synchronize the client and server cache

    - Statistics panel shows static and dynamic information concerning the cache synchronization process, including:

        - How many feature classes are selected and are hence considered for cache synchronization
        - How many tiles those feature classes contain, including how many of those tiles have been successfully synchronized, or synchronized with failures

Printing

Enables high-quality, true-to-scale printing.
- Including large-format plotting in A4 to A0 formats (Letter to E size)
- Rotate content
- Enlarge or diminish the map extract to be printed
- Specify page title, the page subtitle, and any additional info text
- Dynamic attributive information
- Page preview
- Create snapshots
- Include scale bar

Useful application tools
- Bookmarks

    - Create, delete, import, and open user-defined map configurations.

        - Save your current map settings (i.e., the map extract and contents) at any time, and then call them back up again later
        - Capture thumbnail automatically from the map for visual context in the bookmark

    - Smart Search

        - Use a single point of input to search and set legend entries, bookmarks, queries, map center and scale.

Administration and IT
- Automatic delivery of applications over a web HTTPS connection
- High-level enterprise administration for users, roles, apps, etc.
- Secure data access control supporting AD and LDAP and audit trails
- Integration to external data and systems
- Client is running on any Java-enabled platform

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Security

- Supports username/password credentials to authenticate and authorize access from the client to its server application
- Data access control: security, audit-trails and access control (using feature-level attributes, geographic areas, functional groups, etc.)

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Browser client

Browser apps offers BI capabilities to provide a deeper understanding of data inside an organization and allows non-GIS experts to leverage the power of geospatial data in 2D and 3D based on LuciadRIA technology.

Browser apps built with M.App Enterprise support the following web browsers:
- Google Chrome
- Mozilla Firefox
- Microsoft Internet Explorer 11
- Microsoft Edge

LuciadRIA highlights

LuciadRIA is the answer to today's demands for powerful, lightweight applications in the browser. Driven by today's most advanced web technologies, LuciadRIA uses WebGL, HTML5 and JavaScript to deliver desktop-like performance to your web applications.

With LuciadRIA, you can expect high performance and complete accuracy, with desktop-like visualization of satellite and other imagery, vector-based data and dynamic content, such as tracks. Connect to your data via OGC web services or drag and drop common file formats. Data can be explored in a 2D or 3D map view or vertical intersection view. Combine with a timeline view for 4D analysis.

Clean design matters. LuciadRIA is the only web-based geospatial solution that allows users to go from 2D to 3D with a simple click, using the same code and the same data, while providing users with a beautiful, intuitive interface.

LuciadRIA supports 3D and advanced visualization capabilities thanks to hardware acceleration with WebGL technology. Through a single API, LuciadRIA provides users with the capability to develop applications for software 2D, hardware-accelerated 2D and hardware-accelerated 3D.

- Build a standards-based, interoperable web-based solution that handles 2D and 3D
- Visually analyze millions of events or locations directly from a browser
- Handle real-time dynamic data, such as flights, vessels or people, with tens of thousands of moving assets
- Enjoy the interactivity of a desktop solution, including analytics, right in the browser without plugins
- Build a high-performance web solution that exploits graphics hardware for 2D and 3D, while also working in software mode
- Manage data and maps in different projections, including 2D polar projections and 3D, without extract-transform-load (ETL) processing
- Build mission-critical web-based solutions that handle geospatial data with the accuracy required for mission planning

Full vector support in the browser

The browser vector renderer engine supports any map projection and style definitions based on OGC Styled Layer Description and Symbology Encoding (SE) standards. It also supports the server vector caching technology previously described (quadtrees, vector sets with automatic simplification), allowing a single server cache to be consumed by all client types (rich and thin clients).

The standard features provided in browser apps include Map Navigation (Zoom and Pan), Legend Control (layer visibility and translucency), Measurements (show coordinates, measure area and measure line) and Feature Info. For BI Maps, map and BI widget dynamic filtering based on selections is also enabled by default. A JavaScript API is available, providing plenty of customization options to extend the capabilities of browser apps, according to customer needs.

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Browser app examples created with M.App Enterprise Studio

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Dashboards

Additional browser apps that can be built with M.App Enterprise Studio are so-called Dashboards. This type of browser app is based on a specific template integrating a map view with a set of predefined BI widgets connected to a thematic map based on point, linear or areal features. All configuration steps are performed in M.App Enterprise Studio, including the definition of the background maps and imagery to be used, as well as the vector set layer to be used for depicting the thematic map.

Dashboards are particularly suited to analyze datasets in an easily understandable way. Selections made directly on the map or on the BI widgets automatically filter the data that is being displayed, providing a highly dynamic and interactive dashboard view for gaining insights about hidden patterns in the data.

Dashboard example for sustainability indicators

Browser app features:

- Display base map
- Display maps defined by the administrator
- Display raster and vector (coming soon) layers in a form of a map
- Layers can be created on top of the Smart M.App/M.App Enterprise data or received from any WMS, WMTS or slippy tiles service
- Support for multiple projections- any geographic or projection CRS can be used via its EPSG code
- Manipulate the legend, change order of feature classes, set their translucency
- Search for geographical names and addresses globally; addresses and geonames can be given in multiple languages
- Zoom in/Zoom out
- Map pan
- Where am I?
- Adjust layer visibility / Show and hide layer
- Measurements:

    - Show coordinates
    - Measure line
    - Measure area

- Map compositions selector
- Display GetFeatureInfo with feature properties in a form

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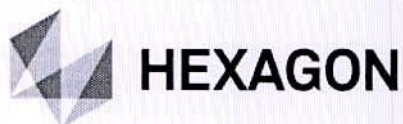
Mobile app

Native app
- iOS, Android, Universal Windows Platform
- Shared code base
- Multiple server support
- Multiple project support
- Single app with dynamic servers or preconfigured custom app
- XML-based configuration

Themeable
- Primary color, accent color
- Advanced control/layout theming

Form
- Different field types (Text, Date, Numeric, Picker, Image, Document, Switch, TextArea, Geometry, Master/Detail List, ...)
- Tabs
- Actions
- Help
- Responsive field layout (single column, two columns)

List
- Different cell types (Text, image, ...)
- Sorting
- Grouping
- Actions
- Responsive display of cells

JavaScript-based scripting
- Allows changing behavior without recompiling

Synchronization
- Data
- WMTS Tiles

GPS tracks
- Managing of recorded GPS tracks
- Background recording

Offline
- Fully encrypted
- Two-way sync
- Differential sync
- Automatic/manual sync (often changing data vs. master data)
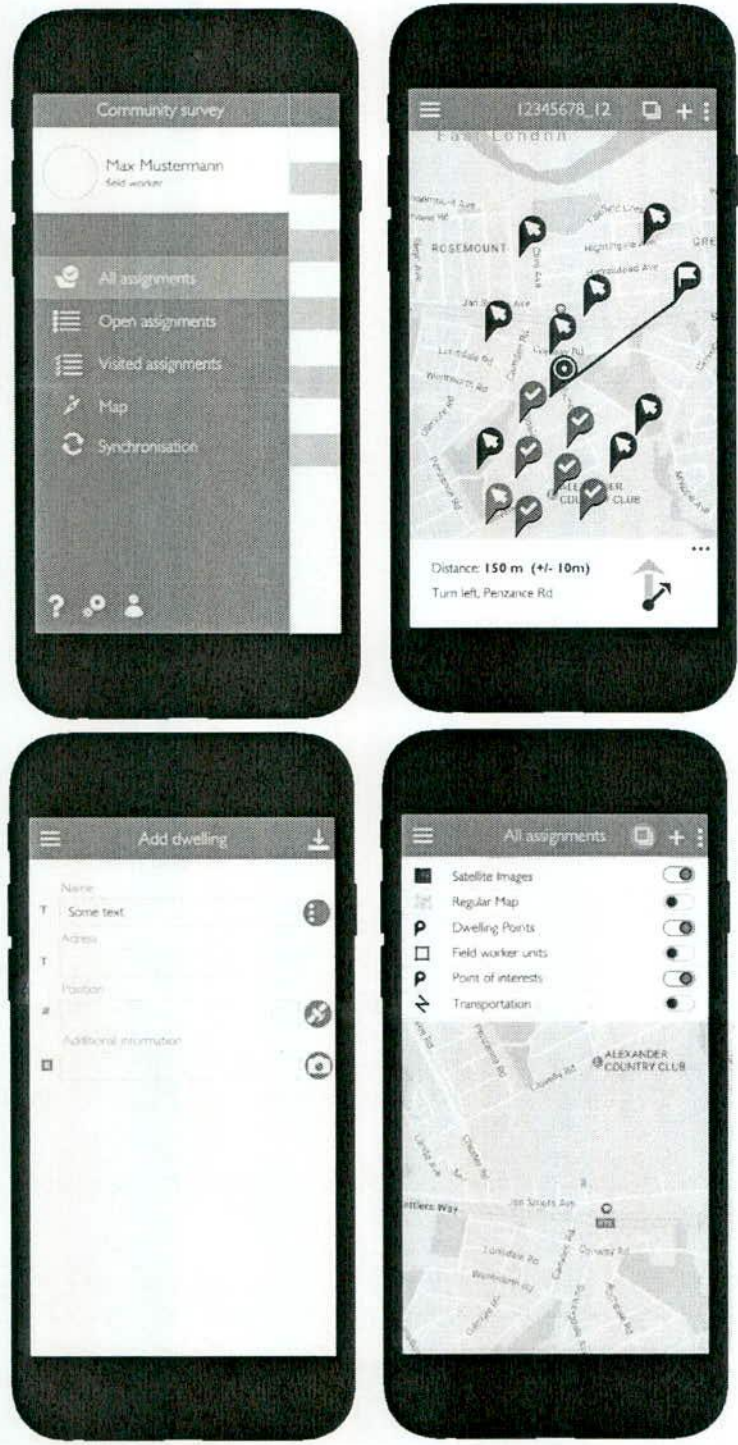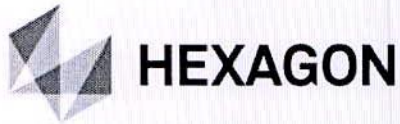- Master/detail support

Map
- Platform specific native map (Google Maps, Apple MapKit, UWP MapControl)
- Marker, polyline, polygon vector layer
- WMTS layer
- Offline capabilities
- Routing

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Server

- Fully customizable via dependency injection
- Support for SQL Server, Oracle, SAP Hana and PostgreSQL

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About Hexagon

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future.

Hexagon's Safety, Infrastructure & Geospatial division improves the resilience and sustainability of the world's critical services and infrastructure. Our solutions turn complex data about people, places and assets into meaningful information and capabilities for better, faster decision-making in public safety, utilities, defense, transportation and government.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 22,000 employees in 50 countries and net sales of approximately 4.3bn EUR. Learn more at hexagon.com and follow us @HexagonAB.