**LuciadRIA** is the answer to the growing demand for powerful, lightweight applications in the browser. Driven by today’s most advanced web technologies, LuciadRIA uses WebGL, HTML 5 and Javascript to deliver desktop-like performance to your web applications.

Developers can create interactive C2 and location intelligence applications thanks to the clean design, modular structure and powerful visual analytics capabilities that can be plugged in. Using its configurable API, you can add support for custom data feeds, add your own symbology or match user interaction and look and feel to your company’s needs and style. LuciadRIA offers a single visualization API for 2D and 3D, with or without hardware acceleration.

With Hexagon’s browser solution, you can expect high performance and retained accuracy, with desktop-like visualization of imagery, satellite pictures, 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.

Who Needs the LuciadRIA Browser Solution?

These are just a few examples of why users turn to LuciadRIA for their geospatial data challenges:

- You need to build a mission-critical web-based solution that handles geospatial data with the accuracy required for mission planning
- You want to build a standards-based, interoperable web-based solution that handles 2D and 3D
- You work with defense symbology, including MS2525 and APP6, in a browser application
- You need to visually analyze millions of events or locations, straight from the browser
- You are faced with real-time dynamic data, such as flights, vessels or people with tens of thousands of moving assets
- You need the interactivity of a desktop solution, right in the browser without plugins, that provides client-side analytics
- You want to build a high performance web solution that exploits the graphics hardware as optimally as possible for 2D and 3D, while also working in software mode
- You deal with data and maps in different projections (including 3D, but also 2D polar projections) and do not want to go through the process of extract-transform-load (ETL)
Figure 2: LuciadRIA can handle tens of thousands of tracks and millions of recorded positions, switching between 2D and 3D views with the click of your mouse. To see a live demo visit 3d.luciad.com.

**Key Benefits**

<table>
<thead>
<tr>
<th>Best-in-class performance</th>
<th>Offers unprecedented user experience within an HTML 5-equipped browser. If the device supports WebGL, this can be exploited for an even better performance.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained geospatial positioning accuracy</td>
<td>Precision on world scale for visualization of and interaction with imagery, transformation and, calculation of any data. All geodetic calculations are performed on the client side.</td>
</tr>
<tr>
<td>Desktop-like experience</td>
<td>Full application running in a browser, enabling desktop-like experience that includes visualization of imagery, vector-based data and dynamic content, such as tracks or annotations.</td>
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<tr>
<td>Builds on web standards</td>
<td>No plugin technology. Compatible with any HTML5-capable browser, including mobile browsers. Delivered as EcmaScript6 (ES6) modules.</td>
</tr>
<tr>
<td>Customizable</td>
<td>Straightforward development of interactive browser-based user interfaces, including editing of content and map annotations. One single API allows configuration for 2D software rendering and 2D and 3D WebGL-based rendering, depending on the target platform. The product allows you to meet 100% of your requirements. Integrates in any environment such as SharePoint or cloud-based environments.</td>
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</tbody>
</table>
Overview
The LuciadRIA options have been organized into product tiers. Depending on the needs of your organization, you can opt for LuciadRIA Essential or Pro. From the Pro tier, you can still extend the functionality available to you with defense symbology.

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Essential</th>
<th>Pro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core GIS Engine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Geospatial Reference Models</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transformation and Projection Engine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4D Cartesian &amp; Geodesic Geometry Model</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CPU 2D Visualization Engine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>GPU 2D/3D Visualization Engine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Customizable Symbology</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2D/3D/4D Interaction Model</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vertical, Profile &amp; Timeline Views</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Visual Analytics</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Raster Connectors</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vector Connectors</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Point Clouds &amp; Reality Meshes</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>OGC Standards</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Advanced GIS Engine</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Defense Symbology</td>
<td></td>
<td>✗</td>
</tr>
</tbody>
</table>
Functional Specification

Below is a high-level, non-exhaustive overview of the components available in LuciadRIA. You can use the functionality of these components out-of-the-box or extend them to meet your advanced requirements.

- Perform on-the-fly map transformations in the browser.
- Visualize data in any EPSG map projection. Visualize accurate geodetic lines and warp raster data.
- Support for MGRS coordinate formatting.

- Model any data format.
- Load big data intelligently, load data asynchronously.
- Represent complex geodetic object geometries with their metadata. Supported geometries include points, polylines, polygons, circles, ellipses, circular arcs, elliptical arcs, circular arc bands and buffers.
- Support for static data as well as dynamic data feeds.

- Visualize data in a multi-layered 2D or 3D view, and add a lon-lat grid.
- Apply flexible styling (2D and 3D icons, meshes, line styles, fill styles, transparency) to your data and customize it using the OGC-defined Styled Layer Descriptor/Symbology Encoding (SLD/SE) standards.
- Create extremely versatile labels, with options for styling and decluttering.
- High-performance imagery rendering, using multi-leveling and tiling techniques, is integrated in the view.
- Draping of any data, including vector data and dynamic data, on terrain.
- Apply lighting effects to simulate light sources realistically.
- Dynamically display thousands of moving tracks and generate interactive and dynamic heat maps.

- Ready-to-use controller functionality includes standard controls (zoom, pan, select), freehand drawing and editing, multi-touch support (including Microsoft Pointer events and Gesture events), and snapping.
- Fine-tune navigation using the configurable 3D camera.
- You can easily create other controllers for custom interaction.

- Cartesian views with the ability to display any kind of quantitative data (e.g. altitudes, distances, speed values, time).
- These views can be configured with a reference that displays these quantities in a certain unit of measure (e.g. flight level, meters, nautical miles).
- A wide range of customizing options is available for the annotation of the view axes. Concrete examples of these views are provided in the form of a vertical view and a timeline view.
• Rapidly gain a thorough understanding of your geospatial data using advanced visual analytics tools.
• Configure clustering algorithms to aggregate a multitude of data objects into easily distinguishable clusters based on their properties.
• Analyze trajectory information and plot information by applying filters and parameterized styles, or interactively and visually explore them simulated over time.
• Create heat maps based on static as well as dynamic data.
• Apply any expression to 3D meshes (e.g. show cross-sections of buildings).

**Visual Analytics**

• Access both raster and vector data.

**Raster data:**
LuciadFusion Tile Service, Bing Maps, Google Maps, OGC WMS, OGC WMTS

**Vector data:**
GeoJSON, glTF, GML, OGC WFS

**Raster Connectors**

• Connect to and visualize unlimited point clouds and reality meshes.
• Smart loading of 3D tiles.
• GPU-based visualization.
• Expression-based styling and filtering of point clouds.
• Apply shading, depth of field and shadow effects to 3D meshes
• Combine 3D data with terrain, other geodata, annotations and measurements.

**Point Clouds**

**Reality Mesbes**

**OGC Standards**

• Client-side constructive geometry calculations
• Creation and visualization of union, intersection and difference between sets of shapes

**Advanced GIS Engine**

**Defense Symbology**

• Client-side creation, visualization and editing of all tactical graphics from military standards, with configurable and customizable symbol styling and graphics stroking.

**Supported through a LuciadFusion connection:**
OSGB, LAS, LAZ, OGC 3D Tiles, HSPC

**OGC Standards**

• Access data through common data exchange standards.

**OGC:** GML, KML, Filter, Simple Features, Symbology Encoding, WFS, WMS, WMTS

**Vector Connectors**

• Connect to and visualize unlimited point clouds and reality meshes.
• Smart loading of 3D tiles.
• GPU-based visualization.
• Expression-based styling and filtering of point clouds.
• Apply shading, depth of field and shadow effects to 3D meshes
• Combine 3D data with terrain, other geodata, annotations and measurements.

**Point Clouds**

**Reality Mesbes**

**Defense Symbology**

• Client-side creation, visualization and editing of all tactical graphics from military standards, with configurable and customizable symbol styling and graphics stroking.

**Symbology standards:**
APP-6A, APP-6B, APP-6C, MS2525b, MS2525c
In addition to these options, LuciadRIA offers many application capabilities in ready-to-use implementations suited to common use cases for developers in your domain. These application capabilities are supported by LuciadFusion-based services. Below is a non-exhaustive overview:

- Combine 2D, 3D, and vertical intersection views for analysis of airspaces
- Replay and analysis of historical data
- Multi-spectral imagery analysis, supported by a LuciadFusion imagery analysis back-end
- Application state store and restore
- LuciadFusion data support through the various OGC services made easy by automatic service capabilities discovery
- LuciadFusion symbology service for military icons
- Fast real-time track display, supported by a LuciadFusion track service
- Edit a 3D cityscape by adding models of planned buildings

More Information
LuciadRIA requires:
  - Any HTML5-capable browser

LuciadRIA comes with:
  - Code samples for all components, running live on dev.luciad.com
  - A convenient sample launcher
  - Developer guides with clear explanations and descriptions of best practices
  - API reference offering detailed description of all interfaces and classes
  - Release notes to see what’s new
  - Technical notes describing technical requirements and device support reporting tool
  - A declaration file and instructions for TypeScript development

To learn more or schedule a demo, contact us at info.luciad.gsp@hexagon.com.
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 Geospatial division creates solutions that deliver a 5D smart digital reality with insight into what was, what is, what could be, what should be, and ultimately, what will be.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 21,000 employees in 50 countries and net sales of approximately 4.4bn USD. Learn more at hexagon.com and follow us @HexagonAB.