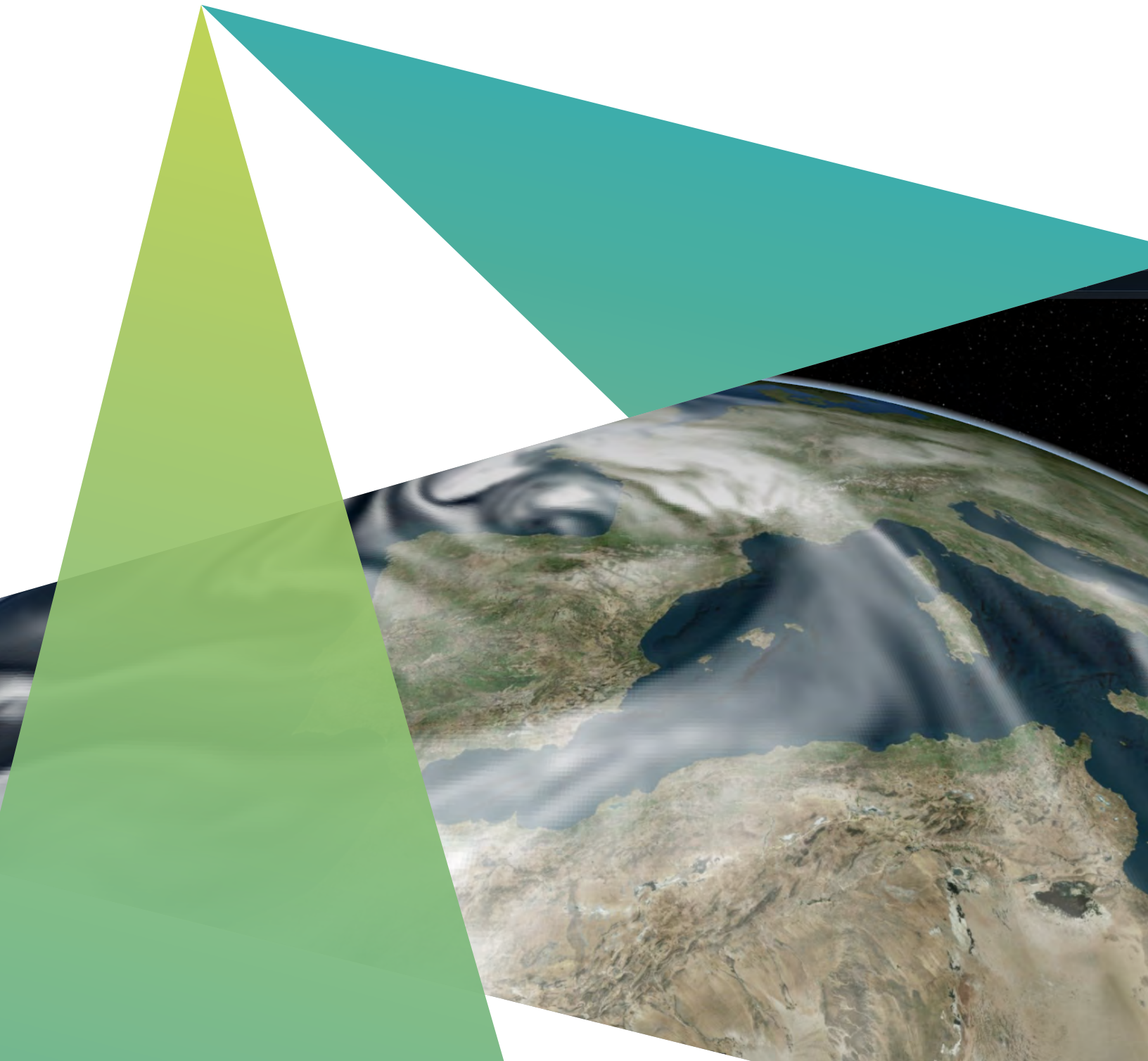
HEXAGON

Brochure

LuciadFusion

Scalable platform for serving geospatial data and analysis



LuciadFusion is a scalable platform for geospatial data management and publication. You can set it up for users to manage their data intelligently, store and process a multitude of data formats and feed data to numerous applications. Features including powerful automatic cataloging and quick and easy data publishing allow you to design, portray, process and set up advanced maps in a few simple clicks.

LuciadFusion Studio is an included browser application that provides you with a graphical user interface with an integrated data preview. With this application, non-GIS specialists can manage data intuitively. As a data administrator, you can organize geospatial data so all users have access to data sets optimized for their needs. This allows data administrators to process large volumes of data and receive regular updates.

LuciadFusion connects directly to over 200 data sources and allows you to publish many different formats, including vector, raster and gridded data and even 3D data and panoramic images. Processing data for efficient streaming is fast and leads to highly-optimized multi-leveled and tiled data structures, preserving links to data attributes.

Who needs LuciadFusion?

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

- Publish large amounts of geospatial data in OGC standard formats with just a few clicks
- Access a lightweight server
- Share maritime ECDIS data using OGC services without hassle
- Catalog raster and vector data from an external device in many different formats (Shape, KML, GeoTiff) in a matter of minutes
- Serve weather data with temporal information allowing clients to quickly browse through time
- Provide operational users access to large data sets of pound clouds and 3D meshes — remotely and from different types of applications
- Share multi-gigabyte shape files as WMS without rasterizing before publishing
- Bring line of sight (LOS) calculations or even custom processing to a web-based application

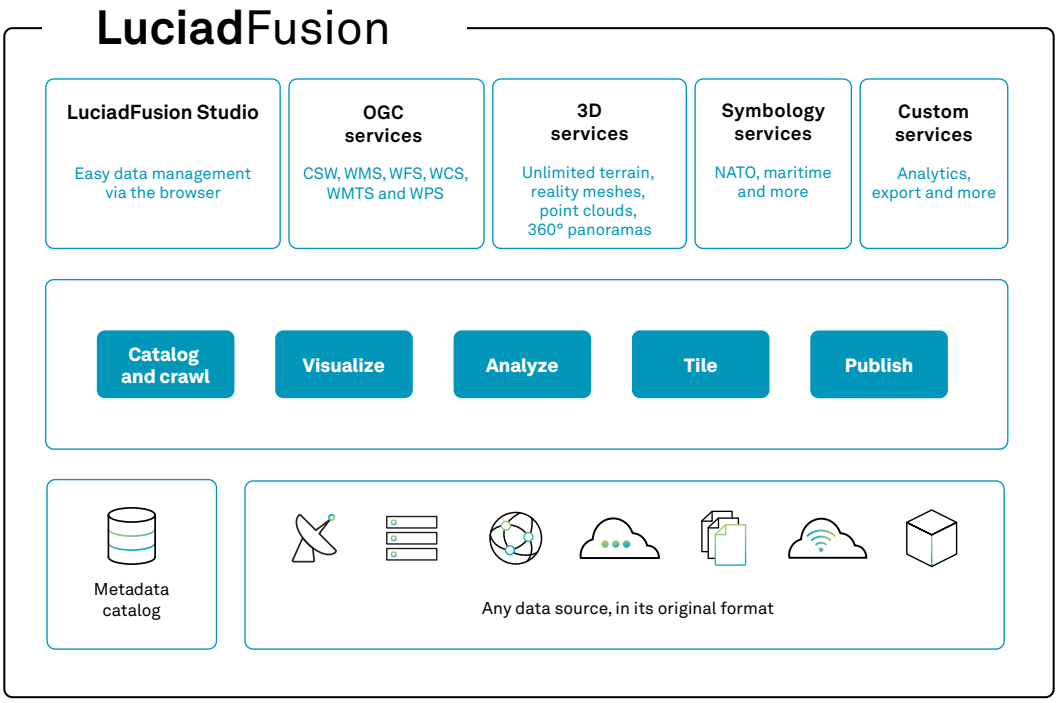


Figure 1 - With LuciadFusion, manage, visualize, analyze and publish data its original format on any platform.

Key benefits

Built for users	• Quickly upload, find and manage data through LuciadFusion Studio's intuitive web interface • Publish data to any service in one click • Set up and create multiple OGC services • Optimize large and 3D data sets for fast streaming with the quickest tiling engine for elevation, (multispectral) imagery, weather data, 3D meshes and point clouds
Connect to over 200 data formats	• Connect to any database • Work with domain-specific formats and standards • Serve earth observation multispectral imagery directly • Handle dynamic 4D data, such as weather data • Connect natively to over 200 data formats and add custom formats through LuciadFusion's API

Add custom formats, styling and analytics	• Bring in new custom formats easily with LuciadFusion's API
	• Include military symbology - APP6 and MS2525
	• Add custom styling
	• Create new services for:
	  • Data
	  • Symbologies
	  • Custom data processing and analysis

Rely on full OGC open standards support	• Serve any data over open standards • Plug and play WMS, WFS, WMTS, WCS or 3D tiles by dragging and dropping to serve in less than one minute — no coding required
Manage data dynamically	• Manage and serve data from any location • Keep data organized with data crawling, data discovery and metadata gathering • Combine vector and raster data in one single product • Connect to data sources and allow LuciadFusion to find new data with automatic data discovery • Monitor data sources and set up scheduled crawling to automatically find new data
Deployable on any platform	• Deploy locally (from a USB or onboard a vessel or aircraft) • Trust in LuciadFusion's built-in security or integrate your own authentication solution • Run LuciadFusion on Windows and Linux, on Amazon AWS, in a Docker container and more - serve data from local, network attached or cloud storage
Out-of-the-box COP	• Share a common operational picture (COP) that combines background imagery, military symbology, NVG files and any additional data • Combine any number of data sources in any format using any reference within a single common operating COP

Practical information

Connecting to LuciadFusion services can be done from:

- OGC-compliant browser applications, built on LuciadRIA or other platforms
- Desktop applications, built on LuciadLightspeed, LuciadCPillar or other platforms
- Mobile applications, built on LuciadCPillar for Android or other platforms

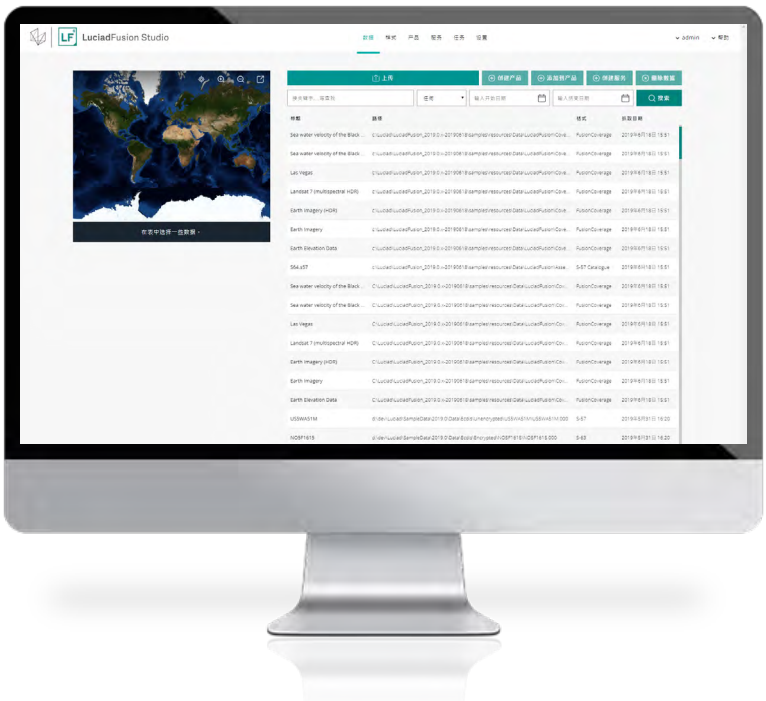


Figure 2 - LuciadFusion offers intuitive data management for non-GIS specialists.

Overview

LuciadFusion components are organized into product tiers. Depending on the needs of your organization, you can opt for LuciadFusion Essential, Advanced or Pro. In the Advanced and Pro tiers, powerful, extended functionality is available to you with extra options.

Legend

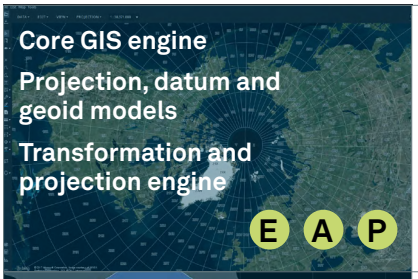
✓ Feature included

○ Optional feature

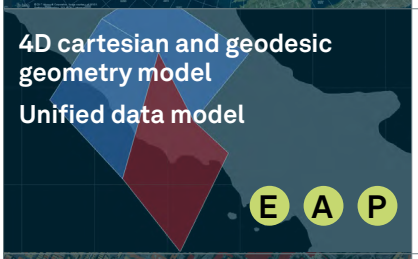
Functionality	Essential	Advanced	Pro
Core GIS engine	✓	✓	✓
Projection, datum and geoid models	✓	✓	✓
Transformation and projection engine	✓	✓	✓
4D cartesian and geodesic geometry model	✓	✓	✓
Unified data model	✓	✓	✓
Customizable styling	✓	✓	✓
Raster connectors	✓	✓	✓
Vector connectors	✓	✓	✓
CPU, GPU image processing image	✓	✓	✓
Point clouds and reality meshes	✓	✓	✓
OGC standards	✓	✓	✓
OGC services	✓	✓	✓
Tiled services	✓	✓	✓
Tiling engine	✓	✓	✓
Symbology services	✓	✓	✓
Data management and catalog	✓	✓	✓
Data crawling and metadata harvesting	✓	✓	✓
Extensible web service platform	✓	✓	✓
Advanced raster connectors		✓	✓
Advanced GIS engine		✓	✓
Real-time engine		✓	✓
Database connectors		○	✓
Terrain analysis engine		○	○
Weather and environment standards		○	○
Graph and routing engine		○	○
Infrastructure standards			○
Radar connectors			○
Aviation standards			○
Defense standards			○
Defense symbology			○
Maritime standards			○
S-63			○

Functional specifications

Below is a high-level, non-exhaustive overview of the functionality available in LuciadFusion. You can use the functionality it offers out of the box or extend it to meet user-specific requirements.

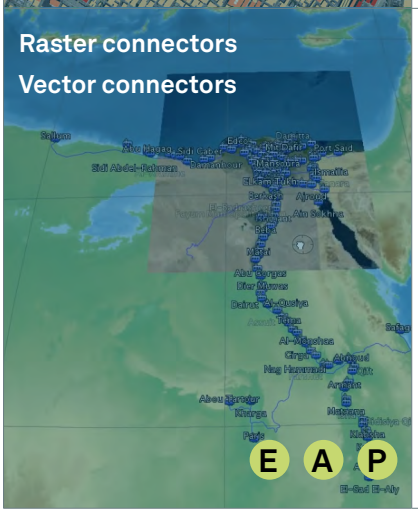


- Access and represent data in any coordinate reference system (geodetic, geocentric, topocentric and grid) and in any projection
- Perform advanced geodetic calculations, transformations and ortho-rectification
- Serve, fuse and tile data on-the-fly in any coordinate reference with accurate warping of vector and raster data



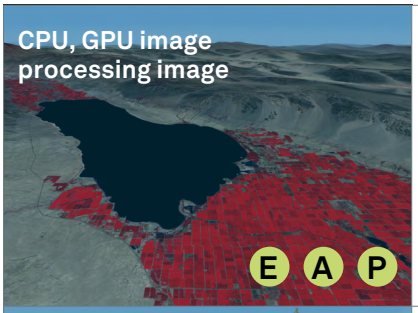
- Model any data format, represent all object geometries and their metadata and apply any data filter
- Get support for complex geometries like geo-buffers, arcs and arc bands, radar coverage areas and more - integrated with all calculations from the GIS Engine
- Represent radar coverage beams and other sensor detection ranges accurately as 3D volumes, and set up geofencing for those volumes

- Apply flexible styling (layers, icons, line styles, fill styles, transparency and more) to your data and customize it using OGC-defined styled layer descriptor/ symbology encoding (SLD/SE) through the LuciadFusion Studio, including vector and raster data
- Extend SLD or implement and plug in custom layer factories to do advanced styling using, for example, density plots and heat maps
- Include processing, such as extracting contours from raster data, before styling using fill and line styles
- Advanced labeling of vector data, including on-path labeling

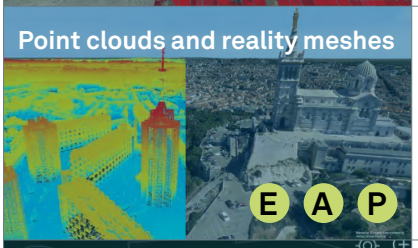


- Access and serve data in many vector and raster formats natively, without pre-processing, and exploit multi-leveling and tiling
- Use visualization, analysis and serving capabilities that are data-agnostic and complementary with any data format
- Access data from Amazon Simple Service Storage (S3) or other cloud storage
- Get out-of-the-box native support for:
  - Raster data: BIL, Bing Maps, BMP, DTED, ESRI TFW and JGW, ETOPO, GeoTIFF and BigTIFF, GIF, JPEG, JPEG2000, MapInfo TAB, PNG, PPM, USGS DEM, Open Street Map
  - Vector data: CGM, Collada, ESRI Shape, GeoJSON, MapInfo MIF and MAP, LiDAR LASer and LASZip (LAZ), OpenFlight (3D), OGC 3D tiles, OSGB 3D meshes, SVG, Wavefront OBJ (3D)
- Add support for new, custom formats in a straightforward, well-documented process

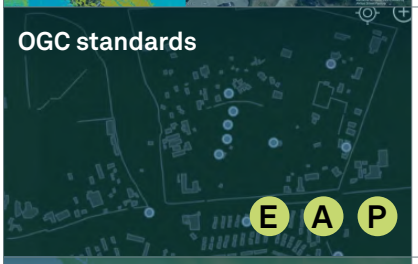
E Included in Essential A Included in Advanced P Included in Pro



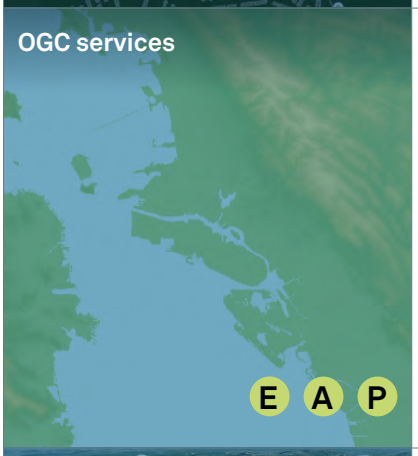
- Benefit from advanced, high-performance processing and rendering of raster data, including high dynamic range (HDR) and multispectral imagery and multidimensional raster data
- Apply image processing chains using a complete set of image algebra operators before serving the data over OGC services, or before exporting data (for example, to OGC GeoPackage)
- Use GPU-based default implementation for optimal performance, with automatic fallback to a multithreaded CPU-based implementation



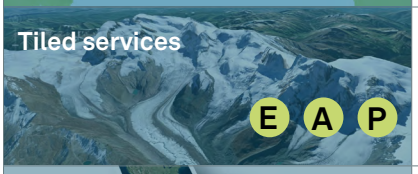
- Connect to, visualize and serve unlimited point clouds and reality meshes
- Serve pre-tiled and multilevel point cloud data as optimized OGC 3D tiles or HSPC stream
- Get out-of-the-box native support for:
  - OSGB, LAS, LAZ, E57, HSPC or OGC 3D tiles, supporting Draco compression



- Connect to several OGC web services, and read data in a variety of OGC formats
- Get support for these standards, formats and services:
  - OGC CSW, GeoPackage, GML, KML, WCS, WFS(-T), WMS, WMTS, OGC Filter 2.0 (Spatial filter capabilities can be enabled from the Advanced GIS Engine listed under Advanced and Pro options), OGC Symbology Encoding (SE) and ISO 19115 metadata



- Serve any data via OGC services on the fly, directly from the source, configure several OGC web service end points and automatically monitor data updates and plug in support for your own custom data or styling
- Manage data, metadata, styles, products and publish services with the easy-to-use web front end
- Support on-the-fly WMTS for any data source, including, but not limited to pre-tiled data sets WMTS from pre-tiled data sets
- Support on-the-fly 3D tiles for OSGB mesh data sources, as well as processed LAS/LAZ data
- OGC services:
  - OG WMS, WCS, WFS(-T), WMTS, CSW and 3D tiles
  - Compatible with INSPIRE and DGIWG directives

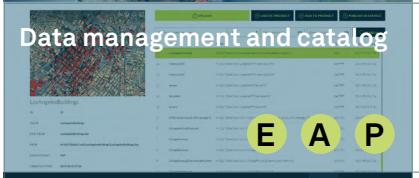


- Serve pre-tiled data via Luciad Tile Services (LTS) for optimal performance; using LTS, you can send multi-dimensional or elevation data tiles for client-side analysis

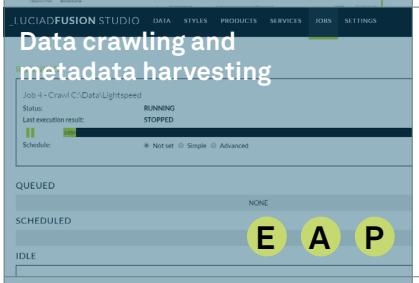
- Fuse, tile and multi-level large amounts of data using the tiling engine
- Build globes with detailed and accurate point-sampled terrain data, centimeter-accurate area-sampled (multispectral) imagery and multi-dimensional weather data and imagery
- Optimize point cloud data for direct access or streaming as OGC 3D tiles

E Included in Essential A Included in Advanced P Included in Pro

- Use a service to provide full sets of military symbology icons with icon styling specifications
  - The same icons across your system are available on the map and other UI components
  - This requires the Defense Symbology option



- Centrally organize, manage and serve all your geospatial data and styles from the LuciadFusion Studio web application, regardless of the data format
- Allow clients to discover data through an OGC CSW catalog and query data based on the ISO metadata profile or your custom metadata attributes



- Discover and aggregate all the geospatial data you have available by crawling your data repositories
- Collect and generate metadata descriptions automatically, and plug in support for your domain-specific metadata
- Define revisit intervals to automatically update services when data changes — for example, automatically publish an updated weather forecast or mission plan
- Integrate data crawling and data updates into your workflow using the REST API

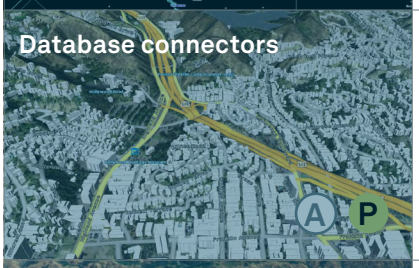
- Benefit from a fast and reliable service application framework that hosts data publication and analysis services
- Take advantage of service discovery, load balancing, failover and security integration
- Dynamically set up services using the REST API
- Integrate custom service types for data publication or processing
- Receive notifications about changes to data, products and services, service access or events related to processing jobs

- Connect to, visualize and serve specialized raster formats and access a GDAL connector to add support for several other raster formats
- Connect to, process and serve 360-degree panoramic imagery from various scanners
- Serve raster data via the OGC service protocols and ECWP (for ECW data)
- Get direct support for these formats:
  - ECW, GeoPDF, GeoSPOT, JPEG2000 (including an encoder), MrSID, Spot DIMAP and Swiss DHM
- Get GDAL support for these formats:
  - ARC/Info Binary Grid(AIG), BSB Nautical Chart Format, ARC/Info Export E00 GRID, ENVI HDR Labelled Raster, ERDAS Imagine, ERDAS Imagine Raw, ILWIS Raster Map, Intergraph Raster, PCI Geomatics database File, PCRaster, Sentinel 1 SAR SAFE, Sentinel 2, SAR CEOS, SRTM HGT, GDAL Virtual, ASCII Gridded XYZ and more
- Support for 360-degree panoramic imagery:
  - E57, Leica Pegasus

E Included in Essential A Included in Advanced P Included in Pro

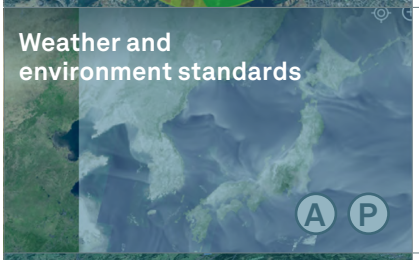
- Calculate binary topological relations (for example, overlaps, contains) and perform constructive geometry on shapes (for example, union, intersection)
- Apply this capability on Cartasian, geodesic and rhumb shapes

- Optimally connect to and serve dynamic data
- Pre-render, convert or relay data streams; includes capabilities to translate and forward data streams in any format, such as the web-friendly GeoJSON format
- Perform analytics on real-time data

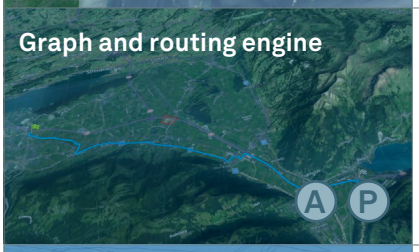


- Add support for connecting to and serving data directly from spatial databases
- Get support for these database formats:
  - IBM DB2, Informix Geodetic and Spatial Datablade, OGC GeoPackage, Oracle Locator and Oracle Spatial, PostGIS (PostgreSQL spatial database extension), SAP HANA (Beta), Microsoft SQLServer and SQLite

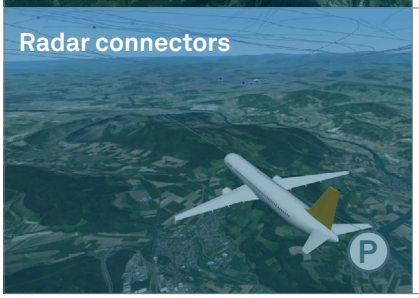
- Perform calculations on terrain data, such as LOS or hypsometric calculations, and get an alternative view on the terrain data
- Benefit from an engine that can use hardware acceleration (for GPU equipped servers) but also includes a software implementation



- Integrate environmental data and preserve dimensional information when serving
- Pre-tile and organize into multiple levels of detail for serving as Luciad Tile Service (LTS)
- Get support for these formats:
  - NetCDF ISC, GRIB V1/V2 weather data (WMO/ICAO Bulletin) and SIGWX (BUFR)

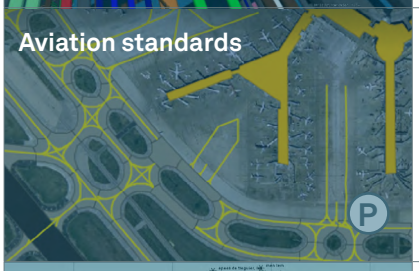


- Exploit the network structure of your geospatial data and make use of algorithms to construct graphs and solve your routing challenges; graph engine supports various network-related processing (for example, shortest path or cross-country movement calculation) and enables the creation of flexible cost functions
- Integrate as processing service

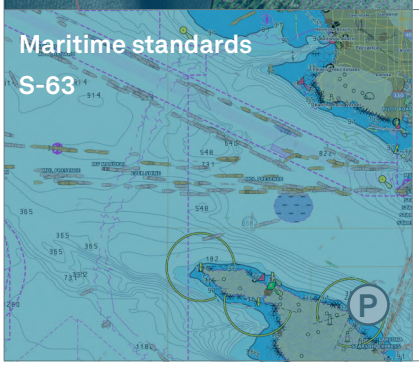


- Connect to and portray radar data captured in ASTERIX and ASDI formats
- Get fast and flexible visualization of ASTERIX and ASDI data, including radar video (ASTERIX Cat 240) with the radar connector, combined with the real-time engine
- Get support for these formats:
  - Eurocontrol ASTERIX categories 1, 8, 10, 11, 21, 30, 48, 62, 240 and 244, and ASDI

P Included in Pro (A) Optional in Advanced (P) Optional in Pro

	• Import and visualize your computer-aided designs with LuciadFusion to see your design in context • Prepare your 3D models and cities for streaming via conversion of OBJ, Binz and IFC to OGC 3D tiles, with the option to compress tiles if the client applications support optimizations and preserve material properties • Get support for these formats: • Autocad DWG/DXF, Microstation DGN, Hexagon Binz and IFC
	• Model, render and serve aeronautical data such as airspaces, navaids, procedures and grid minimum off route altitudes (MORAs); integrate with operations from the Advanced GIS Engine • This includes options for custom styling • Get support for these formats: • AIXM (3.3, 4.0, 4.5, and 5.1), ARINC 424 and DAFIF(T)
	• Integrate the various military data formats at your disposal for full situational awareness • Get support for these formats: • ADRG, ASRP, BCI, CADRG, CIB, ECRG, NITF, NSIF, USRP, VPF products (VMAP0, VMAP1, VMAP2(i), DNC, DCW) including Geosym symbology and MGCP

	• Benefit from full support for symbols and tactical graphics of the latest military symbology standards; NATO Vector Graphics support increases interoperability; this support encompasses the lookup, creation, visualization and serving of military symbols and tactical graphics
	• Serve your NVG files in a matter of seconds over OGC-compliant services using simple drag and drop
	• Get support for these symbology standards/formats:
	  • APP-6A, APP-6B, APP-6C, APP-6D, MS2525b, MS2525c, MS2525d and NVG
	  • Military grids: MGRS, CGRS and GARS

	• Accurately render electronic navigational charts in 2D and 3D; complies with standards defined by the International Maritime Organization (IMO) and the International Hydrographic Organization (IHO); decodes data in the IHO S-57 format, and visualizes the charts in compliance with the IHO S-52 visualization standard • Decode and portray electronic navigational charts in the encrypted IHO S-63 format • Get support for these formats: • IHO S-57, IHO S-52 and UKHO AML

Ⓟ Optional in Pro

Use cases

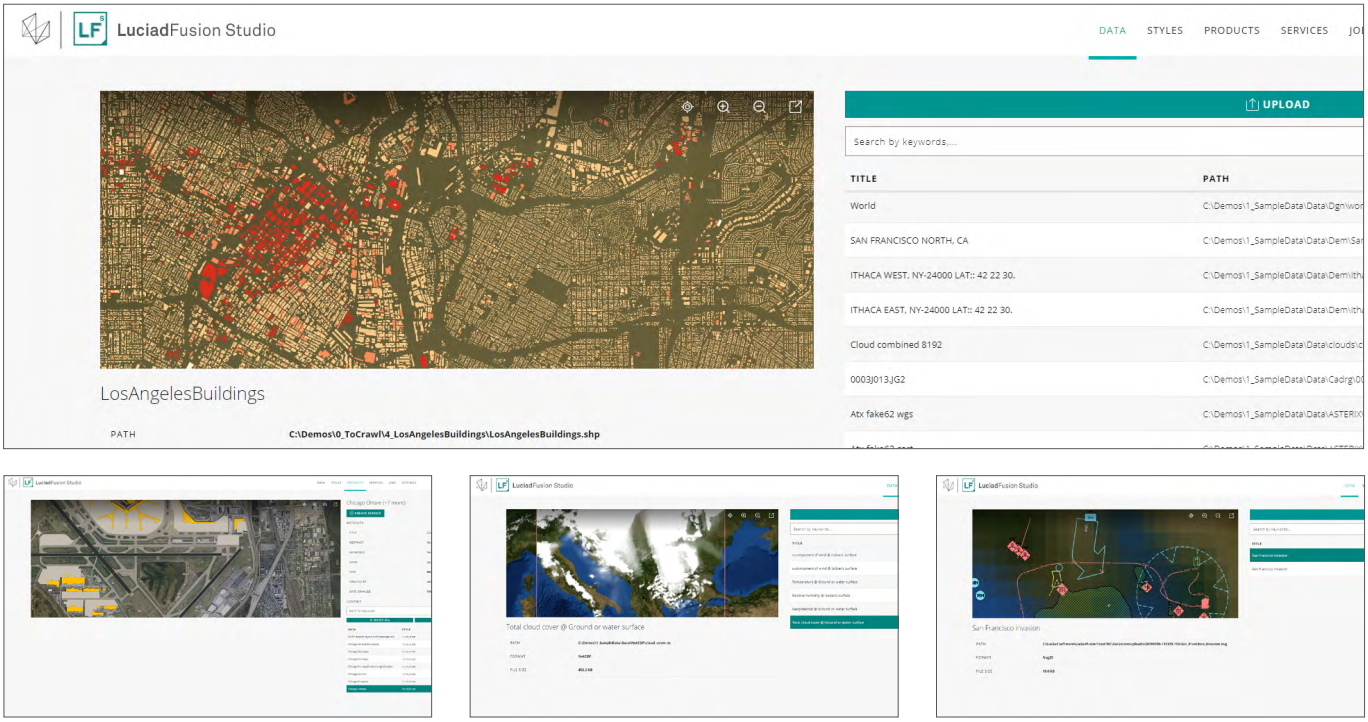


Figure 3 - Using LuciadFusion Studio, you can serve large vector datasets on the fly, with OGC SE filtering and styling applied automatically. You can set up data services in a few clicks, including domain-specific formats like AIXM5.1, NVG or S-57.

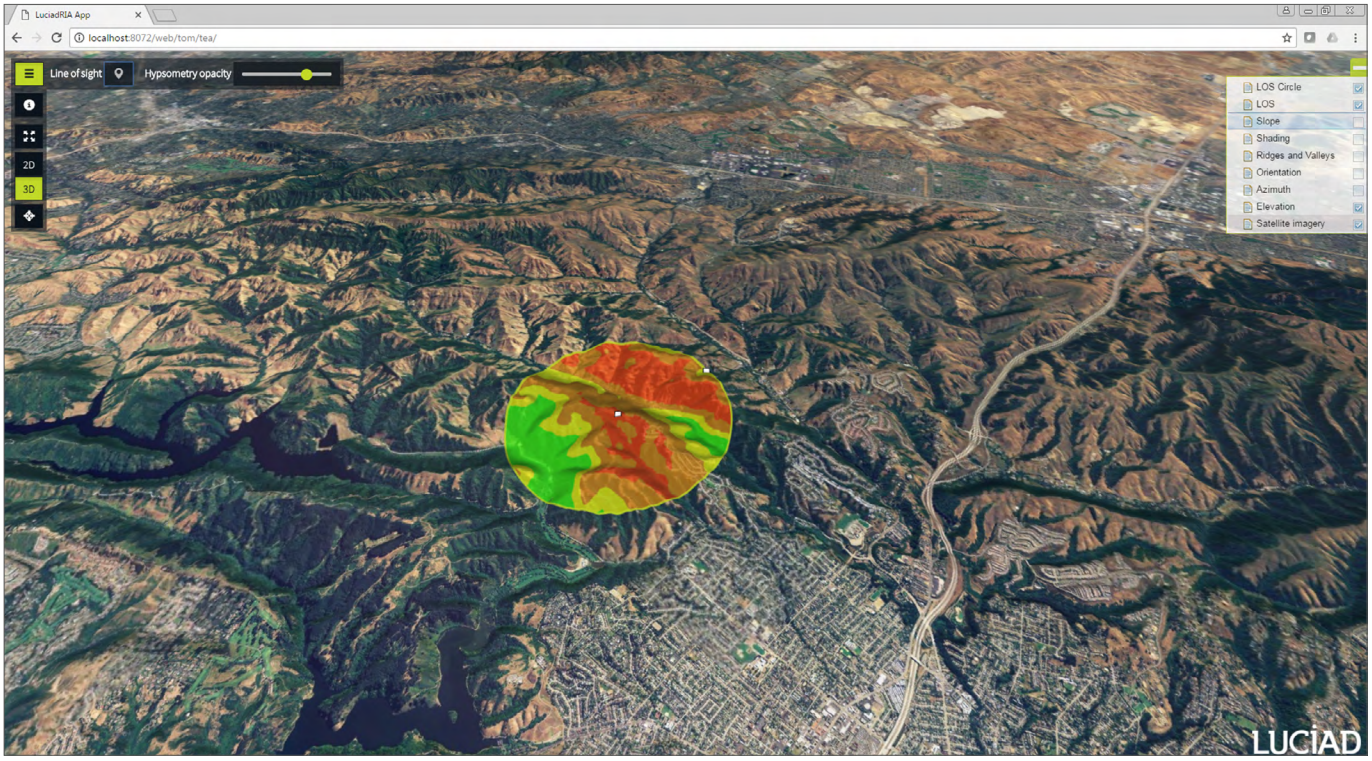


Figure 4 - LuciadFusion can be extended with additional analysis services, for example a service offering remote LOS calculations.

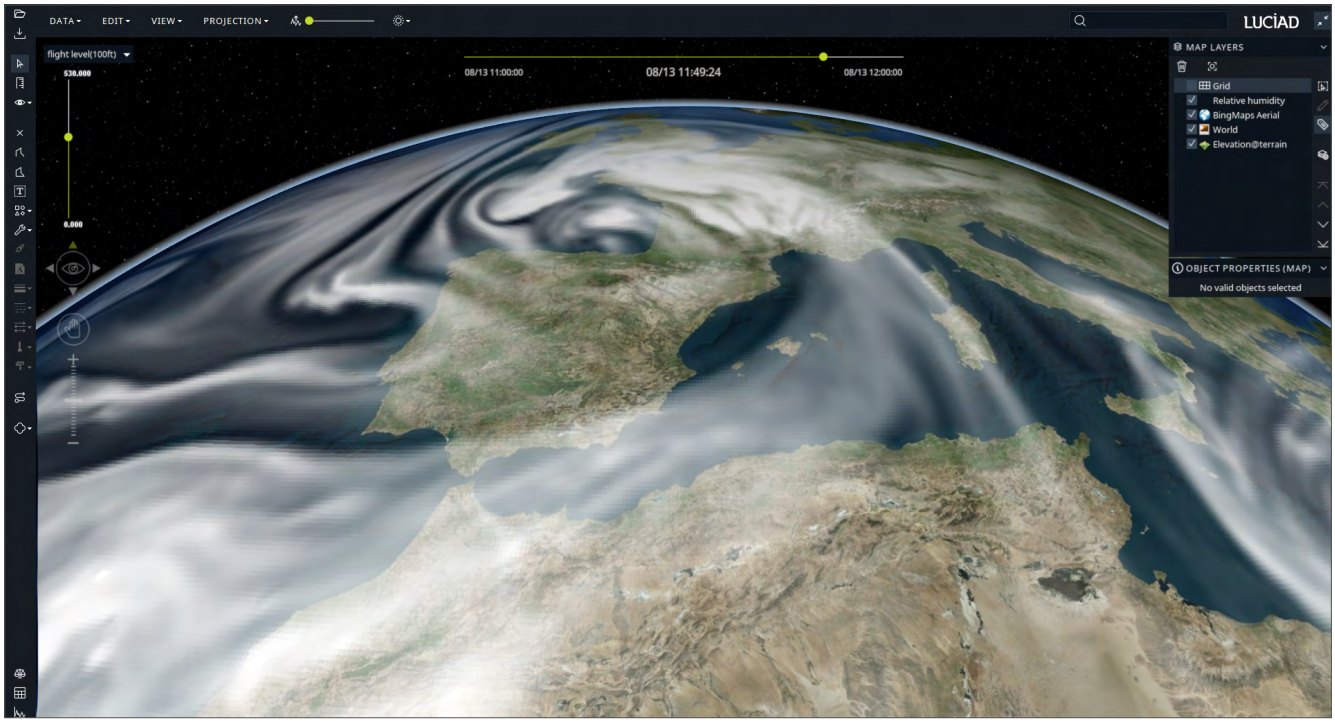


Figure 5 - Visualization and analysis of multi-dimensional weather data in LuciadLightspeed Lucy, served by LuciadFusion as multidimensional WMTS.

Figure 6 - LuciadFusion can connect to, optimize and serve unlimited point clouds and reality meshes.

More information

LuciadFusion comes with:

- Ready-to-use LuciadFusion Studio application
- Guided user tours
- In-application help within LuciadFusion Studio
- Ready-to-use tiling engine application (DCM) with end-user guide
- Developer's guide with clear explanations and descriptions of best practices
- API reference offering detailed descriptions of all interfaces and classes
- Code samples for all components
- Build scripts, Maven POM files and sample servlets for easy project setup and deployment
- Release notes to see what's new
- Technical notes to consult technical requirements

To learn more or schedule a demo, contact us at info.luciad.gsp@hexagon.com.

For developer guides, code snippets, technical articles, videos and more, visit the Luciad Developer Platform.

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related 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. Learn more at hexagon.com and follow us @HexagonAB.