

# Carmenta Engine 4.7

## General

- Software Development Kit (SDK) for development of interactive geographic applications.
- Easy embedding into applications via .NET, COM, Java and C++ APIs. ActiveX and JavaBean controls for 2D and 3D map window creation.
- Integrated raster and vector data handling.
- 2D and 3D visualization and interaction.
- Efficient methods for simultaneously moving large numbers of map objects.
- Map presentation is defined in map configuration files, and can be changed in runtime using the APIs.
- Component-based architecture built around intuitive "data-flow" paradigm.
- Supports over 70 geographic data formats natively.
- Easy deployment using runtime module (MSI/MSM). C++ applications can use simple "XCopy deployment".
- Plug-in architecture allows users to extend functionality.
- 3D hardware accelerated 2D visualization optimized for dynamic presentations. Smart caching on graphics card (GPU) suitable for "moving maps" and head-up displays.
- Low memory footprint thanks to modular architecture where only active modules are loaded into memory.
- Vector and raster data reprojection on the fly; different layers can have different coordinate systems.
- Geographically correct spatial calculations such as projection, distance, great circle, scale factors, azimuth / angle calculations etc available for all reference systems.
- Scale correct printing.
- Efficient support for multi core and multi processor systems. Map layers can update in separate threads, leaving the main thread free to do time-critical tasks.
- Interactive fly-throughs in 3D with dynamic loading of visible data.
- Automatic on the fly generation of 3D worlds straight from 2D/3D GIS data, no CAD or 3D modeling is needed.
- Maps can use both locally stored GIS data and layers that are accessed via remote servers (OGC WMS and WCS).

## Software Development Kit Contents

- Graphical map configuration tool and viewer.
- Comprehensive documentation, including tutorials, technical articles and API documentation.
- More than 20 sample applications with source code in Visual Basic, C#, Java and C++, covering topics such as geographic viewers, 2D / 3D simulators and how to add custom functionality (plug-ins).

## Geographic databases and formats

- Tile handling with the ability to create seamless map layer presentation from many individual files.
- Can generate low resolution variants ("pyramids") of raster data to improve reading performance.
- Application developers can add support for additional formats with their own read/write data plug-ins.
- Support for spatial database queries.
- File indexing for efficient reading of large datasets.
- Reads directly (conversion is not needed) from a large number of formats:

ADRG	JPEG (.jpg) <sup>1</sup>	PCMap CMRG
ARINC <sup>2</sup>	JPEG2000	PolGASP
ASRP	Leica ECW	PNG <sup>1</sup>
Autodesk DXF	Lizardtech MrSID	Raw
Autodesk DWG	MapInfo TAB	RPF
BMP <sup>1</sup>	MapInfo MIF	SDTS DEM
CADRG	MFF	TIFF <sup>1</sup>
CIB	MFF2	USGS ASCII
ESRI Shape (.shp) <sup>1 2</sup>	Microsoft SQL Server-2008	DEM
ESRI Shape 3D <sup>2</sup>	MySQL <sup>1</sup>	USGS DOQ
ESRI Binary ADF	NIMA VPF	USRP
ESRI ASCII Grid	NIMA DFAD	VTP BT elevation
Erdas IMG	NIMA DTED0	CEOS (Spot)
Erdas LAN/GIS	NIMA VPF	ELAS
GeoSoft raster	NIMA DFAD	AUX
GeoTIFF <sup>1</sup>	NIMA DTED0	Envisat N1
GIF <sup>1</sup>	NIMA DTED1	BIL <sup>1</sup>
GridASCII	NIMA DTED2	BSQ <sup>1</sup>
Idevio RaveGeo	NITF	BSP <sup>1</sup>
Intergraph raster	NOAA	HDR <sup>1</sup>
Japanese DEM	Oracle Spatial <sup>1</sup>	BSB Nautical
Jeppesen C-MAP-CM93 Vector	OGC WMS	SRTM HGT
Jeppesen C-MAP-CM93 ECDIS <sup>3</sup>	OGC WCS	WMO GRIB1
		WMO GRIB2

<sup>1</sup> Reads and writes

<sup>2</sup> Uses advanced spatial indexing technology for fast access of large files

<sup>3</sup> ECDIS compliant S52 presentation

## Interaction

- User extendable interaction tool concept with comprehensive event model.
- Interactive overview map windows.
- Several ready-to-use 2D and 3D navigation tools.
- Picking and querying in 2D and 3D.
- Create and edit points, lines and polygons in 2D and 3D.

## Visualization

- Visualizes points, lines and polygons in 2D and 3D. Meshes (TIN) in 3D. Handles different kinds of dashed lines, pattern fills and textures.
- True transparency and alpha handling on all drawing operations, including raster data.
- Anti-aliasing of text, symbols, lines and polygons removes jaggedness in presentation.
- Raster filtering, bilinear and bicubic, improves visualization of scanned maps etc.
- Multiple windows and views in 2D and 3D can present the same data with different visualizations simultaneously.
- Off screen drawing to bitmaps, files or memory that can be further processed (PNG, GIF, JPEG and BMP).
- Handles raster data in 1-bit through 32-bit.
- Raster symbols from file (TIFF, PNG, GIF, JPEG and BMP).
- Resizable, rotatable vector and font symbols. Halo and outline effects.
- Ready-to-use tools for displaying and interacting with military overlays and symbology such as 2525B.
- Multiple visualizations on objects such as multiple texts and symbols at a point or line.
- VRML and 3DS (3D Studio) objects can be used inside 3D maps.
- Complex line styles with auto-placement of symbols or labels along lines or in nodes, texts or symbols that clip lines etc.
- Level of detail in 2D with automatic switching on/off of map layers based on scale and/or geographic area.
- Level of detail in 3D terrain and VRML-objects based on distance from the “observer”.
- Flexible layer handling controls the drawing order of layers in run-time. Ability to mix raster and vector layers in arbitrary order.
- 3D parameters such as camera position, camera angles and fog can be dynamically set.
- Attribute data controlled visualization, selection and discrimination.
- Animation support with double/triple buffering for smooth window updating when displaying dynamic data and editing objects.
- Automatic label placement of text and symbols prevents overlapping.
- Textures from geographic data or image files. Any result from a geographic function can be draped over a 3D surface.
- Multi pass/multi texture effects with full control over texture blend modes.

## Geographic functions “on the fly”

- Isoline calculation, e.g. elevation contours from gridded data.
- Hill shading with dynamic sun position.
- Buffer zone generation for raster data and vector data.
- Visibility, view shed, line of sight and shadow analysis.
- Clipping of geographic points, lines, polygons and meshes by geographic polygons.
- Vertical profiles; intersection along a line in elevation data.
- Geographic and UTM/MGRS grid generation.
- Rasterizing vector points, lines and polygons.
- Reclassification of raster values and vector attributes.
- Raster resampling and operations such as minimum, maximum, addition, weighted addition and overlay between layers.
- Reprojection of vector and raster data.
- De-segmentation of vector lines.
- Transformation of line objects to polygons and vice versa.
- Automatic 3D building and fence generation from 2D lines and polygons.
- Random point generation (e.g. for creating individual trees in a 3D forest).
- Size calculations - polygon area/perimeter and line length.
- 3D mesh (e.g. ground) generation from raster heights, 3D lines and points.
- Terrain accessibility analysis for terrain vehicles.
- Data reduction through line and polygon “thinning” and triangle decimation.
- Automatic clipping of data outside the viewing area.
- Intelligent caching increases performance when re-reading data.

## Reference Systems and Projections

- Configurable reference systems, projections and geodetic datums, support for EPSG IDs.
- Handles embedded reference system information for the most commonly used data formats.
- Supports more than 15 types of projections, including Mercator, Transverse Mercator, UTM, Lambert, Miller, Azimuthal orthographic, equidistant and equal area.
- Polynomial projections for georeferencing using control points.

## System requirements

- Windows 2000, Server 2003, XP (SP2) or Vista.
- Minimum 64 MB of RAM.
- OpenGL 1.1; only required if using the 3D and hardware accelerated 2D features.