Developers Documentation Enigma Research

Version 0.3

Enigma Research - introduction

Enigma Suite is a software suite, written in C#. The program is free and open source. This document provides some information for interested programmers. In future releases, I hope to augment this document.

Please read the User Manual for information about the functionality of Enigma Research.

I want to thank Gökhan Yu for convincing me to use C#. It was the right choice for building a Windows based astrology application. Gökhan also provided valuable insights into the technicalities of C# and .Net.

I also want to thank Cees Jansen for providing valuable insights on the use of randomness, which was important for the realization of control groups.

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Technical basics

Development environment

IDE

I develop Enigma with *JetBrains Rider*. This IDE is not free, but you can try to apply for a free open source license. I am happy JetBrains accepted Enigma for such a free license :-)
The code also works on MicroSoft Visual Studio (Community Edition).

Dependency injection

For dependency injection, Enigma uses the NuGet package *Micosoft.Extensions.DependencyInjection*.

MVVM

The UI uses the MVVM pattern. I implemented this with the NuGet package *Community.Toolkit.Mvvm* from Microsoft.

Material Design

Enigma uses some aspects from Material Design, via the NuGet package *MaterialDesignTheme*s.

Persistency

The database is a *SQLite* instance. As a minimal ORM, I use *Dapper*. Both are accessible via Nuget.

Logging

*Serilo*g takes care of the logging, you can find it in NuGet Serilog.Sinks.File.

Testing

Unit testing is done with *NUnit* (NuGet NUnit). For mocking I use *Moq* (NuGet Mock).

Documentation

I created the HTML version of the user manual with *Writ*erside from JetBrains.

Coding conventions

I will try to abide to the standards.
For a definition check: https://docs.microsoft.com/en-us/dotnet/csharp/fundamentals/coding-style/coding-conventions .

Architectural decisions

Windows based

Enigma works on Windows platforms. I will not attempt to support other platforms, at least not for the foreseeable future.
The main reason is that being multi-platform requires much effort, even with the availability of solutions like Avalonia.
These efforts would be both in time and financial: supporting Apple hardware is difficult without buying it.

Using separated projects

The code of Enigma comprises 6 separate projects:

- **Frontend.Ui** : everything for the user interface.
- **Api** : API's that to access the backend.
- **Core** : code in the backend.
- **Facades** : facades that provide access to external systems (for now only the Swiss Ephemeris).
- **Domain**: domain definitions, accessible by both the frontend and backend.

- **Test**: All unit tests.

WPF for the frontend

The frontend uses WPF and XAML. I also considered Avalonia, which supports multiple environments and improves the XAML syntax. But Avalonia does not support as many NuGet packages as plain WPF does. It does not support the material design package, which was a no-go for me.

Frontend specifics

The frontend uses the MVVM pattern. Navigation between views in the frontend goes partly via messaging.
The look-and-feel is loosely based on Material Design.

Separation of frontend and backend

The separation between the frontend and backend is very strict. All functionality from the backend is only accessible via a set of API's.

Based on dependency injection

The backend uses dependency injection. The frontend uses some DI, but not consistently.
Separate classes, that react on messages, handle the creation and termination of views.

Unit testing

I use NUnit for unit testing. I believe testing is very important though I am not religious about Test Driven Development.
Enigma does not yet support integration tests but I want to add that in a future release.

Interfacing

Most classes are based on an interface. Interfaces and classes share the same file.

Using the Swiss Ephemeris

For astronomical calculations, I use the Swiss Ephemeris (SE). The SE comprises a set of data and a 64-bits dll: *swedll64.dll*. I use the attribute [DllImport] to access the dll. All imports from the dll are defined in facades.
As an example for the definitions I used the file swissdelphi.pas that Pierre Fontaine and others created to access
the same dll from Delphi.

Icons

All icons in Enigma, except the main icon that appears on the Windows screen, are from the icon set by Google, used for
Material Design. You can download the originals at https://fonts.google.com/icons .

Installing the code

Clone the repository from GitHub: https://github.com/jankampherbeek/EnigmaSuite .

Copy swedll64.dll from Enigmasuite/Enigma/Enigma.Frontend.res to
Enigmasuite/Enigma/Enigma.Frontend/bin/Debug/net6.0-windows and to
Enigmasuite/Enigma/Enigma.Frontend/bin/Release/net6.0-windows

Projects

Enigma is a .NET solution that contains 6 projects. There is a separate project for unit testing, the other 5 projects contain the application. There is only limited communication between these 6 projects.

Project Frontend.Ui

Frontend.Ui becomes active as the application starts. It takes care of some initializing. Its main task is showing information to the user and receiving input from the user.

Project API

The classes in this project receive requests from the Frontend, perform some basic validation, and pass the requests to
a handler in the *Core.Handlers* project. In most cases, the API returns a response to the Frontend. An API contains no business logic.

Project Core.Handlers

A Handler orchestrates the fulfillment of a request. Possibly it uses some basic business logic but many times, but often it relies on helper classes. A handler may call other handlers.
Sometimes it will simply pass through a request but it can also combine the results of several helper classes.

Project Facades

The project *Facades* contains classes that can access the outside world. A range of classes is used to access the dll from the Swiss Ephemeris.

Project Domain

Domain contains all domain objects, including enums, DTO's and records. *Domain* cannot access other projects and is itself accessible by all projects.

Astronomical aspects

I follow the usual approach using the Swiss Ephemeris, but I need to mention some specifics.

School of Ram: hypothetical planets

Enigma supports the three hypothetical planets as proposed by the School of Ram: Persephone, Hermes and Demeter.
The calculations are based on the orbital elements and calculated separately, without accessing the SE.

School of Ram: oblique longitude

The School of Ram supports a solution for the projection of the solar system bodies to the ecliptic. This solution ensures a proper placing of bodies in a house. However, the projection to the ecliptic is skewed. The solution is called 'true place' and also 'astrological place'. I prefer the more correct term 'oblique longitude'.

Enigma implements a dedicated calculation of this oblique longitude.

Black Lights Astrology: hypothetical planets

Black Lights Astrology is a system based on the astrology of Dom Neroman, Jean Carteret, and George Bode. Jean Carteret introduced two hypothetical planets: Persephone and Vulcanus. There are no orbital elements known, only a short ephemeris with yearly positions. You can find this ephemeris in: *De Nieuwe Planeten* by George Bode (Dutch, Amsterdam, 1981). The ephemeris show a fully linear orbit for both hypothetical planets. Bode also mentions that an insecurity of 3 degrees should be taken into account. These bodies obviously do not adhere to the laws of Kepler and do not show retrogradation. That could be explained by considering them as non-material points.

The calculation is based on the positions at Jan. 1, 1900 0:00 . For Persephone, that is 2°00' Scorpio, for Vulcanus 15°42' Aries.

The yearly speed for Persephone is exactly 1°00', for Vulcanus 0°33'. For the calculations. The ephemeris uses a calendar year, Enigma uses the mean length of a year instead.

Black Lights Astrology: corrected Apogee

The lunar Apogee, also called *Black Moon*, is an important point in Black Lights Astrology. Due to the extremely irregular orbit of the moon, the calculation is not straightforward. Several solutions for the calculation of a corrected position have been suggested. For an in depth discussion I highly recommend *Lilith und Priapus - die "Schalen" des Menschen* by Dieter Koch and Bernhard Rindgen (German, Frankfurt a.M., 2000) .

The most popular calculation in Black Lights Astrology is the ony as described by Max Duval and calculated by Jean-Marc Font, for which an ephemeris is available: *Tables do Noeud Lunaire, de Lilith et du Soleil Noir* (French, Paris, 1988). Unfortunately, Duval refused to publish the astronomical theory and the formulas that he used. However, in 2021 Cees Jansen published an article *Over het Apogeum van de Maan en de Gecorrigeerde Zwarte Maan* (Dutch, in NVWOA Nieuwsbrief vol. 26, no. 5, may 2021. https://www.nvwoa.nl/nb/2021nb26-5.pdf) in which he presented a formula that almost exactly replicates the positions as calculated by Duval and Font. In this formula, he uses the distance between Moon and the uncorrected lunar apogee to calculate a correction factor that is algebraically added to the uncorrected position.

The formula is:

$$\varphi cD = 12.37. sin[2(\varphi - 11.726. sin(2\varphi))] + (8.8/60). sin(6\varphi)$$

φcD is the correction to the uncorrected longitude of the apogee, φ is the distance between Sun and uncorrected apogee.

Research

Control groups and random numbers

To create a control group, you need to calculate random values. The standard *PRNG* (Pseudo Random Number Generator) does not supply true random numbers.

Enigma uses *System.Security.Cryptography* from Microsoft, a *CSPRNG* (Cryptographic Secure Pseudo Random Number
Generator). More information:
https://download.microsoft.com/download/1/c/9/1c9813b8-089c-4fef-b2ad-ad80e79403ba/Whitepaper%20-%20The%20Windows%2010%20random%20number%20generation%20infrastructure.pdf

This solution is sufficiently random to support the creation of control groups.

Configuration

Enigma uses two configurations: a configuration for general use and an additional configuration for progressions. The system defines a standard configuration, and the user can change the configurations by defining deltas. Enigma uses these deltas to correct the standard configuration and define the actual configuration.

The program saves the configuration as a dictionary. The key-value pairs in the dictionary use a predefined key and a value that can comprise multiple values, separated by two pipes (standing lines). It is not possible to use a single char as a separator as all characters are being used by the Enigma font. Using one character would interfere with the glyph for that character.

Persistency of the general configuration

There are three groups of keys:

- *keys for chart points*, these are prefixed with **CP_**, followed by an index that refers to the enum for chartpoints.
- *keys for aspect types*, the prefix is **AT_**, followed by the index for the enum aspecttypes.
- *keys for aspect line colors*, the prefix is **AC_**, followed by the index for the enum aspecttypes.
- *all other keys*, no specific prefix. The key cannot start with one of the prefixes mentioned above.

The values for both chart points and aspects uses the following structure:

u||g||o||s

The values for colors only shows the full name of the color:

YellowGreen

- **u** means 'use', enter 'y' if the chart point or aspect type should be used, otherwise 'n'.
- **g** means 'glyph', enter the character or unicode for the glyph.
- **o** means 'orb percentage', enter a value of 100 or lower.
- **s** means 'show', enter 'y' if the chart point or aspect type should show in the graphic chart, otherwise 'n'. Enigma will support this in future releases.

An example: **y||a||100||y** means: use this point or aspect, the glyph is 'a', the orb percentage is 100% and the chart drawing should show the point/aspect.

Persistency of the configuration for progressions

The configuration supports three progressive techniques, each with a specific prefix:

- *transits*, the prefix is **TR_**.
- secondary directions*, the prefix is **SC***.
- *symbolic directions*, with the prefix **SM_**

For each progressive technique, there is one orb, and an enumeration of supported chart points. There is also a time-key for symbolic directions.

- *orb:* add **ORB** after the prefix of the progressive technique.
- *chart point:*, add the prefix for the chart point, as defined in the previous paragraph, to the prefix of the progressive technique.
- *time-key:*, add the prefix **KEY** after the prefix of the progressive technique.

The values for the orb contain only a number. The values for the chartpoints have the following structure:
u||g

- **u** means 'use', enter 'y' if the chartpoint should be used, otherwise 'n'.
- **g** means 'glyph', enter the character or unicode for the glyph.

A few lines with keys and values as an example

"TR_ORB", "1.5"

"TR_KEY", 1

"TR_CP_0", "y||a"

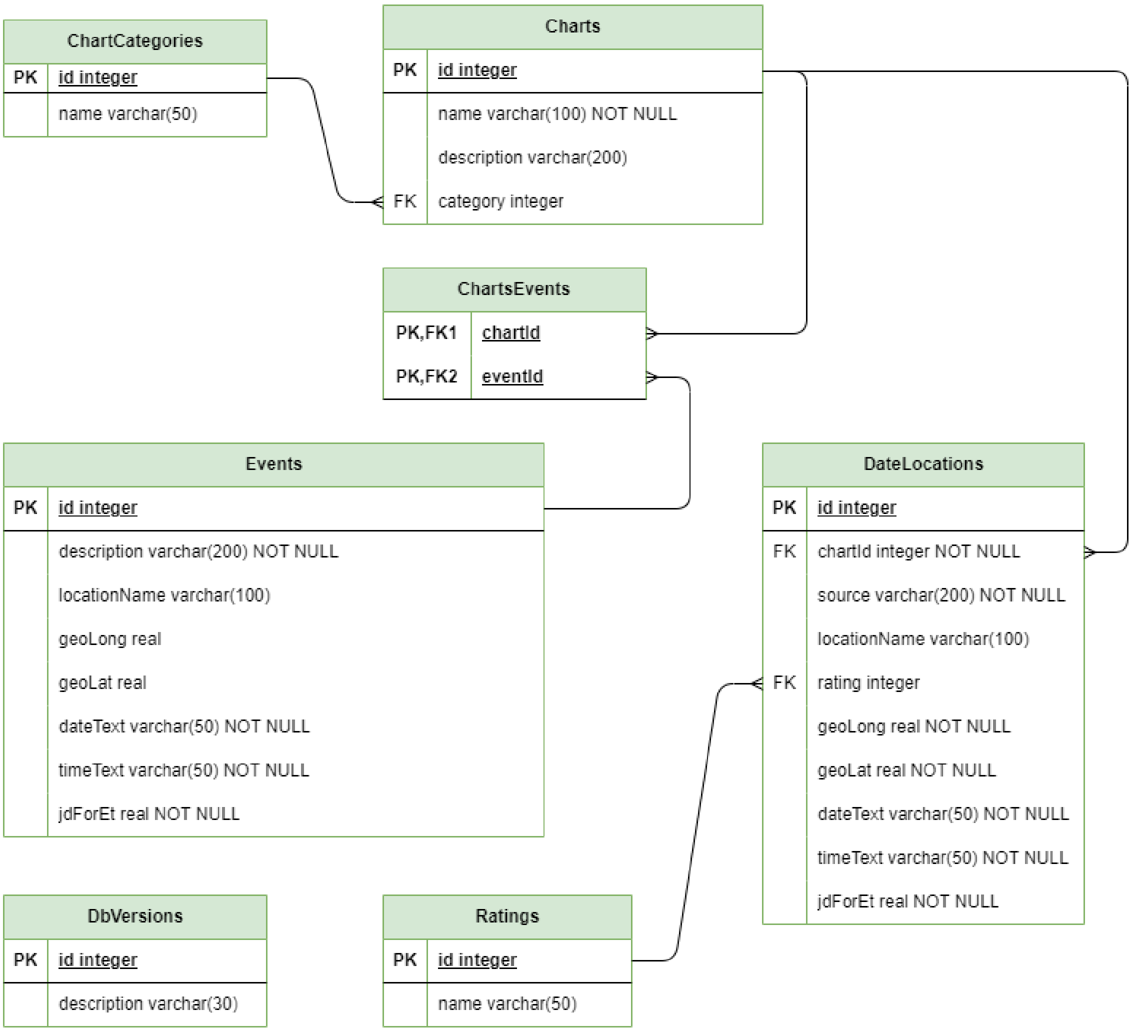
The orb for transits is 1.5 degrees, and the key is 1 (one degree, refers to the enum SymbolicKeys). For transits, the Sun is used and the glyph is 'a'.

Database

The database for Enigma is a RDBMS, a standard relational database.
It is implemented with SQLite and uses Dapper as ORM. Dapper allows for working with plain SQL.

Data model

This image shows the most important tables, it ignores some simple lookup tables.



ChartCategories	
PK	id integer
	name varchar(50)

Charts	
PK	id integer
	name varchar(100) NOT NULL
	description varchar(200)
FK	category integer

ChartsEvents	
PK,FK1	chartId
PK,FK2	eventId

Events	
PK	id integer
	description varchar(200) NOT NULL
	locationName varchar(100)
	geoLong real
	geoLat real
	dateText varchar(50) NOT NULL
	timeText varchar(50) NOT NULL
	jdForEt real NOT NULL

DateLocations	
PK	id integer
FK	chartId integer NOT NULL
	source varchar(200) NOT NULL
	locationName varchar(100)
FK	rating integer
	geoLong real NOT NULL
	geoLat real NOT NULL
	dateText varchar(50) NOT NULL
	timeText varchar(50) NOT NULL
	jdForEt real NOT NULL

DbVersions	
PK	id integer
	description varchar(30)

Ratings	
PK	id integer
	name varchar(50)

Work to do

Enigma is in beta. There is plenty of room for improvement. I intend to finish the following points before declaring Enigma production ready.

1. Adding more functionality.
2. More testing:
    1. Improving the coverage for unit tests.
    2. Adding integration tests.
3. Code:
    1. Replacing several enums with lookup tables in the database.
    2. Solving most warnings.