

# BEL

## A .NET Computational Package Written in Zonnon

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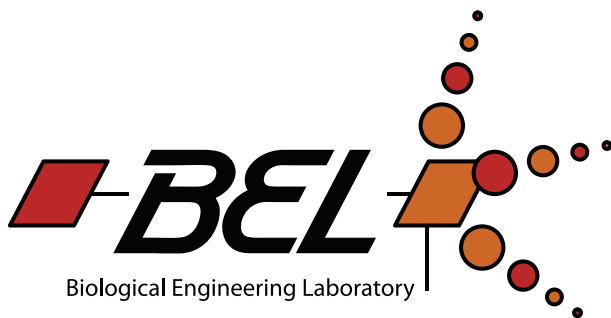
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## Abstract

This document describes the terms, conditions and licensing of the BEL software libraries and their user manuals. These software libraries were written in Zonnon which presently compiles to the .NET and Mono frameworks. BEL provides a simple, computational, programming interface that resides on top of Zonnon. Its purpose is to assist in rapid program development, specifically in the area of computational continuum mechanics, by leveraging the wide diversity of existing .NET and Mono libraries with the simple, logical constructs of the Zonnon programming language.

## 1 Introduction

BEL is an acronym taken for my research laboratory: The Biological Engineering Laboratory at Saginaw Valley State University. What BEL is and what it provides are quite different from what one might expect, given this affiliation. BEL arose out of the author's desire to interface with the .NET and Mono Frameworks for the purpose of writing computational software programs in the Zonnon programming language [1, 2].

The Microsoft .NET framework is free to download from their web server by following links from their site [msdn.microsoft.com](http://msdn.microsoft.com). Versions are available for computers that run their more recent Microsoft Windows operating systems. The Mono framework is an open-source project originally sponsored by Novell that is now managed by Xamarin, a company started by the creator of Mono at the time when Novell was purchased by The Attachmate Group. Mono implements the .NET standard. It too is free to download from their web server at [xamarin.com](http://xamarin.com). Mono is available for computers that run the Apple Mac OS-X, Solaris, Microsoft Windows, and several variants of Linux, with Xamarin clearly placing their focus on the Ap-

ple product line. Both Microsoft and Xamarin have commercial products that they market to enable people and companies to rapidly create applications based on their .NET/Mono technologies.

The author has successfully compiled his Zonnon modules under both the .NET and Mono frameworks running on top of the Linux, Mac OSX, and Windows operating systems. His preference for a programming environment is the Kate editor ([kate-editor.org](http://kate-editor.org)). Kate is a part of the KDE desktop environment for Linux, with ports now available for both the Mac OS-X and Windows operating systems. Enabling the build plugin in Kate results in a powerful yet light-weight programming environment that is easy to use. Other integrated development environments that one may choose to use include Eclipse ([www.eclipse.org](http://www.eclipse.org)) and Visual Studio ([www.microsoft.com/visualstudio](http://www.microsoft.com/visualstudio)).

Zonnon is the most recent descendant from the Euler/Algol/Pascal/Modula/Oberon family tree of the programming languages developed by Profs. NIKLAUS WIRTH and JÜRGE GUTKNECHT from the Computer Systems Institute at ETH Zurich (Eidgenössische Technische Hochschule, Zentrum, i.e., the Swiss Federal Institute of Technology in Zurich). Zonnon was created specifically for .NET, with compiler versions made available for both the .NET and Mono frameworks. The Zonnon compiler, documentation, example programs, and BEL are all free to download from [www.zonnon.ethz.ch](http://www.zonnon.ethz.ch).

To date, no textbook has been written in English (there are two in Russian) that describes how to program in Zonnon. There is a language report [1] and a tutorial [2], plus a variety of reports that one can download from [www.zonnon.ethz.ch](http://www.zonnon.ethz.ch). In this regard, a person new to Zonnon may find it instructive to study the source code of BEL. There are, however, several important features of the Zonnon language that BEL does not use, e.g., activities and protocols.

## References

- [1] Gutknecht, J., 2009, *Zonnon Language Report*, ETH Zürich, Switzerland, 4th ed., available online at [www.zonnon.ethz.ch](http://www.zonnon.ethz.ch).
- [2] Gutknecht, J., Mitin, R., and Gonova, N., 2010, *Zonnon Tutorial*, ETH Zurich, Switzerland, available online at [www.zonnon.ethz.ch](http://www.zonnon.ethz.ch).

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