4th European Workshop on
Mathematical & Scientific e-Contents
11-13 September, Trondheim, Norway

DYNAMIC MATHEMATICS WITH GEONExT: NEW CONCEPTS

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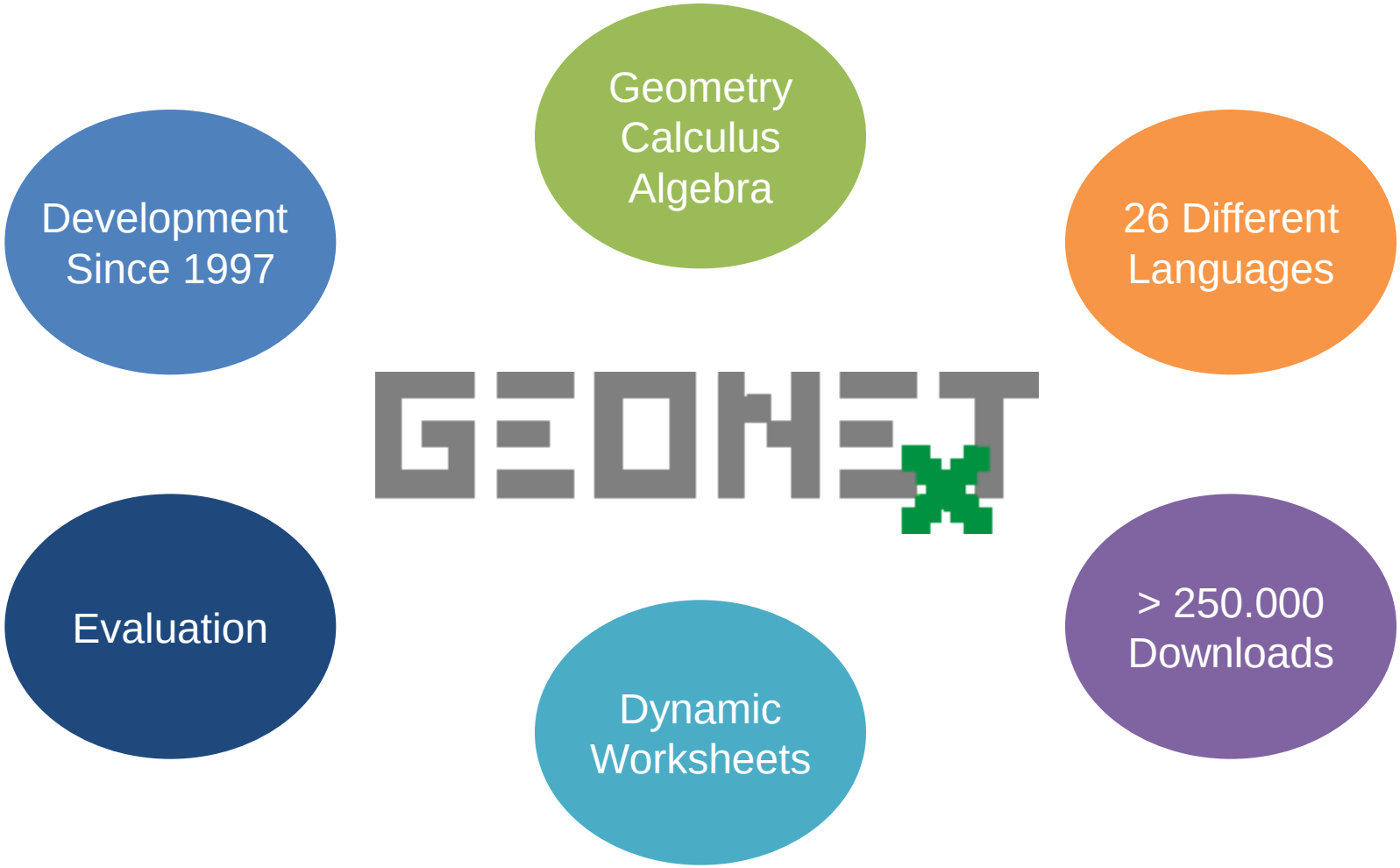
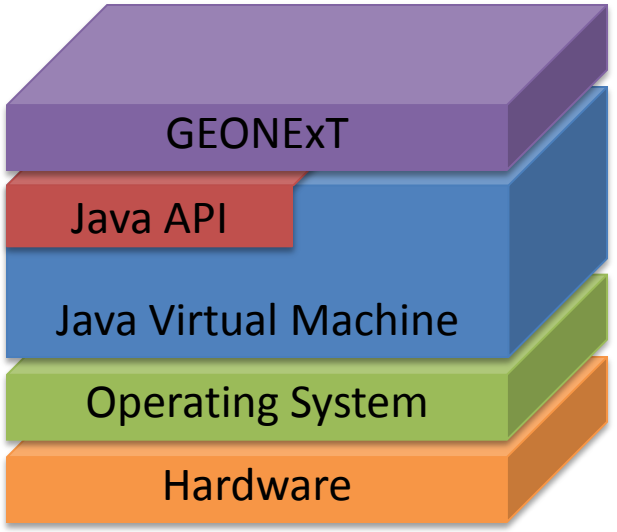
Project „GEONExT“



Technology: Status Quo

- Programming Language: Java
  - Platform independend
- Execution as
  - Java Application
  - Java Applet
    - Integration into web pages
    - Dynamic worksheets
- Requirements
  - Java supported OS
  - Java Runtime Environment
- Effects
  - Parts of the Java platform are loaded before application/applet starts.
  - Java platform allocates memory.



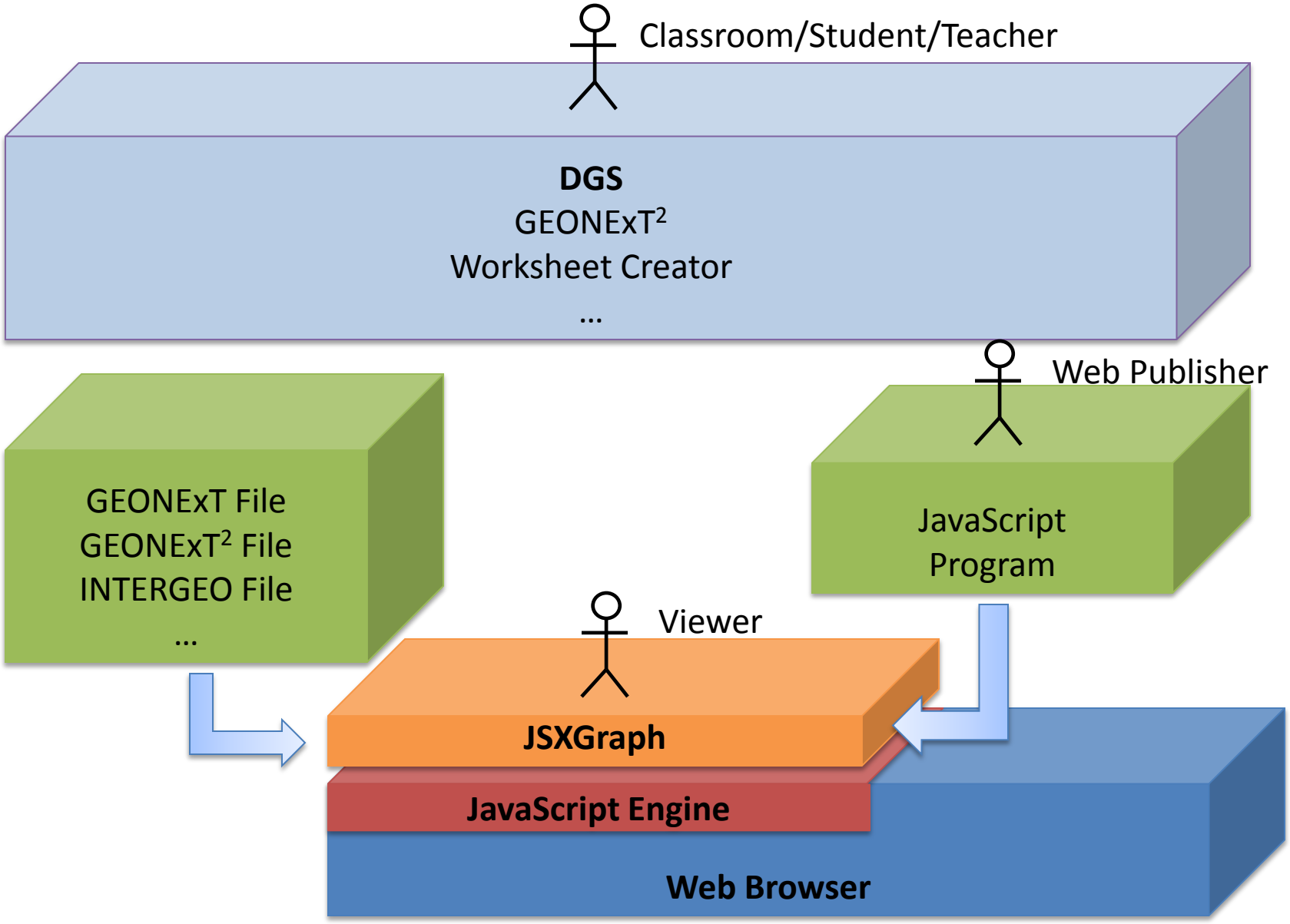
Dynamic Geometry Software

- First generation (since 1980, at least): Standalone programs
  - Geometer's Sketchpad
  - Cabri
  - Euklid (DynaGeo)
  - Thales
  - ...
- Second generation (since 1996): Programs running in a web browser plugin
  - Java based:
    - Cinderella
    - GEONExT
    - GeoGebra
    - ...
  - Flash based:
    - TracenPoche
- Third generation (now): Web2.0
  - Applications are natively embedded into the web browser

Third Generation of DGS

- New version of GEONExT: Split up into two projects
  - GEONExT^2
    - Independent graphical user interface (GUI)
    - Used by teachers and students
  - JSXGraph
    - Underlying visualization library
    - Used by GEONExT^2

New Technology: Layer Model



JavaScript

- Java vs. JavaScript (GEONExT vs. JSXGraph)

	Java	JavaScript
Size of executable	Large >= 1 MB	medium 300 kB
Bandwidth cost	high (>= 1 MB jar file is already compressed)	low 50 kB
Plugin needed	yes	no
Communication App. ↔ Web page	slow	fast (seamless)
Communication App. ↔ Web server	proprietary	easy (AJAX)
Execution speed	fast	medium

Technical Realization

- JavaScript
  - Supported by all web browsers
  - Common myth: “JavaScript is slow”
  - “The worlds most misunderstood language is the worlds most important language” (Douglas Crockford)
- Vector Graphics

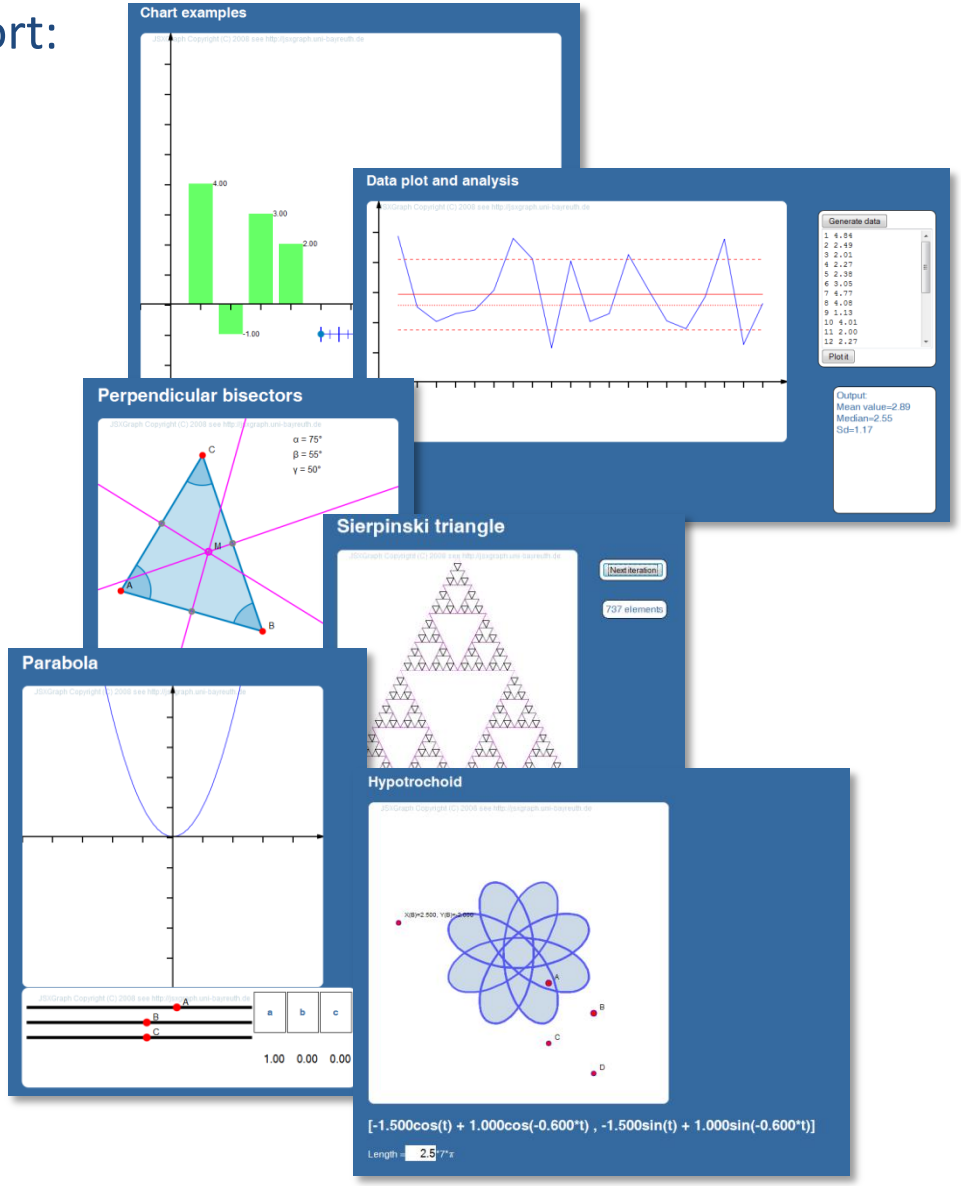
  - Natively supported by all web browsers
  - No plugin necessary
  - No installation problems
  - SVG: Supported by Firefox, Safari, Opera, Google Chrome
  - VML: Supported by Internet Explorer
- Other output options (in preparation):
  - Silverlight-plugin: pushed by Microsoft (works partially)
  - Canvas: Firefox, Safari (iPhone), Opera
  - PostScript, Metapost,...: High quality print output (LaTeX-support)

JavaScript: File Compression

- jsxgraphcore.js
  - File Size Comparison (in bytes):
    - Original size: 297632 bytes
    - Compressed size: 50427 bytes
    - Savings in bytes: 247205 bytes
  - Percentage saved by compression: 84.0%
  - Transfer speed improvement: 5.9x
  - Dial-up Modem
    - 56.0 Kbps: 41.522 s → 7.035 s
- prototype.js
  - Original size: 124136 bytes
  - Compressed size: 28230 bytes
  - Savings in bytes: 95906 bytes
  - Percentage saved by compression: 78.0%
  - Transfer speed improvement: 4.3x
  - Dial-up Modem
    - 56.0 Kbps: 17.318 s → 3.938 s

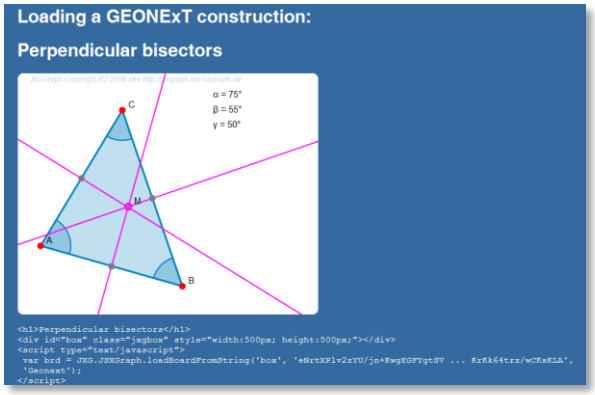
JSXGraph – Fields of Application

- JSXGraph supports/will support:
  - Geometry
  - Calculus
  - Statistics
  - Charts
  - Iterated Function Systems
  - Transformations

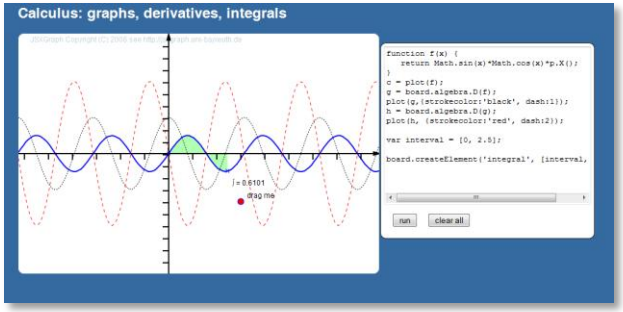


JSXGraph – Current State

- At the moment JSXGraph
  - displays GEONExT files



  - supports the Intergeo file format
  - has a programming interface (API), still evolving



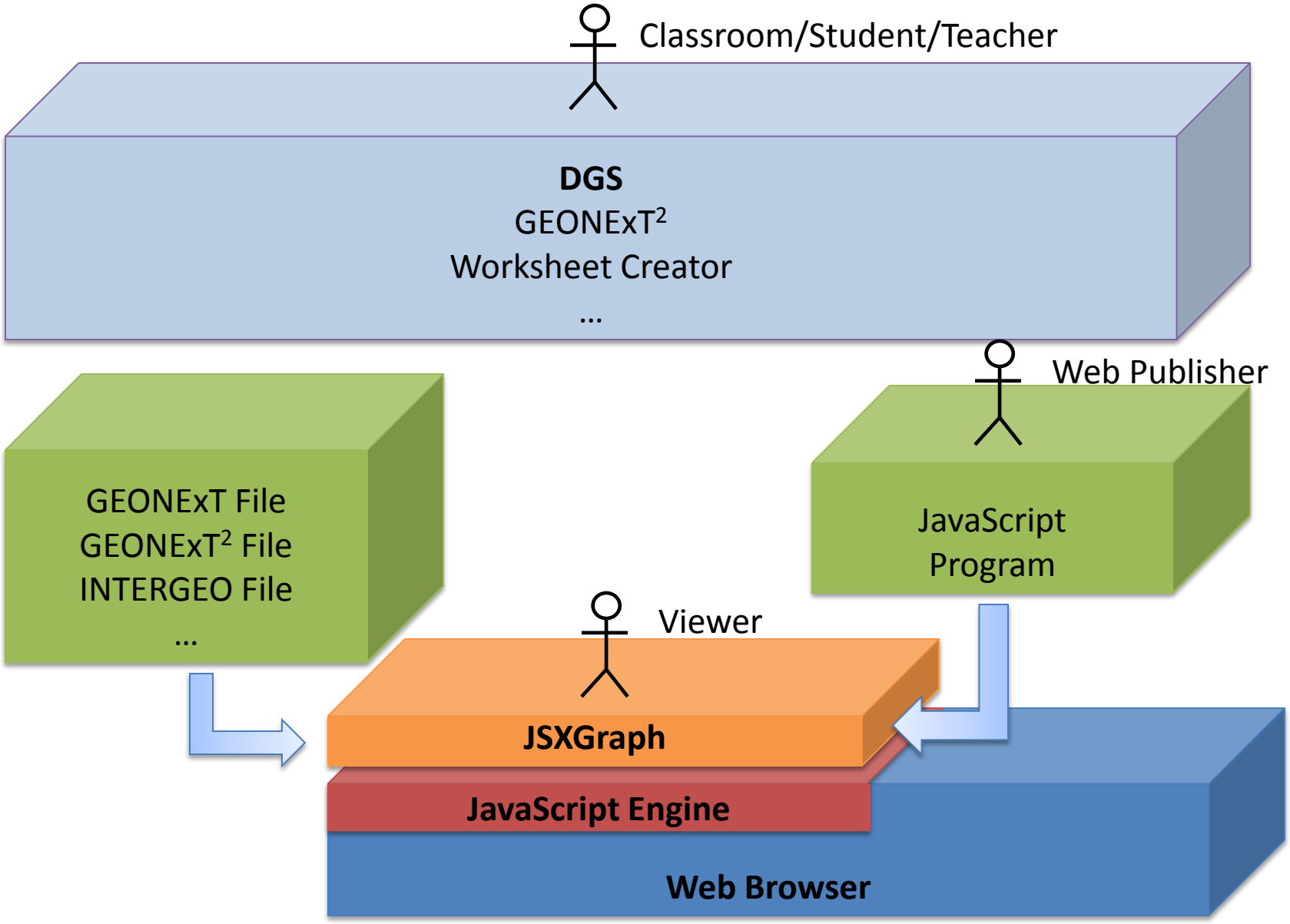
JSXGraph – Distribution

JSXGraph

- is open source software (LGPL)
- can be used freely by anybody
  - to publish mathematical content in the WWW
  - to build a DGS

- Visit JSXGraph
  - http://jsxgraph.org
  - http://jsxgraph.sourceforge.net

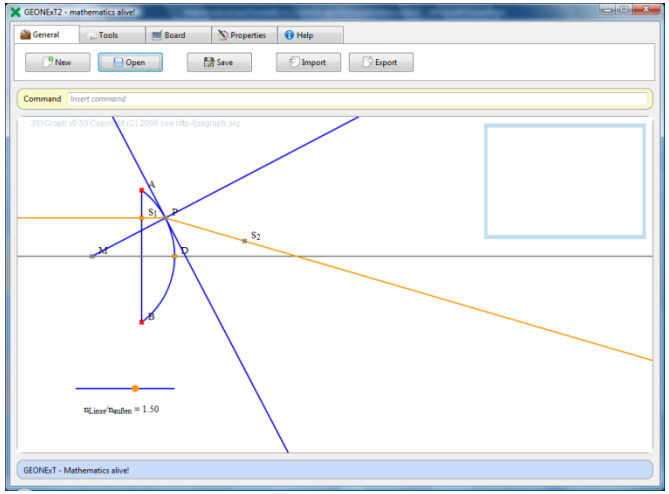
New Technology: Layer Model



Associated Projects

- JSXGraph Worksheet Creator
  - Web service for creating dynamic worksheets online

- GEONExT^2 User Interface
  - XUL (**X**ML **U**ser Interface **L**anguage)
    - XML based user interface markup language
    - Developed by the Mozilla project (platform independend)
    - Execution with XULRunner
  - HTML-JavaScript based User Interfaces



Thank you for your attention.

Visit our projects:

- http://jsxgraph.org
- http://geonext.de