

The Importance of Modularity in Bioinformatics Tools



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Background

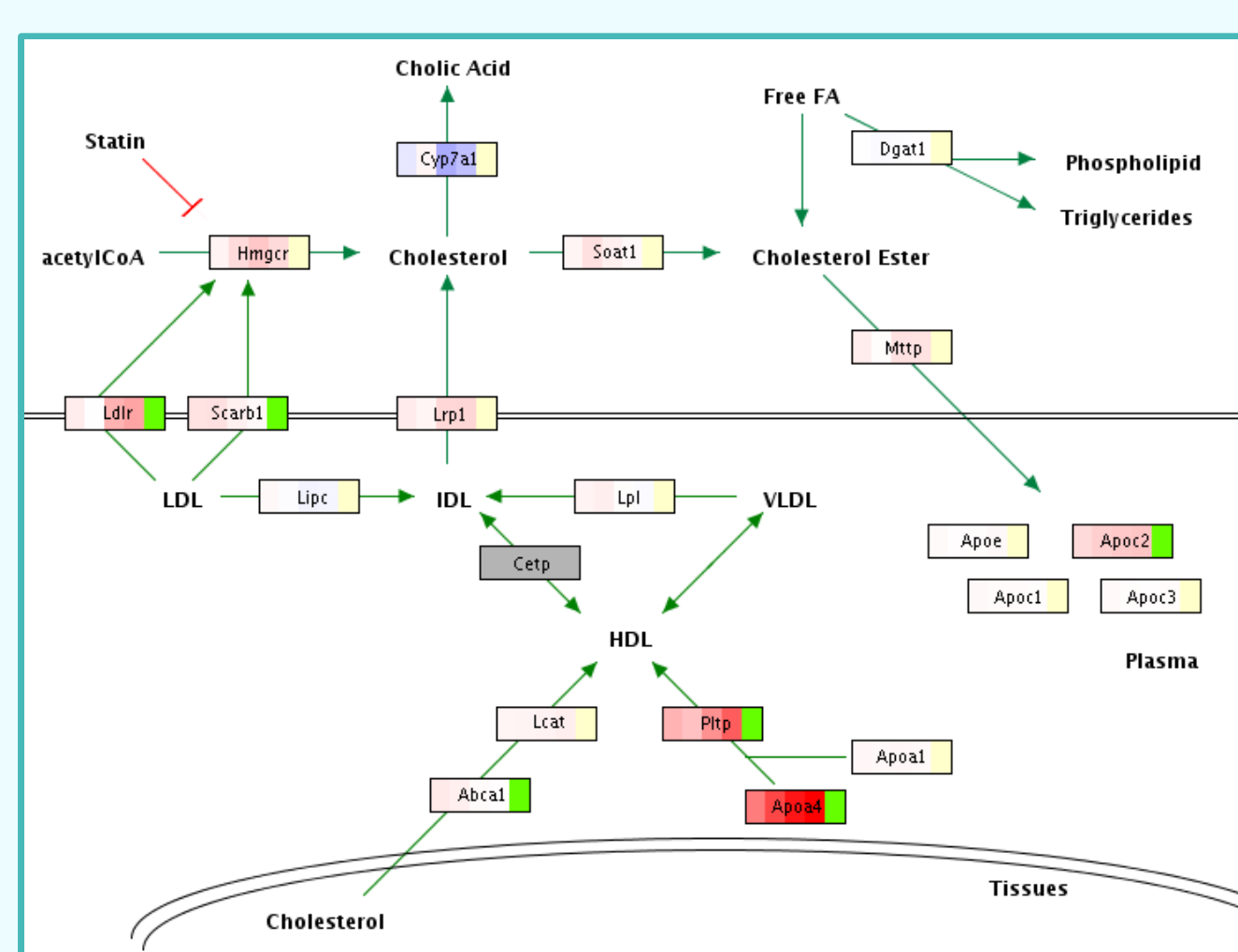
The amount of bioinformatics tools increases and the demand for more functionality in a single piece of software must be balanced against the maintainability of the software. In complex systems, the conflicting demands of features and maintainability are often solved by keeping the system as modular as possible and allowing the extension through plug-ins, e.g. Cytoscape, Eclipse, Firefox.

This allows the development of specific plugins to answer biological questions without complete knowledge about the often complex core structure of applications, and the domain scientist are able to only use a set of plug-ins that is truly relevant for their work.

Modularity Frameworks, like OSGi, allow the user to add and remove plug-ins at run-time and facilitates the possibility to share code between tools.

PathVisio

PathVisio is a tool to **edit and visualize biological pathways**. It is possible to visualize high-throughput data on the pathways, making it easier to interpret. Statistical methods to perform pathway analysis are integrated as plug-ins. The resulting diagrams can be used for publications and presentations.



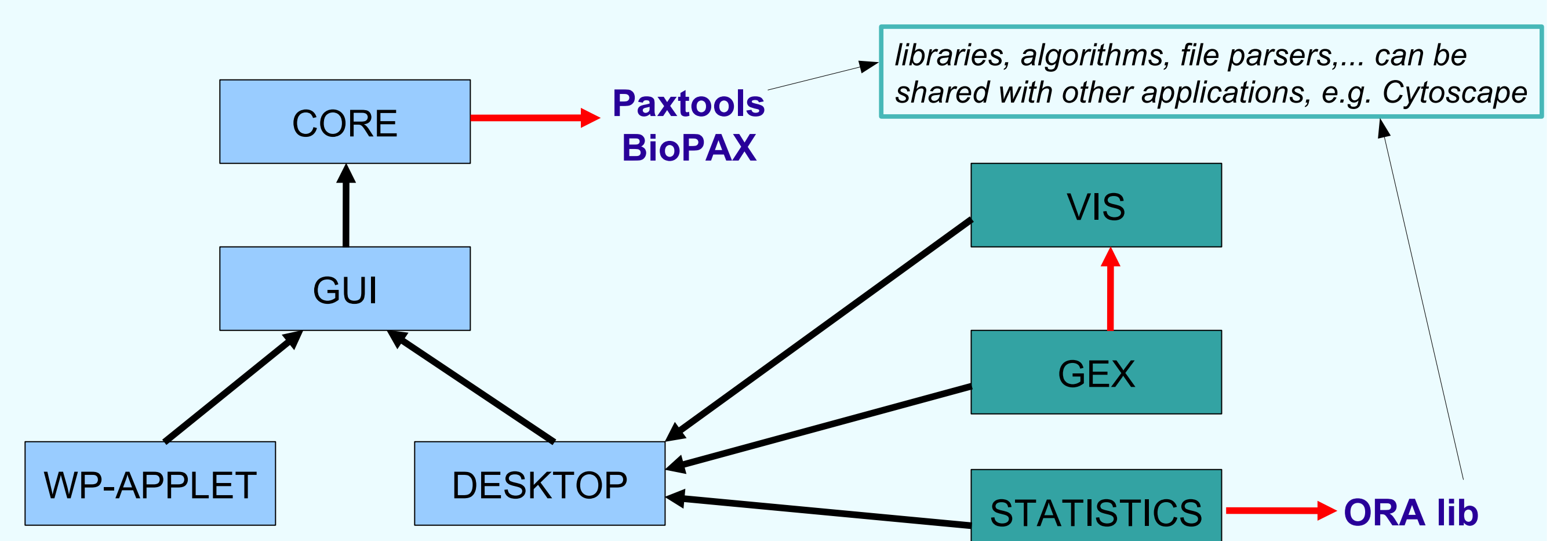
WikiPathways, part of the Statin pathway

Pathways can be shared via **WikiPathways** – a Wiki for open and public curation of biological pathways.

The modular structure of PathVisio allows us to reuse most of the code for the WikiPathways applet.

Modularity

Modularity = division of a software application into logical parts with separate concerns

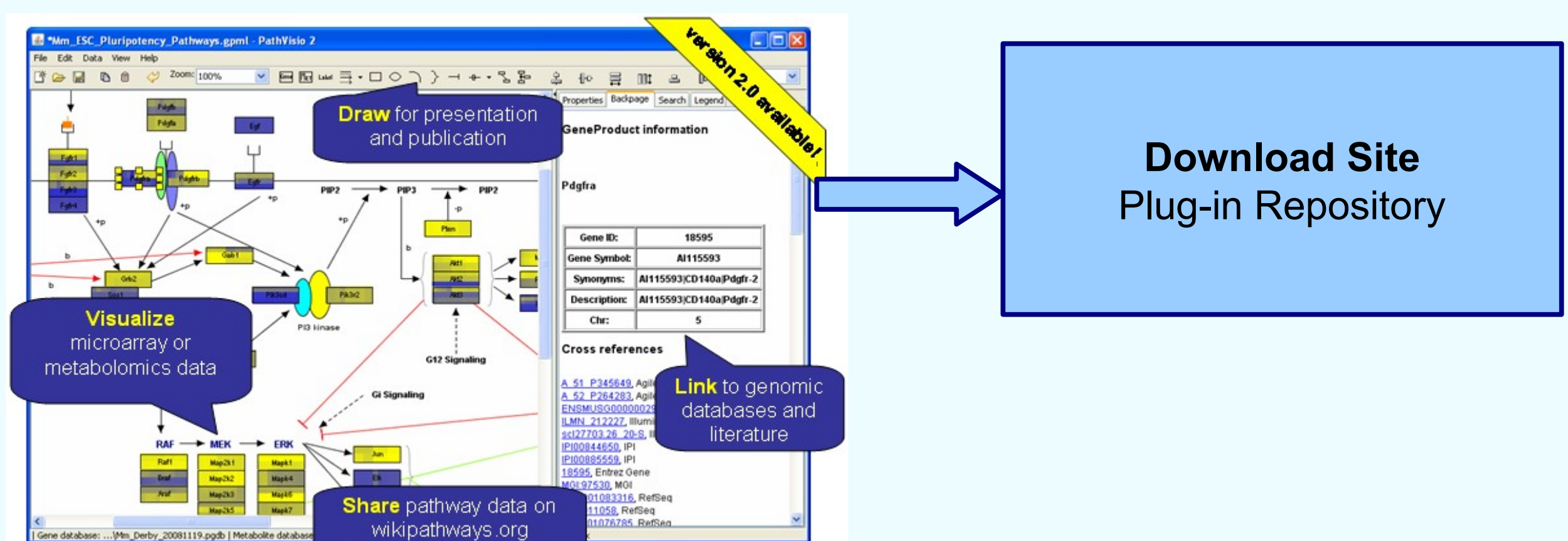


PathVisio's modular structure

Modular systems are better **maintainable**, easier to **test** and code can be **reused** by different applications. Several developers can work on separate modules at the same time. This is especially important for Open Source software.

PathVisio's Manager for OSGi plugins

- provides download site
- plug-in repository for PathVisio plug-ins and third party libraries
- easy to update and submit new plug-ins
- on the fly activation and deactivation of plugins in PathVisio
- plug-in validation: checks dependencies and versions
- simple interface



Discussion

- users can add and remove plug-ins at run-time
- it is possible to use combinations of plug-ins that depend on each other and share information
- it is possible to develop plug-ins without completely understanding the often complex core structure of an application
- users are able to only use a set of plugins that is truly relevant for their work

References

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- [2] **WikiPathways: Pathway Editing for the People**, A.R. Pico et al, PLOS Biology 2008
- [3] **Plug-and-play macroscopse**, K. Börner, Communications of the ACM 2011
- [4] **OSGi in Action**, R.S. Hall et al, Manning 2011

