

**Title: The Virtual R Workbench, towards an open platform for R based e-Science**

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**Abstract.** Biocep frameworks and tools make it possible to use R as a Java object-oriented toolkit or as an RMI server. Calls to R functions from java locally or remotely cope with local and distributed R objects. Stateless and stateful JAX-WS web services can be generated and deployed on demand for R packages. An infrastructure with a large number of R servers running on an heterogeneous set of machines can be deployed and used for multithreaded web applications and web services, for distributed and parallel computing, for thin web clients dynamic content generation including graphics and for R virtualization in a shared computation resources context. The virtualization is based on a universal advanced GUI for R (virtual R workbench) that can be used also to control self-managed R servers. A dedicated HTTP gateway enables the control of R servers running behind firewalls. The workbench includes a powerful and easy-to-use docking framework, advanced script editors, spreadsheet views fully connected to R, R objects inspectors views, data storage views, a highly interactive zooming system for exploring complex visual data and several new R Graphics interactors. It can run as an applet, via Java Web Start or as a cross-platform desktop application.

The virtual workbench is capable of creating R servers on any remote machine having R accessible from the command line without any extra pre-installation/pre-configuration. It enables collaborative R Sessions (one session, multiple simultaneous users, console and devices content broadcasting). It has built-in distributed computing facilities accessible via the API or directly from the R Console. The functions available are similar to what has been defined within the snow package (makeCluster, clusterEvalQ, clusterExport, clusterApply, stopCluster..) and do not require any configuration. Biocep has built-in Python scripting facilities both on server and on client sides. The bridging of R and Python is bidirectional, R objects can be exported to Python and Python objects imported to R. Scripting with R as a component becomes easier than ever by using the Biocep API or from within the workbench via the R / Python Consoles and via the embedded jEdit based script editor.

The virtual workbench is designed to be an open platform: on one hand, it allows users to acquire an R computational resource in different ways either by creating an R server on intranet machines or by connecting to public grids exposing a virtualized infrastructure via a HTTP or a SOAP front-end. On the other hand, it has a plugin architecture that enables the integration of new GUIs designed for end users as new views and perspectives. The creation of those views can be done programmatically (Java/Swing) or visually via a bean builder (Netbeans Matisse) and various Java beans are available as GUI components mapping standard R objects and devices. The plugin architecture handles the notification and the synchronization of the views with the R objects, changes done to the data in the views become effective within the R session and changes made on R objects are visible on real time in the different views. Several available interactive statistical software for data analysis (KLIMT, iPlots, Mondrian..) would become in the future plugins among others available on a web-accessible central repository.

The virtual workbench would enhance the user experience and the productivity of anyone working with R directly or indirectly. The openness would leverage the range of software available for statistical computing and statistical data visualization/exploration. The interoperability coupled with a large-scale deployment of virtualization infrastructures on various grids would democratise R based HPC and enable users from within their browsers to compute with R and visualize data with unprecedented flexibility and performance.

Biocep is a project hosted by R-Forge and it is released under the Apache 2.0 License  
Biocep home: [www.biocep.co.uk](http://www.biocep.co.uk)