Cell Illustrator™: Release Notes

New in This Release 3.0

➢ Import of SBML/CellML files

New input filters allow importing models stored in the widely used CellML and SBML formats. The imported SBML/CellML models are converted to Cell Illustrator models and can be edited, analyzed, simulated or saved as any other Cell Illustrator model. This function converts SBML/CellML models, which use differential equations for representing relationships between entities, to CI models, which use the Petri Net formalism used in CI.

➢ Library of SVG graphical elements

The library of Biological Elements has been extended with SVG images representing biological entities, processes and cellular components. The library consists of: about 40 images for biological entities, more than 250 images for biological processes and about 70 images for cell components. Each image corresponds to one Gene Ontology (or Cell System Ontology) term. Each image can be edited in the SVG editor included in Cell Illustrator.

➢ Enhancements in the Petri Net simulation engine

New options for a better control of the simulation flow have been added. The weak firing and firing accuracy options available in the Simulation Settings facilitate the simulation of continuous models.

➢ Improved Charts

Charts dialog boxes have been enhanced for improved viewing, analysis and control of simulation results.

➢ External References

Since the version 3.0, Cell Illustrator offers an extensive support for external references to public databases, Gene or Cell Ontology terms, etc. These references can be defined in the new *Biological* tab of the *Element Setting* dialog box, as well as in the redesigned *External References* dialog box. Also, *URL Templates* can be defined to access public databases. The URLs of the external references can be opened in the web browser.

➢ Gene Network View

The added *Gene Network Mode* enables the user to view and explore gene relationships networks. This mode offers a special visualization style and tools for the analysis of gene relationship networks, such as *Pathway Search*, *Sub-network Extraction* and *Network Merge*.

New in The Release 2.0

> ➢ **New kinetic styles for easier simulation of biological processes**

With the new kinetic styles of a process: *mass, stochastic mass* and *connector rate* you can build models more easily and define the kinetics of chemical reactions and biological processes. You just need to define reaction parameters such as *stoichiometry*, *rate*, *mass coefficients* and the process speed will be automatically calculated. Additionally, you can introduce random perturbations using the *stochastic mass* function, which allows for modeling reactions and processes of stochastic nature.

> ➢ **The Element Settings and Element Lists dialogs have been improved**

The Element Settings and Element Lists dialogs have been redesigned to simplify model building and analysis. For all process types, you can now view and set all process kinetic properties in one place; the Process Sheet.

> ➢ **New graph layout algorithms**

Using the Graph Layout dialog, you can "beautify" the layout of the model elements on the active canvas. This option can be especially useful when importing models from the BioPACS database or converting models from other formats.

> ➢ **Support for SVG files**

Scalable Vector Graphics (SVG) files can be added to the models as any other image files (PNG, JPEG). An editor of SVG files has been included into Cell Illustrator. All image files, in the PNG, JPEG and now also SVG format can be saved internally or externally in the Cell Illustrator models (CSML files).

> ➢ **The simulation can be executed at a remote Cell Illustrator Server.**

Large, time-consuming simulations can now be executed at a remote server, outside of the Cell Illustrator workspace. For this, Cell Illustrator Server, a new companion product of Cell Illustrator needs to be installed at the simulation server. One server can be accessed by multiple users of the Cell Illustrator desktop package, and the other way around: you can connect to more than one CI Server from your desktop. After the simulation is submitted to a remote server you can continue to work with Cell Illustrator or other software without any loss of performance since the simulation does not take the CPU time of your workstation. The simulation results are returned by the server in the form of a CI log file, and can be viewed and analyzed in the CI Player application.

This solution is recommended for laboratories with a larger number of CI users.

> ➢ **Use Cell Illustrator as a front-end to your own simulation program.**

The advanced user of Cell Illustrator who would like it to run his own simulation program from CI Workspace can do so by replacing the default engine component at the Cell Illustrator Server with his program. The user-created engine must read an input model and write a log file in the Cell System Markup Language (CSML) which is the native format of Cell Illustrator files.

> ➢ **Integrate the command line Cell Illustrator simulation engine into your modeling environment.**

Cell Illustrator can be used to run simulations in the command line mode. This simulation engine works with Cell System Markup Language (CSML) input/output and can be called from user scripts or integrated with a custom GUI. Alternatively, you can utilize Cell Illustrator Server *web service* in your modeling environment.

> ➢ **The maximum memory for Cell Illustrator can be customized**

The new auxiliary program (*CIMemoryConfiguration*) allows you to customize the maximum memory for both Cell Illustrator applications: CI and CI Player.

New in The Release 1.6

> ➢ **The results of each simulation can be logged and saved into CI log files (CILs). The CIL files can be viewed and analyzed in the Cell Illustrator Player program.**

With Cell Illustrator Player, you can:
- deterministically replay a simulation run, even if the original simulation was of stochastic nature,
- display logged entity values and process states in the model view in the canvas,
- visualize entity value changes over time in a chart,
- quickly move forward and backward to a specific part of a simulation log,
- replay a simulation run in a step mode for debugging purposes,
- compare results of several simulation runs.

> ➢ **The new Simulation History dialog in Cell Illustrator allows you to view and manage all the simulation log files (CILs) for your model.**

> ➢ **The set of predefined elements in the Biological Elements dialog has been expanded.**

New in The Release 1.5

➢ **Enhanced implementation of hybrid Petri nets for bio-pathway modeling.**

The modeling features of Cell Illustrator have been refined in version 1.5; The parameters of discrete and continuous elements are unified now. Also, default parameter settings have been improved to make model creation easier for novice modelers.

➢ **Faster and more accurate simulation engine**

In Cell Illustrator 1.0, the minimum sampling interval was 0.001 Petri net time [pt]. In Cell Illustrator 1.5, the minimum sampling interval is 0.000001[pt]. Cell Illustrator 1.5 can realize 1000 times more accurate simulations and simulations which are 10 times faster.

➢ **Much improved GUI for model editing**

GUI interface offers many more editing options and it is easier to use.

➢ **Set of predefined Biological Elements**

You can create biological pathways faster and more intuitively by dragging appropriate elements from the new Biological Elements dialog and dropping them into a canvas window.

Hardware and Software Requirements

Cell Illustrator is available for Windows, Linux, Unix and Mac OS X platforms. In order to run Cell Illustrator correctly, Java version j2sdk 1.5.0 or higher needs to be installed. Java Runtime Environments (JRE) are available for download at: http://java.sun.com/downloads. Alternatively, for Windows and Linux platforms, you may execute the Cell Illustrator installation package bundled with a Java installer. Cell Illustrator installation packages also offer an option to install a beta version of Cell Animator, a program to animate biological pathways.

The recommended hardware requirements are:

CPU: 2 GHz
RAM: 512 MB
Hard disk space: 100 MB

How to Install and Run Cell Illustrator

- ➢ **Windows**

  - ▪ **Java-bundled Installation：**

    1. Uncompress CI3.0x_wj.zip in a temporary directory (You can use WinZip, www.winzip.com)
    2. Click on CI3.0x_wj.exe to install the program. Java Virtual Machine (JVM) will also be installed.
    3. Launch Cell Illustrator from the Start Menu

  - ▪ **Non Java-bundled Installation:**

    1. Uncompress CI3.0x_w.zip in a temporary directory
    2. Click on CI3.0x_w.exe to install
    3. Launch Cell Illustrator from the Start Menu

- ➢ **Linux**

  - ▪ **Java-bundled Installation:**

    To install Cell Illustrator:
    1. Copy "CI3.0x_lj.bin"to a temporary directory.
    2. Execute the command "chmod +x CI10x_lj.bin"
    3. Execute "CI3.0x_lj.bin" file

    Java Virtual Machine (JVM) will also be installed.

    To launch Cell Illustrator:
    1. Go to CI folder
    2. Execute the command ". /CI"

  - ▪ **Non Java-bundled Installation:**

    To install Cell Illustrator:
    1. Copy "CI3.0x_l.bin"to a temporary directory.
    2. Execute the command "chmod +x CI3.0x_l.bin"
    3. Execute "CI10x_l.bin" file

    To launch Cell Illustrator:
    1. Go to CI directory
    2. Execute ". /CI"

- ➢ **Unix**

  - ▪ **Non Java-bundled Installation:**

    To install Cell Illustrator:
    1. Copy "CI3.0x_u.jar"to a temporary directory.

2. Execute the command "java -jar CI3.0x_u.jar"

To launch Cell Illustrator:
1. Go to CI folder
2. Execute ". /CI"

> **Mac OS X**

  ▪ **Non Java-bundled Installation:**

To install Cell Illustrator (CI):
1. Copy "CI3.0x_m.tgz" to a temporary directory.
2. Double-click on "CI3.0x_m.tgz"
3. Double-click on "JExpressInstaller"
4. A Cell Illustrator icon should appear on the desktop, double click to launch Cell Illustrator.

You may also choose to install Cell Animator for Mac OS X. Go to the directory where you installed Cell Illustrator and double-click on the CellAnimator.dmg file. Then, double-click on the Cell Animator application icon.

Licensing Information

To run Cell Illustrator, you need to obtain a license file from GNI or your local distributor of Cell Illustrator. Copy a license file to a directory where the Cell Illustrator is installed. For example, on Windows systems, the Cell Illustrator is installed to "C:\Program Files\GNI\Cell Illustrator" if the default installation settings are used. A license can be bound to your machine and/or time-limited. To obtain a hardware-bound license, you need to send your machine hardware identifier (Hardware ID) which can be revealed by clicking on the About Cell Illustrator option in the Help menu. In the About Cell Illustrator dialog, the Hardware ID is displayed as the License Details tab. The Hardware ID is also displayed in the Invalid License dialog that appears at the application startup, if Cell Illustrator cannot locate a valid license. Press the Copy All button to copy the error message and the Hardware ID into the clipboard. You can later paste this text in into your message to the Cell Illustrator sales and technical support team.

Since the version 3.0, CI offers new license types: *Pro*, *Draw* and *Classroom*. The main differences between the license types are in the simulation capabilities of CI and are briefly summarized in the table below.

License Type	Description
CI Pro	Full version. Includes all simulation and editing/drawing.
CI Classroom	Limited version. Simulation of small models only (up to 30 entities). All editing/drawing capabilities

CI Draw	Limited version. No simulation capabilities. Full editing /drawing capabilities

Note: This manual describes all functions available in the CI (CI Pro license type). A given function described in this manual might be disabled or not available in the limited versions CI Draw and CI Classroom.

Command Line Simulation Engine

Cell Illustrator can be used to run simulations in the command line mode. For this, you need to obtain a CI Server license. The example script *CIEngine* can be found in the CI installation folder. The example script contains the java command which starts the simulation engine in the form:

javaExecutable classPath mainClass inputFilePath

To run a simulation on a sample gon file (e.g. apoptosis.gon)

- Open your command line terminal

- Change to the CI installation directory. The example script should be run from the installation directory.

- Type the command: *CIEngine inputFilePath (e.g. CIEngine sample/apoptosis.gon)*

If you are experienced in Java, please feel free to modify the example script and customize it to your needs.

CI Memory Customization

Using the auxiliary application *CI Memory Configuration*, you can set the maximum memory for both Cell Illustrator applications: CI and CI Player. The application can be found in the installation directory. On Windows machines, the application can be launched from the Cell Illustrator program group in the Start menu.

End User Documentation

The documentation for the Cell Illustrator version 3.0 includes the manuals listed below:

Cell Illustrator User Guide: Introduction to Cell Illustrator system

Cell Illustrator Reference Manual: Detailed description of Cell Illustrator functions

Cell Illustrator Player Reference Manual: Detailed description of Cell Illustrator Player functions

Cell Illustrator Server Installation Manual: Installation instructions for Cell Illustrator Server product (for IT System Administrators)

Cell Illustrator Gene Net Reference Manual: Detailed description of Cell Illustrator functions (Gene Network mode)

Cell Illustrator Gene Net User Guide: Introduction to the Gene Network mode of Cell Illustrator system