nextnano
Software for semiconductor nanodevices

# nextnano Software Documentation

***Release January 2026***

**nextnano GmbH**

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CHAPTER

# ONE

# ABOUT


- *What nextnano Software Is*
- *Requirements*
- *Accessibility Statement*


## 1.1 What nextnano Software Is

The **nextnano** software is the software for **next** generation of **nano** devices. It allows modelling electronic and optoelectronic semiconductor nanodevices. It is characterized by:

- High performance
- Short runtimes
- Python API
- 1D, 2D & 3D simulations
- Seamless workflow integration
- Material database included

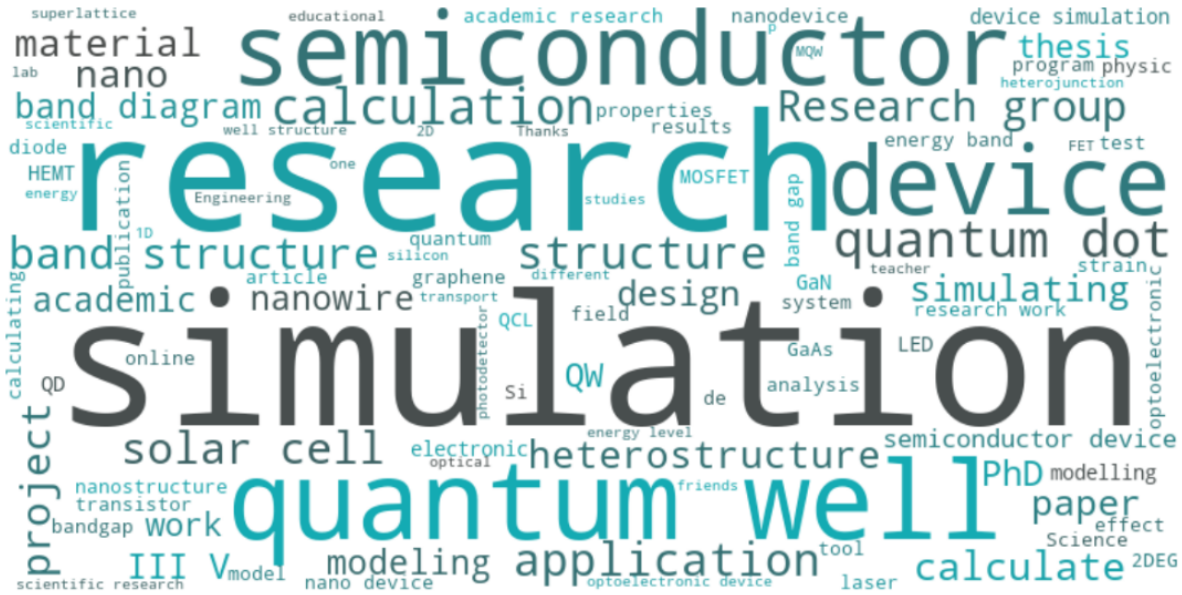


Figure 1.1.1: Applications of the nextnano software

The nextnano software typically is used for research purposes, in the most cases for structures containing quantum wells. However, it can be also successfully used for other type of structures, such as quantum wires, quantum dots, more complicated quantum structures, structures based on p-n junction, 2-dimensional gases, and much more.

Software license includes free access to hundreds of maintained example files and tutorials featuring state-of-the-art physics and publications in semiconductor and quantum science. Easily adapt example files to your device geometry to get started without high initial training effort.

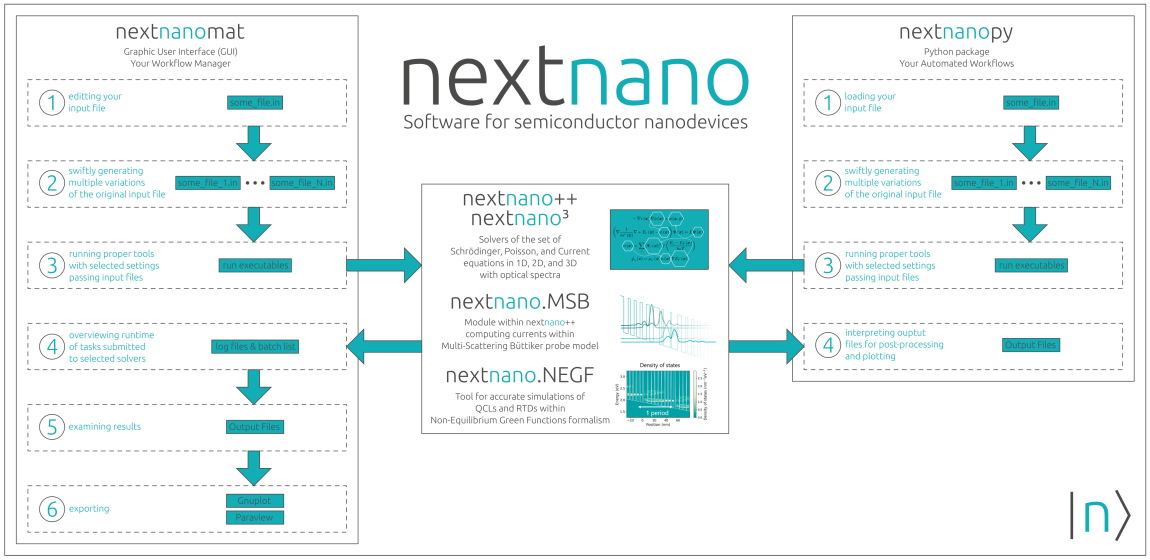


Figure 1.1.2: Structure and typical workflows of the nextnano software

The nextnano software consist of multiple tools aiming at providing you with the best experience while modeling your structures or devices. The tools *nextnano++*, *nextnano*$^3$, *nextnano.MSB*, and *nextnano.NEGF* are our engines of the nextnano software solving sets of specified equations and computing desired results. These tools require input files specifying the structures, models and outputs of interest. The graphical user interface *nextnanomat* is your workflow manager whose purpose is to let you go through the entire process of modeling seamlessly. For those who are looking for automated simulation processes, we provide and maintain an open source *nextnanopy* Python package.

## 1.2 Requirements

**Operating systems:** Our tools are mainly developed for Windows, so all our tools are available for this platform. We also support macOS, Ubuntu, Red Hat 8.1, and Red Hat 7.6 to a certain degree, see package availability for these systems on our *download site*.

**CPU:** Simulations can be CPU-intensive, so multi-core CPUs are always advised, however, the software will also run fine on a single core. Our tools are compiled for Intel processors but they also run well on AMD processors. Support of ARM processors is not ready yet, we are working on it.

**Disk space:** One needs around 1.5 GB of free disk space to install all our tools. The volume varies depending on the type of package and release.

**Software dependencies:** When working on Windows using *nextnanomat*, one also needs to have Latest Microsoft Visual C++ Redistributable installed; If it is needed then *nextnanomat* will notify you as it can be done after it is installed. Additionally, one can consider installing gnuplot, ParaView, and Python to take advantage of *nextnanomat* integrations with these tool.

## 1.3 Accessibility Statement

Accessibility statement and evaluation report can be downloaded using links below:

- Accessibility Statement
- Evaluation Report

*Last update: 2025/07/09*

CHAPTER

TWO

# FIRST STEPS


- *Get the Free Version*
- *Register for Trial License for Professional Version*
- *Download the Software*


## 2.1 Get the Free Version

If you want to try a Free version of our tools then you don't have to register and get any license, just get the *Free nextnano++ package*, install it, and run.

## 2.2 Register for Trial License for Professional Version

Otherwise, if you are seriously considering purchase of our software, and you are looking forward to experiencing the full potential of our tools, you need to register yourself here to get a trial license.

After registration, you will receive an email confirming that we received your registration data. Later, after we process your submission, you will receive an email with credentials to download professional distributions of our software and a license key which you will need for activation of your 14-day evaluation license.

## 2.3 Download the Software

Once you get an email with the credentials and the license key, you can download professional distributions of the nextnano software from one of our download sites for *Windows* and for *macOS and Linux*.

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*Last update: 2025/07/09*

CHAPTER

# THREE

# DOWNLOADS

## 3.1 Windows

All our tools are available for Windows. We always recommend downloading packages with installers, containing MSI files. In case you would like to avoid the installation process, e.g., due to lack of administrator rights on your computer, please download a portable version. You can install several versions of the nextnano software on the same computer. There is no need to uninstall previous versions if you want to keep them.

After you get your version of the nextnano software, check *Windows* for introduction.

### 3.1.1 Professional

Software packages for researchers at universities and in companies; To run them you need to have an active **license**. If you still don't have it, please follow instructions *here*.

| release date | package | nextnar | nextna | nextna | nextnanc | nextnano.NE | installer | portable |
|---|---|---|---|---|---|---|---|---|
| 2025-12-20 | nextnano bundle | 5.6.4.6 | 2.4.27.b | 2.7.2.s | 2025-12-20.b | 2024-01-17 | download **(recommended)** | download |
| 2025-12-20 | nextnano.NE package | 5.6.4.6 | — | — | 2025-12-20.b | 2024-01-17 | download (recommended) | download |
| 2025-12-17 | nextnano++ package | 5.6.4.6 | 2.4.27.b | 2.7.2.s | — | — | download **(recommended)** | download |

Release notes: nextnanomat, nextnano++, nextnano[3], nextnano.NEGF, and nextnano.NEGF_classic.

### 3.1.2 FREE nextnano tools

The Free *nextnano*++ package is a limited version of the standard product (see the table in the product overview ).

| release date | package | nextnanomat | nextnano | nextnan | installer | portable |
|---|---|---|---|---|---|---|
| 2025-12-17 | nextnanomat GUI | 5.6.4.6 | — | — | download (recommended) | download |
| 2025-12-17 | Free nextnano++ package | 5.6.4.6 | 2.4.27.b * | 2.7.2.s * | download | download |
| 2025-04-06 | nextnanomat GUI classic | 4.3.2.15 (deprecated) | — | — | download | download |

Release notes: nextnanomat, nextnano++, and nextnano[3].

* Free edition

Check also our open-source *nextnanopy* package developed for *nextnano++*, *nextnano[3]*, and *nextnano.NEGF* tools to automate simulations and analysis of the results. More details about the package and instruction of installation can be found here: nextnanopy.

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*Last update: 2025/10/10*

## 3.2 macOS and Linux

Only simulation tools are available for macOS and Linux systems. They can be downloaded only as portable packages. Since *nextnanomat* is available only for Windows, you can run it on Linux using tools such a Wine; However, it will not work smoothly here.

### 3.2.1 Professional

Software packages for researchers at universities and in companies; To run them you need to have an active **license**, which can be obtained through our registration page. See the table in the product overview for description of the tools.

| release date | package | nextnano+ | nextnano | nextnano.NEG | portable |
|---|---|---|---|---|---|
| 2025-12-20 | nextnano bundle for Ubuntu | 2.4.27.b | 2.7.2.s | 2025-12-20.b | download |
| 2025-12-20 | nextnano++ package for Ubuntu | 2.4.27.b | 2.7.2.s | — | download |
| 2025-12-20 | nextnano++ package for Red Hat 8.1 | 2.4.27.b | 2.7.2.s | — | download |
| 2025-12-17 | nextnano++ package for macOS (Intel) | 2.4.27.b | 2.7.2.s | — | download |
| 2025-12-17 | nextnano++ package for macOS (ARM) | 2.4.27.b | 2.7.2.s | — | download |
| 2024-12-18 | nextnano++ package for Red Hat 7.6 | 1.22.18.b | 2.6.9.b | — | download |

Release notes: nextnanomat, nextnano++, nextnano[3], and nextnano.NEGF.

> **Note**
>
> nextnano++ package for Red Hat 8.1 and nextnano++ package for Red Hat 7.6 may also run on CentOS, SUSE, and AlmaLinu.

#### Instructions for macOS (ARM)

License activation

```
cd license_activator
xattr -d com.apple.quarantine nextnanoLicenseActivator_macOS_ARMCPU.exe
./nextnanoLicenseActivator_macOS_ARMCPU.exe --firstname Homer --lastname Simpson --
↪email homer.simpson@nextnano.com --institution 'Springfield Nuclear Power Plant' --
↪licensekey homer.simpson@nextnano.com-2025-12-31-de-1vmh --outpath ../License/
```

Run *nextnano++*

```
cd nextnano++/scripts
xattr -d com.apple.quarantine ../bin/nextnano++_clang_macOS_ARMCPU.exe
./nextnano++_macOS_ARM.sh
```

Run *nextnano*$^3$

```
cd nextnano3/scripts
xattr -d com.apple.quarantine ../bin/nextnano3_gcc_macOS_ARMCPU.exe
./nextnano3_free_macOS_ARM.sh
./nextnano3_macOS_ARM.sh
```

---

*Last update: 2025/10/10*

## 3.3 Advanced downloads

Special versions of some of our tools can be found here. The simulation tools can be run only with an active **license**, which can be obtained through our registration page.


- *nextnanomat GUI (32-bit)*
  - *Windows*
    - *stable (2023-08-01)*
- *nextnano License Activators*
- *Libraries for gcc releases*


---

### 3.3.1 nextnanomat GUI (32-bit)

#### Windows

#### stable (2023-08-01)

| Included Tools | Version |
|---|---|
| *nextnanomat* | 4.3.2.6 |

- Download: nextnanomat_stable_portable_32bit.zip

---

### 3.3.2 nextnano License Activators

A stand-alone package for license activator executables (2025-02-27) for Windows, Linux and macOS.

| Operating System | Download Link |
|---|---|
| Windows | nextnanoLicenseActivator.zip |
| macOS (ARM processor) | nextnanoLicenseActivator_clang_macOS_ARMCPU.zip |
| macOS (Intel processor) | nextnanoLicenseActivator_macOS.zip |
| Ubuntu | nextnanoLicenseActivator_Ubuntu.zip |
| Red Hat 8.1 | nextnanoLicenseActivator_gcc_RHEL81.zip |

---

### 3.3.3 Libraries for gcc releases

Libraries needed for **nextnano++_gcc_Windows.exe** executable can be found here . Please download, unzip and place the *.dll files next to the **nextnano++_gcc_Windows.exe** executable.

Libraries needed for **nextnano3_gcc_Windows.exe** executable can be found here . Please download, unzip and place the *.dll files next to the **nextnano3_gcc_Windows.exe** executable.

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*Last update: 22/05/2025*

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## 3.4 Types of Packages and Versioning

### 3.4.1 Installer vs Portable

On this page one can find download links to multiple versions of our tools. Currently, we are providing packages marked as **installer** or **portable**.

**installer** - These packages contain an installation file that manages generation of a folder structure, generating shortcuts, etc., and connecting all tools that we are providing within the packages. New installations are independent of the previous ones, which means that one does not lose the previous versions of the tool during the installation process.

**portable** - These packages are zip files containing folder structure with all the tools. One does not need to install this package; It is ready to use directly as downloaded and unpacked. However, no shortcuts, system variables, or paths for license files are set up in these packages. These require manual setup. It may be a good choice for those who do not have administrator rights on the computer.

### 3.4.2 Versions

We are currently providing three versions of our tools.

**alpha** - (version numbers ending with **.a**) It is a version of the tool that has been developed most recently, often containing new minor features requested by our customers. We are publishing these versions, so you can have your new features as soon as possible.

- Contains new experimental features.
- Some features may be unstable.
- Not all provided input files may be updated to the new syntax.
- Some provided input files may not run until finished or not converge.
- Included documentation (pdf) may not be fully consistent with the provided package.

**beta** - (version numbers ending with **.b**) It is a version of the tool which typically is internally consistent, and contains major changes introduced in some tools.

- New features are quantitatively tested.
- All provided input files are updated to the new syntax and run until finished.
- Included documentation (pdf) is updated and consistent with the provided package.

**stable** - (version numbers ending with **.s**) It is a version of the tool which fulfills all requirements for being called beta, and for which we have carefully tested values outputted from simulations to make sure that all the models are running as they should.

- All major features are quantitatively tested.
- No known bugs are present at the date of the release.

CHAPTER

FOUR

# INSTALL AND RUN

## 4.1 Windows


- *Staring with Installer*


### 4.1.1 Staring with Installer

#### 1. Install the package

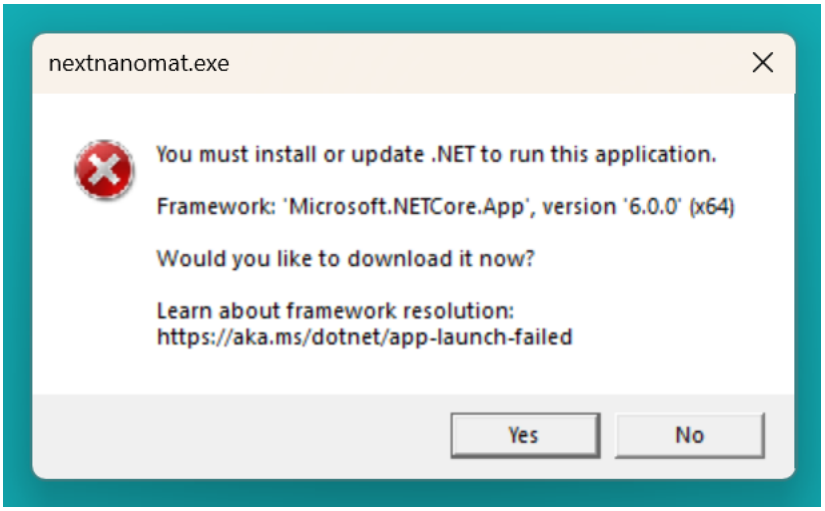
Unzip downloaded package to your preferred location, run the unpacked `MSI` file, and follow instructions of the installer *nextnano Setup*.

#### 2. Run *nextnanomat*

You can achieve it in two ways. First Select the checkbox `Launch the nextnano software` to run *nextnanomat* during the installation process to open it immediately after closing the installation window by clicking `Finish`. Second, run *nextnanomat* using automatically generated shortcut.

#### 3. Install .NET Desktop Runtime

If prompted by nextnanomat, follow the link in the pop-up window. The *nextnanomat* GUI version 5 or higher requires .NET Desktop Runtime libraries to be installed on your computer to run. If it is not the case, then the following notification will occur.




You will need to open *nextnanomat* again after this process.

#### 4. Activate the license

- Make sure that you have connection to the internet.
- Go to `Tools/Activate License` in the top bar of *nextnanomat*.
- Enter your data, including the `License Key` obtained before by email.
- Click `Generate and activate license key` and confirm sending data to our server.
- If everything went fine, you should see an information that you received some licenses, click `OK` to finish the process.

If you got lost or something did not work following steps above, please check other methods to activate your license in *License Activation*.

#### 5. Verify which licenses you have

Go to `Tools/Options...` in the top bar of *nextnanomat*, then select License on the left panel. You will see paths to all licenses you have just received with green background suggesting that they are active.

#### 6. Run your first simulation

Upon the first run, *nextnanomat* is opening an input file with a selected simple simulation.

- Open an `Input` tab of *nextnanomat*, if not already, to preview the input file defining the simulation.
- Click the icon to run the simulation.
- The *nextnanomat* will automatically choose the tool matching the input file to run simulation; In this case it will be either *nextnano++* or *nextnano.NEGF*.
- Confirm that you want to run the simulation.
- After it finished, go to the `Output` tab, where you can preview the simulation results.

See *What Next* for the final part of "getting started" with our software, before you depart to do your research.

---

*Last update: 2025/07/09*

## 4.2 Linux

There are three options:

> A: Run simulations from Terminal (linux native executable) - basic simulation is possible.
>
> B: Run simulations with *nextnanopy* (linux native executable) - it can not only run the simulations but also sweep variables and postprocess the results.
>
> C: Run simulations with *nextnanomat* using Wine or Mono (Windows executable).

We recommend the option B.

---

### 4.2.1 Option A (running from Terminal)

#### License activation

Please see *License activation via command line*.

### Running nextnano++ on Linux from Terminal

The *nextnano++* simulations can be executed from the **Linux terminal** by directly using the Linux executables.

To run the 'Intel_Ubuntu' *nextnano++* executable, the path to the OpenMP library has to be specified. We ship a `.so` file together with the executable. Go to `nextnano++/bin` and run:

```
$ currentFolder=$(pwd)
$ export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$currentFolder
```

The terminal commands to run a *nextnano++* example input file are follows:

```
$ cd ..
$ ./bin/nextnano++_intel_nextgen.exe --license "License/License_nnp.lic" --
↪outputdirectory "Output" -log "examples/electronic_band_structures/1Dwell_GaAs_AlAs_
↪nnp.in"
```

Detailed documentation on command line features can be found on the page nextnano++. Further information and more examples can be found in the README_Linux file and the shell scripts included in the nextnano folder.

### Running nextnano$^3$ on Linux from Terminal

The *nextnano*$^3$ simulations can be executed from the **Linux terminal** by directly using the Linux executables.

Set the environment variable `NEXTNANO`. To do this, go to `nextnano3/bin` and run:

```
$ cd ../..
$ currentFolder=$(pwd)
$ export NEXTNANO=$currentFolder
```

The terminal commands to run a *nextnano*$^3$ example input file are as follows:

```
$ cd nextnano3
$ ./bin/nextnano3_intel.exe -log -license "License/License_nnp.lic" -outputdirectory
↪"Output/<name_of_input_file>" -inputfile "examples/education/lecture_on_quantum_
↪mechanics/DoubleQuantumWell_nn3.in"
```

Detailed documentation on command line features can be found on the documentation of nextnano$^3$. Further information and more examples can be found in the README_Linux file and the shell scripts included in the nextnano folder.

### Running nextnano.NEGF on Linux from Terminal

The *nextnano.NEGF* simulations can be executed from the **Linux terminal** by directly using the Linux executables.

The path to the OpenMP library has to be specified. We ship a `.so` file together with the executable. Go to `nextnano.NEGF/bin` and run:

```
$ currentFolder=$(pwd)
$ export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$currentFolder
```

The terminal commands to run a *nextnano.NEGF* example input file are as follows, to be executed from the `nextnano.NEGF` directory:

```
$ ./bin/nextnano.NEGF_ubuntu.exe --input-file ./examples/THz_QCL_GaAs_AlGaAs_
↪Fathololoumi_OptExpress2012_10K-FAST.negf --output-folder ./output/THz_QCL_GaAs_
↪AlGaAs_Fathololoumi_OptExpress2012_10K-FAST --material-database ./database/Material_
↪Database.negf --license ./path/to/your/License_nnNEGF.lic --threads 4
```

Detailed documentation on command line features can be found in the documentation of nextnano.NEGF.

*Last update: 08/01/2025*

### 4.2.2 Option B (running with nextnanopy)

#### License activation

Please see *License activation via command line*.

#### Running nextnano++, nextnano$^3$, and nextnano.NEGF on Linux with nextnanopy

*nextnanopy* is our open-source Python package for running simulations, sweeping variables and post-processing results. Please follow the instructions from the link.

*Last update: 08/01/2025*

### 4.2.3 Option C (running with nextnanomat)

**We strongly recommend using |nextnanopy| on Linux since it runs Linux-native executables and provides methods to modify input files and interact with simulation output.**

The *nextnanomat* GUI is programmed in C#, and can thus be executed on any operating system. It is, however, developed on and optimized for Windows. On Linux, you have to either install Wine or Mono and then execute *nextnanomat*.

Please note that we developed *nextnanomat* for Windows and not for Linux, therefore many things might not work as expected.

Status 2020-04-07: Recommended to use Wine as described below.

Status 2018-05-03: Recommended to use Wine as described below.

#### Option C1: Wine

The following instructions are for **Ubuntu version 20.10** (Groovy Gorilla). Commands for the Wine installation on various distributions are given in *Wine Installation*. A detailed description on how to install WineHQ on Ubuntu can be found here: Install WineHQ package on Ubuntu

The following commands are needed to install WineHQ on Ubuntu 20.10 (Groovy Gorilla). For older versions of Ubuntu, please see here: *Wine Installation*.

```
sudo dpkg --add-architecture i386
wget -nc https://dl.winehq.org/wine-builds/winehq.key
sudo apt-key add winehq.key
sudo apt-add-repository 'deb https://dl.winehq.org/wine-builds/ubuntu/ groovy main'
sudo apt update
sudo apt install --install-recommends winehq-stable
```

Download the portable version of *nextnanomat* from *this site* or any other portable package containing *nextnanomat* from *Downloads*.

- Unzip this file.
- Open a Terminal window and change to the directory where the `nextnanomat.exe` is located.
- Type: `wine nextnanomat.exe`
- There will be a pop-up message that a Mono package is missing which can be installed automatically. Click ''Install".
- There will be a pop-up message that a Gecko package is missing which can be installed automatically. Click ''Install".
- If *nextnanomat* does not work, close the terminal and open a new terminal and then try again.

The first thing you have to do when *nextnanomat* opens is to activate your license. Normally this operation fails when performed under Wine or Mono. Instead you should activate your licenses via command line *License activation via command line*. Afterwards, you need to update the paths within *Tools* ==> *Options* ==> *Licenses*. (You can cancel the activation dialog of nextnanomat)

Please note that we developed *nextnanomat* for Windows and not for Linux, therefore some things might not work as expected. Optionally, one can execute the *nextnano++* and *nextnano*$^3$ executables on Linux without *nextnanomat* (see *Option A (running from Terminal)* and *Option B (running with nextnanopy)*).

Known problems are:

- On very old CPUs, the 64-bit version of *nextnano++* does not work. In this case, please select the 32-bit version of *nextnano++*. Tools => Options => Simulation => *nextnano++* executable => `<path>\nextnano++\bin 32bit\nextnano++_Microsoft_32bit_serial.exe`
- Somehow the settings are not saved, i.e. you need to re-enter custom paths or settings at each program start.
- The program crashes.

Things that have to be fixed for future updates are:

- Use a monospaced font for the Input tab. (It seems that the default font for Windows is not found and then another default font (Tahoma) which is not monospaced is chosen.) One can choose a different font for the editor. Tools => Options => Editor => Editor font

---

The following instructions are for **Ubuntu version 18.04 LTS**.

Run commands in a terminal:

```
$ sudo apt update      # Update system
$ sudo apt install wine-stable winetricks # Install required packages (without "-
↪stable" in versions bevore Ubuntu 16.10)
$ winetricks dotnet45  # Install .net support, follow along on-screen instructions,␣
↪ignore warnings
$ winetricks corefonts # Install basic fonts of Windows
```

Finally run `winecfg` -> Select "Windows 8" in Applications -> Windows Version **and** reboot afterwards.

To start the application, use `wine /<your_directory_name>/nextnanomat.exe`

Example: ''wine '/home/ubuntu/nextnanoTestversion/nextnanomat.exe' ''

#### Option C2: Mono

> **Attention**
>
> This documentation is for old Ubuntu and Mono versions. It is not clear if it works with their latest versions!

```
$ mono nextnanomat.exe &
```

On some Linux distributions (e.g. Ubuntu), Mono is already preinstalled.

The current Mono version uses .NET Framework version 4.0 by default. The *nextnanomat* GUI, however, still requires the installation of the .NET Framework version 2.0. Therefore the following error occurs:

```
The assembly mscorlib.dll was not found or could not be loaded.
It should have been installed in the `/usr/lib/mono/2.0/mscorlib.dll' directory.
```

The following solution works:

```
$ sudo apt-get install libmono-corlib2.0-cil
$ sudo apt-get install libmono-winforms2.0-cil
$ sudo apt-get install mono-complete
```

All *nextnanomat* features seem to work on Linux Ubuntu. However, what does not work satisfactorily is the coloring of the 2D plots. They look too bright, so one can hardly recognize the results. A quick fix is to activate "Show grid". Then the figure looks better.

If you have any feedback on these instructions, please let us know, then we can keep our documentation up to date.

Please check out *Downloads* for the nextnano software we provide for various Linux distributions.

---

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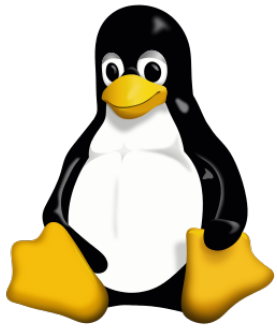
### 4.2.4 Wine Installation

Below are the commands for installing Wine on various Ubuntu distributions.



#### Ubuntu 20.10 (Groovy Gorilla)

On Ubuntu 20.10, the following commands will install the stable branch of Wine:

```
sudo dpkg --add-architecture i386
wget -nc https://dl.winehq.org/wine-builds/winehq.key
sudo apt-key add winehq.key
sudo add-apt-repository 'deb https://dl.winehq.org/wine-builds/ubuntu/ groovy main'
sudo apt update
sudo apt install --install-recommends winehq-stable
```

#### Ubuntu 20.04 (Focal Fossa)

On Ubuntu 20.04, the following commands will install the stable branch of Wine:

```
sudo dpkg --add-architecture i386
wget -nc https://dl.winehq.org/wine-builds/winehq.key
sudo apt-key add winehq.key
sudo add-apt-repository 'deb https://dl.winehq.org/wine-builds/ubuntu/ focal main'
sudo apt update
sudo apt install --install-recommends winehq-stable
```

#### Ubuntu 18.04 (Bionic Beaver)

On Ubuntu 18.04, the following commands are instead used:

```
sudo dpkg --add-architecture i386
wget -nc https://dl.winehq.org/wine-builds/winehq.key
sudo apt-key add winehq.key
sudo apt-add-repository 'deb https://download.opensuse.org/repositories/Emulators:/
↪Wine:/Debian/xUbuntu_18.04/ ./'
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys DFA175A75104960E
sudo apt update
sudo apt install --install-recommends winehq-stable
```

#### Debian 10

On Debian 10, the following commands will install Wine:

```
sudo dpkg --add-architecture i386
sudo apt update
sudo apt -y install gnupg2 software-properties-common
wget -qO - https://dl.winehq.org/wine-builds/winehq.key | sudo apt-key add -
sudo apt-add-repository https://dl.winehq.org/wine-builds/debian/
wget -O- -q https://download.opensuse.org/repositories/Emulators:/Wine:/Debian/Debian_
↪10/Release.key | sudo apt-key add -
echo "deb http://download.opensuse.org/repositories/Emulators:/Wine:/Debian/Debian_10␣
↪./" | sudo tee /etc/apt/sources.list.d/wine-obs.list
sudo apt update
sudo apt install --install-recommends winehq-stable
```

#### RHEL/CentOS 8

We have successfully installed Wine 5 on RHEL 8 using the following commands:

(These build Wine from source, hence the installation takes considerably longer.)

```
sudo -i
dnf clean all
dnf update
dnf groupinstall 'Development Tools'
```

(continues on next page)

(continued from previous page)

```
dnf install libX11-devel freetype-devel zlib-devel libxcb-devel libxslt-devel␣
↪libgcrypt-devel libxml2-devel gnutls-devel libpng-devel libjpeg-turbo-devel libtiff-
↪devel gstreamer1-devel dbus-devel fontconfig-devel
cd /opt
wget https://dl.winehq.org/wine/source/5.0/wine-5.0.tar.xz
tar -Jxf wine-5.0.tar.xz
cd wine-5.0
##For 32-Bit Systems:
./configure
##For 64-Bit Systems:
./configure  --enable-win64
make
make install
```

#### Configuring Wine

After installing Wine, if you encounter errors about Mono, a useful trick is to delete the folder **.Wine** and force Wine to download and install Gecko and Mono automatically. Normally, Wine will suggest installing these the first time it is used. Furthermore, opening the `wine uninstaller` and removing interfering applications might solve some problems. In the end, we are able to use Wine without installing Winetricks or dotnet manually. If you are working on a remote machine, you might need to enable X11 forwarding to see the windows created during the Wine configuration. This is done by connecting via **ssh -X** and modifying the **ssh.config** file under **etc/ssh** accordingly.

### 4.2.5 Troubleshooting

#### error while loading shared libraries: libiomp5.so

This implies that the system could not find the shared object file required by the nextnano executable. Please specify the path to this file by setting the variable `LD_LIBRARY_PATH`:

```
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/path/to/file
```

Please also see *Option A (running from Terminal)*.

---

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## 4.3 macOS

There are three options:

A: Run simulations from Terminal (macOS native executable) - basic simulation is possible.

B: Run simulations with *nextnanopy* (macOS native executable) - it can not only run the simulations but also sweep variables and postprocess the results.

C: Run simulations with *nextnanomat* using Wine or Mono (Windows executable).

We recommend the option B.

For the options A and B, you need nextnano executables compiled for Mac, which we can provide you on request. Please feel free to contact us at *nextnano Help Center*. For the option C, Mono requires the Mac executables but Wine uses the ones compiled for Windows.

### 4.3.1 macOS (Intel-CPU)

#### License activation

Please see *License activation via command line*.

#### Option A: Run simulations from Terminal

#### Install Homebrew

See Homebrew documentation and install Homebrew.

Furthermore, run the following two codes as Homebrew requires:

```
(echo; echo 'eval "$(/usr/local/bin/brew shellenv)"') >> /Users/username/.zprofile
```

```
eval "$(/usr/local/bin/brew shellenv)"
```

#### Install gcc

Our solvers require some libraries to be present on your machine. Please run:

```
brew install gcc
```

#### Run simulation

Please refer to documentation of Command Line of respective tools nextnano++, nextnano$^3$, and nextnano.NEGF for leatning how to invoke the executable from Terminal.

#### Option B: Run simulations with nextnanopy

*nextnanopy* is our open-source Python package for running simulations, sweeping variables and post-processing results.

#### Install Python

One way is to install Python package Anaconda to establish a Python environment including NumPy, Matplotlib and an IDE called "Spyder". With this, you can use *nextnanopy* from a graphical user interface.

Here, we explain an alternative way to install a Python package from Terminal via Homebrew.

1. See Homebrew documentation and install Homebrew.
2. In a macOS Terminal, type in:

   ```
   # install Command Line Tools, if not installed on your machine
   xcode-select --install

   # update Homebrew
   brew update

   # install Python3
   brew install python3
   ```

3. Unversioned commands 'python', 'pip' etc. pointing to 'python3', 'pip3' etc., respectively, are installed into. It is useful to set this path to `~./zprofile`.

```
# open ~/.zprofile with a text editor and write
``eval "$(/opt/homebrew/bin/brew shellenv)"``
``export PATH=/path/to/python@3.9/libexec/bin:$PATH``
# apply the changes
source ~/.zprofile

# make sure that the version 3.9 or later has been installed
python --version

# upgrade pip (NOT update)
pip install --upgrade pip
```

4. Using `pip`, please install NumPy and Matplotlib which are required for *nextnanopy*.

```
pip install numpy
pip install matplotlib
```

### Install nextnanopy

You can either manually or automatically install *nextnanopy*. For more details, please refer to: nextnanopy

Manual installation:

```
# go to a folder where you want to store local repository of |nextnanopy| project
cd <folder name>

# clone source code from Github
git clone https://github.com/nextnanopy/nextnanopy.git

# build nextnanopy
cd nextnanopy/
python setup.py install
```

Automatic installation:

```
pip install nextnanopy
```

### Configure nextnanopy

Open the file `config_nextnano.py` with an text editor to adjust the paths to your license, output and executable installation folders:

```
open config_nextnano.py
# (adjust the paths)
# (save the file)
# run the config file to apply changes
python config_nextnano.py
```

### Running nextnanopy

Please see nextnanopy and sample Python scripts to learn how to run a simulation with *nextnanopy*. The repository of *nextnanopy* includes sample Python scripts under `/nextnanopy/templates`.

### Option C: Run simulations with nextnanomat using Wine or Mono

This option is for those who wish to use GUI *nextnanomat* to run simulations.

The *nextnanomat* GUI is programmed in C#, and can thus be executed on any operating system. It is, however, developed on and optimized for Windows. On macOS, you have to install either Wine or Mono to run *nextnanomat*.

Wine was available from Mountain Lion 10.8 until Mojave 10.14. We confirmed that using **Wine** one could run nextnanomat.exe on Mojave 10.14.

> **Note**
>
> Wine did not work on Catalina 10.15 or later. However, Wine version 6.0.1 released on 7 Jun. 2021 claims to support wine64 on Apple M1. The Wine built package might enable GUI experience on Mac machines with Intel processor.

The following is for macOS 10.14 Mojave.

#### Installation procedure

1. Install XQuartz (version 2.7.7 or later).
   - Please open Xquartz and check if it starts without errors.
2. Install Wine Stable for macOS.
   - On the website, both .pkg files and .tar.gz files are provided. Installation from .pkg files is handy. In this case, however, only the 32-bit version of the nextnano software can be used, and currently one has to make sure that appropriate libiomp5.dll files are located in the same directory as "nextnano3.exe" and "nextnano++.exe" (even for the serial version of the nextnano software). If you need libiomp5.dll files, please contact us.
   - If you install Tarball for "Wine Stable" (32 + 64-bit), the 64-bit version is also available.
3. Install winetricks.
   - Launch **Wine stable** from Applications or Launchpad.
   - Terminal window shows up with a short introduction of important commands.

```
###########################################################################
#                          Wine Is Not an Emulator                        #
###########################################################################

 Welcome to wine-4.0.2.

 In order to start a program:
   .exe: wine program.exe
   .msi: wine msiexec /i program.msi

 If you want to configure wine:
   winecfg

 To get information about app compatibility:
   appdb Program Name
```

   - **Run**

```
ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/
↪master/install)"
brew install winetricks
```

4. Install .NET Framework using winetricks. .NET Framework of version 4.5.2 or later is needed.

```
winetricks dotnet452

- Follow the instructions and ignore Warnings.
- Restart the computer.
```

1. Fonts and configuration
   - Launch **Wine stable** again.
   - **Run:**

     ```
     winetricks corefonts   # install basic fonts of Windows
     winecfg  # Configure Wine
     ```

   - Setting window shows up. Select "Windows 10" for Windows version in the "Application" tab.
   - Press "OK" button.

#### Running nextnanomat

1. Launch **Wine Stable** from Application or Launchpad.
2. Run:

   ```
   wine /<your directory>/nextnanomat.exe
   ```

3. Activate the license with your email address (only once) and have fun!

If you have any feedback on these instructions, please let us know by sending an email to *nextnano Help Center*. It helps us keeping our documentation up to date.

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### 4.3.2 macOS (ARM-CPU)

#### License activation

Please see *License activation via command line*.

#### Option A: Run simulations from Terminal

#### Install Homebrew

See Homebrew documentation and install Homebrew.

Furthermore, run the following two codes as Homebrew requires:

```
(echo; echo 'eval "$(/usr/local/bin/brew shellenv)"') >> /Users/username/.zprofile
```

```
eval "$(/usr/local/bin/brew shellenv)"
```

#### Install gcc

Our solvers require some libraries to be present on your machine. Please run:

```
brew install gcc-11
```

### Run simulation

Please refer to documentation of Command Line of respective tools nextnano++, nextnano[3], and nextnano.NEGF for leatning how to invoke the executable from Terminal.

### Option B: Run simulations with nextnanopy

*nextnanopy* is our open-source Python package for running simulations, sweeping variables and post-processing results.

### Install Python

One way is to install Python package Anaconda to establish a Python environment including NumPy, Matplotlib and an IDE called "Spyder". With this, you can use *nextnanopy* from a graphical user interface.

Here, we explain an alternative way to install a Python package from Terminal via Homebrew. We have tested this with an M1 Mac with macOS 11.4 (Big Sur).

1. See Homebrew documentation and install Homebrew.
2. In a macOS Terminal, type in:

```
# install Command Line Tools, if not installed on your machine
xcode-select --install

# update Homebrew
brew update

# install Python3
brew install python3
```

3. Unversioned commands 'python', 'pip' etc. pointing to 'python3', 'pip3' etc., respectively, are installed into, e.g., `/opt/homebrew/opt/python@3.9/libexec/bin`. It is useful to set this path to `~./zprofile`.

```
# open ~/.zprofile with a text editor and write
``eval "$(/opt/homebrew/bin/brew shellenv)"``
``export PATH=/path/to/python@3.9/libexec/bin:$PATH``
# apply the changes
source ~/.zprofile

# make sure that the version 3.9 or later has been installed
python --version

# upgrade pip (NOT update)
pip install --upgrade pip
```

4. Using `pip`, please install NumPy and Matplotlib which are required for *nextnanopy*.

```
pip install numpy
pip install matplotlib
```

### Install nextnanopy

You can either manually or automatically install *nextnanopy*. For more details, please refer to: nextnanopy

Manual installation:

```
# go to a folder where you want to store local repository of |nextnanopy| project
cd <folder name>
```

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```
# clone source code from Github
git clone https://github.com/nextnanopy/nextnanopy.git

# build nextnanopy
cd nextnanopy/
python setup.py install
```

Automatic installation:

```
pip install nextnanopy
```

### Configure nextnanopy

Open the file `config_nextnano.py` with an text editor to adjust the paths to your license, output and executable installation folders:

```
open config_nextnano.py
# (adjust the paths)
# (save the file)
# run the config file to apply changes
python config_nextnano.py
```

### Running nextnanopy

Please see nextnanopy and sample Python scripts to learn how to run a simulation with *nextnanopy*. The repository of *nextnanopy* includes sample Python scripts under `/nextnanopy/templates`.

### Option C: Run simulations with nextnanomat using Wine or Mono

This option is for those who wish to use GUI *nextnanomat* to run simulations. However, we have not tested this option on ARM Mac machine.

The *nextnanomat* GUI is programmed in C#, and can thus be executed on any operating system. It is, however, developed on and optimized for Windows. On macOS, you have to install either Wine or Mono to run *nextnanomat*.

> **Note**
>
> Wine did not work on Catalina 10.15 or later. However, Wine version 6.0.1 released on 7 Jun. 2021 claims to support wine64 on Apple M1. The Wine built package might enable GUI experience on Mac machines with ARM processor.

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*Last update: 08/01/2025*

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*Last update: 07/11/2024*

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*Last update: 2025/07/09*

CHAPTER

FIVE

# LICENSE ACTIVATION

## 5.1 License activation via nextnanomat

After purchasing a software license or starting a trial period, you will receive a license key per email. This license key is used to generate a license for your computer by *activating your license*.

**Note**

*Activation* will not influence the validity period of your license. The validity/trial interval starts according to your purchase process. *Activation* will activate the license **on your computer**.

**Important**

nextnano licenses are hardware specific. You have to perform the license activation on the same computer where you want to run the software.

If no licenses are found at program start of *nextnanomat*, the license activation dialog will prompt automatically. Else you can start the license activation dialog by clicking the main menu function *Tools* ==> *Activate License*.

When you activate the license, please enter exactly your License Key into the field *License key*. You will receive the key via email after purchasing a license, it has the format:

```
<email of license owner>-<end of validity>-<5-15 digits hash>
```

1. Online activation

   By clicking *Generate and activate license key* your hardware fingerprint will be sent to our license server and you will instantly receive all license files associated with your license key.

2. Offline activation

   If your institution does not allow *Online Activation* or the connection fails, you can can use *Offline activation*. Check this option in the activation dialog, then the hardware fingerprint will be written to a text file. After saving the file on your computer you have two options to receive your license file(s):

   1. Fingerprint activation from another device (by your colleague or yourself)
   2. Fingerprint activation via nextnano support (can take up to two weekdays)

3. Fingerprint activation

   *Fingerprint activation* is a special form of online activation. Instead of sending the hardware fingerprint of the current computer, the selected hardware fingerprint file will be sent to the nextnano license server. As a result, the received license files will only work on the computer on which the fingerprint file was generated and not on the computer used for license activation. To use this option check *Load Fingerprint File from Local Disk*.

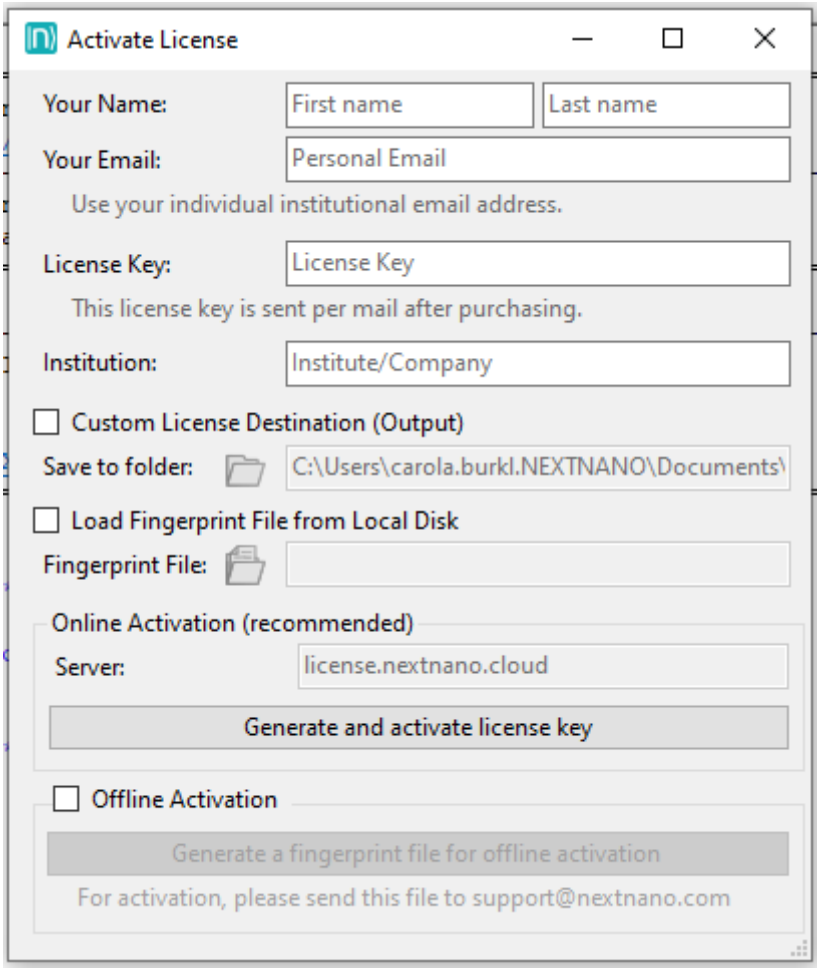


Figure 5.1.1: License activation dialog with example License Key.

**Hint**

If you have not done so already, you first have to allow expert features in *nextnanomat* ==> *Tools* ==> *Options* ==> *Expert settings*.

The number of the received files depends on your contract. Each of our products has its own distinctive license file, however `License_nnp.lic` can be used for both the *nextnano++* and *nextnano³* tools. After a successful online activation you can choose to automatically update the paths to your license file(s). If you want to update or check the location of the license file(s) manually, go to:

*nextnanomat* ==> *Tools* ==> *Options* ==> *Licenses*.

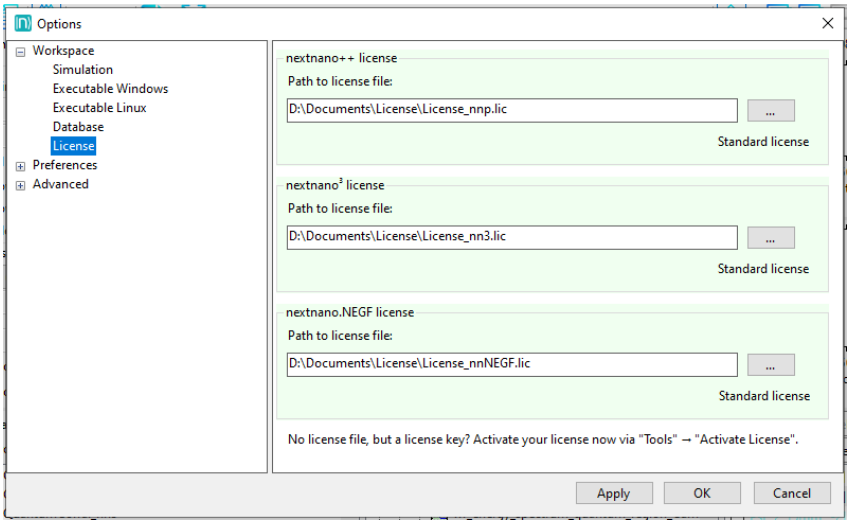


Figure 5.1.2: Path settings for the nextnano license files.

If you encounter any issues regarding license activation or validity, please check our FAQ section: *FAQ - Licensing*

## 5.2 License activation via command line

### 5.2.1 Available license file on different operating systems

Two types of licenses are available:

1. license.txt (old licensing system, will be deprecated in the future)
2. License_nnp.lic and License_nnNEGF.lic (new licensing system, same as Windows executable)

| Operating system | *nextnano++* | *nextnano³* | *nextnano.NEGF* |
|---|---|---|---|
| Windows | `.lic` file | `.lic` file | `.lic` file |
| Ubuntu Linux | `.lic` file | `.txt` file | `.lic` file (since 2022) |
| Intel Mac | `.txt` file | `.txt` file | unavailable |
| ARM Mac | `.lic` file (since 7th Nov 2024) | `.txt` file | On request |

To obtain a `.txt` license file, please contact us via *nextnano Help Center* to request issuing the license.

### 5.2.2 Online and offline activation

**Important**

nextnano licenses are hardware specific. You have to perform the license activation on the same computer where you want to run the software.

**The executable necessary for license activation is called:**

- *deprecated* Windows native: **ClientSideServerActivation** and **ClientSideActivator** (before May 2023)
- *deprecated* Linux and Mac native: **ClientSideActivator** (between May and October 2023)
- Windows, Linux, and Mac native: **nextnanoLicenseActivator.exe** for Windows or **nextnanoLicenseActivator_<OS NAME>** for other operating systems (since October 2023)

For each activator version, the necessary and optional parameters will be displayed if you run the executable without giving any parameters. The `--help` option is also available since November 2024.

**Note**

In the previously distributed and deprecated license-activation executables, the argument "email" refers to the *License-Key*.

**Note**

When you activate the license, please enter exactly your License Key for the `licensekey` parameter. You will receive the key via email after purchasing a license, it has the format:

`<email of license owner>-<end of validity>-<5-15 digits hash>`

Example commands to activate licenses:

```
$ ./nextnanoLicenseActivator_ubuntu --firstname Albert  --lastname Einstein  --email␣
↪albert.einstein@nextnano.com
--institution nextnano --licensekey albert.einstein@nextnano.com-2026-01-01-someHash -
↪-outpath ./path/you/want/to/save/licenses
[--fingerprint <path to fingerprint file> in case of Fingerprint activation]
[--address <server IP address> in case default one shall be overwritten]
[--offline <> in case of offline activation]
```

Note that the name `nextnanoLicenseActivator` depends on your computer. For instance, if you use macOS, it is `nextnanoLicenseActivator_macOS`.

If everything works, you will find the license file(s) `License_<nextnano tool>.lic` in your specified output directory. The number of the received files depends on your contract. Each of our products has its own distinctive license file, however `License_nnp.lic` can be used for both the *nextnano++* and *nextnano*$^3$ tools.

If the communication with the licensing server is not successful, please specify the `--offline` parameter to obtain a fingerprint file. After we receive your fingerprint file, we will activate and send you your license(s).

Please contact us via *nextnano Help Center* if you encounter any issues.

### 5.2.3 Fingerprint activation

*Fingerprint activation* is a special form of online activation. Instead of sending the hardware fingerprint of the current computer, the selected hardware fingerprint file will be sent to the nextnano license server. As a result, the received license files will only work on the computer on which the fingerprint file was generated and not on the computer used for license activation.

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CHAPTER

SIX

# WHAT NEXT


- *Get Familiar with nextnanomat*
- *Tutorials and Examples*
- *Automate and Optimize*
- *Feedback and Support*


## 6.1 Get Familiar with nextnanomat

If it is your first time using our graphical user interface *nextnanomat*, have a look at its the documentation, nextnanomat.

## 6.2 Tutorials and Examples

Our online documentations offer extensive number of tutorial on various semiconductor devices. Each simulator contains its own list of dedicated tutorials, hence you should visit relevant documentation sites and explore them dependently on your needs.

- nextnano++,
- nextnano$^3$,
- nextnano.NEGF,
- nextnano.MSB.

All input files for the tutorials are already included in your installation location.

**Hint**

Let us know in nextnano support Help Center if you need assistance in finding tutorials to begin.

## 6.3 Automate and Optimize

You can get a free Python package *nextnanopy* for running simulations and postprocessing. It is an alternative to *nextnanomat* for those who are running simulations on Linux or macOS, and a tool for everybody looking for automating simulation executions via scripts in their development workflows. The *nextnanopy* package does not require you to have much experienced in Python to be used. It is, however, advised that you are already familiar with other nextnano tools before starting with *nextnanopy*.

```
pip install nextnanopy
```

We also offer a Python package nextnanoevo, currently available for beta testing. It employs various optimization methods for simulations with other our tools.

## 6.4 Feedback and Support

Let us know if you have any further questions, or if you have any feedback on our software. Please send support questions using nextnano support Help Center. You will then receive a support ticket and we will come back to you as soon as possible.

---

*Last update: 2025/07/09*

CHAPTER

SEVEN

# NEXTNANOMAT

The *nextnanomat* GUI is a convenient graphical user interface for *nextnano++*, *nextnano*$^3$, and *nextnano.NEGF*. It allows for 1D, 2D and 3D visualizations of computed results. This workflow manager is designed in a general way allowing to run any executables and overview generated output files.

Full documentation of this tool can be found here: nextnanomat.

CHAPTER

EIGHT

# NEXTNANO++

The *nextnano*++ tool is a Schrödinger-Poisson-current solver and simulates quantum wells, quantum wires, quantum dots, …

Features of *nextnano*++ include:

- includes group IV materials (Si, Ge, SiGe) and all III-V materials, its ternaries and quaternaries;
- the nitrides are available in the zinc blende and wurtzite crystal structure
- flexible structures and geometries (1D, 2D and 3D)
- fully quantum mechanical electronic structure, based on the 8-band $\mathbf{k} \cdot \mathbf{p}$ model
- strain, piezo- and pyroelectric charges
- growth directions along [001], [011], [111], [211], … in short along any crystallographic direction
- equilibrium and non-equilibrium, calculation of current close to equilibrium (semi-classical)
- magnetic fields

Full documentation of this tool can be found here: nextnano++.

CHAPTER

# NINE

# NEXTNANO$^3$

The *nextnano*$^3$ tool is the predecessor of *nextnano*++.

Full documentation of this tool can be found here: nextnano$^3$.

CHAPTER

TEN

# NEXTNANO.NEGF

The *nextnano.NEGF* tool is designed for accurate quantum simulations of semiconducting devices using the Non-Equilibrium Green Functions (**NEGF**) formalism. It has been originally developed to simulate electron dynamics and gain in quantum cascade lasers (**QCLs**) and superlattices. It can also be applied to infrared detectors such as quantum well infrared detectors (**QWIPs**) and quantum cascade detectors (**QCDs**), as well as transport in resonant tunneling diodes (**RTDs**). It is progressively extended to further applications such as interband devices.

Full documentation of this tool can be found here: nextnano.NEGF.

CHAPTER

ELEVEN

# NEXTNANO.MSB

The *nextnano.MSB* tool has been developed to simulate *Quantum Cascade Lasers* (QCLs) and *Resonant Tunneling Diodes* (RTDs). The tool calculates current-voltage characteristics and gain.

Full documentation of this tool can be found here: nextnano.MSB.

CHAPTER

# TWELVE

# NEXTNANOPY

The *nextnanopy* Python package is developed for *nextnano++*, *nextnano*$^3$, *nextnano.NEGF* and *nextnano.MSB* tools to automate nextnano simulations and analysis of the results.

Full documentation of this tool can be found here: nextnanopy.

CHAPTER

# THIRTEEN

# NEXTNANOEVO

The *nextnanoevo* Python package is interfacing minimization and evolution algorithms with nextnano simulation tools: *nextnano++*, *nextnano*$^3$, and *nextnano.NEGF*. The package takes care of proper execution of simulations for optimization algorithms and definitions of problems to optimize based on standard nextnano outputs.

Full documentation of this tool can be found here: nextnanoevo.

CHAPTER

# FOURTEEN

# SUPPORT TICKET SYSTEM


- *How to get the fastest support possible?*
- *Channels*
  - *Help Center (recommended)*
  - *Widget*
  - *Email*


We are using a support system on all our channels. You have plenty of possibilities to get in contact with us. Whether you prefer writing emails, using the widget on our website or the Help Center directly, all requests are collected centrally and will be processed by their number - fair and square. Note, unless you purchased a special support option only technical support is included in your license fee, i.e. **no** simulation requests or adapting your input files.

This support system also offers the possibility of giving feedback. Critique and suggestions are highly appreciated.

## 14.1 How to get the fastest support possible?

There are certain rules you can follow to faciliate the work of the support team and thus ensure fast and meaningful support.

1. **Create *single* and *new* tickets for each separate topic**
   a. Do not answer to resolved support tickets, if you have a new unrelated question. (There is a risk we will not get notified at all)
   b. Do not mix up questions about e.g. graphical user interface, syntax of the input file, simulation results, errors, billing etc.
2. **Give a meaningful subject - it will be easier to find the right person for your request**
   a. Do nots: *I need help*
   b. Dos: *How can I plot multiple files superimposed?*
3. **Give us all the information we need**
   a. Describe what led to the observed behaviour
   b. Attach screenhots of error messages or input and log files
   c. Refer to this documentation to find the right files: *Preparing Support Request*
4. **Stay polite and respectful**
   a. Please sign your request with your name, so we can address you ;)
   b. Check for spelling and grammar - it's a hassle to guess the meaning of sentences

c. Support conversations can be a helpful and satisfactory process for both sides, it's in our hands to make them this way.

## 14.2 Channels

### 14.2.1 Help Center (recommended)

In the help center https://nextnano.atlassian.net/servicedesk you can raise a new request or view your current or closed support tickets. It is all kept together, media files and conversation on your request.

**How to set up your free customer account**

This only needs to be done **once**. If you encounter any problems, do not hesitate to contact us! Just click on the link `View your support ticket` in the first mail you receive, after creating a ticket (see Figure 14.2.1.1). You will be leaded through the process of setting up your help center account. Note, you do not need an account for the communication on your ticket, but you will need one to access files which are provided by our support team.

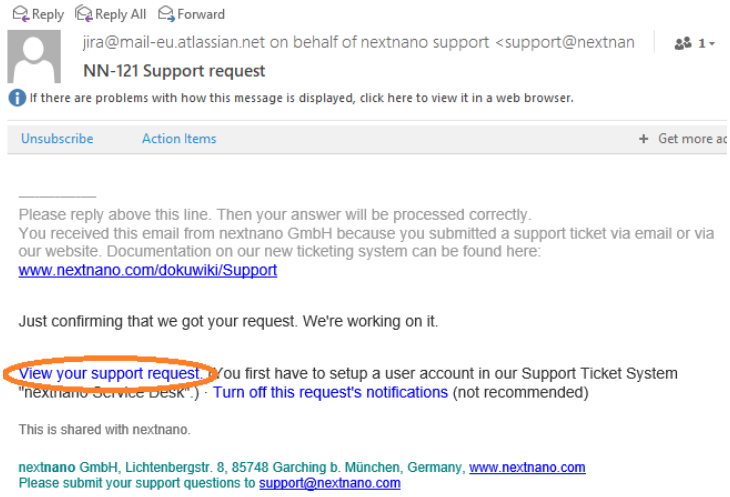


Figure 14.2.1.1: Email confirmation after creating a support request.

### 14.2.2 Widget

The easiest way, if you encounter a problem or do not find what you search for on our website - just click on the widget in the bottom right corner and fill out the form. The Widget is not suitable for elaborate support requests with multiple files, but rather quick questions. If you have a larger support request, use our help center.

### 14.2.3 Email

Emails to support [at] nextnano.com will automatically create a support ticket.

CHAPTER

FIFTEEN

# PREPARING SUPPORT REQUEST

There are four major groups of issues that our users are typically facing. Below you can find guidelines about to prepare a support ticket for your problem.

## 15.1 nextnano simulation does not start


- *Possible error sources*
- *Files to be included in support request*


### 15.1.1 Possible error sources

If a nextnano simulation will not start, possible error sources could be

- the license
- the path to the nextnano executable
- the path to the output directory
- the path to the material database
- the path or syntax of the input file

So first check the *nextnanomat* settings ('Tools' -> 'Options') for

1. 'Simulation'
2. 'Material database'
3. 'Licenses'
4. 'View/Output'

Additionally, verify if your input file does exist and is not located on a shared drive. For help on the input file syntax, go to the product specific syntax documentation for either *nextnano*$^3$, *nextnano++*, *nextnano.NEGF* or *nextnano.MSB*.

### 15.1.2 Files to be included in support request

If you are unable to solve the error on your own, please provide the following files for your support request:

1. System snapshot for trouble shooting
2. Screenshot of error message, if there is any
3. Simulation log file, if there is any, including additional debug comments
4. Simulation input file

Have a look at *Preparing Support Request* if you do not know how generate/find these files.

## 15.2 nextnano simulation does not finish (errors in log file)

Note, if the error is connected to the syntax of the input file, please try to resolve the error on your own. You can find the product specific syntax documentation within the product sections of this documentation.

If an error message occurs during the simulation and you do not know how to resolve it on your own, add the following files to your support request:

1. System snapshot for trouble shooting
2. Screenshot of error message
3. Simulation log file, including additional debug comments
4. Simulation input file

Have a look at *Preparing Support Request* if you do not know how generate/find these files.

## 15.3 nextnanomat GUI does not start

Sometimes the application will not start or crash unexpectedly. The Windows event log file can be helpful to troubleshoot errors. You can find them by opening the 'Event Viewer' application:

1. Search for 'event viewer' in the Windows search bar
2. Select and open the Event Viewer application
3. Navigate to 'Windows Logs' and select 'Application'
4. You will see a list of recently occured errors and warnings
5. Select the Application error which correlates with the time of the application crash
6. Copy the information within the 'General' tab
7. Paste the information into a text editor (e.g. Notepad++) and save as `.txt`
8. Additionally, you can take a screenshot of the Event Viewer and save as `.jpg` or `.png` file
9. Attach these files to your support request
10. Note, sometimes two error events belong to one application crash. Then proceed as described for both of them.

## 15.4 nextnanomat GUI prompts error or exception message

If an error message pops up during the runtime of *nextnanomat*, please send the following files with your support request:

1. System snapshot for trouble shooting
2. Screenshot of error message

Have a look at *Preparing Support Request* if you do not know how generate/find these files.

CHAPTER

SIXTEEN

# FREQUENTLY ASKED QUESTIONS (FAQ)

## 16.1 FAQ - General


- *Copyright Statement*
- *Are there any video tutorials available?*
- *How shall I cite the nextnano software in publications?*


### 16.1.1 Copyright Statement

Copyright

### 16.1.2 Are there any video tutorials available?

Yes, there are! Check out our Sway presentation and our YouTube channel.

### 16.1.3 How shall I cite the nextnano software in publications?

**You can cite any of the following papers:**

- nextnano: General Purpose 3-D Simulations

  S. Birner, T. Zibold, T. Andlauer, T. Kubis, M. Sabathil, A. Trellakis, P. Vogl

  IEEE Trans. Electron Dev. **54**, 2137 (2007)

- The 3D nanometer device project nextnano: Concepts, methods, results

  A. Trellakis, T. Zibold, T. Andlauer, S. Birner, R. K. Smith, R. Morschl, P. Vogl

  J. Comput. Electron. **5**, 285 (2006)

**For simulations including electrolytes, you should cite:**

- Theoretical model for the detection of charged proteins with a silicon-on-insulator sensor

  S. Birner, C. Uhl, M. Bayer, P. Vogl

  J. Phys.: Conf. Ser. **107**, 012002 (2008)

**For simulations that use the Contact Block Reduction method (CBR) (ballistic transport), you should cite any of the following papers:**

- Efficient method for the calculation of ballistic quantum transport

  D. Mamaluy, M. Sabathil, P. Vogl

  J. Appl. Phys. **93**, 4628 (2003)

- Ballistic quantum transport using the contact block reduction (CBR) method - An introduction

  S. Birner, C. Schindler, P. Greck, M. Sabathil, P. Vogl

  J. Comput. Electron. **8**, 267 (2009)

**The *nextnano.MSB* tool: For simulations that use the multi-scattering Büttiker (MSB) probe model (NEGF), you should cite:**

- Efficient method for the calculation of dissipative quantum transport in quantum cascade lasers

  P. Greck, S. Birner, B. Huber, P. Vogl

  Optics Express **23**, 6587

**The *nextnano.NEGF* tool: For simulations that use the NEGF method, you should cite:**

- Contrasting influence of charged impurities on transport and gain in terahertz quantum cascade lasers

  T. Grange

  Phys. Rev. B **92**, 241306(R) (2015)

**For simulations that use the NEGF algorithm included in *nextnano*$^3$, you should cite any of these publications:**

- Modeling techniques for quantum cascade lasers

  C. Jirauschek, T. Kubis

  Appl. Phys. Rev. **1**, 011307 (2014)

- Theory of non-equilibrium quantum transport and energy dissipation in terahertz quantum cascade lasers

  T. Kubis, C. Yeh, P. Vogl, A. Benz, G. Fasching, C. Deutsch

  Phys. Rev. B **79**, 195323 (2009)

There might be further papers in the literature that are more suited to be cited in certain cases.

## 16.2 FAQ - Licensing


- *Which types of licenses exist?*
- *How many people can use the software simultaneously?*
- *Which license do I need for Cluster computing?*
- *Is there a possibility to evaluate the nextnano software before purchasing?*
- *I remember there have been* .txt *licenses before, what happened to them?*
- *License activation*
  - *I do not have a license (key).*
  - *I already purchased a license.*
  - *Can I activate my license without using nextnanomat?*
- *Errors and Exceptions*

### 16.2.1 Which types of licenses exist?

**There are three types of licenses:**

- University license
- Government institution license
- Company license

### 16.2.2 How many people can use the software simultaneously?

**This depends on the type of license:**

- A *University license* and a *Government institution license* are issued to a particular research group (e.g. a professor or group leader) and can be used by all group members simultaneously. The university and government institution licenses can be used on several computers simultaneously. A university license includes 10 computers, a government institution license includes 5 computers.
- A *Company license* applies to a single and named user or a single-PC.

The license is an annual license. After the license has expired, no further simulations can be done. Visualization of previous results of calculations is still possible.

If a user has a valid license, this license can also be installed on a private computer.

### 16.2.3 Which license do I need for Cluster computing?

Only *.lic* licenses can be used for cluster computing. Any computer that has the free HTCondor software installed can be connected to a licensed computer. There is **no** need to activate a license for the cluster computers or install nextnano on them. They can be used to execute a batch list of nextnano simulations.

### 16.2.4 Is there a possibility to evaluate the nextnano software before purchasing?

Yes, we offer evaluation licenses with feature restriction. You have to register with an institutional email address. Register now.

If you got granted an evaluation period for a product of the nextnano software, you will receive an `evaluation license key` by mail. Your evaluation license (free-of-charge) will be valid for 1 month starting on the day you receive the mail and can be activated on 1 computer. If you need a prolongation, please do not hesitate to contact us. Note, we reserve the right to not grant an evaluation license, for example if the same user already used an evaluation license in previous years.

### 16.2.5 I remember there have been *.txt* licenses before, what happened to them?

*.txt* has been the extension of our outdated license format. This license format has been abolished due to security risks and is not used anymore. The current format has the *.lic* extension and enables a wider range of features within the nextnano software.

### 16.2.6 License activation

#### I do not have a license (key).

Before being able to run any simulations with nextnano software, you need a valid license. After your purchase order is complete you will receive a `license key` by mail. This key is necessary to activate your license. If you have not purchased your license yet, please contact us.

#### I already purchased a license.

For each PC where you want to use nextnano software, you have to activate your license(s). For the online activation, you need an internet connection. There are also possibilities to activate your license without an internet connection. The license activation procedure is documented here: *License Activation*

#### Can I activate my license without using nextnanomat?

The license activation procedure via command prompt is documented here: *License activation via command line*.

### 16.2.7 Errors and Exceptions

Errors related to licensing are described in FAQ sections of respective tools: nextnanomat, nextnano++, and nextnano.NEGF.

---

*Last update: 23/10/2024*

FAQs specific for tools can be found within respective documentation sites:

- nextnanomat
- nextnano++
- nextnano$^3$
- nextnano.NEGF

CHAPTER

# SEVENTEEN

# OLD SITES

The sites on this list will be deleted in the near future.

## 17.1 HTCondor

This site has been moved here.

## 17.2 Keywords

The keywords of *nextnano*++ has been moved here.

## 17.3 structure{ }

This site has been moved to the new documentation.

## 17.4 contacts{ }

This site has been moved to the new documentation.

## 17.5 currents{ }

This site has been moved to the new documentation.

## 17.6 global{ }

This site has been moved to the new documentation.

## 17.7 grid{ }

This site has been moved to the new documentation.

## 17.8 import{ }

This site has been moved to the new documentation.

## 17.9 impurities{ }

This site has been moved to the new documentation.

## 17.10 output{ }

This site has been moved to the new documentation.

## 17.11 poisson{ }

This site has been moved to the new documentation.

## 17.12 run{ }

This site has been moved to the new documentation.

## 17.13 strain{ }

This site has been moved to the new documentation.

## 17.14 quantum{ }

This site has been moved to the new documentation.

## 17.15 optics{ }

This site has been moved to the new documentation.

## 17.16 database{ }

This site has been moved to the new documentation.

## 17.17 classical{ }

This site has been moved to the new documentation.

## 17.18 Tutorials

Tutorials of *nextnano*++ has been moved here.

## 17.19 Tutorials

Tutorials of *nextnano*++ has been moved here.

## 17.20 Keywords

This site has been moved to the new documentation.

## 17.21 Bias{ }

This site has been moved to the new documentation.

## 17.22 Contacts{ }

This site has been moved to the new documentation.

## 17.23 Crystal{ }

This site has been moved to the new documentation.

## 17.24 EMfield{ }

This site has been moved to the new documentation.

## 17.25 Equilibrium{ }

This site has been moved to the new documentation.

## 17.26 Gain{ }

This site has been moved to the new documentation.

## 17.27 Hybrid{ }

This site has been moved to the new documentation.

## 17.28 LateralDiscretization{ }

This site has been moved to the new documentation.

## 17.29 Materials{ }

This site has been moved to the new documentation.

## 17.30 Output{ }

This site has been moved to the new documentation.

## 17.31 OverwriteMaterialdatabase{ }

This site has been moved to the new documentation.

## 17.32 Poisson

This site has been moved to the new documentation.

## 17.33 Scattering{ }

This site has been moved to the new documentation.

## 17.34 SimulationParameter{ }

This site has been moved to the new documentation.

## 17.35 Structure{ }

This site has been moved to the new documentation.

## 17.36 AnalysisSeparator{ }

This site has been moved to the new documentation.

## 17.37 Doping{ }

This site has been moved to the new documentation.

## 17.38 InterfaceWidth

This site has been moved to the new documentation.

## 17.39 Layer{ }

This site has been moved to the new documentation.

## 17.40 SurfaceRoughness{ }

This site has been moved to the new documentation.

## 17.41 SweepParameters{ }

This site has been moved to the new documentation.

## 17.42 Temperature

This site has been moved to the new documentation.

## 17.43 Tutorials

The documentation of *nextnano*$^3$ has been moved here.

## 17.44 Input Syntax

The documentation of *nextnano*$^3$ has been moved here.

## 17.45 $alloy-function

The documentation of *nextnano*$^3$ has been moved here.

## 17.46 $Auger-recombination

The documentation of *nextnano*$^3$ has been moved here.

## 17.47 $binary-wz-default

The documentation of *nextnano*$^3$ has been moved here.

## 17.48 $binary-zb-default

The documentation of *nextnano*$^3$ has been moved here.

## 17.49 $buffer-constant-A(T)

The documentation of *nextnano*$^3$ has been moved here.

## 17.50 $buffer-solutions

The documentation of *nextnano*$^3$ has been moved here.

## 17.51 $CBR-current

The documentation of *nextnano*$^3$ has been moved here.

## 17.52 $current-cluster

The documentation of *nextnano*$^3$ has been moved here.

## 17.53 $current-models

The documentation of *nextnano*$^3$ has been moved here.

## 17.54 $current-regions

The documentation of *nextnano*$^3$ has been moved here.

## 17.55 $direct-recombination

The documentation of *nextnano*$^3$ has been moved here.

## 17.56 $domain-coordinates

The documentation of *nextnano*$^3$ has been moved here.

## 17.57 $doping-function

The documentation of *nextnano*$^3$ has been moved here.

## 17.58 $electric-field

The documentation of *nextnano*$^3$ has been moved here.

## 17.59 $electrolyte-ion-content

The documentation of *nextnano*$^3$ has been moved here.

## 17.60 $electrolyte

The documentation of *nextnano*$^3$ has been moved here.

## 17.61 $global-parameters

The documentation of *nextnano*$^3$ has been moved here.

## 17.62 $global-settings

The documentation of *nextnano*$^3$ has been moved here.

## 17.63 $grid-specification

The documentation of *nextnano*$^3$ has been moved here.

## 17.64 $import-data-on-material-grid

The documentation of *nextnano*$^3$ has been moved here.

## 17.65 $impurity-parameters

The documentation of *nextnano*$^3$ has been moved here.

## 17.66 Keywords

The documentation of *nextnano*$^3$ has been moved here.

## 17.67 $input-filename

The documentation of *nextnano*$^3$ has been moved here.

## 17.68 $interface-states

The documentation of *nextnano*$^3$ has been moved here.

## 17.69 $magnetic-field

The documentation of *nextnano*$^3$ has been moved here.

## 17.70 $material-interfaces

The documentation of *nextnano*$^3$ has been moved here.

## 17.71 $material

The documentation of *nextnano*$^3$ has been moved here.

## 17.72 $mobility-model-arora

The documentation of *nextnano*$^3$ has been moved here.

## 17.73 $mobility-model-constant

The documentation of *nextnano*$^3$ has been moved here.

## 17.74 $mobility-model-dar

The documentation of *nextnano*$^3$ has been moved here.

## 17.75 $mobility-model-lom

The documentation of *nextnano*$^3$ has been moved here.

## 17.76 $mobility-model-masetti

The documentation of *nextnano*$^3$ has been moved here.

## 17.77 $mobility-model-minimos

The documentation of *nextnano*$^3$ has been moved here.

## 17.78 $mobility-model-simba

The documentation of *nextnano*$^3$ has been moved here.

## 17.79 $Monte-Carlo

The documentation of *nextnano*$^3$ has been moved here.

## 17.80 $NEGF-spintronics

The documentation of *nextnano*$^3$ has been moved here.

## 17.81 $NEGF

The documentation of *nextnano*$^3$ has been moved here.

## 17.82 $numeric-control

The documentation of *nextnano*$^3$ has been moved here.

## 17.83 $optical-absorption

The documentation of *nextnano*$^3$ has been moved here.

## 17.84 $output-1-band-schroedinger

The documentation of *nextnano*$^3$ has been moved here.

## 17.85 $output-bandstructure

The documentation of *nextnano*$^3$ has been moved here.

## 17.86 $output-current-data

The documentation of *nextnano*$^3$ has been moved here.

## 17.87 $output-densities

The documentation of *nextnano*$^3$ has been moved here.

## 17.88 $output-file-format

The documentation of *nextnano*$^3$ has been moved here.

## 17.89 $output-geometry

The documentation of *nextnano*$^3$ has been moved here.

## 17.90 $output-grid

The documentation of *nextnano*$^3$ has been moved here.

## 17.91 $output-kp-data

The documentation of *nextnano*$^3$ has been moved here.

## 17.92 $output-material

The documentation of *nextnano*$^3$ has been moved here.

## 17.93 $output-raw-data

The documentation of *nextnano*$^3$ has been moved here.

## 17.94 $output-section

The documentation of *nextnano*$^3$ has been moved here.

## 17.95 $output-strain

The documentation of *nextnano*$^3$ has been moved here.

## 17.96 $poisson-boundary-conditions

The documentation of *nextnano*$^3$ has been moved here.

## 17.97 $quantum-bound-states

The documentation of *nextnano*$^3$ has been moved here.

## 17.98 $quantum-cluster

The documentation of *nextnano*$^3$ has been moved here.

## 17.99 $quantum-dot-layer-density

The documentation of *nextnano*$^3$ has been moved here.

## 17.100 $quantum-model-electrons

The documentation of *nextnano*$^3$ has been moved here.

## 17.101 $quantum-model-holes

The documentation of *nextnano*$^3$ has been moved here.

## 17.102 $quantum-regions

The documentation of *nextnano*$^3$ has been moved here.

## 17.103 $quantumstate-recombination-rates

The documentation of *nextnano*$^3$ has been moved here.

## 17.104 $region-cluster

The documentation of *nextnano*$^3$ has been moved here.

## 17.105 $regions

The documentation of *nextnano*$^3$ has been moved here.

## 17.106 $simple-drift-models

The documentation of *nextnano*$^3$ has been moved here.

## 17.107 $simulation-dimension

The documentation of *nextnano*$^3$ has been moved here.

## 17.108 $simulation-flow-control

The documentation of *nextnano*$^3$ has been moved here.

## 17.109 $SRH-recombination

The documentation of *nextnano*$^3$ has been moved here.

## 17.110 $strain-minimization-model

The documentation of *nextnano*$^3$ has been moved here.

## 17.111 $ternary-wz-default

The documentation of *nextnano*$^3$ has been moved here.

## 17.112 $ternary-zb-default

The documentation of *nextnano*$^3$ has been moved here.

## 17.113 $tight-binding

The documentation of *nextnano*$^3$ has been moved here.

## 17.114 $tighten

The documentation of *nextnano*$^3$ has been moved here.

## 17.115 $voltage-sweep

The documentation of *nextnano*$^3$ has been moved here.

## 17.116 $warnings

The documentation of *nextnano*$^3$ has been moved here.