

Nsight Eclipse Plugins Guide

Release 12.2

NVIDIA

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Nsight Eclipse Plugins Edition Getting Started Guide

The user guide for using Nsight Eclipse Plugins Edition.

This guide introduces Nsight Eclipse Plugins Edition and provides instructions necessary to start using this tool. Nsight Eclipse is based on Eclipse CDT project. For a detailed description of Eclipse CDT features consult the integrated help "C/C++ Development User Guide" available from inside Nsight (through Help->Help Contents menu).

Chapter 1. About Nsight Eclipse Plugins Edition

NVIDIA[®] Nsight[™] Eclipse Edition is a unified CPU plus GPU integrated development environment (IDE) for developing CUDA[®] applications on Linux and Mac OS X for the x86, POWER and ARM platforms. It is designed to help developers on all stages of the software development process. Nsight Eclipse Plugins can be installed on vanilla Eclipse using the standard Help->Install New Software.. Menu. The principal features are as follows:

- Edit, build, debug and profile CUDA-C applications
- ▶ CUDA aware source code editor syntax highlighting, code completion and inline help
- ▶ Graphical user interface for debugging heterogeneous applications
- Profiler integration Launch visual profiler as an external application with the CUDA application built in this IDE to easily identify performance bottlenecks

For more information about Eclipse Platform, visit http://eclipse.org

Chapter 2. Using Nsight Eclipse Edition

2.1. Installing Nsight Eclipse Edition

Nsight Eclipse Plugins archive is part of the CUDA Toolkit. Nsight Eclipse Plugins archive can be installed using the Help -> Install New Software... Menu on Eclipse

2.1.1. Installing CUDA Toolkit

To install CUDA Toolkit:

- 1. Visit the NVIDIA CUDA Toolkit download page: https://developer.nvidia.com/cuda-downloads
- 2. Select appropriate operating system. Nsight Eclipse Edition is available in Mac OS X and Linux toolkit packages.
- 3. Download and install the CUDA Driver.
- 4. Download and install the CUDA Toolkit.
- 5. Follow instructions to configure CUDA Driver and Toolkit on your system.

2.1.2. Configure CUDA Toolkit Path

When Eclipse is first launched with Nsight Eclipse plugins in the new workspace, NVIDIA usage data collection dialog will be displayed as below. Click Yes to enable usage collection. This can be disabled later from the CUDA preference page.

To get started, CUDA Toolkit path must be configured in Eclipse with Nsight Plugins:

- 1. Open the Preferences page, Window > Preferences.
- 2. Go to CUDA toolkit section.
- Select the CUDA toolkit path to be used by Nsight. CUDA tookits that are installed in the default location will automatically appear.
- 4. CUDA toolkit path can be also specified in the project properties page in order to use different toolkit for a project.
- 5. Enable usage data collection if you wish to send usage data to NVIDIA.

Usage Data Collection



NVIDIA software packages collect usage and platform data via Google Analytics, including product version, display device, session data, and CPU information. If you agree, this data will be used anonymously for the sole purpose of improving NVIDIA software. For more information, please visit NVIDIA's Privacy Policy at https://www.nvidia.com/en-us/about-nvidia/ privacy-policy/.

Select "Yes" to enable usage collection.

Select "No" to disable usage collection.

| No | Yes |
|----|-----|
|----|-----|

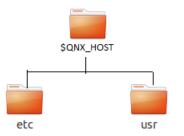
Fig. 1: Usage data collection page

| 😣 🗉 Preferences | _ | | | |
|---|--|--|-------------------------|--------------------------------------|
| type filter text 🛛 🕿 | CUDA | | | ← < ⇒ < < |
| General Ant C/C++ ChangeLog CUDA Docker Help Install/Update Java Library Hover | CUDA Toolkit Target OS: Target Architecture: CCBIN CUDA Software Preen | /usr/local/cuda/bin Native x86-64 g++ | • • | Add new SDK location Browse |
| Man pages CUDA software preemption enables single-GPU debugging and si Mylyn CUDA applications on the same device. Oomph Software preemption is supported on SM 3.5+ devices and not rest Plug-in Development Enable CUDA software preemption debugging Remote Development Enable CUDA software preemption debugging Remote Systems RPM | | | | |
| Run/Debug SystemTap Team Terminal Tracing Validation XML | version, display devic anonymously for the | kages collect usage and platform data via Google An :e, session data, and CPU information. If you agree, t sole purpose of improving NVIDIA software. For mo cy at https://www.nvidia.com/en-us/about-nvidia/pr | his data v re inform | vill be used nation, please visit |
| | Make cuda-gdb and t | NVIDIA visual profiler as default launchers | Restore I | Defaults Apply |
| ? 🖲 🕲 | | | Cancel | Apply and Close |

- 6. Click on the button to set cuda-gdb and Visual Profiler as the default launchers.
- 7. For QNX: When QNX is selected as Target OS, a dialog will be displayed to set the QNX_HOST and QNX_TARGET environment variables if they were not already set.

| Set QNX_HOST and QNX_Target Environment Variables Set Environment Variable | | | | | | | |
|--|--|--------|--|--|--|--|--|
| QNX_HOST: | /p4/sw/tools/embedded/qnx/qnx700-ga1/host/linux/x86_64 | Browse | | | | | |
| QNX_TARGET: udeen/p4/sw/tools/embedded/qnx/qnx700-ga1/target/qnx7 | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| ? | Cancel | ОК | | | | | |

QNX_HOST environment variable identifies the directory that holds the host-related components:



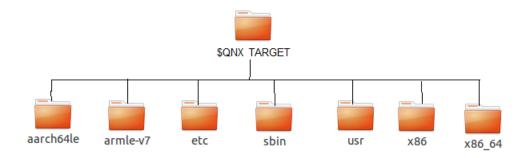
QNX_TARGET environment variable identifies the directory that holds the target-related components:

2.2. Nsight Eclipse Main Window

On the first run Eclipse will ask to pick a workspace location. The workspace is a folder where Nsight will store its settings, local files history and caches. An empty folder should be selected to avoid overwriting existing files.

The main Nsight window will open after the workspace location is selected. The main window is divided into the following areas:

▶ Editor - displays source files that are opened for editing.



- Project Explorer displays project files
- > Outline displays structure of the source file in the current editor.
- Problems displays errors and warnings detected by static code analysis in IDE or by a compiler during the build.
- ▶ Console displays make output during the build or output from the running application.

2.3. Creating a New Project

- 1. From the main menu, open the new project wizard File > New... > CUDA C/C++ Project
- 2. Specify the project name and project files location.
- 3. Specify the project type like executable project.
- 4. Specify the CUDA toolchain from the list of toolchains.
- 5. Specify the project configurations on the next wizard page.
- 6. Complete the wizard. The project will be shown in the Project Explorer view and source editor will be opened.
- 7. Build the project by clicking on the hammer button on the main toolbar.

2.4. Importing CUDA Samples

The CUDA samples are an optional component of the CUDA Toolkit installation. Nsight provides a mechanism to import these samples and work with them easily:

Note: Samples that use the CUDA driver API (suffixed with "Drv") are not supported by Nsight.

- 1. From the main menu, open the new project wizard File > New... > CUDA C/C++ Project
- 2. Specify the project name and project files location.
- 3. Select Import CUDA Sample under Executable in the Project type tree.
- 4. Select CUDA toolchain from the Toolchains option. location.

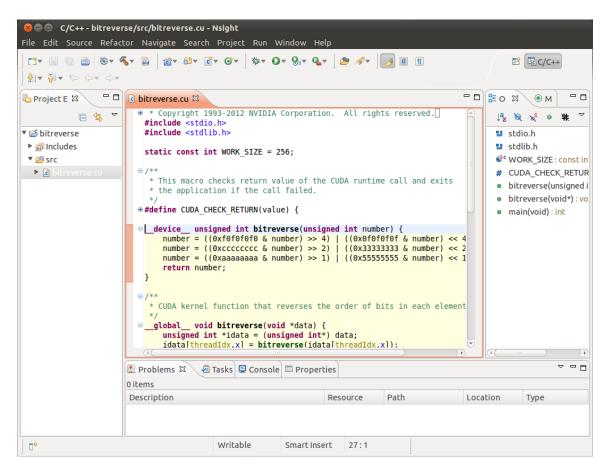


Fig. 2: Nsight main window after creating a new project

- 5. On the next wizard page select project sample you want to import. Also select the target CPU architecture. Press Next...
- 6. Specify the project parameters on the next wizard page.
- 7. Complete the wizard. The project will be shown in the Project Explorer view and source editor will be opened.
- 8. Build the project by clicking on the hammer button on the main toolbar.

2.4.1. cuHook Sample

cuHook sample builds both the library and the executable. cuHook sample should be imported as the "makefile" project using the following steps.

- 1. From the main menu, open the new project wizard File > New... > CUDA C/C++ Project
- 2. Select project type "Makefile project" and choose "Empty Project"
- 3. Specify the project name and project files location.
- 4. Complete the wizard. The project will be shown in the Project Explorer view.
- 5. Right click on the project Import... > General > File System
- 6. On the next wizard page, select the location of cuHook sample(Samples/7_CUDALibraries/cuHook)
- 7. Select all the source files and makefile and Finish the wizard
- 8. Build the project by clicking on the hammer button on the main toolbar.
- 9. To run the sample, from the main menu Run > Run Configurations... > Select the executable > Go to Environment tab > New... > enter Name=LD_PRELOAD, Value=./libcuhook.so.1 > Run will execute the sample

2.5. Configure Build Settings

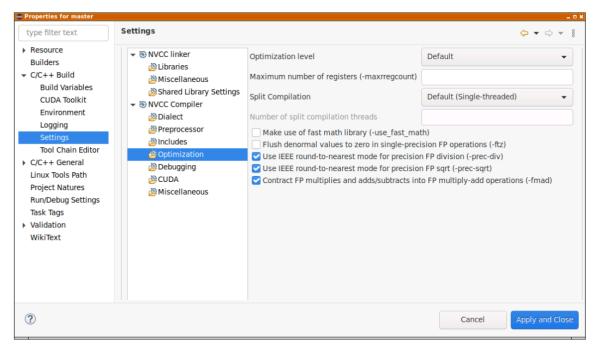
To define build settings: In the C/C++ Projects view, right-click your project, and select Properties. Select C/C++ Build, Settings from the list.

The following are the categories of Nvcc linker settings that can be configured for the selected project.

Note: All options field in the main page is not editable and it's the collection of options set in the child categories.

- Libraries Configure library search path(-L) and to include linker libraries(-l). When you are cross compiling for different target os, the library search path should point to the appropriate location where the target os libraries are present.
- ▶ Miscellaneous Set additional linker options and option to link with OpenGL libraries.
- Shared Library Settings Set option to build a shared library.

| Resource Builders C/C++ Build | Configuration: Debug [Active] | | | |
|--|--|--|---|--|
| Build Variables CUDA Toolkit | < ऄ Tool Settings | ntainer Settings | 🔎 Build Steps | Build Artifact |
| ECODA TOOKIL Environment Logging Settings Tool Chain Editor C/C++ General Linux Tools Path Project Natures Refactoring History Run/Debug Settings Task Repository Task Tags Validation WikiText | NVCC linker Libraries Miscellaneous Shared Library Settin NVCC Compiler Dialect Preprocessor Includes Optimization Debugging CUDA Miscellaneous | gs Command: All options: Expert settir Command line pattern: | arch=compute gencode arch=compute | c -ccbin g++ -gencode e_52,code=sm_52 - e_52,code=compute_52 D} \${FLAGS} \${OUTPUT_F |
| | L | | Restore | e Defaults Apply |
| ? | | | Cance | el Apply and Close |



The following are the categories of Nvcc Compiler settings that can be configured for the selected project.

Note: All options field in the main page is not editable and it's the collection of options set in the child categories.

- > Dialect Select the language standard and dialect options.
- ▶ Preprocessor Add the defined and undefined symbols for the preprocessor.
- ▶ Includes Set include paths and include files for the compiler.
- Optimization Set the optimization level used by the compiler for code generation. Additionally, set the number of threads that the compiler will use during the compiliation process ("split compilation").
- > Debugging Set the options to generate debug information.
- CUDA Generate code for different real architectures with the PTX for the same vitrual architectures.

2.6. Debugging CUDA Applications

Nsight must be running and at least one project must exist.

- 1. In the Project Explorer view, select project you want to debug. Make sure the project executable is compiled and no error markers are shown on the project.
- 2. Right click on the project and go to Debug As > NVIDIA CUDA GDB Debugger menu.
- 3. You will be offered to switch perspective when you run debugger for the first time. Click "Yes". Perspective is a window layout preset specifically designed for a particular task.
- 4. Application will suspend in the main function. At this point there is no GPU code running.
- 5. Add a breakpoint in the device code. Resume the application.

Debugger will break when application reaches the breakpoint. You can now explore your CUDA device state, step through your GPU code or resume the application.

Additional debugger options can be set in the debug configuration dialog through Run > Debug Configurations .. menu..

2.7. Remote development of CUDA Applications

Nsight Eclipse Edition also supports remote development of CUDA application starting with CUDA Toolkit 6.0. The picture below shows how Nsight Eclipse Edition can be used for local as well as remote development:

For remote development you do not need any NVIDIA GPU on your host system. The remote target system can be a Linux x86 or POWER system with an NVIDIA GPU or an Tegra-based ARM system. Nsight IDE and UI tools can only be hosted on x86 and POWER systems.

Nsight Eclipse Plugins supports the cross compilation mode for remote devices.

| ‡ Debug ¤ | 💥 🕅 🚺 😵 🔻 🕯 | | 🗱 🔨 😵 🕲 🗱 | akpoints 🖗 Expressions 📃 🗖 |
|--|--|------|--|---|
| ▼ CUDA Thread (0,0) ■ BlackScholesGPI ▶ All Kernel Threads ▶ Host Process [black ↓ gdb |] [device 0 (GK104GL)] (Breakpoint) | - 8 | Name | Image: Second |
| <pre>//const int T const int opt // Calculati if (opt < (op { float cal float put BlackScho </pre> | <pre>tid = blockDim.x * blockIdx.x + threadIdx.x; ber of threads in execution grid HREAD_N = blockDim.x * gridDim.x; = blockDim.x * blockIdx.x + threadIdx.x; ng 2 options per thread to increase ILP (instruction</pre> | leve | 0000000008fff58: 0000000008fff58: 0000000008fff58: 0000000008fff78: 0000000008fff78: 000000008fff79: 000000008fff99: 0000000008fff99: 0000000008fff88: 0000000008fff88: 0000000008fff88: 0000000008fff88: | Enterlocation here LDC R0, c[0x0][R0] MOV R3, c[0x0][0x20] SZR R4, SR CTAID.X MOV R4, R4 IMUL R3, R3, R4 SZR R4, SR TLD.X MOV R4, R4, R4 IADD R2, R3, R4 MOV R0, R0 MOV R3, R3 MOV R3, R3 |
| 🖳 Console 🛛 🧟 Tasks blackschole [C/C++ Applie | Problems Executables tation] blackschole | | | ■ X ½ 5 11 8 6 6 1 0 • 11 • 1 |
| Initializing data allocating CPU men generating GPU men generating input d copying input data Data init done. | ory for options. ata in CPU mem. | | | |

Fig. 3: Debugging CUDA application

In the **cross compilation mode** the project resides on the host system and the cross compilation is also done on the host system. The cross compilation mode is only supported on an Ubuntu x86 host system.

To cross compile select the target cross compile architecture in CPU architecture drop down in the project properties page:

2.8. Debugging Remote CUDA Applications

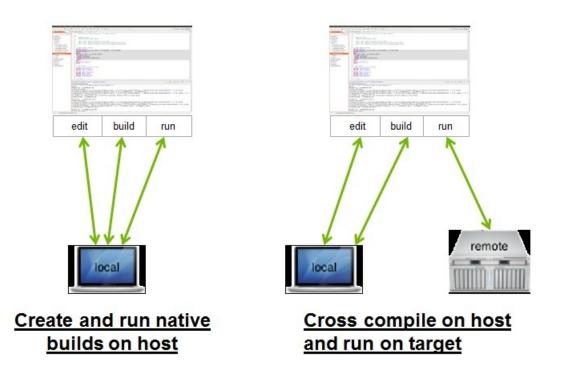
Remote debugging is available starting with CUDA Toolkit 5.5. A dedicated GPU is not required to use Nsight remote debugging UI. A dedicated GPU is still required on the debug target. Only Linux targets are supported. Debug host and target may run different operating systems or have different CPU architectures. The remote machine must be accessible via SSH and CUDA Toolkit must be installed on both machines.

Note: If there is a firewall between the host and the target, it must be set up to let RSP messages through, or SSH port-forwarding must be used.

 Select the project and right click then go to Debug As...>NVIDIA CUDA GDB Debugger(Remote) menu item.

| 😣 🗊 Debug Configurations | | | | | |
|---|---|--|-------------------------------------|--|--|
| Create, manage, and run configuration | IS | | Ť | | |
| Image: Second Se | Name: blackschole Main ↔ Arguments Environme Stop on startup at: main Main Shared Libraries Break on CUDA API call failure Enable CUDA memcheck Print to console when CUDA ker Extrapolate "optimized out" CU Force thread list update on susp CUDA GDB executable: CUDA GDB init file: (Warning: Some commands in this f example "run".) | nel is launched or terminated IDA register values | Browse Browse e debugger, for | | |
| Filter matched 17 of 27 items | Using CUDA GDB Create Process Laun | cher - Select other Revert | Apply | | |
| 0 | 111 - ATRAT - 11 - 11 - 7 - 11 - 7 | Close | Debug | | |

Fig. 4: Debugging CUDA application



| × + Properties for BlackScholes | | | | | | |
|--|---|---|-------------------|---------------------------------------|--|--|
| type filter text 🛛 🖾 | CUDA Toolkit | | | ← ▼ ⇒ ▼ | | |
| ▶ Resource Builders ▼ C/C++ Build Build Variables CUDA Toolkit Environment Logging Settings Tool Chain Editor ▶ C/C++ General Run/Debug Settings ▶ Task Repository Task Tags ▶ Validation WikiText | CUDA Toolkit Target OS: Target Architecture: CCBIN | /usr/local/cuda-9.0/bin Native ARM arm-linux-gnueabihf-g++ | \$ | Add new SDK location 32 Bit Browse | | |
| ? | | Res | store De Cance | | | |

| Debug As | Þ | <u>1</u> Local C/C++ Application |
|----------------------------|---|-------------------------------------|
| Profile As | ► | 2 NVIDIA CUDA GDB Debugger |
| Compare With | • | 3 NVIDIA CUDA GDB Debugger (Remote) |
| Restore from Local History | | De <u>b</u> ug Configurations |

2. Type the full path to a local executable or select one using the Local file... button.

| 😣 💷 Debug CUDA Application | | | | | | |
|---|--|---------------------------|--|--|--|--|
| | Debug application on a remote system Run cuda-gdbserver remotely and connect debugger | | | | | |
| | | | | | | |
| O Upload local exect | utable O Debug remote executable O D | o not transfer executable | | | | |
| Local Executable | /blackschole/Debug/blackschole | | | | | |
| | (V | Norkspace | | | | |
| Remote connection: | ubuntu@172.17.162.109 | ▼ Manage | | | | |
| Remote executable: | /tmp/cuda-debug/blackschole | Browse | | | | |
| Program arguments: | | | | | | |
| cuda-gdbserver port: | 2345 - + | | | | | |
| i ubuntu@172.17.162.109 is not connected. Remote paths will not be validated. | | | | | | |
| ? | < Back Next > C | ancel Finish | | | | |

- 3. Select a remote connection from a drop-down list or press the Add connection... button to create a new one.
- 4. If you are creating a new remote connection, enter the host name(or IP address) as well as the user name. Select the SSH as system type. Also select the QNX check box for QNX targets and then press Finish.
- 5. For Android devices: To configure the remote connection using Android debug bridge, select the Android debug bridge from the Remote Connection drop-down list, Android device must be connected to the host system using USB port.

Press Manage button, and enter or select the path to adb utility. You need to install Android SDK platform tools to use Android debug bridge. press Detect button to find the android device available through ADB.

- 6. **Optional:** Press Connect to verify the selected remote connection.
- 7. Press the Next button.
- 8. Type the full path to cuda-gdbserver on the remote system or select one using the Browse... button.
- 9. Click on "Add new path" or on the Browse... button to specify the path to the shared libraries the remote application depends on.

🗵 🔲 New Remote Connection

Remote Connections

Manage available connections

| root@172.16 | Add Remove |
|--------------|---------------------------|
| Host name: | 172.16.174.115 QNX |
| User name: | root |
| Label: | root@172.16.174.115 |
| System type: | SSH Port number: 22 - + |
| | |
| ? | Cancel Finish |

| × + Debug CUDA Application | | | | | | | |
|--|--|---------------------|--|--|--|--|--|
| Debug application on a remote system | | | | | | | |
| Run cuda-gdbserver remotely and connect debugger | | | | | | | |
| • Upload local exect | • Upload local executable O Debug remote executable O Do not transfer executable | | | | | | |
| Local Executable | /async/Debug/async | | | | | | |
| | W | orkspace Local File | | | | | |
| Remote connection: | Android debug bridge | ▼ Manage | | | | | |
| Remote executable: | /data/local/tmp/async | Browse | | | | | |
| Program arguments: | | | | | | | |
| cuda-gdbserver port: | 2345 – + | | | | | | |
| i Android debug bridge is not connected. Remote paths will not be validated. Connect | | | | | | | |
| ? | < Back Next > Car | rcel Finish | | | | | |

| × | | |
|--------------|--|--------|
| ADB Connec | tion | |
| Configure A | OB Connection | |
| ADB path: | deen/JetPack_Android2/android-sdk-linux/platform-tools/adb | Browse |
| ADB devices: | P2180A00P03600000505 | Detect |
| | | |
| | | |
| | | |
| _ | | |
| ? | Cancel | ОК |

| Toolkit path: | /usr/local/cuda/ | bin | | | Browse | Detect |
|----------------|--------------------------------|-----------------|-----------------|-------------|---------|---------|
| library paths: | | | | | | Browse. |
| | /usr/local/cud Add new path | a/lib | | | | Delete |
| | | | | | | Ŷ |
| | | | | | | P |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | - |
| i ubuntu@1 | 2.17.162.109 is no | t connected. Re | mote paths will | not be vali | idated. | Connect |

- 10. Click on the Finish button to finish the new debug configuration wizard and start debugging the application.
- 11. You will be offered to switch perspective when you run the debugger for the first time. Click Yes. Perspective is a window layout preset specifically designed for a particular task.

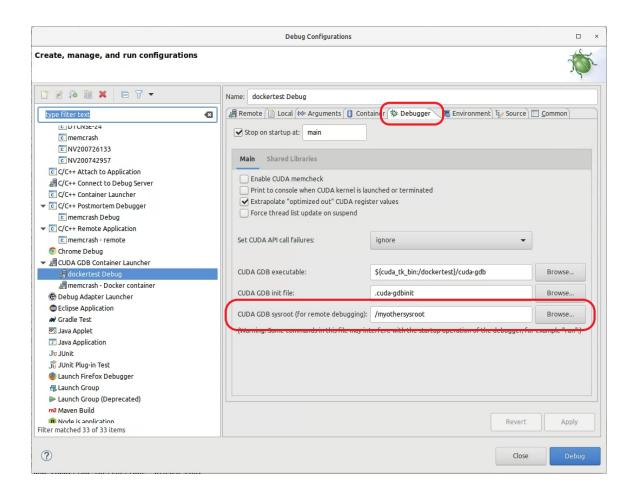
The debugger will stop at the application main routine. You can now set breakpoints, or resume the application.

| 😣 🖨 🗉 Debug - /home/test/bitreverse/bitreverse.cu - Nsight | | | |
|---|------------------|-----------------------|------------------------|
|] ➡ ▼ 📓 💩] 券 ▼ O ▼ 9: ▼ 0 <u>↓</u> ▼] 🔌 া⊳ ।। 🔳 №] ⊿ | 3. O. A. 19 | ≅ ∞] 🕭 🖋 🕶 | Ê ▼ ″ |
|] st = 题 = th + + + + + + + + + + + + + + + + + + | | | |
| 拳 Debug X 🕺 👔 👔 i i > マ 🗖 🗖 | 🕬= Variable 😫 🧕 | ə Breakpo 🕅 CUDA 🚟 Re | gister 🛋 Modules 🛛 🗖 🗖 |
| ▼ ⓒ bitreverse on debugger-target [C/C++ Remote Application] | | ‱ ⇒t ; ⊟ | 8° × 🔆 🖬 🖻 🔻 |
| ▼ m Host Process [bitreverse] [cores: 0] ▼ m Thread [1] 10000 [core: 0] (Suspended : Breakpoint) | Name | Туре | Value |
| ■ miclo [1] 10000 [core: 0] (305)chice : Dreakpoint) ■ main() at bitreverse.cu:40 0x4027d0 | | | |
| Remote Shell | | | |
| ji gdb | | | |
| | | | |
| 🗈 bitreverse.cu 🕱 | | 🗖 🗖 🔚 Outline | e X - D |
| <pre>* Host function that prepares data array and passes it to */</pre> | the CUDA kernel. | Ę | 🗄 🞼 😿 🔏 🔹 🗰 🎽 |
| <pre>int main(void) { bitreverse<<<1, WORK SIZE, WORK SIZE * sizeof(int)>>></pre> | (). | | |
| CUDA_CHECK_RETURN(cudaThreadSynchronize()); // Wait for | | work to com | |
| CUDA_CHECK_RETURN(cudaGetLastError()); | the dro fadhened | | |
| CUDA_CHECK_RETURN(cudaDeviceReset()); | | | |
| return 0; } | | | |
| 📮 Console 🕱 🖉 Tasks 🕄 Problems 📀 Executables 🚺 Memory | = × 3 | | |
| bitreverse on debugger-target [C/C++ Remote Application] gdb | | | |
| Coalescing of the CUDA commands output is off. | | | |
| | | | 1 |
| | | | |
|] 0* | | | _ _ |

Fig. 5: Debugging remote CUDA application

2.8.1. Improving Remote Debugging Performance

When doing remote debugging, it can be useful to host copies of the target libraries in a local sysroot. Starting with CUDA 11.5, this feature is available on the **Debugger Configurations -> Debugger** tab. You can modify 'CUDA GDB sysroot (for remote debugging)' to point to a local sysroot directory to improve debugging performance.



2.9. Profiling CUDA applications

Nsight must be running and at least one project must exist. Profiler cannot be used when debugging session is in progress.

Nsight Eclipse Edition profiling features are based on the NVIDIA Visual Profiler (nvvp) code. Nsight Eclipse Plugins Edition will launch the Visual Profiler as an external tool with the executable and other information from the selected project.

- 1. In the Project Explorer view, select project you want to profile. Make sure the project executable is compiled and no error markers are shown on the project.
- 2. Select the project and right click and go to Profile As>NVIDIA Visual Profiler menu.

| Profile As | • | <u>1</u> Local C/C++ Application |
|------------------------------|---|--|
| Compare With | • | <u>2</u> NVIDIA Visual Profiler |
| Restore from Local History | | <u>3</u> NVIDIA Visual Profiler (Remote) |
| Run C/C++ Code Analysis – | | Profile Configurations |

Nsight Eclipse will launch the Visual Profiler to specify extra profiler options with the executable information already passed from the selected project.

| File View Window Help | | | | |
|-----------------------|---|--|-----------|---|
| | 😣 🗉 Create New | Session | | |
| | Executable Prope Set executable prop | | | |
| | Connection: | Local Cocal | nnections | |
| | Toolkit: | CUDA Toolkit 8.0 (/usr/local/cuda-8.0/bin/) | Manage | |
| | File: | /home/kjalaludeen/runtime-NsightPlugins3/blackschole/Debug/blackscho | Browse | |
| | Working directory: | [Enter working directory [optional] | Browse | |
| | Arguments: | Enter command-line arguments | | |
| | | Profile child processes | : | |
| | Environment: | Name Value | Add | |
| | | | Delete | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| 🛅 CPU Detail 🖾 📮 🗖 | | | | 7 ° 0 • Pr 🛛 ° 0 |
| 1: 1: 5 | | | | |
| (Thread) 🔻 | | < Back Next > Cancel | Finish | Select or highlight a single interval to |
| Event | _ | | _ | see properties |
| | | | | |

Fig. 6: Profiling CUDA Application

2.10. Build CUDA Projects inside a Docker Container

You can build and debug C/C++ and CUDA projects in a Docker container using Nsight Eclipse Edition. To get started, you need to first pull and install the Docker image that encapsulates the CUDA toolkit and cross platform tool chains. You can get the Docker images from NVIDIA GPU Cloud.Then you can use Nsight Eclipse Edition to build CUDA projects in a Docker container.

- 1. Open Nsight Eclipse Edition and configure the container settings.
- 2. Open the Preferences page, Window > Preferences and go to: CUDA > Container Settings

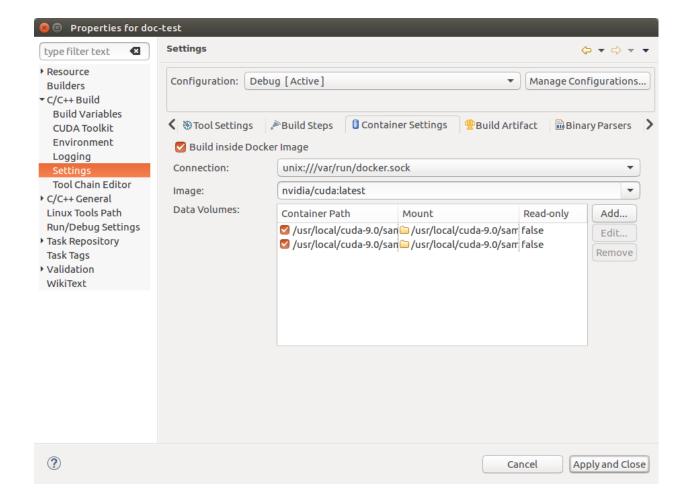
| 😣 🗉 Preferences | | |
|---|--|------------------------|
| type filter text | Container Settings | ↔ → → → |
| General Ant | Build inside Docker Image | |
| C/C++ ChangeLog CUDA | Connection: unix:///var/run/docker.sock Image: hvidia/cuda:latest | • |
| Container Settings | | |
| Java Library Hover Man pages | | |
| Mylyn Oomph Plug-in Development Remote Development | | |
| Remote Systems RPM Run/Debug SystemTap Team Terminal | | |
| Tracing Validation | | Restore Defaults Apply |
| ? • ? | | Cancel Apply and Close |

- 3. Select the option if you want to build the projects inside the Docker container. Make sure the CUDA toolkit path that is specified in the CUDA preferences is the path of the CUDA toolkit inside a Docker container.
- 4. Select the Connection and the Image dropdown will display all the Docker images that are currently installed. Choose the docker image that you want to use to build/debug the projects. The preferences that are set here will be automatically displayed in the project setup wizard. You can choose to modify the container settings for the individual projects from the project setup wizard.
- To create a project, From the main menu, open the new project wizard: File > New... > CUDA C/C++ Project
- Specify the project name and project files location. And select the CUDA toolchain from the list of toolchains.

7. In the last page of project setup wizard, the container options will be displayed. The default container settings from the preference page will be displayed here. You can choose to modify the settings for this project in this Container settings page.

| 😣 🗊 C++ P | roject | | | | | |
|---|----------------|----------------|--------|--------|--------|--|
| Container Settings Specify container settings for the project | | | | | | |
| | ide Docker Ima | | | | | |
| Connection: | unix:///var/r | un/docker.sock | | | • | |
| Image: | nvidia/cuda: | latest | | | • | |
| | | | | | | |
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| ? | | < Back | Next > | Cancel | Finish | |

- 8. Complete the project setup wizard. The project will be created and shown in the Project Explorer view.
- 9. The project source directories will be automatically mounted to the docker container.
- 10. If you need to mount any other directories that contains the include files/libraries and etc to the docker container, you can mount those directories from the project property page.
- Right click on the project and go to Properties. Select C/C++ Build > Settings > Container Settigns Tab. Additional directories can be mounted from this property page.
- 12. Build the project by hitting the hammer button on the main toolbar. The project is now built in the chosen Docker container the executable will be available on the host.



2.11. Remote debugging using CUDA GDB inside Docker container

From Nsight Eclipse, you can remote debug the applications running on the target using the CUDA GDB inside the Docker container running on the host. Docker images with CUDA GDB and CUDA toolkit must be already installed on the host. The remote machine must be accessible via SSH and CUDA Toolkit must be installed on target machine.

Note: If there is a firewall between the host and the target, it must be set up to let RSP messages through, or SSH port-forwarding must be used.

- 1. From the main menu, goto Run>Debug Configurations... menu item.
- 2. Create a new debug configuration under CUDA GDB Container Launcher either double clicking or using right click menu.
- 3. Configure the remote connection details in the "Remote" tab. If you are creating a new remote connection, click on the manage button in Remote Connection enter the host name(or IP address) as well as the user name. Select the SSH as system type. Also select the CUDA toolkit location on the target and choose the location to where to upload the executable.

| 🐱 Debug Configurations _ 💷 × | | | | | |
|---|--|--------|--|--|--|
| Create, manage, and run configurations | | Ť | | | |
| | Name: Docker remote debug | | | | |
| type filter text | 📲 Remote 👔 Local 🖗 Arguments 🚺 Container 🕸 Debugger 🖾 Environment 🤴 Source 🔟 Common | | | | |
| C/C++ Application | Remote connection: root@172.16.174.104 | Manage | | | |
| C/C++ Attach to Application | Remote toolkit: /usr/local/cuda-10.0/bin | Manage | | | |
| C/C++ Container Launcher | Upload local executable Debug remote executable Do not transfer executable | | | | |
| C C/C++ Postmortem Debugger C C/C++ Remote Application | Remote executable: /tmp/nsight-debug/app | Browse | | | |
| ✓ I CUDA GDB Container Launcher | Debugger port: 2345 – + | | | | |
| 📕 Docker remote debug | Commands to execute remotely before starting debug server: | | | | |
| | | | | | |
| Filter matched 17 of 18 items | Revert | Apply | | | |
| 0 | Close | Debug | | | |

4. Choose the project and the executable to upload to the target in the "Local" tab.

5. From the "Container" tab, select the connection and Docker image that contains the CUDA GDB. Also you can select any host directories required to mounted to the Docker container.

| e | Debug Configurations | - • × |
|---|---|----------|
| Create, manage, and run configurations | | 1. Alton |
| | Name: Docker remote debug | |
| type filter text 🛛 🛛 | 📲 Remote 📄 Local 🚧 Arguments 🚺 Container 🚿 Debugger 🖉 Environment 🦆 Source 🛅 Common | |
| C/C++ Application | Connection: unix:///var/run/docker.sock | - |
| C/C++ Attach to Application 場C/C++ Connect to Debug Server | Image: drive_os_qnx_sdk_new2:latest | - |
| C/C++ Container Launcher | Required host directories | New |
| C/C++ Postmortem Debugger | /home/kjalaludeen/Drive_5072/drive-t186ref-qnx/targetfs | |
| C/C++ Remote Application | | Remove |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | Additional Options | <u> </u> |
| | Run in privileged mode | |
| | | |
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| | | |
| | | |
| | | |
| | | |
| | | |
| Filter matched 17 of 18 items | Revert | Apply |
| | | |
| ? | Close | Debug |

- 6. Select the debugger options from the "Debugger" Tab. Make sure to enter the CUDA GDB executable path inside Docker container. And add the required environment variables in the "Environment" tab.
- 7. Click on the Apply button to save the changes and click on the Debug button to start the debug session. This action will upload the local executable to the target system and will start CUDA GDB Server on the target. And the Docker container will be started on the host and CUDA GDB running inside the docker container will establish the remote debug session with the target.
- 8. You will be offered to switch perspective when you run the debugger for the first time. Click Yes. Perspective is a window layout preset specifically designed for a particular task.

The debugger will stop at the application main routine. You can now set breakpoints, or resume the application.

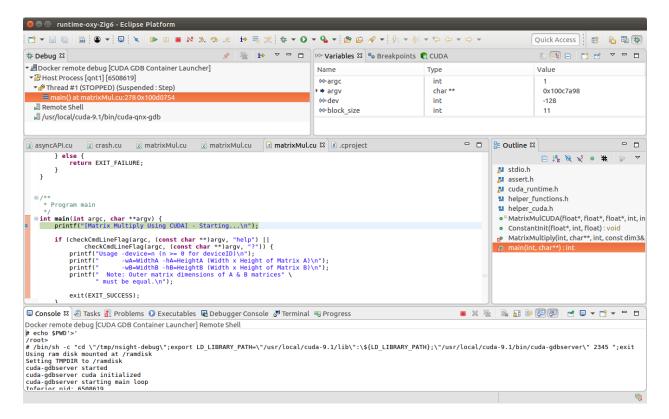


Fig. 7: Debugging remote CUDA application

2.12. Importing Nsight Eclipse Projects

The projects that are created with Nsight Eclipse Edition can be imported into the Eclipse workbench with Nsight Eclipse plugins.

- 1. Open Nsight Eclipse edition and select the project that needs to be exported.
- Right click on the Nsight Eclipse project and go to Export > C/C++ > C/C++ Project Settings > Next menu.
- 3. Select the project and settings to export.
- 4. Specify the "Export to file" location.
- 5. Settings will be stored in the given XML file.
- 6. Go to Eclipse workbench where the project settings needs to be imported.
- 7. Create a CUDA C/C++ Project from the main menu File > New > CUDA C/C++ Project
- 8. Specify the project name and choose Empty project type with CUDA toolchains.
- 9. Right click on the project to import the source files. Import > General > File System >(From directory) or copy the source files from the existing project.
- Import the project settings like include paths and symbols using the following right click menu Import > C/C++ > C/C++ Project Settings >Next...
- 11. Select the location of the project settigns file and select the project and configuration on the next wizard page.

| × + Export | | | | |
|--------------------------|-----------|--------|--------|--------|
| Select | | | | 2 |
| Select an export des | tination: | | | |
| type filter text | | | | × |
| ▶ 🗁 General ▼ 🗁 C/C++ | | | | |
| 🕆 C/C++ Projec | | | | |
| , Team Shared | Index | | | |
| 🕨 🗁 Install | | | | |
| | | | | |
| | | | | |
| ? | < Back | Next > | Cancel | Finish |

- 12. Complete the wizard. The project settings will be imported from the file exported from Nsight Eclipse Edition.
- 13. Build the project by clicking on the hammer button on the main toolbar.

2.13. More Information

More information about the Eclipse CDT features and other topics is available in the Help contents. To access Help contents select Help->Help Contents from the Nsight main menu.

More information about CUDA, CUDA Toolkit and other tools is available on CUDA web page at http: //developer.nvidia.com/cuda

| × + Import | |
|------------------------------------|----------------------|
| Import | |
| Import C/C++ project settings | |
| Settings file /tmp/settings.xml | Browse |
| / cmp/secongs.and | Drowsen |
| Select Project | Select Configuration |
| 🗢 newp | 🕥 🔉 Debug (Active) |
| 😂 ssl | 🛞 Release |
| 😂 stl | |
| 😂 twd | U |
| 😂 wds | |
| Select settings to import | |
| 🗹 🕒 Include Paths | 0 |
| Select All Deselect All | |
| | |
| | |
| ? < Back | Next > Cancel Finish |

Chapter 3. Known Issues

Executable must exist in order to start debug session for the first time

Nsight will not automatically perform build when starting debug session for a given project for the first time. Build must be invoked manually. Nsight will automatically rebuild executable when starting subsequent debug sessions.

Note: To manually build the project, select it (or any file within the project) in a Project Explorer view and click hammer icon on the main window toolbar.

Source editors may show error markers on a valid code for the files in newly created projects.

These markers will be cleared after Nsight indexes included header files.

Mac OS X users may be prompted to install Java Runtime Environment (JRE) when running Nsight Eclipse Edition for the first time.

Nsight Eclipse Plugin Edition requires functioning Java Runtime Environment to be present on the local system to run.

Nsight Eclipse Plugin Edition does not provide compilation support for using the QNX qcc and q++ compilers.

The workaround to compile using qcc and q++ is

- Specify the q++ path in CCBIN field on toolkit configuration page on project properties dialog as shown below. You can access toolkit configuration page by clicking main menu Project > Properties > C/C++ Build > CUDA Toolkit
- Change default CONF to gcc_ntoaarch64le in the file \${QNX_HOST}/etc/qcc/gcc/5.4.0/default as below

CONF=gcc_ntoaarch64le

Eclipse versions 4.26 through 4.28 are not presently supported.

Eclipse versions 4.26 through 4.28 are not presently supported due to a known compatibility issue with the Nsight Eclipse Edition plugins. The root cause of this compatibility issue has been identified, and a fix will be implemented in an upcoming release.

| 😣 🗊 Properties for tes | t | | | |
|--|---|--------------------------|-----------|--|
| type filter text 🛛 🕿 | CUDA Toolkit | | | |
| Resource Builders C/C++ Build Build Variables CUDA Toolkit Environment Logging Settings Tool Chain Editor C/C++ General Linux Tools Path Project Natures | CUDA Toolkit Target OS: Target Architecture: CCBIN | \${QNX_HOST}/usr/bin/q++ | Restore I | Add new SDK location Browse Defaults Apply |
| ? | | | Cancel | Apply and Close |

Chapter 4. Notices

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