Working with User-Defined Projects Lab

WIND RIVER

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Objective

In this lab you will learn more advanced techniques for managing projects within Workbench. You will have the opportunity to work with one of the two fundamental build types provided by Workbench, and learn its unique advantages.

NOTE: This lab should take approximately 30 minutes.

Lab Overview

This lab focuses on the user-defined build type provided by the Workbench build system. In a user-defined project, the user is wholly responsible for managing the project's build infrastructure — Workbench merely calls out to this user-managed framework as needed.

While implementing and maintaining a build system may sound like a bad deal, there are many cases where this type of build is beneficial. Consider the following projects:

- *the Linux kernel*
- *Busybox*
- *any software package driven by **autoconf** (that is, driven by a **configure** script)*
- *any project that includes a **Makefile***

Chances are, you've worked with more than one of these in the past. These all have one thing in common: they come with their own build system. If Workbench didn't work with user-defined build systems, you would have to spend time mapping flexible managed build constructs to duplicate functionality already provided by the project's existing build infrastructure.

User-defined projects let you leverage work that has already been done, and at the same time enjoy all the benefits Workbench has to offer.

*In this lab, you will work with the source in the archive **/Labs/workbench/vitetris-0.57.tar.gz**. The archive contains the source code for an open-source clone of the popular game, Tetris, which renders on a standard text-based console. The archive is structured as follows:*

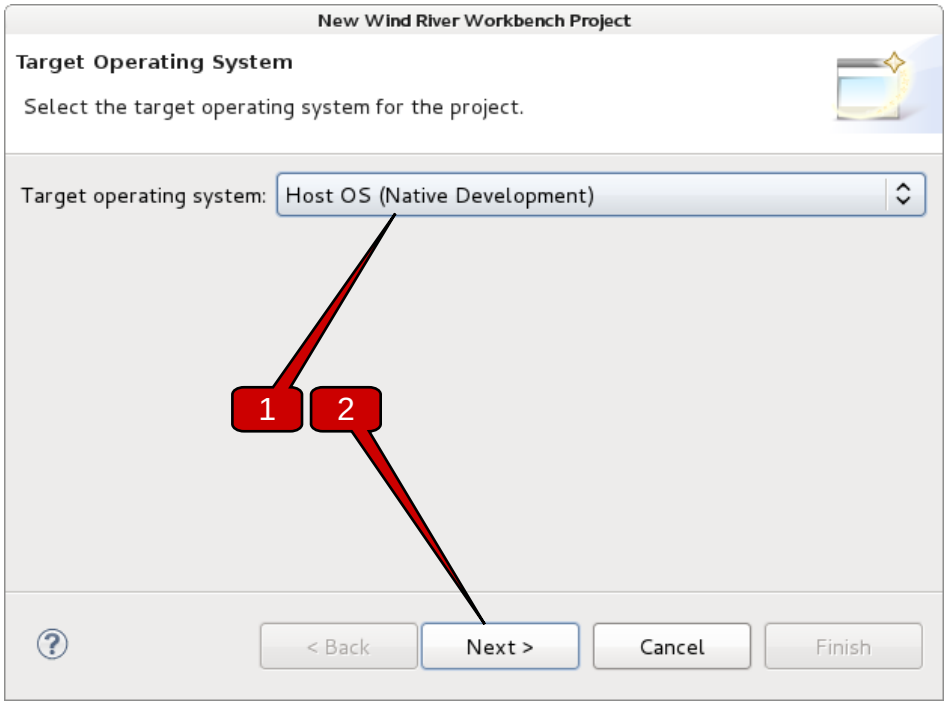
- *A subdirectory called **src**, which functions as the root for all source code, and contains a main **Makefile** that drives the build of the entire application*
- *Subdirectories within **src** which implement various subsystems (input, rendering, etc). Each subsystem is driven by its own makefile, and is built as a self-contained static library.*

This structure is fairly representative of projects that are deeply entrenched in a build system of their own. Consider, for a moment, how you might import this project into your workspace using a flexible managed build.

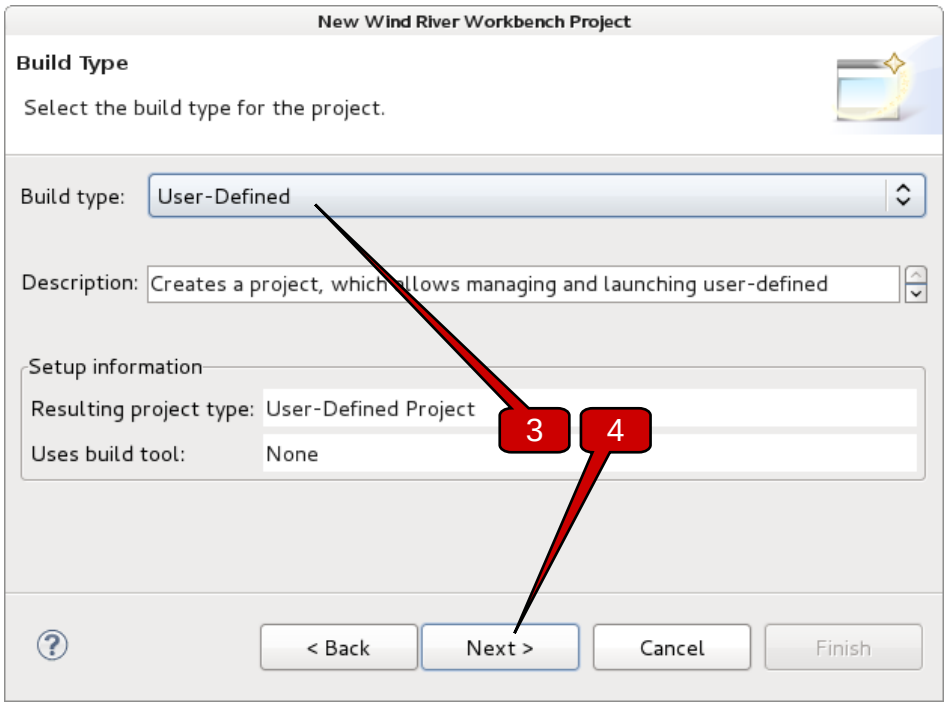
In situations like these, the value of user-defined projects becomes apparent — if the software you're working with comes with a build infrastructure that works, why not use it?

Creating and Populating a User-Defined Project

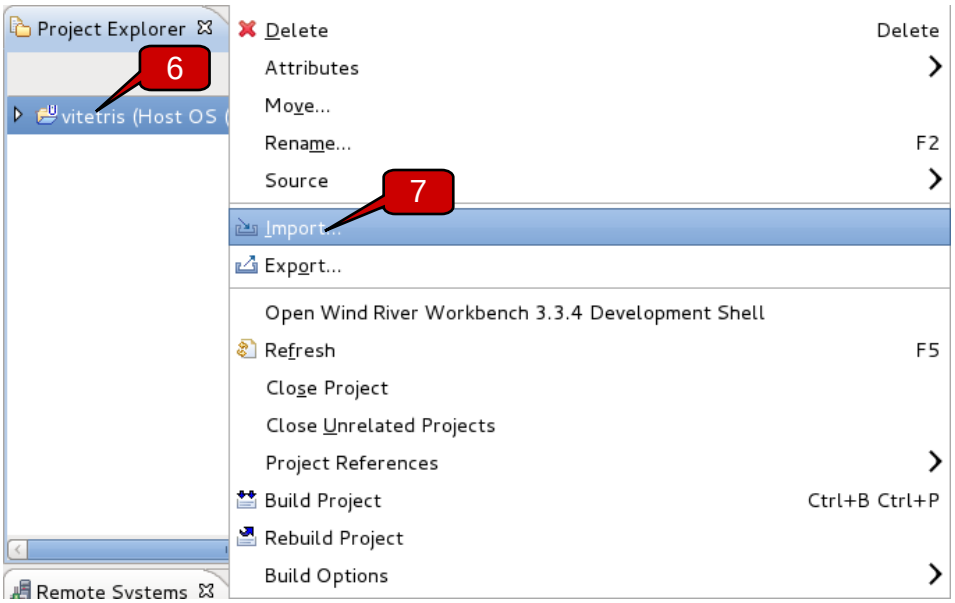
1. Begin by creating a new native user-defined project, similar to the way you created a native application project in the lab, *Getting Started with Workbench*. In the **New Wind River Workbench Project** wizard, select **Host OS (Native Development)**.
2. Click **Next**.



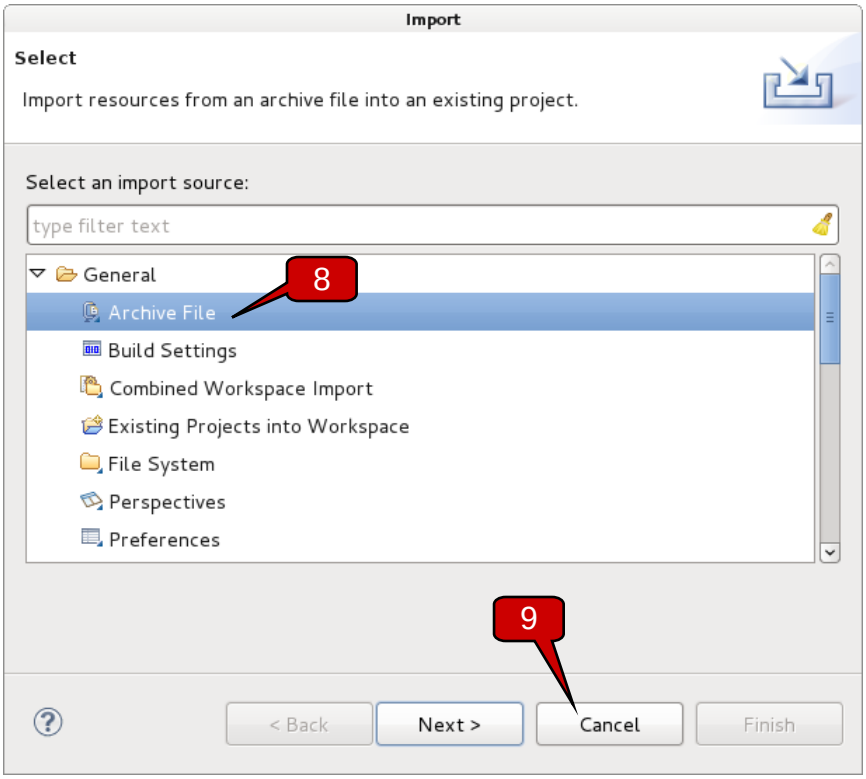
3. In the **Build type** field, select **User-Defined**.
4. Click **Next**.



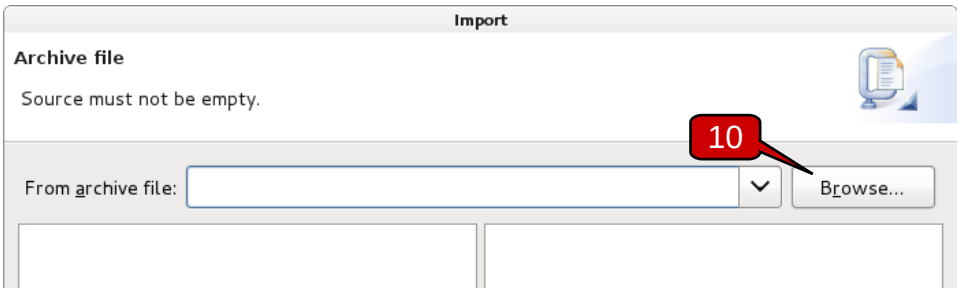
5. Name this project **vitetris** and click **Finish** to create the project.
6. Now, import the source code into the project. In the **Project Explorer** view right-click on the new **vitetris** project.
7. In the context menu, select **Import** to import the source code into the project**.**



8. In the **Import** dialog, select **General > Archive File**.
9. Click **Next**.

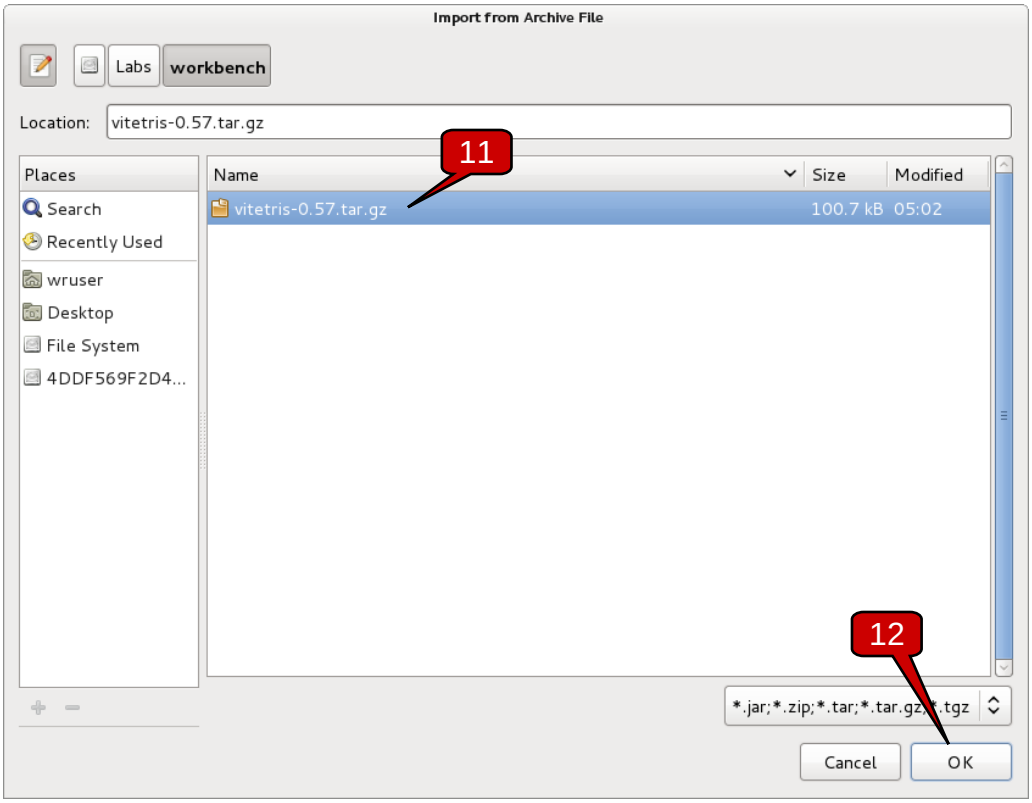


10. Click **Browse** to locate the archive from which Workbench will import resources.

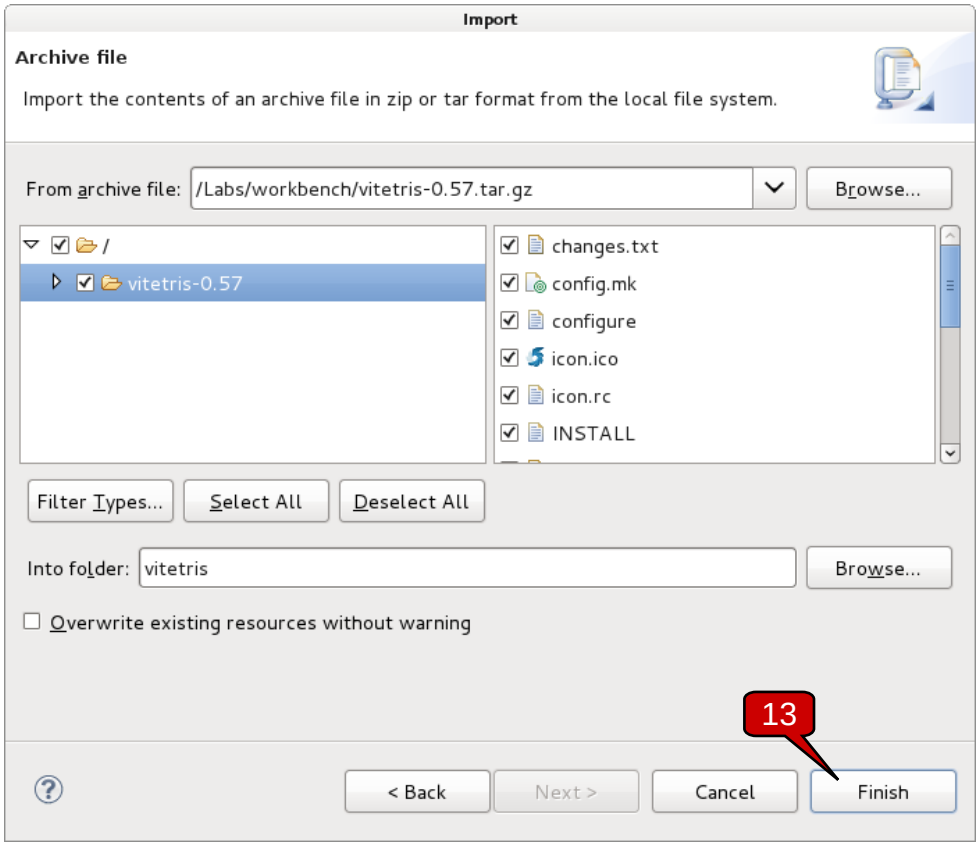


11. In the **Import from Archive File** dialog, navigate to the **/Labs/workbench** directory, and select **vitetris-0.57.tar.gz**.

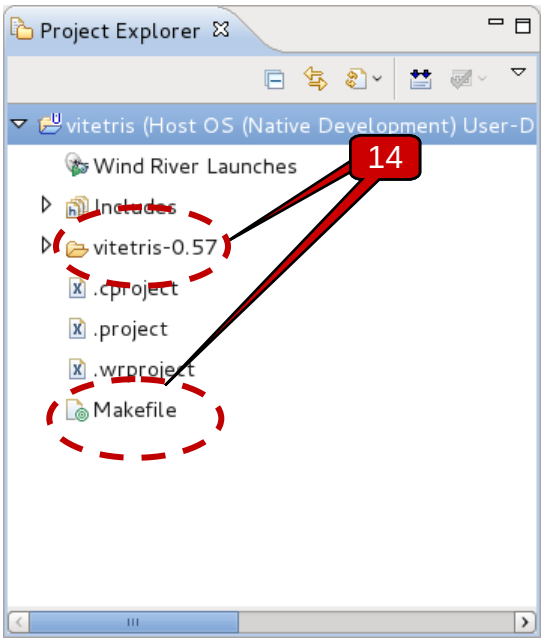
12. Click **OK**.



13. In the **Import** dialog, Workbench presents a view of the files in the selected archive. Verify that **all** files in the archive are selected (not just source files), and click **Finish**.

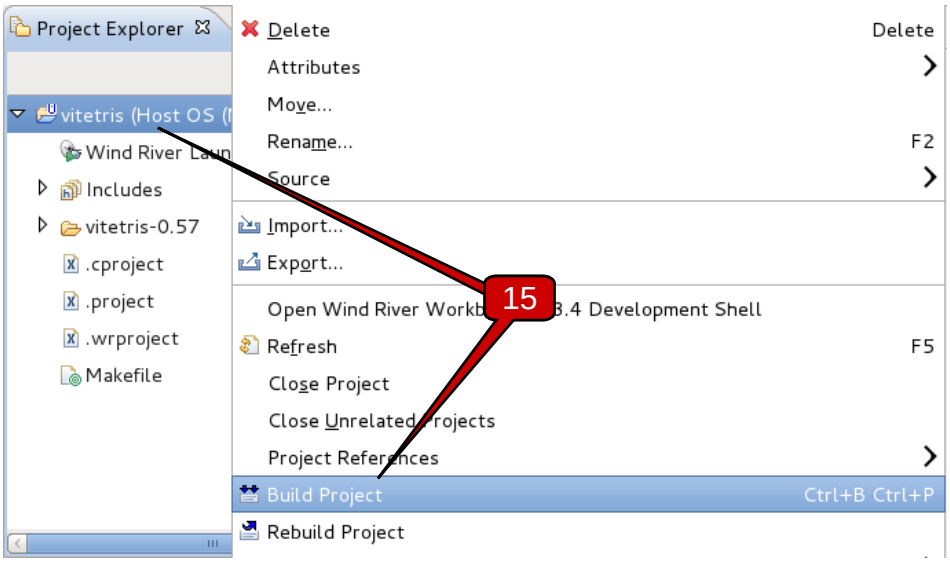


14. In the **Project Explorer** view, review the contents of your new project. Notice that:
    - The imported source appears in the **vitetris-0.57** subdirectory within your project (mirroring the structure of the files within the source archive)
    - Workbench has created a default **Makefile** in the root directory of the project
    - There are no build targets, like you would see for a flexible managed build. This is because the build targets for a user-defined project are defined and managed differently than for a flexible managed build.



Building the Project

15. Build the project — in the **Project Explorer** view, right-click on the project and select **Build Project** from the context menu.



Not much happens. Why? Examine the contents of **Makefile** to investigate the cause.

```
all :
   @echo "make: built targets of `pwd`"

clean :
   @echo "make: removing targets and objects of `pwd`"
```

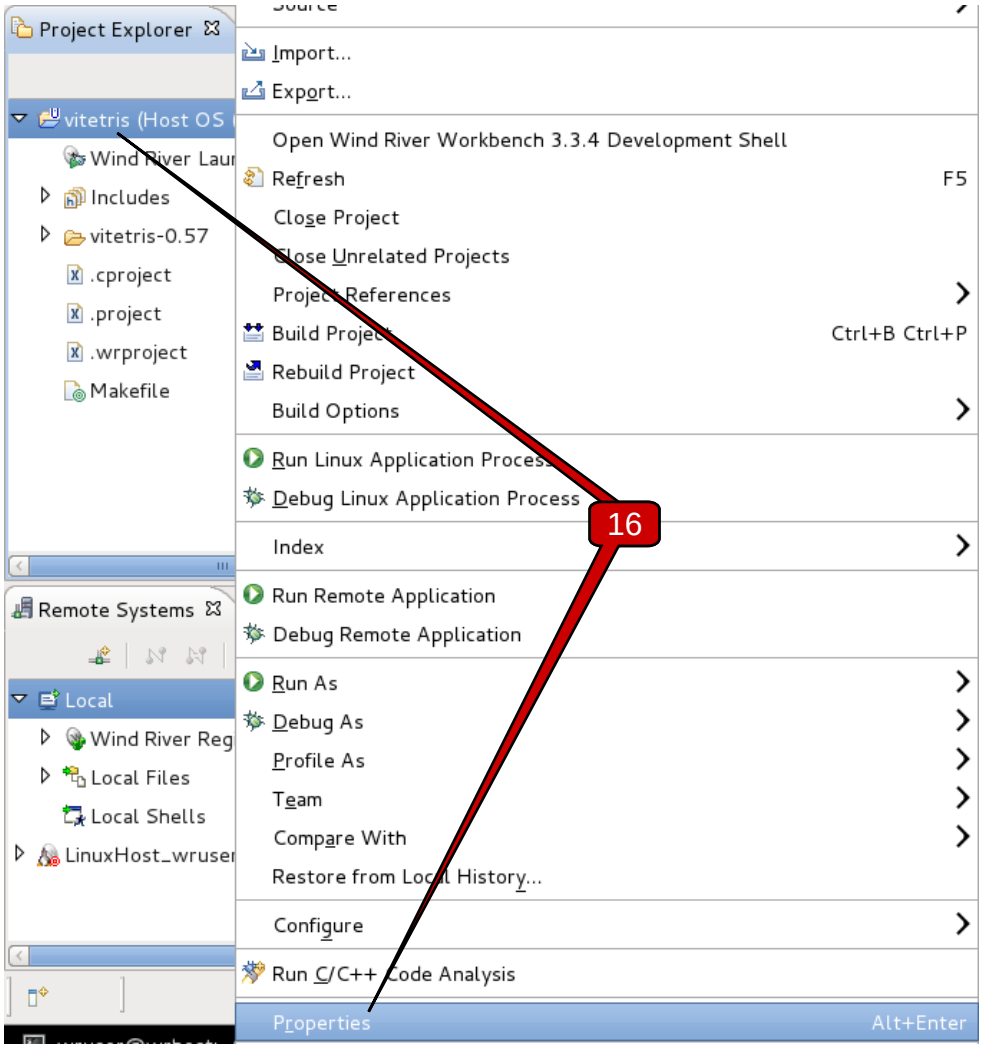
When creating a new user-defined project, Workbench supplies a very basic **Makefile** that essentially does nothing – it's meant to be populated by you.

There are different solutions to the problem:

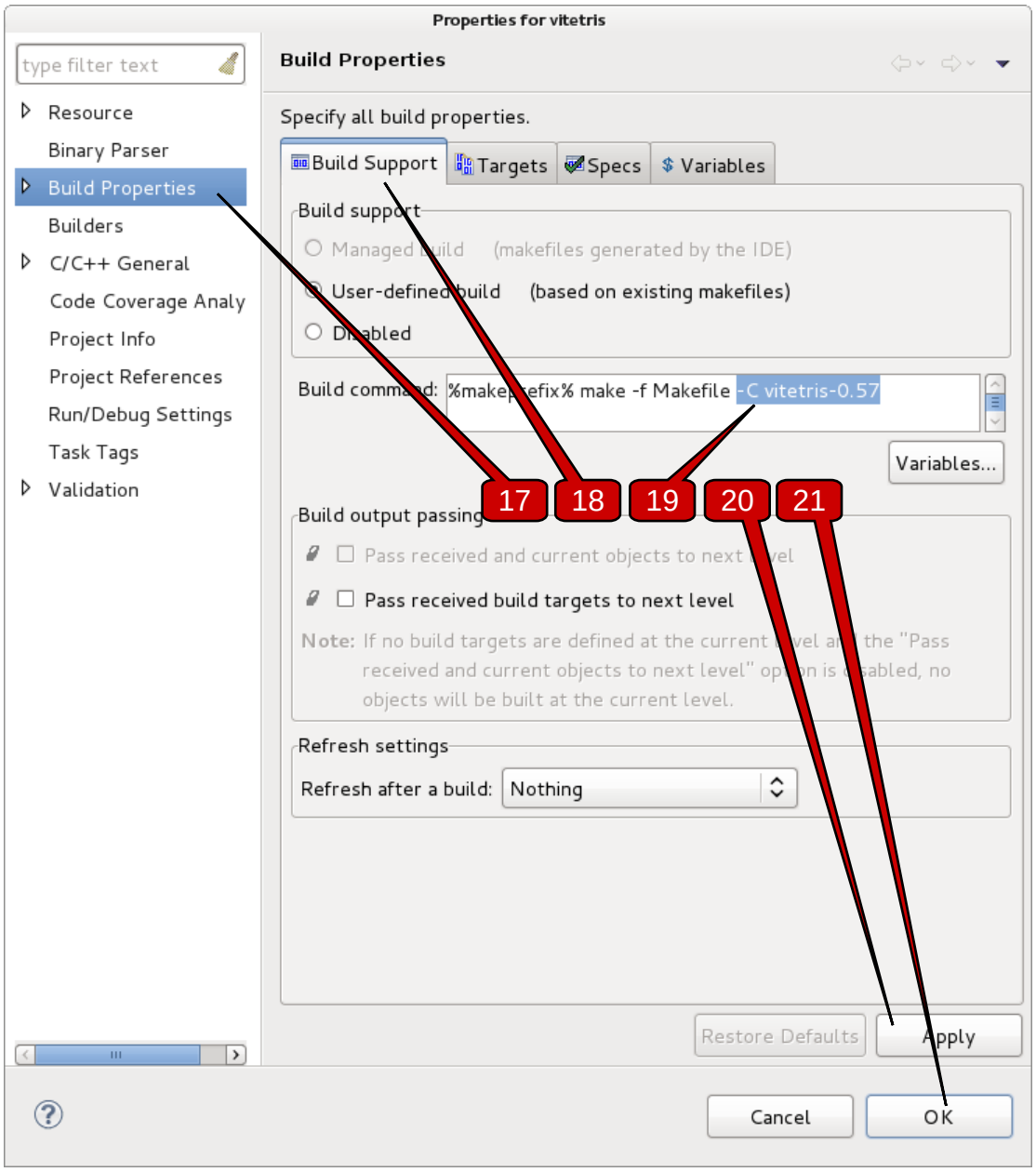
- Rewrite the **Makefile** to call into the **Makefile** provided by the **vitetris-0.57** directory.
- Shift the contents of the **viteris-0.57** directory up one directory level, thereby overwriting the Workbench-supplied **Makefile**.
- Tell Workbench to call into the **Makefile** found in the **vitetris-0.57** directory.

For the purpose of this exercise, consider the last option, for the first two will not teach you anything about Workbench project management.

16. Access the **Makefile** options via the build properties for the project; in the **Project Explorer** view, right-click on the **vitetris** project and select **Properties** from the context menu.

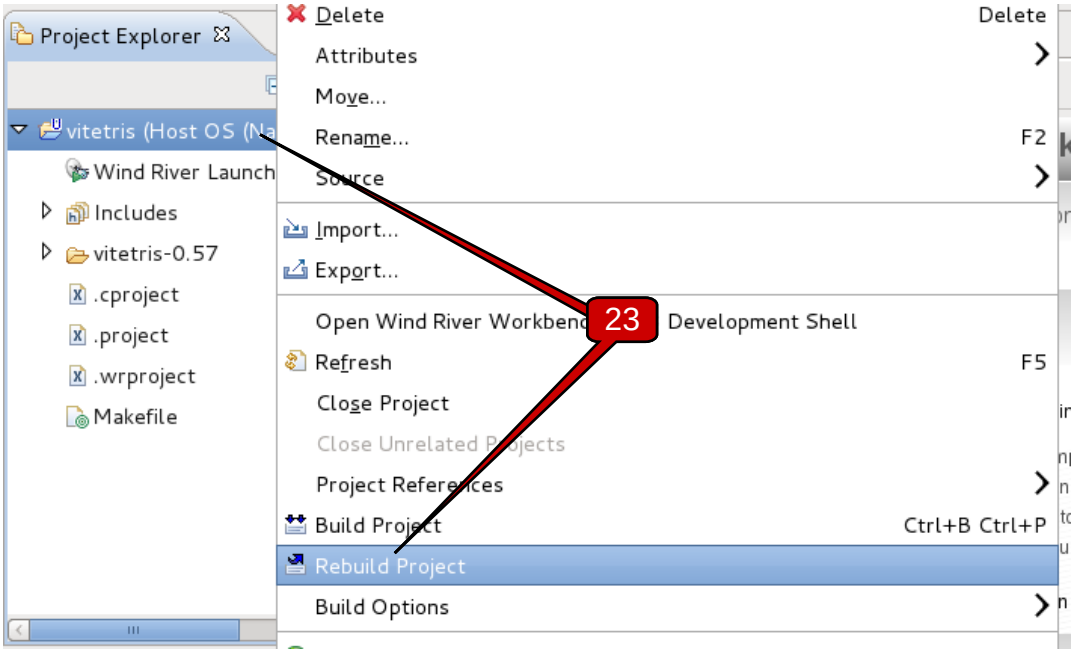


17. In the **Properties for vitetris** dialog, in the navigation panel on the left, select **Build Properties**.
18. Click the **Build Support** tab to access build settings.
19. In the **Build command** field, add the option **-C vitetris-0.57**; this option will instruct **make** to use the **Makefile** in the **vitetris-0.57** subdirectory rather than the one contained in the top-level project directory.
20. Click **Apply**.
21. Click **OK**.



22. Attempt to build the project again, as you did in the first step of this section. Use the **Build Project** option, not the **Rebuild Project**. This time, your build will succeed.

23. Now, attempt to rebuild the project using the **Rebuild Project** option in the context menu.



The build fails this time, with the following error. Why?

```
make: *** No rule to make target `all'.  Stop.
```

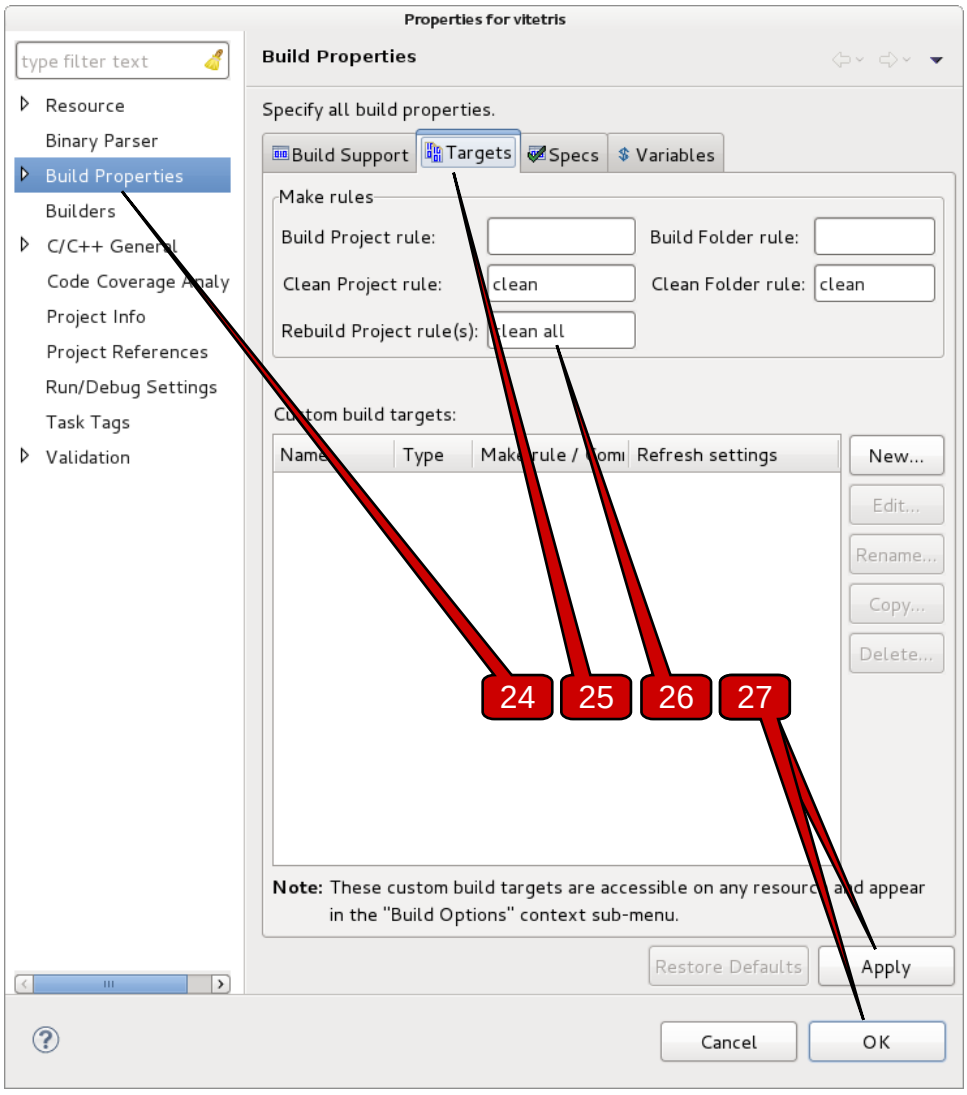
The error indicates that the target Workbench invokes (**all**) cannot be found in the **Makefile**. To see why Workbench is invoking this target, you will need to revisit the properties for the **vitetris** project as you did earlier in this section.

24. In the **Properties for vitetris** dialog, in the navigation panel on the left, select **Build Properties**, as you did before.

25. This time, click the **Targets** tab to access build target settings.

26. Focus your attention on the **Rebuild Project rule(s)** field. Notice that this is preset to a value of "**clean all**". In order for this to work, the Makefile must have both targets defined. Refer back to the **Makefile** in the **vitetris-0.57** directory to see which targets are defined, and you will find that **all** is not defined. Replace **all** in the **Rebuild Project rule(s)** field with an equivalent target that can be found in the **Makefile**.

27. When you've made your change, click **Apply** and **OK**.



28. Test your changes by rebuilding the project.

Adding Build Targets

You have seen how to edit the default targets that Workbench invokes in a user-defined build. Sometimes, you must add new targets in order to access additional functionality provided by a project's **Makefile**. In this section, you will learn how to do this.

29. Add the following code to the end of the Makefile in the **vitetris-0.57** directory, to allow you to play the game via a build target:

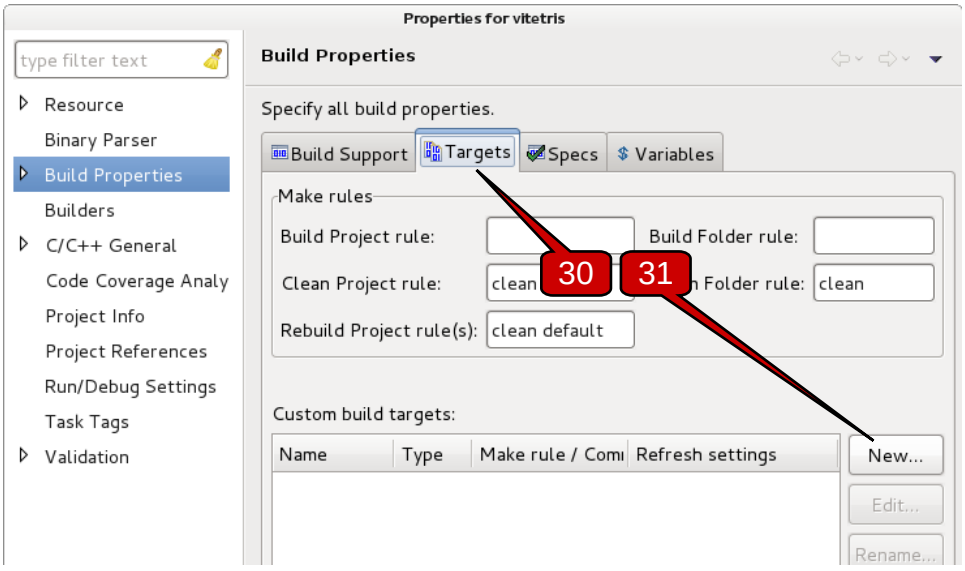
```
play:<Space>build<Enter>
<Tab>$(TERM)  ./$(PROGNAME)<Enter>
```

> **NOTE:** **Makefiles** are notoriously picky about line formatting and spacing. Type the lines exactly as shown, paying particular attention to the **Tab** in the second line.

When invoked, this target (after ensuring that the project is built) will start the built program in a shell defined by the **TERM** environment variable (typically this is set to something like **xterm**).

30. Now, add this new build target to the vocabulary for this project. As you did in the previous section, reopen the properties for the **vitetris** project and advance to the **Targets** tab.

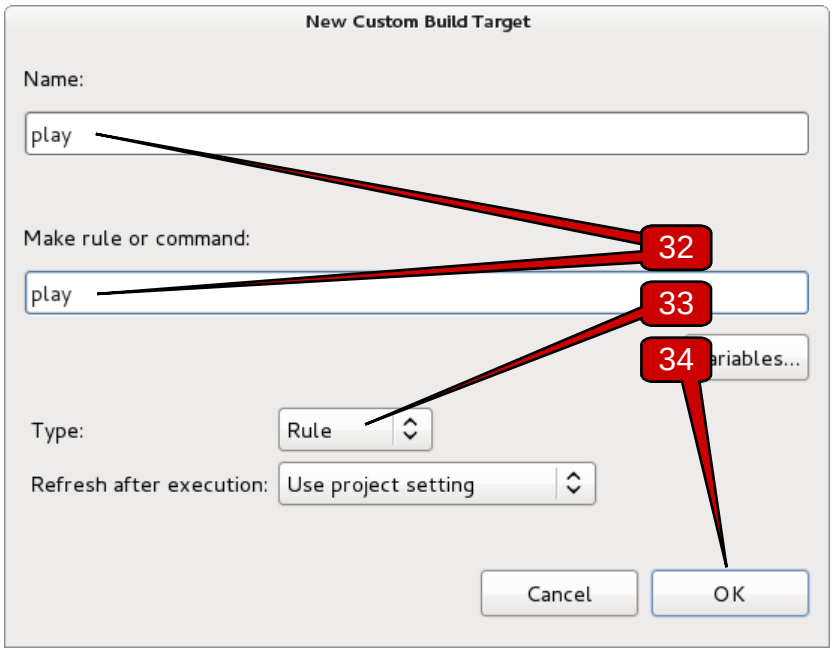
31. In the **Custom build targets** area, click **New…**



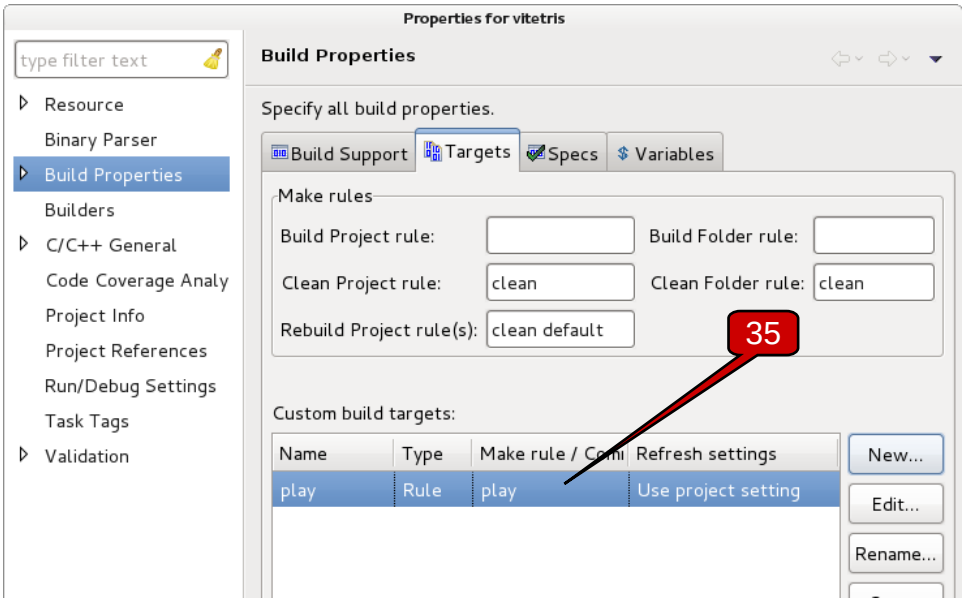
32. In the **New Custom Build Target** dialog, in both the **Name** and **Make rule or command** fields, enter **play**.

33. Ensure that the **Type** field is set to **Rule**.

34. Click **OK**.

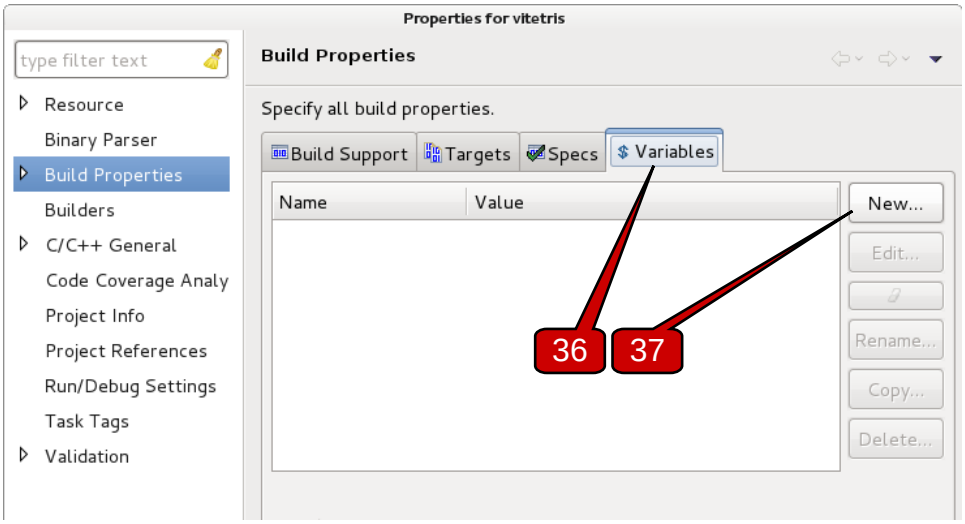


35. In the **Properties for vitetris** dialog, in the **Custom build targets** panel, notice the addition of your new target.



36. Now ensure that Workbench sets a value for the **TERM** environment variable. Click on the **Variables** tab in the **Properties for vitetris** dialog.

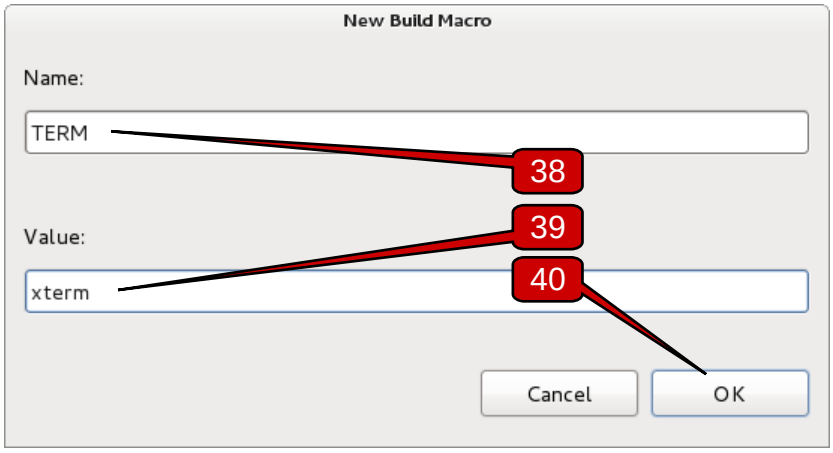
37. Click **New…**



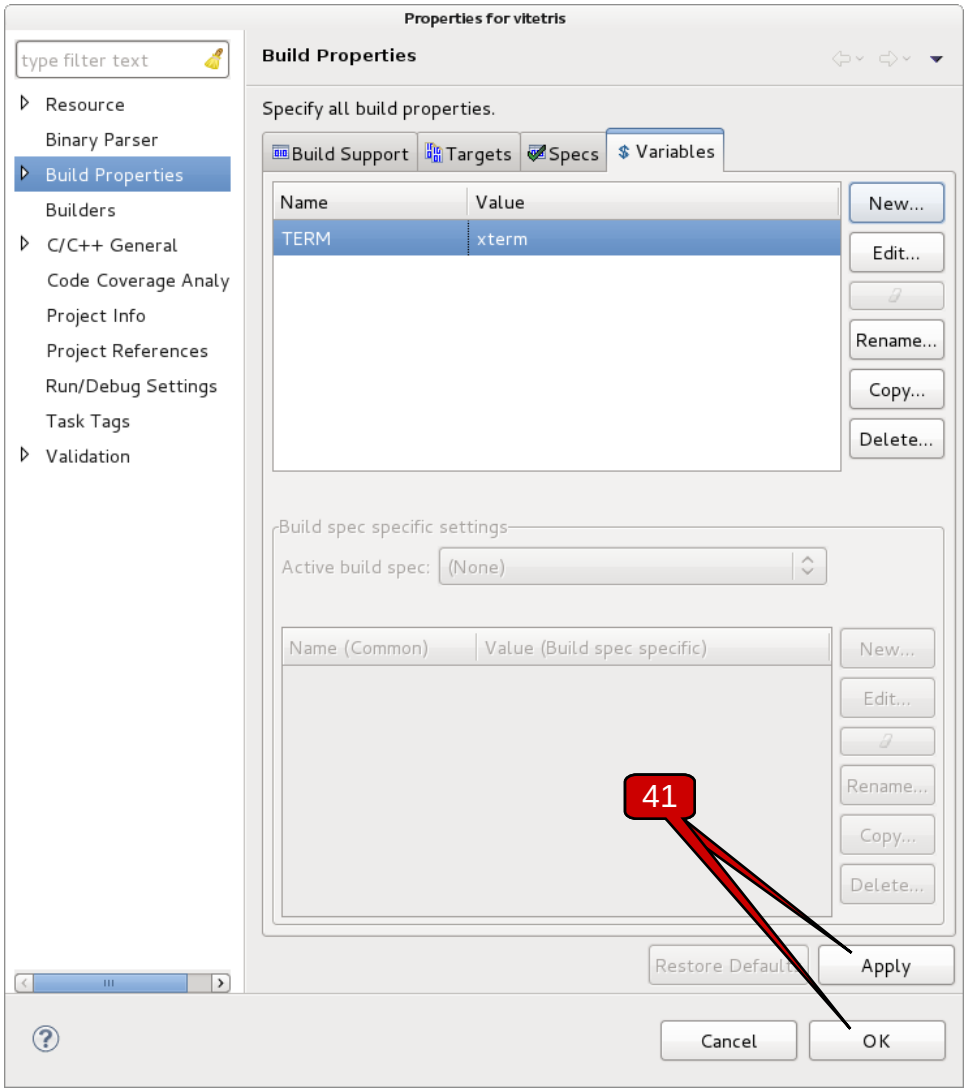
38. In the **New Build Macro** dialog, in the **Name** field, enter a value of **TERM**.

39. In the **Value** field, specify **xterm**.

40. Click **OK**.

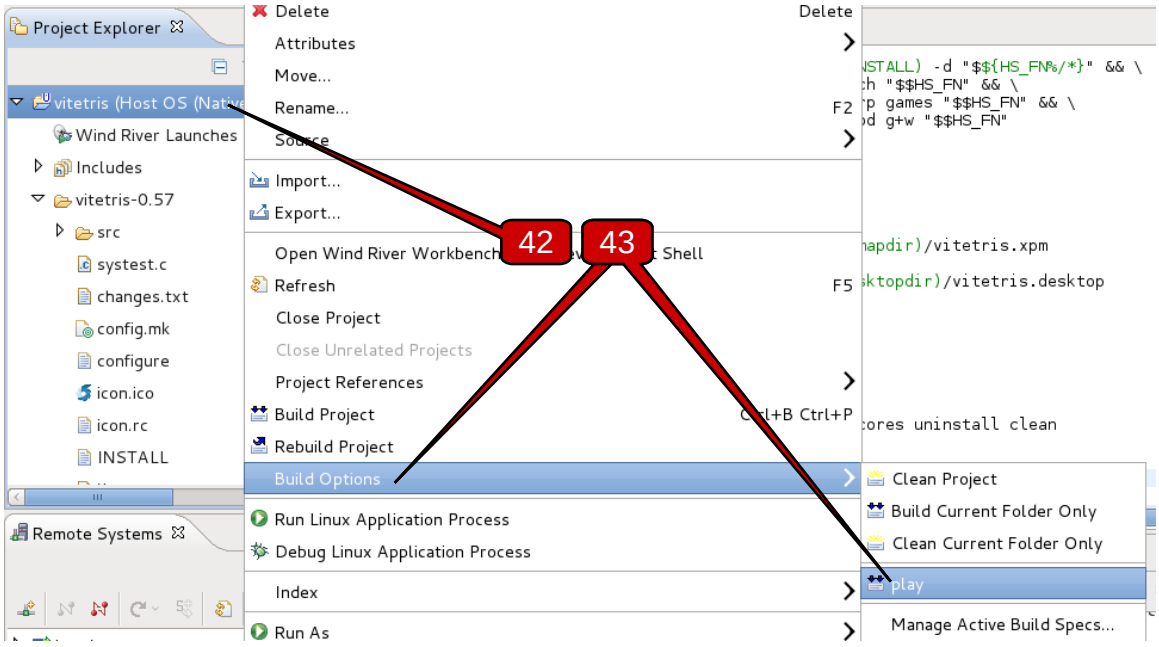


41. In the **Properties for vitetris** dialog, click **Apply** and **OK**.

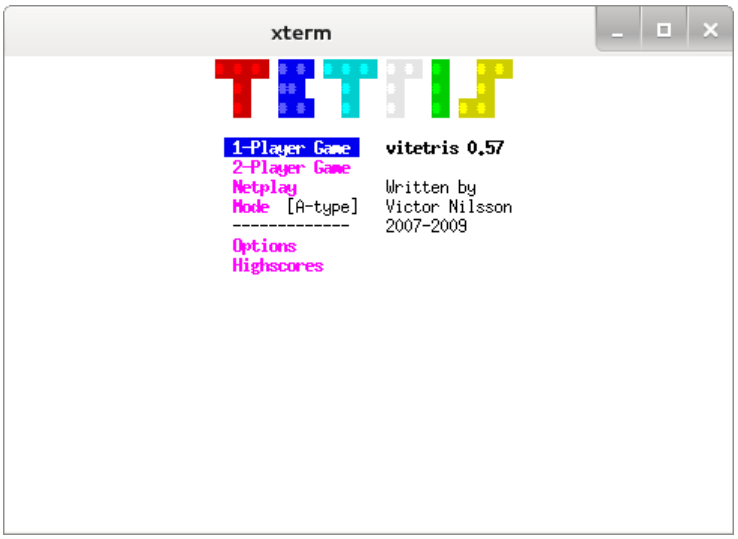


42. Now, right click on the **vitetris** project in the **Project Explorer** view.

43. In the context menu, select **Build Options > Play**.



44. Enjoy!



This concludes the lab. Do not proceed.