

# Instanced Rendering

Instancing allows duplicating a model with variations. In contrast to using the **Repeater3D** component, the model and its graphics resources are only allocated once. The rendering of the duplicated instances is done at a low level by the GPU. Depending on the complexity of the model, this can give a performance improvement of several orders of magnitude.

In practice, instancing is done by defining a table that specifies how each instance is modified relative to the base model.

You can add instancing to your scenes by using the instancing components available in **Components > Qt Quick 3D > Qt Quick 3D**:

- > **Instancing**
- > **Instance List**
- > **Instance List Entry.**

## Reading Instance Tables from Files

The **Instancing** component makes it possible to read instance tables from files in XML or binary format. The binary file format uses the same layout as the table that is uploaded to the GPU, so it can be directly mapped to memory.

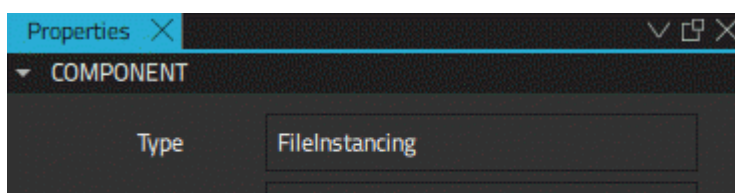
In order to be valid, the XML file must have a top-level instance table element. Each instance is represented by an Instance element inside the InstanceTable. Unknown elements are silently ignored.

An Instance element can have a number of attributes. Color attributes are specified by using SVG color names, such as "red", "green", or "lightsteelblue", or by using a hexadecimal notation. **Vector3d** and **vector4d** attributes are specified by a string of space-separated numbers, where missing trailing numbers indicate zeroes. The following attributes are supported: position, scale, eulerRotation, quaternion, custom, and color. For more information about instance tables, see the documentation for the [FileInstancing](#) QML type.

To use the **Instancing** component, drag-and-drop it from **Components** to **Scene** in **Navigator**.

## Instancing Properties

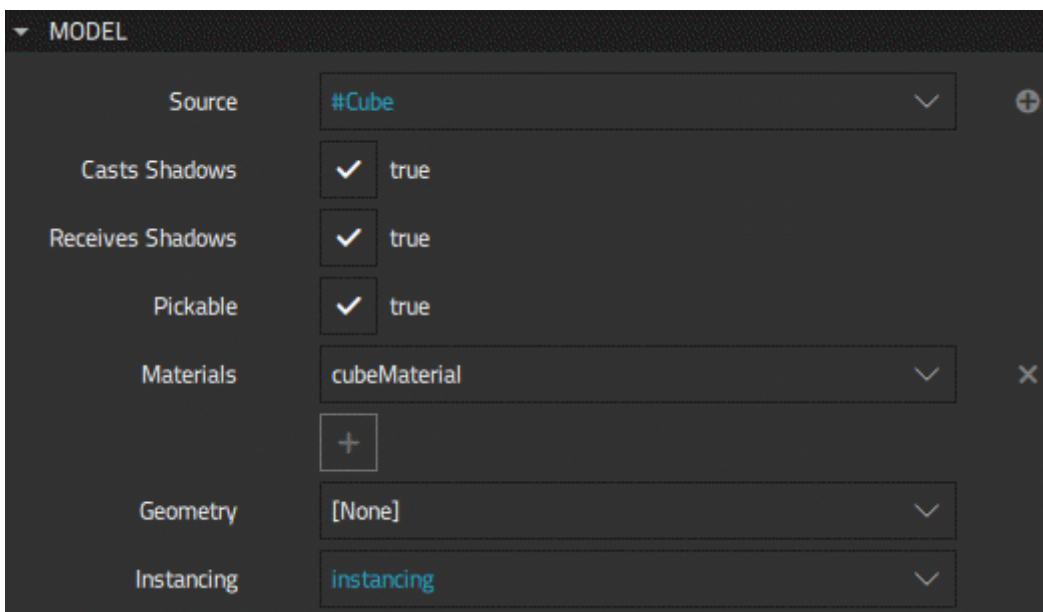
Define the location of an XML or a binary file containing the instance data in **Properties > File Instancing > Source**.





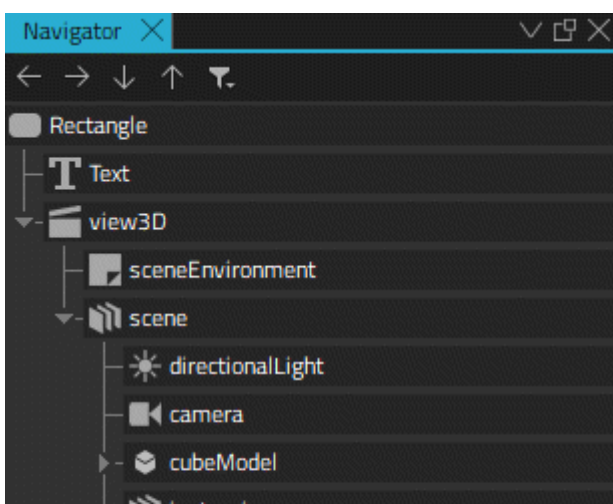
If the file name has a `.bin` extension, it is assumed to refer to a binary file. Otherwise it is assumed to refer to an XML file. If an XML file `foo.xml` is specified, and the file `foo.xml.bin` exists, the binary file `foo.xml.bin` will be loaded instead.

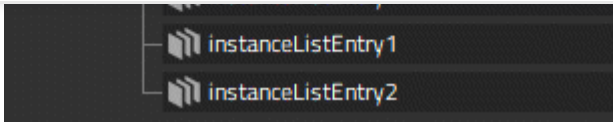
After defining the **Source** property for the **Instancing** component, select a model in **Navigator**, and in **Properties > Model > Instancing**, select the name of the **Instancing** component.



## Using Instance Lists to Build Instance Tables

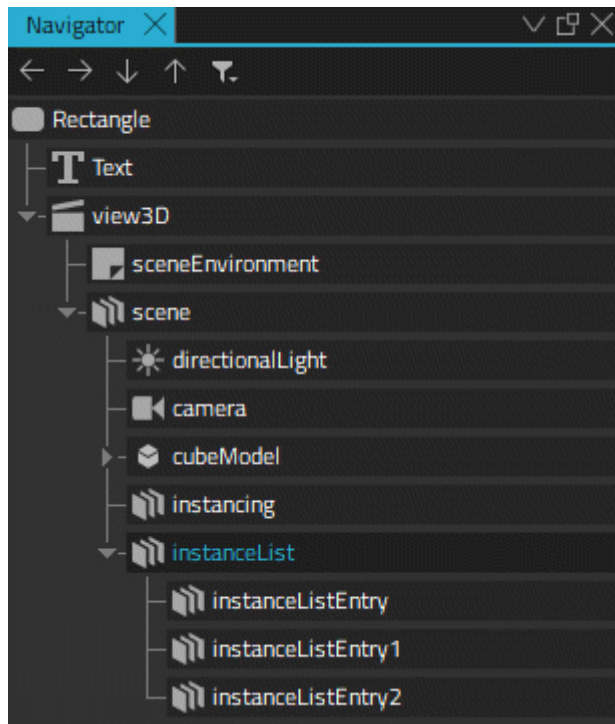
Use the **Instance List** component to define an instance table in Qt Design Studio. An instance table consists of instances defined as **Instance List Entry** components, which can have property bindings and animation. This gives great flexibility but also causes memory overhead. Therefore, it is not recommended to use **Instance List** for procedurally generated tables containing a large number of instances. Also, any property change to an entry will cause the entire instance table to be recalculated and uploaded to the GPU.





To build an instance table:

1. Drag-and-drop an **Instance List** component from **Components > Qt Quick 3D > Qt Quick 3D** to **Scene** in **Navigator**.
2. Drag-and-drop **Instance List Entry** components to the **Instance List** component to create list items.

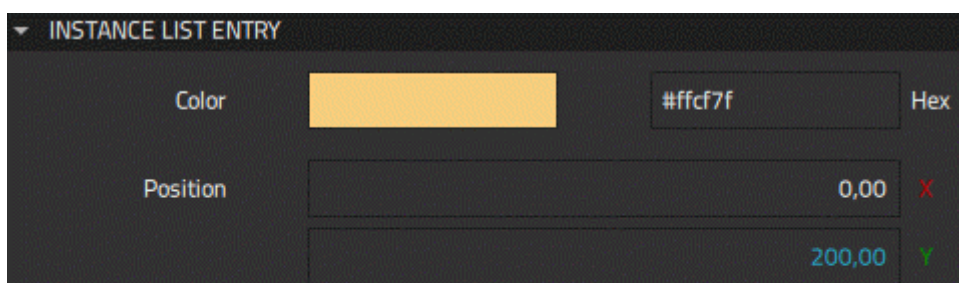


3. Select the **Instance List** in **Navigator**, and in **Properties > Instance List > Instances**, select each **Instance List Entry** you wish to include in the **Instance List** by using the dropdown menu. You can add more fields for the property by clicking the **+** icon.
4. To define an **Instance List Entry**, select it in **Navigator**, and specify its properties in **Properties > Instance List Entry**.
5. Select a model component in **Navigator**, and in **Properties > Instancing**, select the name of the **Instance List** component.

## Defining Instance List Entries

Use the **Instance List Entry** component to specify each instance in an **Instance List**.

Each of the **Instance List Entry** properties can have **bindings** and animation. Select an **Instance List Entry** in **Navigator** to specify the properties in **Properties > Instance List Entry**.



Scale		0,75	X
		0,75	Y
		0,75	Z
Rotation		0,00	X
		0,00	Y
		0,00	Z

Use the **Color** property to specify the color for the instance.

Specify the position for the instance using the **Position** property, and the scale by defining the scale factors of the **Scale** property along the x, y, and z axes.

Set the rotation for the instance using the **Rotation** property, which specifies the rotation for the instance as an Euler vector containing the rotation in degrees around the x, y, and z axes.

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