

Portfolio notes

Unity follows a DITA-like content model, splitting topics into tasks, concepts, reference, and landing pages. This large **reference page** describes a debugging tool for physics simulation.

The debugging tool has five sections, each with a long list of properties that the user can use to generate debugging visualisations in the development software. Some properties trigger other properties to appear and disappear (a feature of the Unity UX design system), and therefore have sub-properties.

The goal here was to make sense of a complex UX design, and improve this legacy reference documentation. I broke the content down by section, and rewrote the property descriptions to more directly describe their behaviour. For a comparison with the original documentation, see [legacy Physics Debug documentation](#).



Physics Debug window reference

Use the Physics Debug window to configure and generate visual representations of 3D physics activity in a scene. These visualizations appear in the [Scene view](#).

To open the Physics Debug window in the Unity Editor, go to **Window > Analysis > Physics Debugger**.

Physics Debugger inserts a [Physics debug panel](#) in the Scene view, and opens a Physics Debug window that contains the following tabs:

- **[Info](#)**: Track Rigidbody and Articulation Body information. **Center of Mass** and **Inertia Tensor** visualization can also be found here.
- **[Filtering](#)**: Determine which physics objects should be shown.
- **[Rendering](#)**: Settings that define how Unity renders and displays the physics visualization.
- **[Contacts](#)**: Select whether or not contacts should be visualized.
- **[Queries](#)**: Select whether or not queries should be visualized.

To revert the Physics Debug window back to its default settings, select **Reset**.

For more information on improving physics performance in your project, see documentation on the [Physics Profiler](#)

Physics debug panel

When the Physics Debug window is open in Unity, the Physics Debug panel appears in the Scene view. By default, it appears in the bottom-right corner of the Scene view; however, you can click and drag to move it around.

Property	Description
Collision Geometry	Enable Collision Geometry to visualize collision information in the Scene view. Disable Collision Geometry to hide collision information in the Scene view.
Mouse Select	Enable Mouse Select to enable mouse-over highlighting and mouse selection. This is useful if you have large GameObjects that obstruct each other in the visualization.

Info

The **Info** tab contains data about any selected [Rigidbody](#) or [ArticulationBody](#) GameObjects. You can use this data to monitor the physics body's behavior.

You cannot edit the property values in this tab. You can modify them via script, but it is not recommended; in most cases, you should apply forces via the physics system to change these values instead.

To keep a specific GameObject permanently docked in the **Info** tab, enable **Lock** for that GameObject. You can lock an infinite number of GameObjects. Use the **Number of items per row** property to arrange the Info tab in a way that is easiest for you to navigate.

The Info tab always displays the following properties.

Property	Description
Number of items per row	Define how many selected GameObjects to display horizontally in the top row of the Info tab. By default, if you select or lock multiple GameObjects, Unity displays them all vertically. However, you can arrange them horizontally instead. Use Number of items per row to define how many GameObjects to display next to each other on one horizontal row, up to a maximum of 10. If the number of selected or locked GameObjects exceeds this number, the more recently selected GameObjects appear on a new row underneath the first. GameObjects always appear in the Info tab in the order of selection. The default value for this property is 1.
Tracked objects	Displays the total number of unique GameObjects that currently appear in the Info tab. This includes selected GameObjects and locked GameObjects. It does not include duplicates.
Clear locked objects	Select Clear locked objects to disable Lock for all GameObjects. This removes any GameObjects from the Info tab that are not already selected in the Hierarchy window.

The **Info** tab displays the following properties when you select a GameObject in the Hierarchy that has a physics body (that is, a [Rigidbody](#) or an [ArticulationBody](#)):

Property		Description
GameObject		Displays the name of the selected or locked GameObject that the following properties refer to.
Draw Gizmos For		Select which physics property the Physics Debug should display a gizmo for.
	Center of Mass	Display a gizmo that indicates the location of the physics body's global center of mass (see World Center of Mass).
	Inertia Tensor	Display a gizmo that indicates the rotation and scale of the physics body's Inertia Tensor (see Inertia Tensor).
Lock		Enable Lock to keep the GameObject in the Info tab even when it is not selected in the Hierarchy window.
Speed		The speed at which the physics body is moving, measured in meters per second (m/s).
Velocity		The velocity of the physics body along each vector, measured in meters per second (m/s).
Angular Velocity		The velocity of the physics body along each vector, measured in degrees per second.
Inertia Tensor		The inertia tensor of this physics body. Like mass, an inertia tensor defines how much force or torque is required to make a physics body move; however, while mass affects linear movement, inertia tensor affects rotational movement. The higher the Inertia Tensor value is, the more torque is required to make the physics body rotate on its axis.
Inertia Tensor Rotation		The rotation of the inertia tensor. By default, Unity calculates inertia tensor rotation automatically, based on all of the colliders attached to the physics body.

Local Center of Mass	The local location of the physics body's center of mass along each vector. To change the center of mass via script, use <code>centerOfMass</code> . Unity can also change it based on collider placement.
World Center of Mass	The global location of the physics body's center of mass along each vector. To change the center of mass via script, use <code>worldCenterOfMass</code> . Unity can also change it based on collider placement.
Sleep State	The sleep state of the physics body. Displays Awake if the physics body is awake and included in physics calculations. Displays Asleep if the physics body is asleep, and not included in physics calculations.
Sleep Threshold	The energy threshold for the physics body, below which the physics engine stops including the body in physics updates. By default, this is the Sleep Threshold value defined in the global Physics settings .
Max Linear Velocity	The maximum linear velocity the physics body can reach, defined by <code>maxLinearVelocity</code> .
Max Angular Velocity	The maximum rotational velocity the physics body can reach, defined by <code>maxAngularVelocity</code> .
Solver Iterations	The number of iterations that the physics system solver needs to perform on this physics body.
Solver Velocity Iteration	The number of velocity iterations that the physics system solver needs to perform on this physics body. These bring the exit velocity of overlapping GameObjects closer to the correct value, taking into account the contact bounciness.
Body Index	The Articulation Body index in the tree. This property only appears for Articulation Bodies.

Filtering

The **Filtering** tab contains properties to configure which physics elements appear in the Physics Debug visualization.

Property	Description
Show Physics Scene	Select which Physics Scenes to include in the visualization, if you have multiple physics scenes loaded at once.
Show Unity Scene	Select which Unity Scenes to include in the visualization, if you have multiple scenes loaded at once.
Show Layers	Select which Layers to display in the visualization.
Show Static Colliders	Enable Show Static Colliders to display visualization for Colliders that have no Rigidbody component. Disable Show Static Colliders to remove visualization for Colliders that have no Rigidbody component.
Show Triggers	Enable Show Triggers to display visualization for Colliders that are Triggers. Disable Show Triggers to remove visualization for Colliders that are Triggers.
Show Rigidbodies	Enable Show Rigidbodies to display visualization for Rigidbody components. Disable Show Rigidbodies to remove visualization for Rigidbody components.
Show Kinematic Bodies	Enable Show Kinematic Bodies to display visualization for Colliders that have Kinematic Rigidbody components. Disable Show Kinematic Bodies to remove visualization for Colliders that have Kinematic Rigidbody components.
Show Articulation Bodies	Enable Show Articulation Bodies to display visualization for ArticulationBody components. Disable Show Articulation Bodies to remove visualization for ArticulationBody components.
Show Sleeping Bodies	Enable Show Sleeping Bodies to display visualization for Colliders that have Sleeping Rigidbody components. Disable Show Sleeping Bodies to remove visualization for Colliders that have Sleeping Rigidbody components.

Collider Types		Use these options to show specific Collider types in the physics visualization.
	Show BoxColliders	Enable Show BoxColliders to display visualization for Box Colliders . Disable Show BoxColliders to remove visualization for Box Colliders.
	Show SphereColliders	Enable Show SphereColliders to display visualization for Sphere Colliders . Disable Show SphereColliders to remove visualization for Sphere Colliders.
	Show CapsuleColliders	Enable Show CapsuleColliders to display visualization for Capsule Colliders . Disable Show CapsuleColliders to remove visualization for Capsule Colliders.
	Show MeshColliders (convex)	Enable Show MeshColliders (convex) to display visualization for Mesh Colliders that have their Is Convex property enabled. Disable Show MeshColliders (convex) to remove visualization for Mesh Colliders that have their Is Convex property enabled.
	Show MeshColliders (concave)	Enable Show MeshColliders (concave) to display visualization for Mesh Colliders that have their Is Convex property disabled. Disable Show MeshColliders (concave) to remove visualization for Mesh Colliders that have their Is Convex property disabled.
	Show TerrainColliders	Enable Show TerrainColliders to display visualization for Terrain Colliders . Disable Show TerrainColliders to remove visualization for Terrain Colliders.
	Show None	Select Show None to clear all filtering criteria and remove all Colliders from the visualization.
	Show All	Select Show All to enable all filters and display visualization for all Colliders.

Rendering

The **Rendering** tab contains properties to configure how Unity renders and displays the physics visualization.

Property	Description
Static Colliders	Select a color to represent static Colliders (Colliders with no Rigidbody component) in the visualization.
Triggers	Select a color to represent Colliders that are also Triggers in the visualization.
Rigidbody	Select a color to represent Rigidbody components in the visualization.
Kinematic Bodies	Select a color to represent kinematic Rigidbody components from the visualization. The physics system does not control kinematic Rigidbody components.
Articulation Bodies	Select a color to represent Articulation Body components in the visualization.
Sleeping Bodies	Select a color to represent Sleeping Rigidbody components (which are not currently engaging with the physics engine) from the visualization.
Variation	Define to what extent the selected colors blend with a random color. Use this to visually separate Colliders by color, and to see the structure of the GameObjects. The value is between 0 and 1, and is set to 0.15 by default.
Transparency	Set the transparency of drawn collision geometry in the visualization. The value is between 0 and 1, and is set to 0.5 by default.
Force Overdraw	Enable Force Overdraw to display collider geometry on top of render geometry in the visualization. This is useful if render geometry is obscuring collider visualizations. Disable Force Overdraw to display collider geometry as it appears in relation to the camera.

View Distance		Set the view distance of the visualization. This is set to 1000 by default. The value is measured in units, which are assumed to be 1m by default in Unity.
Terrain Tiles Max		Set the maximum number of Terrain tiles in the visualization. This is set to 60 by default.
Gizmos settings		Configure the Physics Debug gizmos that the Info tab controls.
	Constant screen size	Enable Constant screen size to make Physics Debug gizmos appear the same size on the screen at any distance from the camera. Disable Constant screen size to make the gizmos' size scale with perspective.
	Inertia Tensor scale	Define the value by which to multiply the Inertia Tensor vector 3. This is useful if the Inertia Tensor is especially large; for example, if you need to visualize and observe the ratio of the vector's components.

Contacts

The **Contacts** tab contains properties to configure which contact data appears in the Physics Debug visualization, and the colors used for different types of contact.

Property		Description
Show Contacts		Enable Show Contacts to display visualization for contacts. The visualization options are: • Show All Contacts • Show Impulse • Show Separation • Use Filtering Settings
	Show All Contacts	Enable Show All Contacts to display visualization for all collision contact data in the Physics Debug visualization. Disable Show All Contacts to limit the contact data that appears in the Physics Debug visualization. When Show All Contacts is disabled, only the following contacts appear in the visualization: • Colliders with <code>MonoBehaviour</code> scripts that receive messages from <code>OnCollisionEnter</code>, <code>OnCollisionSay</code>, or <code>OnCollisionExit</code> • Colliders that have the <code>providesContact</code> property set to true.
	Show Impulse	Enable Show Impulse to display an arrow in the visualization that represents the contact point impulse. Disable Show Impulse to remove impulse visualization.
	Show Separation	Enable Show Separation to display a segment and disc in the visualization that represents contact point separation. Disable Show Separation to remove separation visualization.
	Use Filtering Settings	Enable Use Filtering settings to use the settings in the Filtering tab to filter incoming contact visualization. Disable Use filtering settings to use only the settings in the Contacts tab.
Contact colors		Select the colors Unity should use in the visualization to indicate collision contact data.

Use varied colors	Enable Use varied colors to use random colors for each contacting Collider pair. Disable Use varied colors to use the three colors defined in the following properties (Contact color , Contact separation color , and Contact impulse color).
Contact color	Select a color to represent the contact. This appears in the visualization as an arrow that starts in the contact point and faces the contact normal.
Contact separation color	Select a color to represent the contact separation. This appears in the visualization as a segment and disc.
Contact impulse color	Select a color to represent the contact impulse. This appears in the visualization as an arrow that points in the normal direction, with a length equal to the length of the impulse.

Queries

The **Queries** tab contains properties to configure which query types appear in the Physics Debug visualization, and how they appear. For information on PhysX queries, see the NVIDIA PhysX documentation on [Scene Queries](#) and [Geometry Queries](#).

Property	Description
Show queries	Enable Show queries to display visualization for physics queries.
Query color	Select the color Unity should use in the visualization to indicate physics queries.
Show shapes	Choose which query shapes to display in the Physics Debug visualization. Enable a query shape to display queries of that shape in the visualization. Disable a query shape to remove queries of that shape from the visualization. The options are: • Box-shape queries • Capsule-shape queries • Collider-shape queries • Ray-shape queries
Show types	Choose which query types to display in the visualization. Enable a query type to display queries of that type in the visualization. Disable a query type to remove queries of that type from the visualization. For information on PhysX query types, see the NVIDIA PhysX documentation on Geometry Queries. The options are: • Overlap queries • Check queries • Cast queries
Max Queries	Define the maximum number of queries that Physics Debug can visualize at once. This is set to 100 by default.
Show None	Select Show None to clear all filtering criteria. This hides all query shapes and types from the visualization.
Show All	Select Show All to enable all filters. This displays all query shapes and types in the visualization.

