



**APEX**STEER

Components

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## Version History

Version 1.0	Initial Version
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# Introduction

Apex Steer offers a range of components to control how units move around in the game world, and how they interact with obstacles and other entities.

This document provides a detailed description of each of these components.

For a full reference on all types in Apex Steer, please refer to the Apex Steer API help file.

# Unit Components

## Steer For Blocked Cell Repulsion

This component prevents units from colliding with obstacles and blocked cells in general.

It is an optional component, but it can be useful to prevent units from hitting walls etc. when avoiding other units. This is especially true for kinematic rigid bodies.

Property	Description
Draw Gizmos	If true, draws debug information, including the last cell repulsion vector.
Radius Margin	A margin added to the unit's radius when it considers whether it overlaps with a blocked cell
Repulsion Strength	A factor used for multiplying the repulsion vector, i.e. this factor explicitly sets the repulsion vector magnitude
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.

## Steer For Containment

This component prevents units from falling into holes, off ledges or off the map.

Property	Description
Buffer Distance	How far away in meters, from the unit, it height samples in 4 directions. Note that this value is added to the unit's radius, so small values are recommended
Draw Gizmos	If true, draws debug information, including the latest containment vector.
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.

### Steer For Formation

This component keeps units in formation if the group has been assigned a formation. Formations are held whenever possible, that is as long as the units have enough space. If the need to avoid other units or obstacles, the formation will be temporarily abandoned.

Property	Description
<b>Debug Draw</b>	If true, draws debug information including the desired formation position and the formation indices.
<b>Drop Formation On Arrival</b>	Controls whether the unit will drop its formation on arrival and instead allow other steering components to control the unit's behaviour.
<b>Max Formation Radius</b>	The maximum distance at which this unit still responds to its formation. Outside of this radius (from the group) the formation is ignored.
<b>Sampled Cell Count</b>	How many cells ahead the formation samples. If any sampled cells are blocked, the formation is dropped temporarily.
<b>Sampling Update Interval</b>	How often cell sampling is done, load balanced, towards the formation position and towards the model unit.
<b>Arrival Distance</b>	The distance from the final destination where the unit will stop.
<b>Auto Calculate Slowing Distance</b>	Determines whether the slowing distance is automatically calculated based on the unit's speed and deceleration capabilities.
<b>Slowing Algorithm</b>	The algorithm used to slow the unit for arrival.
<b>Slowing Distance</b>	The distance within which the unit will start to slow down for arrival.
<b>Priority</b>	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
<b>Weight</b>	The weight this component's input will have in relation to other steering components.

### Steer For Separation

This component ensures that units keep a certain distance to each other. While moving it keeps units within the same group at a set distance from each other. When units have arrived this component will cause them to evade other units that come close, mainly in order to allow units to yield their position to other units that intend to arrive at the same position.

Property	Description
<b>Blocked Neighbours Behaviour</b>	Controls the behaviour when the unit is next to blocked cells. Keeping full separation may result in unwanted oscillation.
<b>Draw Gizmos</b>	If true, draws the last separation vector as a Gizmo.
<b>Maximum Units To Consider</b>	The maximum surrounding units to consider when calculating the separation vector. This is only honoured if the scanner sorts units by distance.
<b>Minimum Force Magnitude</b>	A factor used for ignoring separation vectors of less magnitude than this value.
<b>Separation Distance</b>	The distance at which units are at rest with each other, i.e. if the distance between two units center + radius is less than this value, they will separate.
<b>Separation Strength</b>	How much force is applied on separation vectors - as a percentage of the maximum acceleration, when not swarming (arrival).
<b>Arrival Distance</b>	The distance from the final destination where the unit will stop.
<b>Auto Calculate Slowing Distance</b>	Determines whether the slowing distance is automatically calculated based on the unit's speed and deceleration capabilities.
<b>Slowing Algorithm</b>	The algorithm used to slow the unit for arrival.
<b>Slowing Distance</b>	The distance within which the unit will start to slow down for arrival.
<b>Priority</b>	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
<b>Weight</b>	The weight this component's input will have in relation to other steering components.

### Steer For Unit Avoidance

This component prevents units from colliding with each other.

Property	Description
<b>Ignored Units</b>	Defines which types of units are ignored by this unit in relation to unit avoidance
<b>Accumulate Avoid Vectors</b>	Whether to accumulate all avoid vectors (true), or only avoid the first perceived unit (false). If false, the SteeringScanner on this unit must sort units with distance. When true, groups generally form lanes when avoiding other groups. When false, groups generally interweave when avoiding other groups.
<b>Draw Gizmos</b>	If true, draws the latest avoidance vector and the last avoided position as gizmos.
<b>Head-On Collision Angle</b>	The angle in degrees used for evaluating whether a collision is head-on, i.e if the angle between units' velocities is greater than this value in degrees, the collision is considered head-on
<b>Minimum Avoid Vector Magnitude</b>	A factor defining the minimum magnitude that an avoidance vector must have, otherwise it is ignored
<b>Prevent Passing In Front</b>	When true this unit will attempt to avoid behind other units, instead of avoiding in front of them. Only applies to units with a higher determination.
<b>Radius Margin</b>	A margin added to the unit's radius when it considers whether it overlaps with another unit.
<b>Priority</b>	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
<b>Weight</b>	The weight this component's input will have in relation to other steering components.

### Steer For Vector Field

This component steers units along a vector field.

Property	Description
Arrival Radius Margin	This radius margin is added to the unit's radius and used to evaluate whether <code>hasArrivedAtDestination</code> is true, i.e. when the distance to the destination is less than the radius plus this margin.
Arrival Distance	The distance from the final destination where the unit will stop.
Auto Calculate Slowing Distance	Determines whether the slowing distance is automatically calculated based on the unit's speed and deceleration capabilities.
Slowing Algorithm	The algorithm used to slow the unit for arrival.
Slowing Distance	The distance within which the unit will start to slow down for arrival.
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.

### Steer For Jump

This component allows the unit to jump if told to do so.

Property	Description
Default Force	The default force power used for jumping.
Default Height	The default height that jumping reaches.
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.



### Steer For Auto Jump

This component will make units jump when they need to scale terrain of a certain height.

Property	Description
Minimum Height To Jump	The minimum height of elevated terrain to cause the unit to jump.
Scan Distance	How far ahead the unit will scan for elevated terrain that it needs to jump onto.
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.

### Steer To Align With Model Unit

This component will make the unit align its heading with that of the group's model unit.

This basically causes a group to always face the same direction when not moving.

Property	Description
Priority	The priority of this orientation behaviour relative to others. Only the behaviour with the highest priority will influence the orientation of the unit.
Slowing Algorithm	The algorithm used to slow the unit's rotation
Slowing Distance	The distance within which the unit will start to slow down its rotation speed to smoothly 'arrive' at the designated rotation

### Steering Scanner

This component supports steering components by supplying information on other units in the vicinity.

Property	Description
Filter Away Units in Same Group	If true, the scanner does not return units in the same transient group as this unit, if false returns all units within scanRadius.
Forecast Distance	If not 0, the position used as origin for the overlap sphere cast is projected in velocity direction by this magnitude. This distance is always capped by scanRadius.

<b>Scan Interval</b>	How often the load balancer executes this scanner. Lower values grant better behaviour, but higher values grant better performance
<b>Scan Radius</b>	How large a radius this scanner scans units in, i.e. how far away other units and blocks can be and still be perceived. Higher values grant better behaviour, lower values better performance.
<b>Sort Units With Distance</b>	If true, the scanner sorts all scanned units according to their distance to this unit (nearest first). Must be true if used in conjunction with UnitAvoidance without accumulating avoid vectors.

### Steer For Seek

Mainly meant as a working example, this component causes a unit to seek a specific target.

Property	Description
<b>Awareness Radius</b>	The radius within which the seeking unit may start seeking the target (set to 0 to always seek).
<b>Target</b>	The target used for seeking
<b>Arrival Distance</b>	The distance from the final destination where the unit will stop.
<b>Auto Calculate Slowing Distance</b>	Determines whether the slowing distance is automatically calculated based on the unit's speed and deceleration capabilities.
<b>Slowing Algorithm</b>	The algorithm used to slow the unit for arrival.
<b>Slowing Distance</b>	The distance within which the unit will start to slow down for arrival.
<b>Priority</b>	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
<b>Weight</b>	The weight this component's input will have in relation to other steering components.

### Steer For Pursuit

Mainly meant as a working example, this component causes a unit to pursue another unit.

Property	Description
Awareness Radius	The radius within which the pursuing unit may start pursuing the target (set to 0 to always pursue).
Stop Radius	The radius at which the unit will slow to a stop and move no further towards the target.
Stop Time Frame	The time over which to stop as permitted by deceleration capabilities.
Target	The target used for pursuit, i.e. the target that this unit will attempt to pursue
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.

### Steer For Evasion

Mainly meant as a working example, this component causes a unit to evade another unit.

Property	Description
Awareness Radius	The radius within which the evading unit may start evading its target (set to 0 to always evade from target).
Target	The target for evasion, i.e. the target that this unit will attempt to evade.
Priority	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
Weight	The weight this component's input will have in relation to other steering components.

**Steer For Flee**

Mainly meant as a working example, this component causes a unit to flee another unit.

Property	Description
<b>Awareness Radius</b>	The radius within which the fleeing unit may start fleeing away from the target (set to 0 to always flee from target).
<b>Target</b>	The target used for fleeing, i.e. the target that this unit will attempt to flee.
<b>Priority</b>	The priority of this steering behaviour relative to others. Only behaviours with the highest priority will influence the steering of the unit, provided they have any steering output
<b>Weight</b>	The weight this component's input will have in relation to other steering components.

# Game World Components

## Vector Field Manager

This component controls which type of Vector Field is being used and allows configuration of the field.

Property	Description
Start Bounds Padding	What value the group bounds padding (the extra space added to group bounds) starts at.
Bounds Recalculate Threshold	The distance that the group's center of gravity needs to move, before the vector field is re-calculated. Set to lower value for better performance, and higher value for better behaviour.
Built-In Containment?	If units are not supposed to leave the grid that they are on (except through portals), set to true, otherwise false.
Expected Group Growth Factor	How many percentages (0.5 = 50%) the group bounds is expected to grow. Set to higher value if you expect a large separation between units.
Funnel Width	The distance from the path in meters that the funnel vector field uses for its funnel width.
Max Bounds Padding	The maximum value for group bounds padding increase, e.g. how much the group bounds can be increased.
Obstacle Strength Factor	A factor that is used to multiply the magnitude of vector field vectors neighbouring blocked cells, in order for them to have a higher contribution in the smoothing pass.
Bounds Padding Increase	How much to increase the group bounds by per increase.
Update Interval	How often the load balancer executes the vector field. Set to lower value for better behaviour, while higher values give better performance.
Vector Field Type	The desired vector field type.

# QuickStarts

Quick Starts are components that act as factories to add various other components to a GameObject.

Most quick starts will also add and setup a Game World object if one does not exist.

## Game World with Vector Fields

Adds (or updates) a Game World object to the scene and configures it for use with Vector Fields.

## Navigating Unit with Vector Fields

Adds the components necessary for a unit to navigate via a vector field. This is typically an enemy or another unit that is moved by AI instead of player interaction.

## Navigating Unit with Selection and Vector Fields

Adds the components necessary to navigate via a vector field and adds the ability to select and move a player controllable unit using the mouse or other input device.