

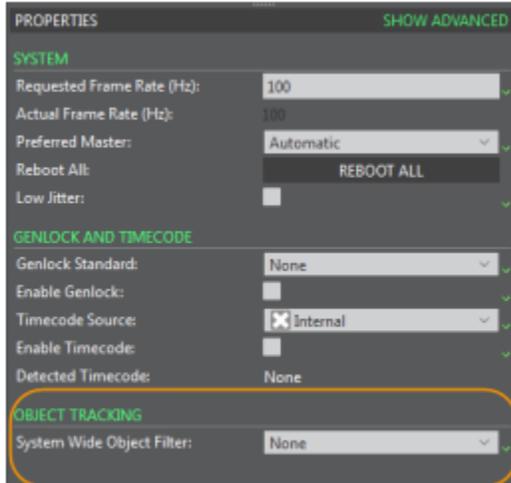
# Tracker 3.0 new features and functions

New features including the following were added to Vicon Tracker 3.0:

- [Filtering and smoothing](#)
- [Choose different smoothing options for each object](#)
- [Jitter reduction](#)
- [Improved processing](#)
- [Access Tracker data from Simulink](#)
- [Other enhancements in Vicon Tracker 3.0](#)

## Filtering and smoothing

- Location: **Resources** pane > **System** tab > **Local Vicon System** > **Properties** pane > **Object Tracking** section



Vicon Tracker 3.0 offers new filtering options to detect static objects and minimize jitter caused by marker occlusion.

In the **Properties** pane for **Local Vicon System**, the new **Object Tracking** section contains the **System-wide Object Filter** dropdown list.

To apply a filter to all objects, choose one of the options:

- **None**: No filtering of any objects (unless object-specific filtering is applied – see [Choose different smoothing options for each object](#)).
- **Motion Model**: Enables Tracker to detect static objects. When selected, Tracker outputs a constant position and orientation for an object from the time it is detected as not moving to the time it resumes motion. Use this option to clamp the position of an unmoving object to its previous known position.
- **Bias Tracking**: Applies a smoothing filter that tracks systematic errors in the camera measurements to minimize motion jitter when markers become occluded in the camera views.

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## Choose different smoothing options for each object

- Location: **Resources** pane > **Objects** tab > **Filter Mode Preset** section

Vicon Tracker 3.0 enables you to apply a One Euro low-pass smoothing filter to a selected object. Where you have multiple objects, you can apply different filtration settings to each object, enabling you to tailor the amount of filtration to the motion of the specific object.

To assist you in setting appropriate filtration for your objects, Tracker 3.0 provides the following commonly used filter mode presets:



- **None:** Apply no object-specific filtering to the selected object.
- **HMD:** Apply settings normally appropriate for head-mounted devices.
- **InteractionDevice:** Apply settings normally appropriate for Vicon Apex devices.
- **General:** Use as a general-purpose filtration type.

If none of the supplied filter mode presets is suitable for your application, you can also create and save your own custom filter mode presets, so that you can quickly and accurately apply them to other objects, as required.

#### To apply filtering to a selected object:

1. In the **Objects** tree at the top of the **Objects** tab, ensure that the object to which you want to apply the filter is selected.
2. Depending on whether you want to use an existing filtration type or create your own, do one of the following:
  - If you want to use one of the existing filter types, in the **Filter Mode Preset** section, select the required filter from the dropdown list and save the object as described in step 5.

or

  - If the required filtration type does not exist, in the **Filter Mode Preset** section, click **Manage Presets** and in the **Filter Presets** dialog box, enter a name in the **Create New Preset** box and then click **Add**.
3. In the **Filter Presets** section, ensure the new preset is selected, then in the **Smoothing** section, change the **Translation** and **Rotation** properties as required:
  - a. With **Translation Beta** set to zero, change the value of **Translation Min Cut-Off** to eliminate jitter during very slow movements. Note that decreasing the value of **Translation Min Cut-Off** reduces jitter but increases lag.
  - b. When you have finished adjusting the **Translation Min Cut-Off** value, increase the value of **Translation Beta** by very small increments to eliminate lag during faster movement. Note that 0 = filtering on all translation motion; 1 = filtering on very slow translation motion only.
  - c. Follow the same procedure for adjusting the **Rotation Min Cut-Off** and **Rotation Beta**. For detailed information on the One Euro filter and how to adjust these settings, visit [www.lifl.fr/~casiez/1euro/](http://www.lifl.fr/~casiez/1euro/).
  - d. When you have finished adjusting the properties, click **Close**.
4. On the **Objects** tab, make sure that in the **Filter Mode Preset** section, the required filter is displayed for the selected object.



#### Tip

To apply a filter to an Apex device, select the device and in the **General** section of the **Properties** pane, from the **Filtering Type** list, select the required filtering type.

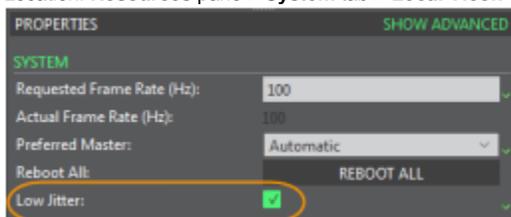
5. Save the object by right-clicking it the **Objects** list and selecting **Save Object** from the context menu.

Tracker saves the contents of the object in a .vsk file in the **Objects** folder.

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## Jitter reduction

- Location: **Resources** pane > **System** tab > **Local Vicon System** > **Properties** pane > **System** section > **Low Jitter** option



To enable you to minimize jitter in marker positions while tracking objects, a new **Low Jitter** option is now available in **System** properties.

This option sets the **Grayscale Mode** for all cameras to **Only** (this is necessary to enable jitter reduction to work), and applies Tracker's jitter reduction algorithms to the current data. This reduces noise in the data by using advanced centroid fitting and other jitter reduction measures.

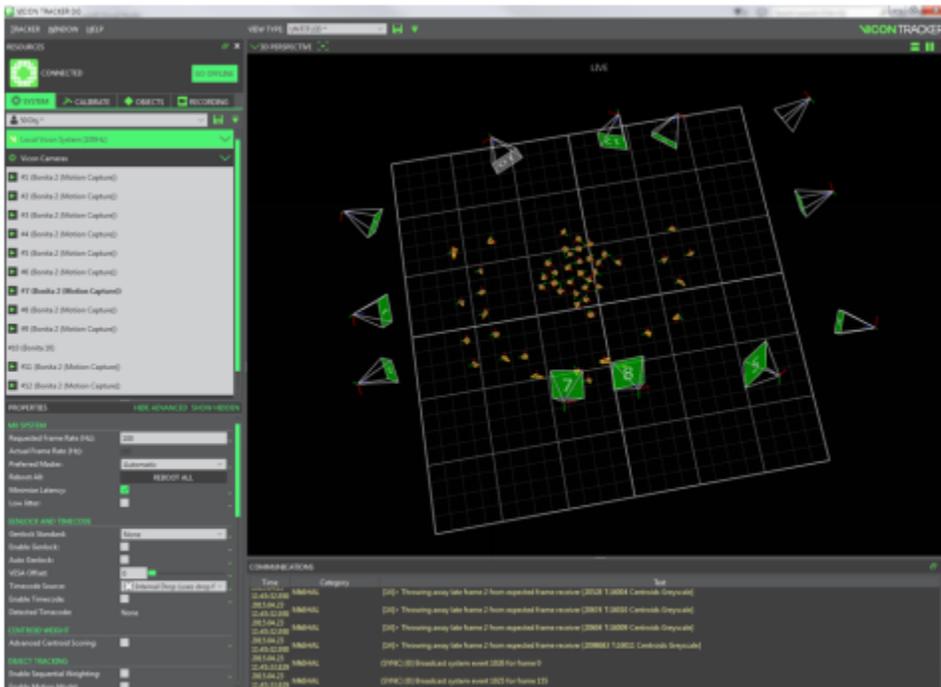
### ⚠ Caution

Low jitter mode is more sensitive to bandwidth limitations than previous versions of tracking and its effectiveness is related to system size. For further information on the impact of using low jitter mode with your system, contact [Vicon Support](#).

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## Improved processing

Vicon Tracker 3.0 has been re-engineered to significantly reduce processing latency and improve processing frame rate, even with high numbers of tracking objects and cameras, by making full use of modern multiple-core CPUs.



Improvements in processing rate mean that end-to-end latency may also be reduced by increasing the Vicon camera frame rate.

## Access Tracker data from Simulink

See [Access Vicon Tracker data from Simulink](#).

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## Other enhancements in Vicon Tracker 3.0

Further enhancements and updates including the following have been made in Tracker 3.0:

- [Calibration error displayed in millimeters](#)
- [Easier setup of Apex devices](#)
- [New hotkey/Tracker shortcut](#)
- [Auto-naming of new objects](#)
- [Additional VRPN output](#)
- [Easier upgrading](#)
- [Improved analysis and troubleshooting for captured data](#)

- New Track mode minimizes output latency
- Set Camera view background to Threshold value
- Automatic selection of cameras and view for masking and calibration
- Change in Shared data locations
- Change in default Minimum Cameras to Start Trajectory

## Calibration error displayed in millimeters

- Location: **Resources** pane > **Calibration** tab > **Camera Calibration Feedback** section > **World Error** column

CAMERA	WAND COUNT	WORLD ERROR	IMAGE ERROR
#1 (MX T160)	2569	0.154046	0.179132
#2 (MX T160)	2118	0.19691	0.194675
#3 (MX T160)	3353	0.164636	0.16925
#4 (MX T40...)	2205	0.254085	0.128648
#5 (MX T160)	3922	0.137991	0.115596
#6 (MX T160)	2663	0.1741	0.158016
#7 (MX T160)	2593	0.156798	0.143857
#8 (MX T160)	4157	0.201622	0.16482
#9 (MX T160)	3077	0.148689	0.108592
#10 (MX T4...)	1819	0.175485	0.116204

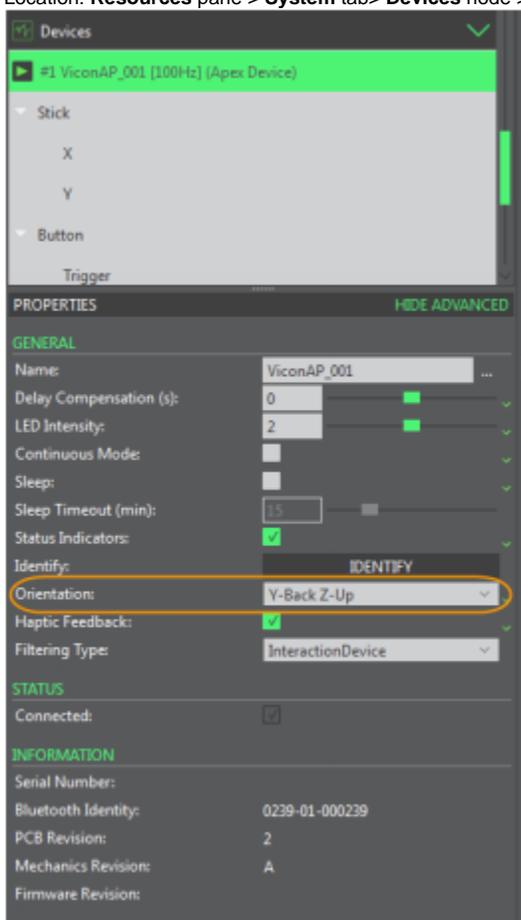
In Tracker 3.0, the **World Error** column in the **Camera Calibration Feedback** section displays the calibration error in millimeters, giving you a sense of how much the errors in the camera contribute to the reconstruction of object pose error.

World error is calculated per camera from the **Image Error** in pixels and the distance of the camera to the center of the volume. Cameras further away display a higher **World Error** than cameras closer to the center of the volume with the same image error.

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## Easier setup of Apex devices

- Location: **Resources** pane > **System** tab> **Devices** node > **Apex device** node > **Properties** pane > **General** section



In the **Properties** pane for the selected device, the **General** section enables you to select from the following orientation options for the device coordinate system:

To facilitate the setting up of Apex devices within a virtual environment, Vicon Tracker incorporates options for the device axes.

- Y-Back Z-Up
- Y-Forward Z-Up
- X-Back Z-Up
- X-Forward Z-Up

This property is saved in the .system file.

The **General** section also contains the new **Filtering Type** field, where you can specify the filtering type for the selected Apex device. For more information on filtering types, see [Choose different smoothing options for each object](#).

## New hotkey/Tracker shortcut

A new hotkey (CTRL+E) creates a named object from selected markers.

This provides the same functionality as pressing the **Create** button in the **Create Object** section of the **Objects** tab.

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## Auto-naming of new objects

- Location: **Resources** pane > **Objects** tab > **Create Object** section

When you enter a name in the **Create Object** text box and click **Create**, the name is automatically incremented by 1, so that, to create another object with the default name of **ObjectName\_n**, you can just select the required markers and click **Create**.



## Additional VRPN output

- Location: **Resources** pane > **System** tab > **Local Vicon System** > **Properties** pane (to see all options, click **Show Advanced**) > **VRPN Stream** section



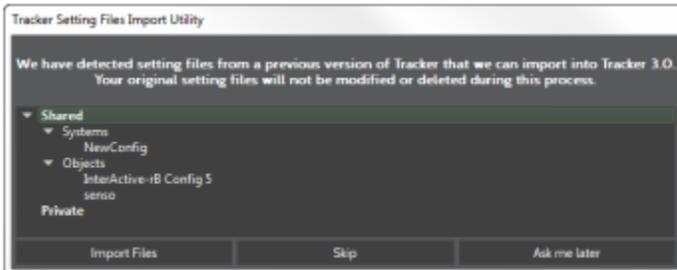
If you are rendering the same object to different display types (for example, to both a large screen and an immersive environment such as a head-mounted display), to obtain smooth visualization on both display types, you are likely to need to apply different amounts of filtration for each.

To enable you to do this, Tracker 3.0 provides a second set of VRPN Trackers, which are output with the existing ones. For easy identification, the names of this second set of VRPN Trackers are suffixed with `_2`.

The second set of VRPN Trackers includes customizable One Euro filtering. (For information on adjusting the filtering parameters, see [Choose different smoothing options for each object.](#))

## Easier upgrading

To make data migration easier between Tracker upgrades, you are given the option of migrating and updating shared user data stored in the old location (ProgramData\Vicon\Tracker) into the new location (C:\Users\Public\Documents\Vicon\Tracker3.x).



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## Improved analysis and troubleshooting for captured data

- Location: **Resources** pane > **Recording** tab

For each trial recorded, at least three files are saved: `.x2d`, `.system`, and `.xcp` files. With Vicon Tracker 3.0, an `.x2d` file containing the latest calibration data, of the format LatestCalibration yyyyymmddnnnnn.x2d, is also saved in the same location as the `.x2d` containing the recorded trial data.

The file that contains the calibration data can be useful for data analysis and troubleshooting. When you have captured a trial, you can find the calibration `.x2d` in the same location as the `.x2d` of the recorded trial.

## New Track mode minimizes output latency

- Location: **Resources** pane > **Objects** tab> **Object Tracking Mode** section> **Track** mode button



To minimize output latency, the new Track mode prevents the display of unlabeled markers in the 3D Perspective view. Because viewing unlabeled reconstructions requires additional processing, for lowest output latency, when you have finished creating objects, click the Track button to change to Track mode.

#### To turn off the display of unlabeled reconstructions:

- In the **Resources** pane, click the **Objects** tab and ensure that in the **Object Tracking Mode** section at the bottom of the tab, **Track** mode is selected.  
When Track mode is selected, the Track button is green. This mode switches off the display of unlabeled reconstructions in 3D Perspective view.

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## Set Camera view background to Threshold value

- Location: **Options** dialog box > **General View Options** section> **Threshold** option

To help you to determine the most effective threshold setting for grayscale blobs, you can set the background color of the **Camera** view to the value of the **Threshold** control in the **Centroid Fitting** section of the **Properties** pane.

To do this:

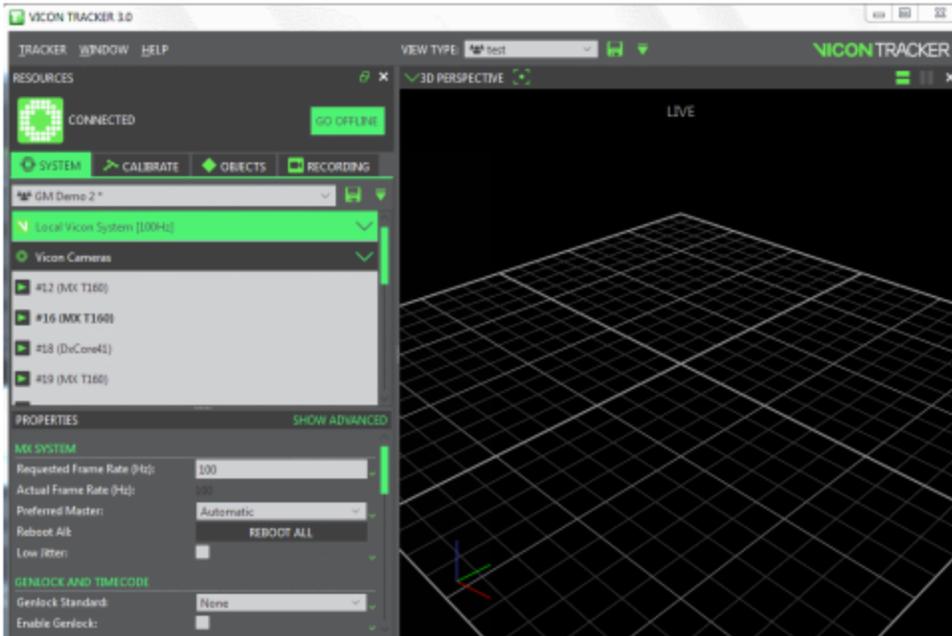
1. Open the **Options** dialog box (F7), and in the **General View Options**, select **Threshold**.
2. On the **System** tab, select the camera and ensure that the view pane is displaying a **Camera** view.
3. For each camera, in the **Properties** pane:
  - a. In the **Settings** section, ensure **Grayscale Mode** is set to **All**.
  - b. In the **Centroid Fitting** section, adjust the camera's **Threshold** settings to obtain the clearest possible view of the blobs, with minimal flickering in the **Camera** view.

## Automatic selection of cameras and view for masking and calibration

- Location: **Resources** pane > **Calibrate** tab > **Create Camera Masks** and **Calibrate Cameras** sections > **Start** button

A new time-saving feature of Tracker 3.0 improves the process of masking and calibration.

When you begin masking or calibration by clicking the Start button in the **Create Camera Masks** or **Calibrate Cameras** sections, the cameras are automatically selected and the view pane displays Camera views of all the selected cameras.



## Change in Shared data locations

In Vicon Tracker 3, data is saved in the following folders:

- Shared files are saved in the appropriate sub-folder in: C:\Users\Public\Documents\Vicon\Tracker3.x\
- Private files are saved in the appropriate sub-folder in: C:\Users\UserName\AppData\Roaming\Vicon\Tracker3.x\

## Change in default Minimum Cameras to Start Trajectory

- Location: **Resources** pane > **System** tab> **Local Vicon System** node > **Properties** pane > **Reconstruction** section

The **Local Vicon System** property **Minimum Cameras to Start Trajectory** specifies the number of cameras that must see the same marker to create a new reconstruction and potentially form a new trajectory.

In Tracker 3.0, the default value for this property is 3 (ie three cameras), so if you are using a two-camera system, ensure you change the value to two before starting to work with Tracker.

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