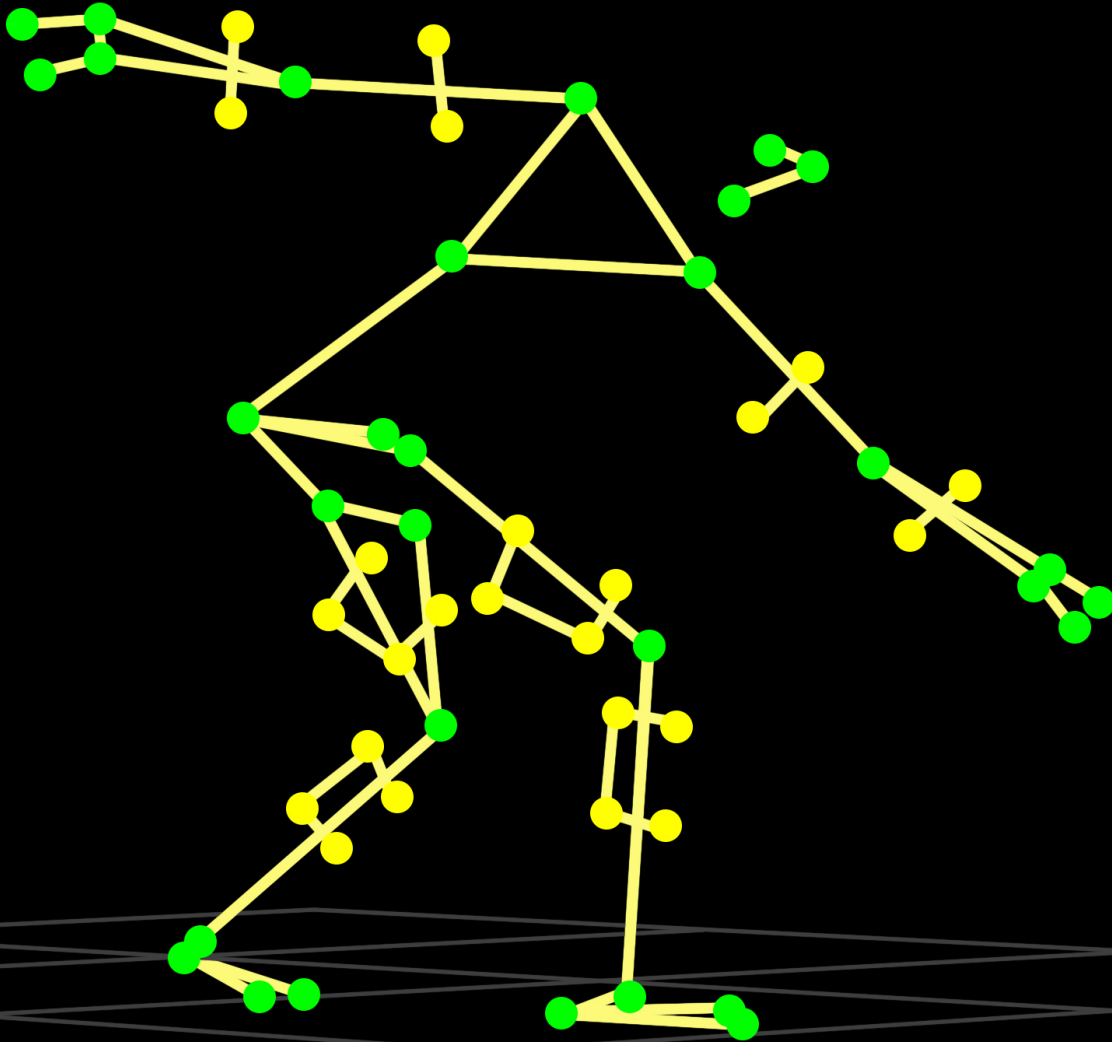


# QUALISYS TRACK MANAGER (QTM)





## ***Motion Capture software for tracking movements***

Qualisys Track Manager (QTM) is Qualisys' proprietary tracking software designed to work seamlessly with Qualisys cameras ensuring fast and precise data collection. The system allows users to perform 2D, 3D and 6DOF capture of data in real-time, with minimal latency.

QTM meets the needs of both advanced users and those who are less experienced in a range of applications. The software has integration and synchronization with force plates and EMG devices as well as real-time streaming into 3rd party analysis software.

QTM is built and developed around a set of advanced motion capture algorithms ensuring high performance, accuracy and low latency. QTM supports all Qualisys cameras. Hardware and software settings are controlled from one intuitive graphical user interface and are easily saved for future use.

### FEATURES

- 2D/3D/6DOF data tracking
- Real-time streaming
- 4ms latency
- Automatic Identification of Markers (AIM)
- Marker masking
- Skeleton Solving capabilities
- Force Plate, EMG, IMU, and eye tracker integration
- Passive and active marker support
- Video overlay
- Runs with laptop or desktop with Windows 8, and Windows 10
- Facility licensed - no dongle
- Skeleton Solving capabilities

# Tracking

## CALIBRATION

For any measurement, the system needs to be calibrated. QTM uses a dynamic calibration method. A wand is simply moved around in the volume while a stationary reference object in the volume defines the coordinate system for the capture. All settings for the calibration are controlled by QTM and the result of the calibration is visualized in a quick and intuitive way often executing in under one minute depending on the volume. Using the same setting with only a wand the refine calibration tool can be used to recalibrate in setups where it is hard to place the L-frame.

## VOLUME VISUALIZATION

QTM gives you the tools to visualize your volume in 3D once the calibration is complete. View your calibrated volume and/or show the camera view cones to help you plan your capture volume. QTM also lets you visualize camera rays after a measurement is captured, highlighting a single trajectory to count the number of cameras it is seen by.

## ACCURATE 2D / 3D / 6DOF TRACKING

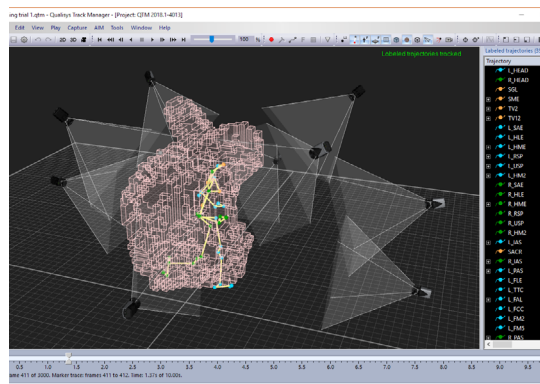
QTM's advanced 3D / 6DOF tracker computes 3D and 6DOF data from 2D marker data with minimal latency. Tracking can be done in real-time or in post-processing. In real-time, marker data is displayed on screen allowing instant confirmation of accurate data acquisition. The cameras have an architecture adapted for low latency which, together with the frame rate-independent latency of the QTM processing pipeline, provides an exceptionally low latency.

## 6 DEGREE OF FREEDOM - 6DOF

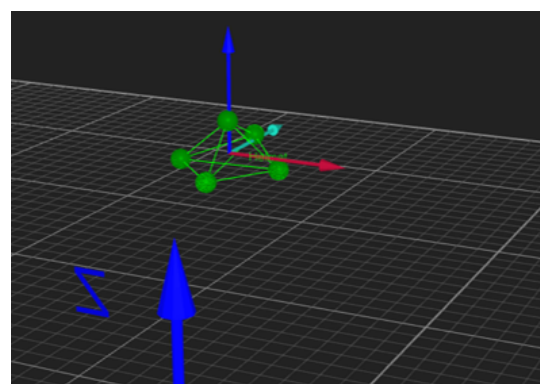
The 6DOF tracking function provides 6 Degree of Freedom (pitch, roll, yaw, x, y, z) data from user defined rigid bodies. The 6DOF data will give information about the position and rotation of a moving body. QTM can save 6DOF data and send 6DOF data over TCP/UDP in real-time.

## REAL-TIME SDK

QTM has a built-in real-time server which can be used to stream motion data (2D, 3D and 6DOF) over TCP or UDP for integration with other applications., useful for closed control loops, real-time visualizations or real-time biomechanical feedback. Use the open source real-time SDK to interface with QTM programmatically. A variety of SDKs in the major programming languages are located on [www.github.com/qualisys](http://www.github.com/qualisys). For a full list of integrated applications, visit [www.qualisys.com/software/](http://www.qualisys.com/software/).



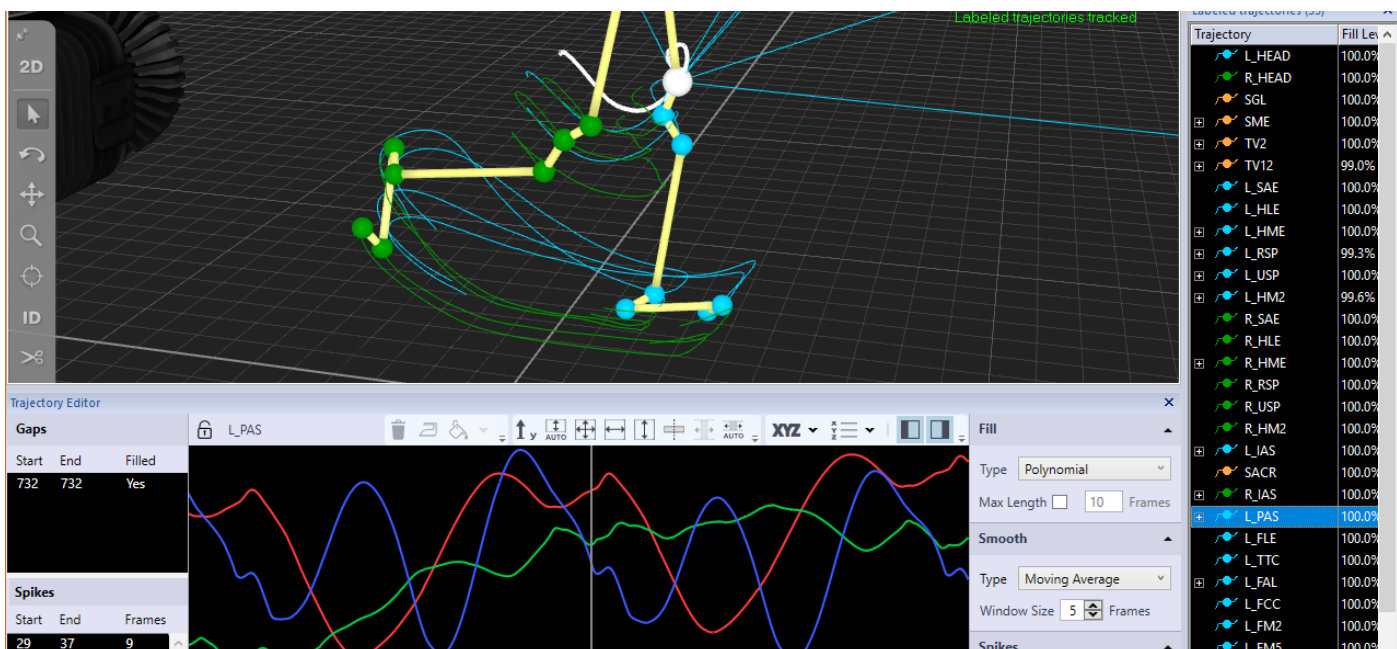
Adjust calibration settings and view the calibrated volume in QTM.



Automatically track 6DOF data in real-time allowing instant confirmation of accurate data.



Collect and visualize eye tracker data in QTM. The data is visualized as a gaze vector with a maneuverable vector trace



## Editing

### AUTOMATIC IDENTIFICATION OF MARKERS - AIM

A useful feature of the QTM software is the option to use a pre-defined Automatic Identification of Markers (AIM) model to label your markers automatically. The AIM feature allows our customers to spend less time identifying trajectories and more time performing captures or analyzing data.

The AIM model is created from an identified file and can then be applied to any measurement that captures similar motions. All markers that fulfill the rules and constraints of the AIM model will be identified. As you use the AIM model, it becomes more and more familiar with the marker set in place and the process of manually identifying and processing trajectories will no longer be necessary.

The QTM software indicates how many markers were identified in each frame of the capture, which means no more searching for missing markers. AIM works in real-time with any marker or marker set and is not limited to humanoids.

### EASY TRAJECTORY EDITING

With a built in Trajectory Editor tool, identifying, editing, and processing trajectories has never been easier. The Trajectory Editor can open as a separate window to make your workspace easier to manage as you use the tool to locate and fill any gaps or detect and smooth artifacts.

### GAP-FILL BASED ON TRAJECTORIES

In some cases, markers may be completely covered and impossible to be tracked. With the gap-fill feature, you can identify, select, and fill gaps using a graphical representation of the captured and missing data. Gaps can be interpolated as a linear connection of the trajectory edges, a cubic polynomial interpolation between the edges, or they can be filled based on the movement of the surrounding markers which QTM categorizes as Relational.

### VIRTUAL MARKERS

In addition to the interpolated gap-fill features, QTM allows you to virtually fill the data in the selected range. By choosing the Static fill option, you specify the fixed X, Y, and Z values of the trajectory. Alternatively, you can create a virtual marker by specifying 1-3 context markers used to define a new one.

### SMOOTHING AND SPIKE DETECTION

QTM's Trajectory Editor allows you to detect spikes, or artifacts, in your measurement, and smooth them as you find fit. Artifacts are detected based on the acceleration threshold, which can also be adjusted in QTM. Artifacts are plotted in the Trajectory Editor window to aid in the selection and analysis of artifacts. Smooth the artifact in a selected frame range by means of an unweighted moving average or through a low-pass filter.

# Processing

## PROJECT AUTOMATION FRAMEWORK

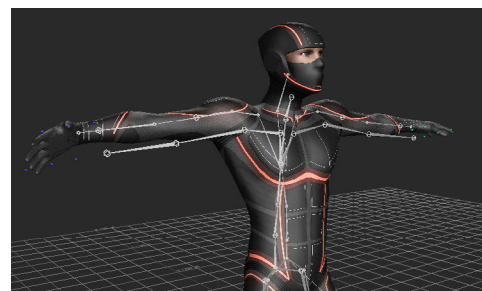
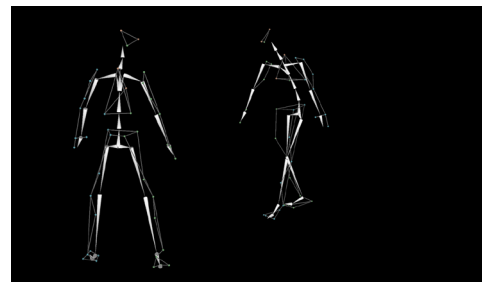
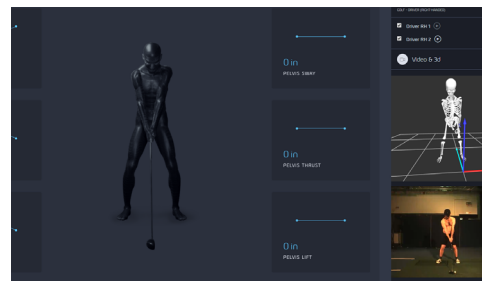
Project Automation Framework, or PAF, is a framework used to create QTM projects with extended functionality, also known as analysis modules. Project Automation Framework allows you to create your own analysis pipeline and run it directly from Qualisys Track Manager. The end user will never have to see the analysis code and can treat it as a black box. Available modules include Golf, Baseball, Running, Cycling, and Gait Analysis, in which each module, data is collected in QTM is processed as an interactive Web Report.

## BATCH CAPTURE AND PROCESSING

Speed up the time from data acquisition to analysis by capturing and processing a set of measurements in an automated way within QTM. The measurement files are then automatically processed and saved.

## KINEMATIC SOLVER

QTM uses a proven and very robust inverse kinematics solver that is capable of dealing with occluded markers in challenging multi-character takes. By using the pre-defined animation marker set in QTM, you will be capturing and streaming live skeletal data in no time. Skeletons are created and solved in QTM and can be streamed in real-time or skeletal data can be exported as an FBX and imported to the external game engines or animation software of your choice.



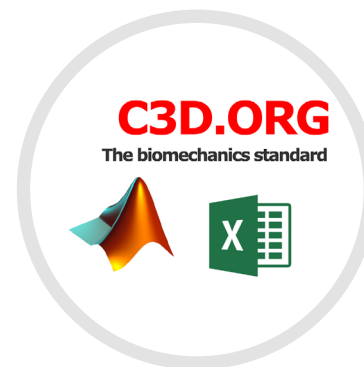
### A/D Signal Acquisition

QTM has integrated support for 64-channel & 16-channel A/D-interfaces. Through the A/D-interface, basically any type of signal can be acquired synchronously with motion data.



### Control QTM via HTTP

QTM comes with a built-in web server that exposes a (RESTful) HTTP API making it possible to run commands as well as read, create, modify & deleting PAF resources via client applications.



### Export

Export 3D data to C3D format for use in Visual3D and more. Skeletal data can be exported as an FBX. Export 3D/6DOF/force/analog data to MATLAB and LabVIEW or to tab separated value files.

# Integrations

## Hardware

### External hardware

Analog and digital data from devices such as EMG, force plate, IMUs and eye tracking devices can be recorded and collected along with mocap data. View and plot data in different window layouts as a captured file or in real-time.

### External timebase

The system can be synchronized to a periodic TTL signal. It is also possible to use a time code signal as an external timebase source. SMPTE and IRIG standards are supported.

### Video devices

Video cameras can be connected for a synchronized video with the 3D capture. QTM can capture video from DV cameras, webcams and via HDMI input. Using Qualisys video cameras, 3D data can overlay the 2D video image.

### Open Sound Control (OSC)

The stream of identified 3D data, 6DOF data and/or analog data can be packaged in OSC messages for transport over UDP/IP to an OSC-aware software such as Max/MSP/Jitter.

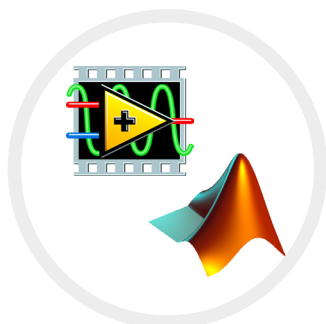
### Passive & active markers

QTM can use both passive and active markers with the same camera system. The short range active marker is a light weight active marker, which can be used in situations when it is hard to use the passive markers.

### Precision Time Protocol (PTP)

PTP is the most powerful and accurate way to synchronize devices connected to an Ethernet network. Use an external clock master that utilizes GPS satellite signals to get the most accurate time..

## Software



LABVIEW & MATLAB



UNREAL



MOTIONBUILDER



UNITY



MAYA



ICLONE

# Project Automation Framework

The Project Automation Framework (PAF) for Qualisys Track Manager (QTM) is a customizable infrastructure that lets you automate repetitive tasks in your work flow, effectively streamlining the motion capture process for any particular application.

Clicking the Start Processing button triggers data export from QTM and report generation, often using processing software such as Visual3D.

This makes PAF the perfect tool where data must be collected according to a specific protocol, for example in a research study.

Pre-defined modules exist for a number of applications, including gait, running, cycling, golf and baseball. These modules export as interactive web reports giving coaches and athletes a sharable and comprehensive Web report. Alternatively, the PAF built into QTM allows you to create your own analysis module. Use Visual3D, Matlab, Python, Excel or any other application to do the biomechanical calculations. Example modules are available for free download at <https://github.com/qualisys/paf-resources>.

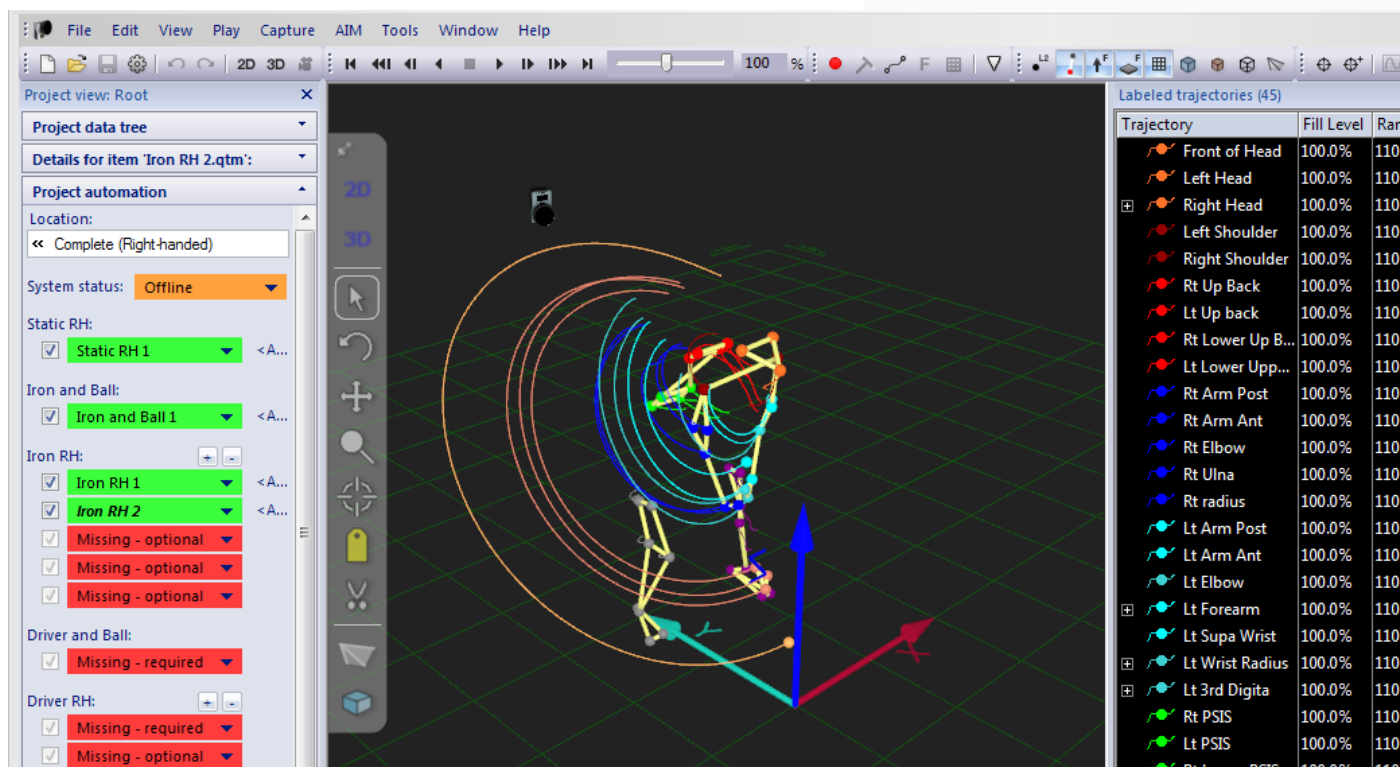
PAF modules come with a finished template for creating reports in Microsoft Word and select modules come with a customizable, interactive web report where you can add your own comments or training advice. The results are presented in an attractive design and user-friendly layout.

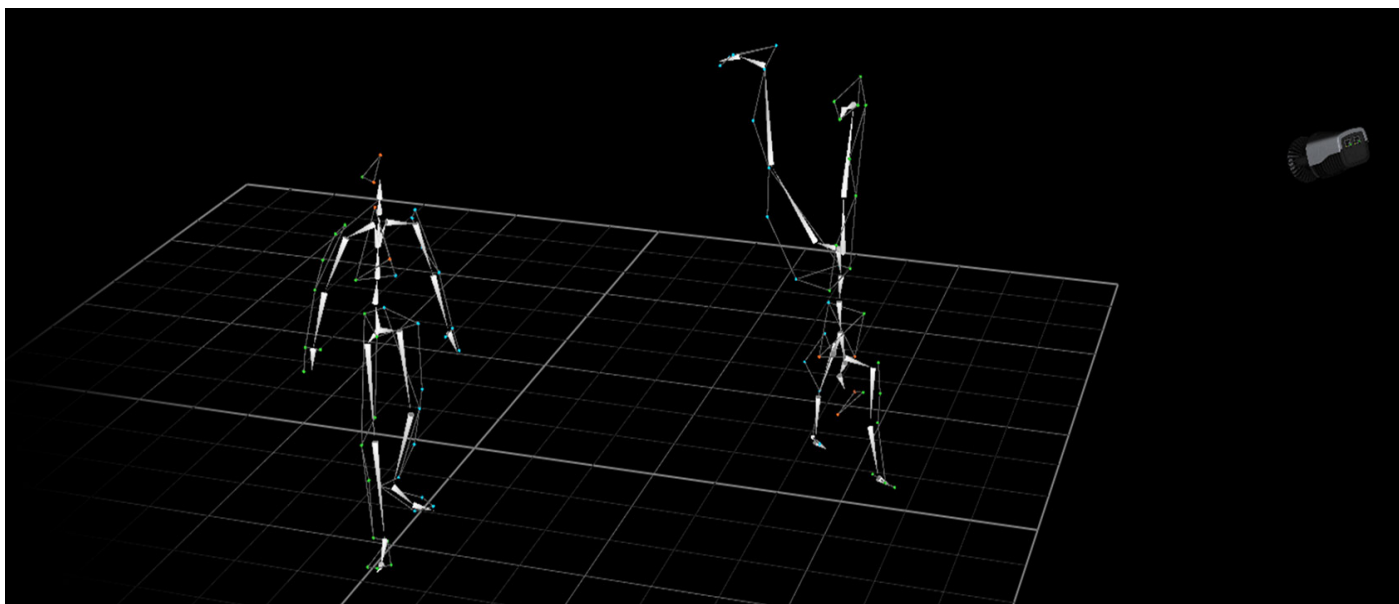
## FEATURES

- Unified project work flow
- Automated report generation
- Ability to create custom modules
- Meta data management
- Full QTM integration
- Not limited to single marker set

## AVAILABLE MODULES

- Gait and Clinical Gait
- Golf Performance
- Running
- Cycling
- Equine
- Baseball
- Create-your-own





## Kinematic solver

QTM uses a proven and very robust inverse kinematics solver that is capable of dealing with occluded markers in challenging multi-character takes. By combining skeleton solving with our Automatic Identification of Markers (AIM), you can capture advanced setups in a simplified work flow. Capturing crouching, wrestling and lying on the floor have never been this straight-forward. The calibrated skeleton will track and stream even when markers are unseen.

QTM has full-featured plugins for Unity, Unreal Engine, MotionBuilder, Maya, and iClone, which makes integration a breeze. Record and export skeletal data in FBX format for use in a variety of third party software. All full-featured plugins are released as open source C++ software and are available for download on [www.github.com/Qualisys](https://www.github.com/Qualisys) or on the Qualisys website under the name Qualisys Connect.

## FEATURES

- Direct streaming
- No middleware or third-party software needed
- Free plugins available for download
- Available for Maya, MotionBuilder, Unity, iClone and Unreal
- Works with multiple marker sets
- Track and stream multiple bodies simultaneously
- Export characters, skeletons, optical markers, & MotionBuilder actors to FBX

## STAY UP TO DATE

Major updates are released about 2 times annually. If you are within support warranty, access the QTM updates by visiting your Qualisys dashboard at <https://www.qualisys.com/my/>

If you are no longer within warranty or if you have any other questions regarding QTM, contact your regional sales manager or support representative to renew your support license and for additional information.

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