

The M.O. UFC 'Freedom 250' at The White House

Camera tracking service provision for global live events



Project Overview

On 14th June 2026, the South Lawn of the White House became the most scrutinised sports venue on earth.

To mark 250 years of American independence, the UFC staged a live fight night – ‘Freedom 250’ – in partnership with national broadcaster CBS, with the White House as the backdrop and over 100 million eyes watching.

For the coverage of the event, streamed live on the Paramount+ service, the broadcast would include immersive AR graphics for statistics and ‘tales of the tape’.

The AR graphics were to be applied to two specific camera feeds at the event - a large camera crane system to be tracked by Mo-Sys and an overhead CableCam rig that would be operated and tracked by another provider.



Project Partners



UFC
Organisers of the live event, working with their broadcast team who oversee all UFC events.

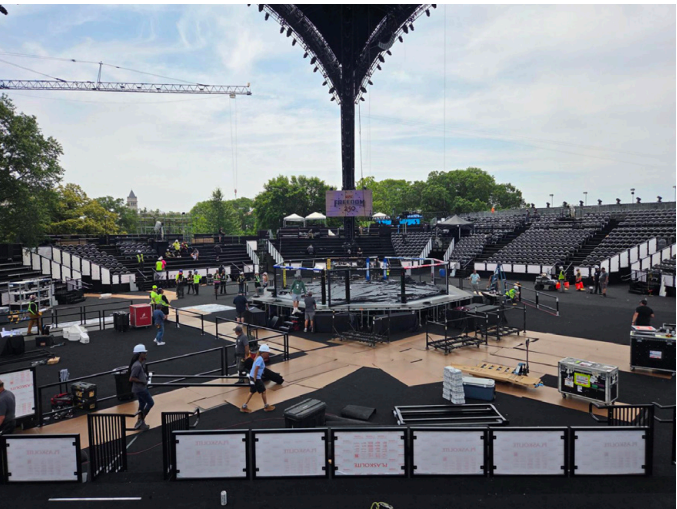


CBS
Official Broadcast partner of the UFC – streaming the event on Paramount+.



Mo-Sys
Providing camera tracking technology and operators for the full live event

The Challenge



On short notice, Mo-Sys was brought in by CBS to provide camera tracking to support 3D augmented overlay graphics. The CBS team needed rock-solid camera tracking on a 45-foot crane, and Mo-Sys had almost no time to prepare.

There would be multiple challenges to overcome on this project, as the production would be staged outdoors, in the open air, starting in daylight and continuing into the night, with a large crowd moving about the area.

Operational flexibility was further limited by the technologies already deployed by the production and the extremely strict security protocols.

The crane arm itself was to be positioned away from the canopy, known as 'The Claw', that had been erected over the octagon. This would make conventional marker placement impractical. Under such circumstances, Mo-Sys would normally recommend mechanical tracking; however, due to grip equipment requirements, this was not possible.

Given the short time frame, Mo-Sys not only provided the tracking technology but also sent its lead engineers to personally operate and oversee the tracking for the entire event.

“StarTracker Max is the most accurate, robust and reliable camera tracking available. It’s ideal for studios and indoor spaces where permanent markers can be applied to the ceiling, walls or floor, in order to create a unique map that the sensor can calculate the camera’s position from.

For outdoor tracking scenarios, we often recommend mechanical tracking, depending on the requirements. For example, if the camera is on a crane that stays in a fixed position, you can go mechanical, but if the whole crane needs to move, then you need StarTracker.

James Uren - Chief Technology Officer

“Markerless tracking is a very appealing concept – just calibrate and track, without any prep. However, most markerless trackers are prone to drift over time, making them unreliable for broadcast. At Mo-Sys, we use VisionMax, our own markerless technology, as a fallback system, supporting continuous tracking if StarTracker Max loses line-of-sight with all stars.”

Martin Parsley - Lead Developer, Optical Tracking

Camera Tracking Methods

Marker-Based Optical Tracking

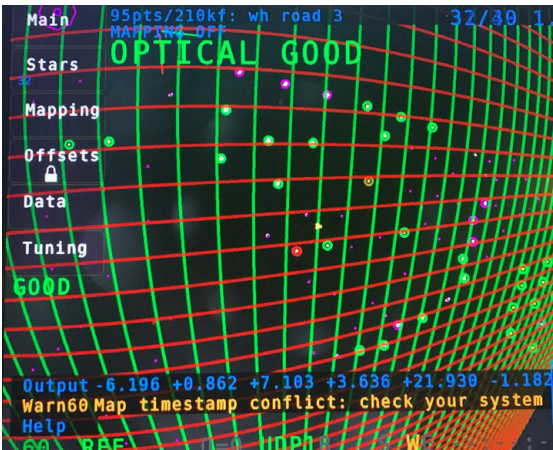
Marker-based tracking uses fixed reference markers to deliver consistent accuracy, stability in changing light, making it a strong fit for studios. Mo-Sys StarTracker is an inside-out system, where the sensor is mounted directly on the camera, observing a unique map of markers to calculate position. That makes it highly robust against occlusion and lighting changes. For the UFC event, Mo-Sys would deploy StarTracker Max.

Mechanical Tracking

Mechanical camera tracking uses mechanical encoders, either embedded in the grip equipment or mounted to it, in order to calculate exact rotational movement. All Mo-Sys remote heads have encoding built-in as standard, making them AR graphics-ready. Due to the complex challenges associated with the staging of the event, along with the grip equipment and production requirements, this alternative solution was not possible.

Markerless Optical Tracking

Markerless tracking identifies natural features using vSlam algorithms, tracking the movement of these features in real-time to calculate camera movement. This allows for faster deployment and less preparation, which suits temporary or location-based productions. However, performance depends more on the visual environment, which in this case would be changing drastically over the course of the event, requiring constant recalibration due to lighting changes and crowd movement.



Deployment



Once on site, the Mo-Sys team determined that, due to the distance from the canopy, they would use an alternative tracking marker method, placing the retroreflective ‘stars’ on the floor.

Over the course of the preparation, the team mounted tracking markers on low stakes across the lawn below – stable enough not to shift within

a compact space whilst avoiding disruption to the site.

The site, however, was constantly evolving. The Federal Parks Service were required to lay down fresh turf that would have to cover the markers, as well as arranging new foliage around the main staging area for the event.

Late-stage decorative decisions also included the addition of white pebble paths, which had the potential to significantly impact the optical sensor’s ability to detect the markers amidst all the additional visual ‘noise’.

“Our team have a long track record of world-class service and support, and our clients know that when they work with Mo-Sys, they don’t just get the equipment, they get a production partner with the expert knowledge and experience to help them at every stage of the journey.”

For global productions such as this, we will often send our top engineers, who actually develop the technology, giving our clients the reassurance that whatever happens during the event, they have the global leaders on-site to make sure the tracking stays on point.

Selin Kemal - Managing Director

Rehearsals

Rehearsals ran during the day, but the actual show would run into the night. However, this meant the Mo-Sys team were able to push the tracking to its absolute limits, creating an adaptable workflow that would ensure stable performance throughout the event.

Full sun washed out the markers positioned around the new white pebble paths. The team therefore placed black carpet underneath the markers to increase contrast and visibility to the sensor.

During late-stage preparations, the team would face additional challenges, including forklift trucks that would drive over paths with markers on them. Other markers were inevitably disturbed as the Parks team had to water the lawn and foliage, and occasional thunderstorms would shower the area.

Closer to the live broadcast, the production team decided that the Mo-Sys-tracked crane would be the sole feed for AR graphics for the entire event.

In the midst of all this, the production team were still refining the graphics, adjusting their scale to make them impressive enough, without limiting the camera movement.

“Not As the production was at such a unique venue and had been put together on relatively short notice, one of the biggest takeaways from the rehearsals for our team was that the staging of the event would be subject to constant change.

This meant we would have to remain constantly vigilant throughout the lead-up and into the broadcast itself, standing by to adapt as necessary.”

Martin Parsley – Lead Developer, Optical Tracking



The Live Event

The initial daylight portion of the broadcast went as planned, with the adapted marker map holding firm. Once the event shifted to evening, and then night, the black sky provided similar conditions to that of an indoor studio. This allowed the Mo-Sys team to switch to more standard settings, no longer having to compete with direct sunlight!

However, the nature of the live event meant they would still have to be ready to adapt on the fly. During broadcast, the team would add additional markers to increase accuracy, as well as using environmental features, such as printed logos on the event floor that featured the US flag, which, of course, included its own stars.





The Outcome

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The best tracking is the tracking you don't notice.

We got the call less than two weeks out for a broadcast of global significance. Despite adverse conditions and continual disruption to the tracking process caused by the intersection of so many different non-broadcast related stakeholders, our team of camera tracking professionals were able to improvise, achieving a seamless result.

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Michael Geissler - CEO



StarTracker Max was deployed on a 45-foot crane, in an open outdoor environment, under conditions that would easily have defeated a less robust system.

When unrehearsed events risked reducing the stability of the tracking, the expert Mo-Sys team were on hand to adapt and ensure a seamless viewing experience for over a hundred million viewers worldwide.

mo-sys

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