



LOGIPIX

# STADIUM VIDEO SURVEILLANCE SOLUTION

[www.logipix.com](http://www.logipix.com)





# STADIUM VIDEO SURVEILLANCE SOLUTION

The Logipix stadium solution was designed to keep stadium crowds under surveillance before, after and during events with a resolution level that is high enough to identify all individuals. The system helps maintain safety in stadiums as operators can quickly respond to any suspicious or critical situation. They can inform and navigate security staff effectively, and they can also investigate prior incidents collecting irrefutable visual evidence.







## OUR EXPERIENCE IN THE STADIUM INDUSTRY

The Logipix Stadium Video Surveillance Solution has been deployed in more than 70 stadiums around the globe to date. Among many prestigious venues, the main stadiums of 2018 FIFA World Cup have been equipped with the Logipix system, which proved its capabilities during the games. More than a decade has passed since our first stadium project, meanwhile the system has been continuously and progressively evolved. Now it is the 4th generation of the solution.

## MORE THAN 70 STADIUMS WORLDWIDE

59 %

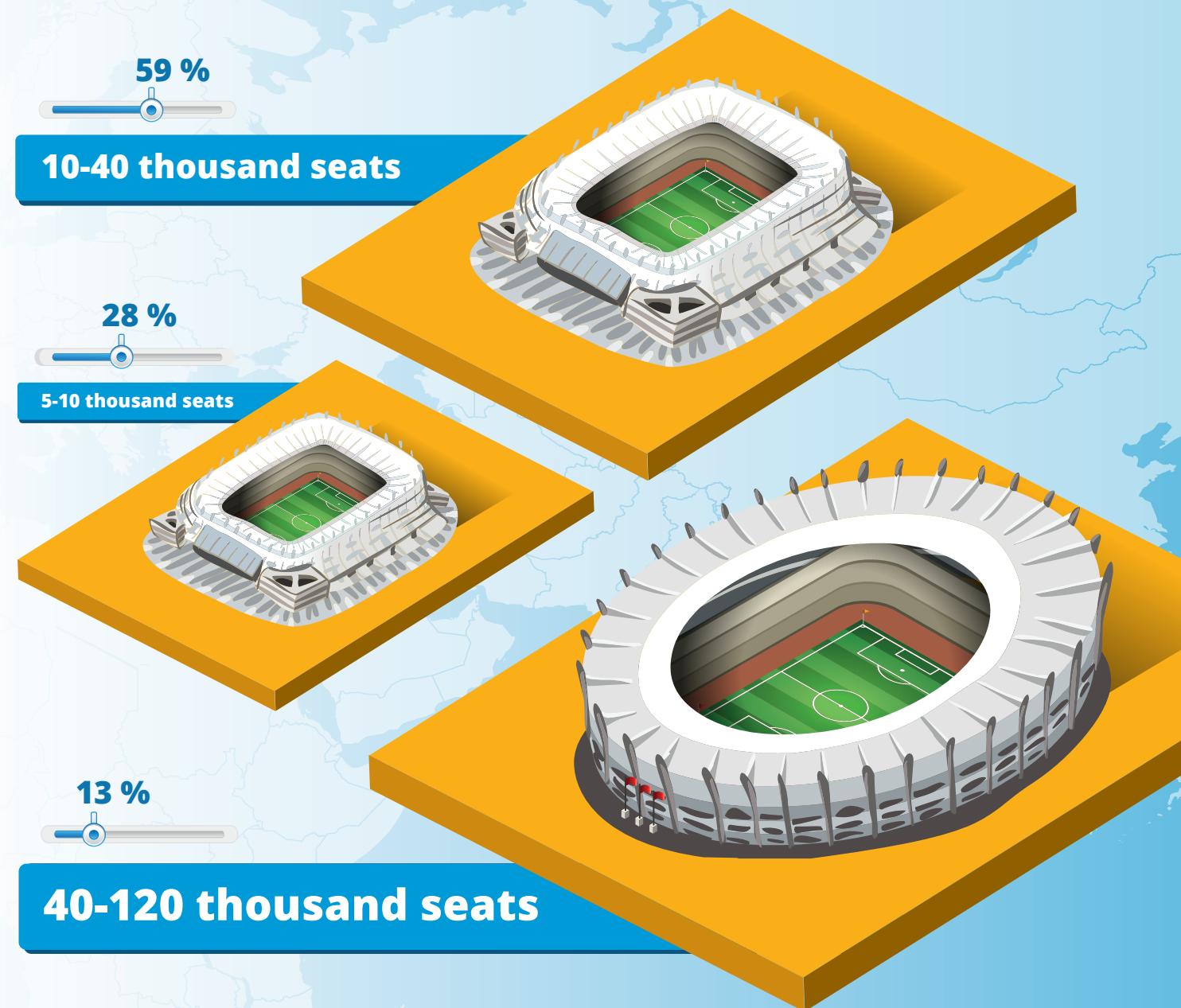
10-40 thousand seats

28 %

5-10 thousand seats

13 %

40-120 thousand seats







## YOU NEED OUR SYSTEM, IF YOU WOULD LIKE TO...

- equip your stadium with a video surveillance system that complies to FIFA and UEFA regulations
- have a high-end video surveillance system at a competitive price
- deploy a complete solution that is specifically developed for stadium environments
- install an end-to-end system consisting of cameras, network video recorders and VMS
- recognize faces of all spectators in the seating area
- cover all seats by only a few panoramic images and have transparent video monitors with a manageable number of camera feeds
- ensure safety and security within the entire venue and at the surrounding areas as well
- have a top-of-the-line video surveillance system, but want to keep your existing one and integrate it into the Logipix solution
- have a system that is easily expandable so you don't have to replace it in case of future developments





## SECURITY AND SAFETY BENEFITS

- **Continuous hi-res footage of all seats** - The Logipix seat cameras provide 120-300 MP panoramic images wherein faces and tiny details are recognizable in the whole seating area.
- **Increased spatial orientation** - As the panoramic images cover multiple sectors at the same time, operators can better orientate within the camera image and faster locate the exact spot of any incident.
- **Easy to track spectators** - Operators can use multiple zoom windows on each panoramic image. They can seamlessly zoom in and pan certain areas to track individuals in the seating bowl.
- **Smooth, continuous motion in the video** - Operators can see rapid situations in the video without losing continuity in motion. Logipix cameras provide 20 fps at full resolution, therefore even fast motions are displayed smooth on the video monitor.
- **Security video of all areas** - Crowd movements can be monitored throughout the entire venue and in its surrounding areas as well.

## FINANCIAL BENEFITS

- **Long lifespan** - Our leading-edge technologies ensure the system avoids both physical and technological obsolescence for a long time.
- **Uninterrupted operation** - Logipix provides uninterrupted system availability as all their components are developed to operate with high MTBF.
- **Low running cost** - Standard maintenance is well-planned and organized for the Logipix solution. Besides, the system constantly gives feedback of its condition. By exploring early warnings, failures of components can be prevented.
- **Cost-efficient system expansion on demand** - The system can be flexibly and incrementally expanded regarding both the scope of devices and the system functionality.





## WHAT DIFFERS US FROM OTHERS

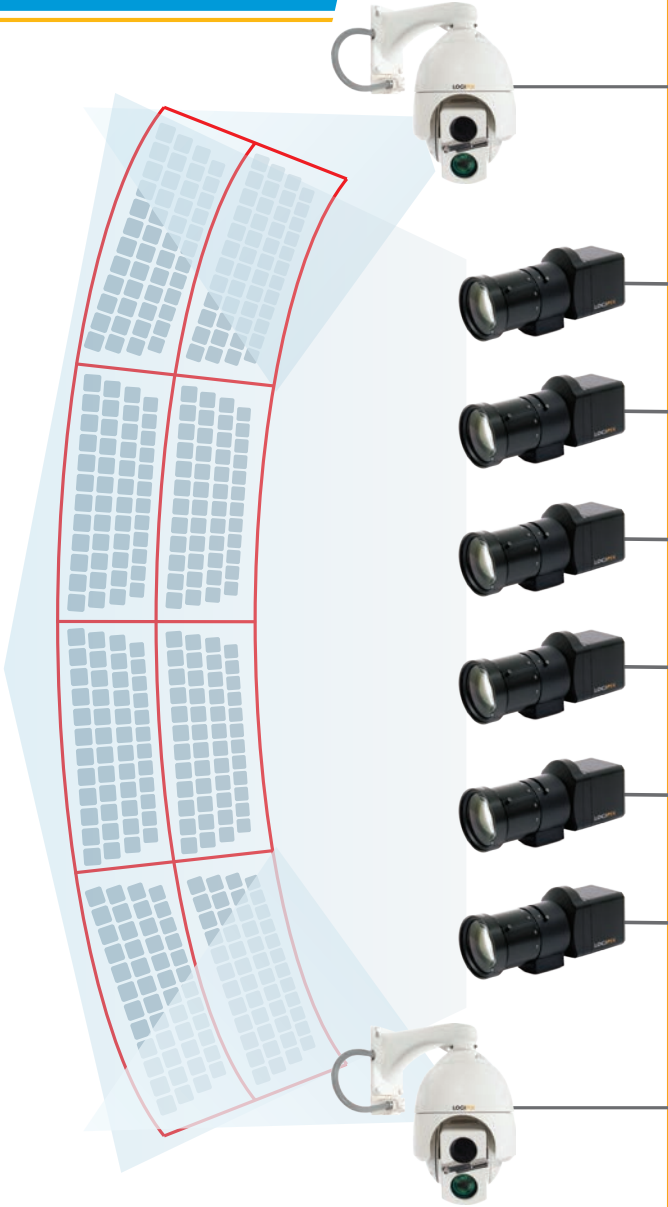
- Complete, stadium specific video surveillance system from a single developer and manufacturer company
- High-end Virtual Panorama Camera system built from individual cameras in the purpose of higher structural flexibility
- During system design the resolution level can be tailored to customer needs starting from 250 ppm to higher resolutions
- 20 fps panoramic video stream with hundreds of megapixels
- Worldwide unique PTZ camera control by selecting the area of interest in the panoramic image
- Logipix applies the JPEG2000 video compression standard in order to achieve the highest video quality and utilize the full resolution during monitoring with effective bandwidth usage
- We are able to overcome challenging stadium environmental factors like hazy weather, which hinders visibility and disturbing lens flares caused by stadium reflectors
- Stadium event management using dual system configuration for events and periods between events
- Long storage periods, thanks to intelligent frame reducing technology



# SYSTEM ARCHITECTURE

## SEAT CAMERAS

- LOGIPIX VIRTUAL PANORAMA:  
LOGIPIX ONE 20MP
- LOGIPIX 2MP PTZ
  - LOGIPIX 6MP PTZ



## CAMERA VLAN

Logipix NVR  
4<sup>th</sup> gen.  
256 TB

Logipix NVR  
4<sup>th</sup> gen.  
256 TB

Logipix NVR  
4<sup>th</sup> gen.  
256 TB

Logipix NVR  
4<sup>th</sup> gen.  
256 TB

## VMS VLAN

LOGIPIX SERVER  
SQL DATABASE

CONTROL CENTER  
CLIENT 1

...

CONTROL CENTER  
CLIENT 15

## OUTSIDE THE SEATING AREA

LOGIPIX 4 – 20 MP CAMERAS  
LOGIPIX PTZ CAMERAS

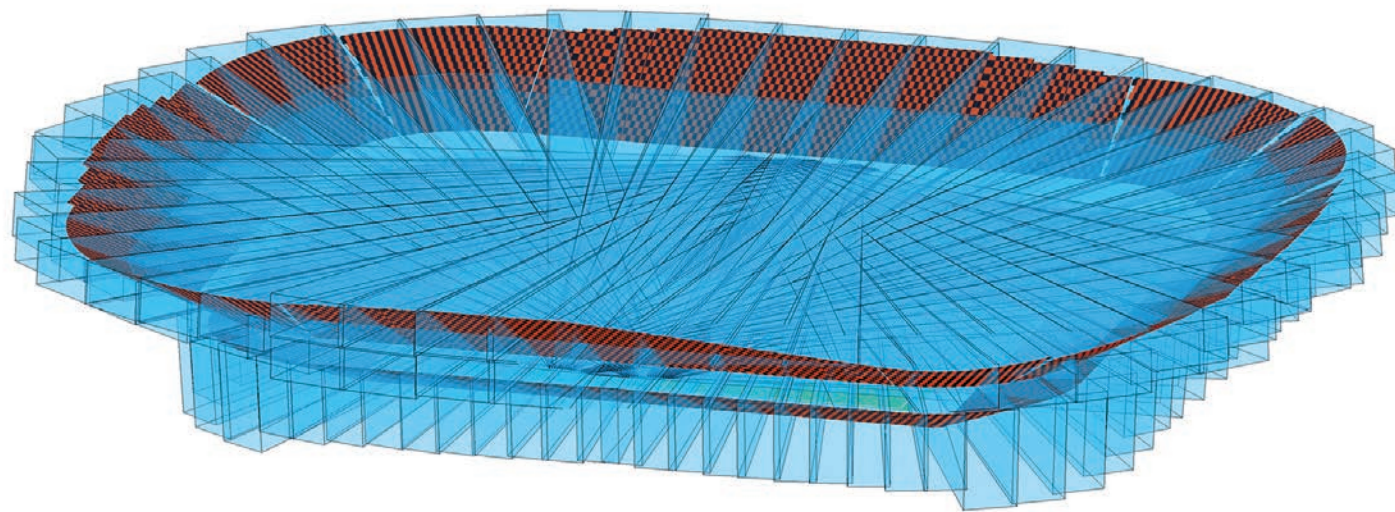




## DESIGNING YOUR PROJECT

Logipix starts each stadium project with a carefully designed 3D model of the video coverage. It helps achieve the required image resolution, while keeps costs at bay. This way stadium security professionals get an early overview of the camera arrangement with respect to quality requirements.

The final plan contains the 3D model of the stadium with accurate camera positions and simulated views of all individual cameras. This preliminary plan greatly facilitates the overall system installation.



## CONSIDERING SPECIAL ENVIRONMENTAL FACTORS

The most efficient surveillance can be performed when spectators face the camera lenses. Otherwise fan's experience is top priority, therefore it is necessary to install the cameras to the opposite side of the monitored area. This arrangement results in great distances between the cameras and the crowd, which induces annoying problems that could decrease image quality.

One of the most disturbing challenges is when fog, evaporating steam from watered grass or heavy rain obscure visibility. The other is the problem of the necessary high resolution level. Logipix ensures the technologies that help overcome these issues. First we provide the required extreme resolution. We also developed image enhancement algorithms embedded in our specially designed camera chip, which make the camera possible to take high-quality images even in obscured visibility conditions. Besides, Logipix engineers consider the direction of all reflectors during the phase of preliminary project design. This way they can find the ideal installation spots in order to eliminate disturbing lens flares.







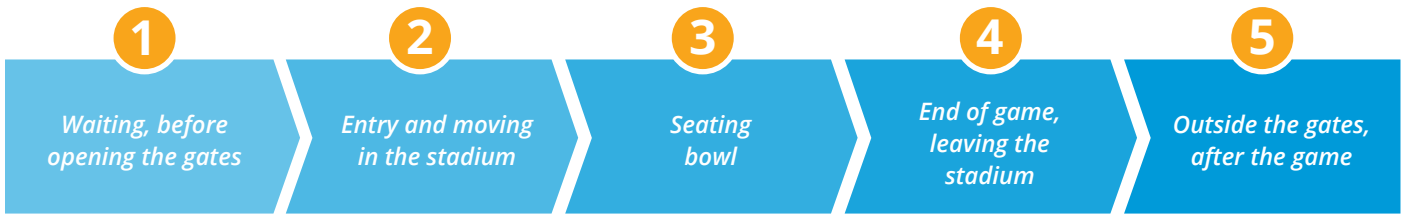
# TECHNOLOGICAL DESCRIPTION

## MONITORING THE CROWD FROM THE BEGINNING TO THE END

The Logipix Stadium Video Surveillance Solution can cover the entire stadium and also its perimeter areas. Therefore crowds can be observed even before they enter stadium gates. Once they step inside the stadium their movements are monitored using PTZ and standalone cameras until they take their places in the seating area. In the seating bowl the Logipix Virtual Panorama

cameras and high-end PTZs take videos of all spectators. Once a game is ended, operators can track the crowd as they leaving the stadium and the surrounding perimeter area. In any case of a disorderly conduct operators can react fast and instruct the security staff to take necessary measures in order to prevent the escalation of the situation.

### Stages of video surveillance



## SPECIFIC FEATURES FOR THE SEATING AREA

### Virtual Panorama camera

Logipix can cover the entire seating bowl of even the largest stadiums by only a few Virtual Panoramas, which consist of several individual high-resolution cameras. They can be considered as multi-sensor panorama cameras, as the images of the individual ones are stitched together. A single Virtual Panorama Camera delivers 120-300 MP resolution depending on how many cameras belong to a camera group. The frame rate of the video stream is 20 fps at full resolution.

The specially developed Logipix stitching technology allows for precise, real-time stitching of the video content. The individual images are not just overlapped at the image borders, but geometrically merged. As the cameras take their



images synchronized, the displayed video stream is free of disturbing glitches like object duplication or disappearance. Logipix also provides white balance correction at the image borders, providing a smooth color gradient throughout the panoramic image.



## PTZ and Panorama cross mapping

High-end 6 MP and 2 MP PTZ cameras can complete the Logipix Virtual Panorama at the seating area. They serve as optical zoom extensions for the main panoramic camera system. They operate together thanks to the panorama and PTZ cross mapping function. Operators control the PTZ cameras by selecting the area of interest in the panoramic image.

The PTZ accurately zooms in on the desired area based on previously associated image coordinates. The PTZ cameras are able to deliver even 1000 ppm resolution on the focused area. As operators see more visual details of a situation they can provide more information to security guards so they can handle the situation more effectively.



## STADIUM EVENT MANAGEMENT

The Logipix Stadium Surveillance Solution allows to save high performance and moderate camera configurations that can be used alternately for different stages of events in the stadium. Operators can easily open and close an event in

the VMS ensuring the quick and straightforward change of system settings. Closed events automatically locked by the system, which means the corresponding footage remains intact and become write-protected.

## LOGIPIX RECORDING TECHNOLOGY

The Logipix Network Video Recorders (NVR) continuously record and store the image streams. The system is designed with effective storage utilization as it enables dual configuration. Matches are recorded with high performance settings, but between events the system operates with reduced fps and lower quality.

Storage periods can be prolonged applying the Logipix Aging Technology, which periodically reduces the frame rate within the stored footage. It drops specified frame sequences, but preserves the full length video. This way the whole footage can be played back but with moderate fps until final deletion. After a while it is sufficient to preserve incident free archive videos with reduced fps. The most recent footage always remains intact.



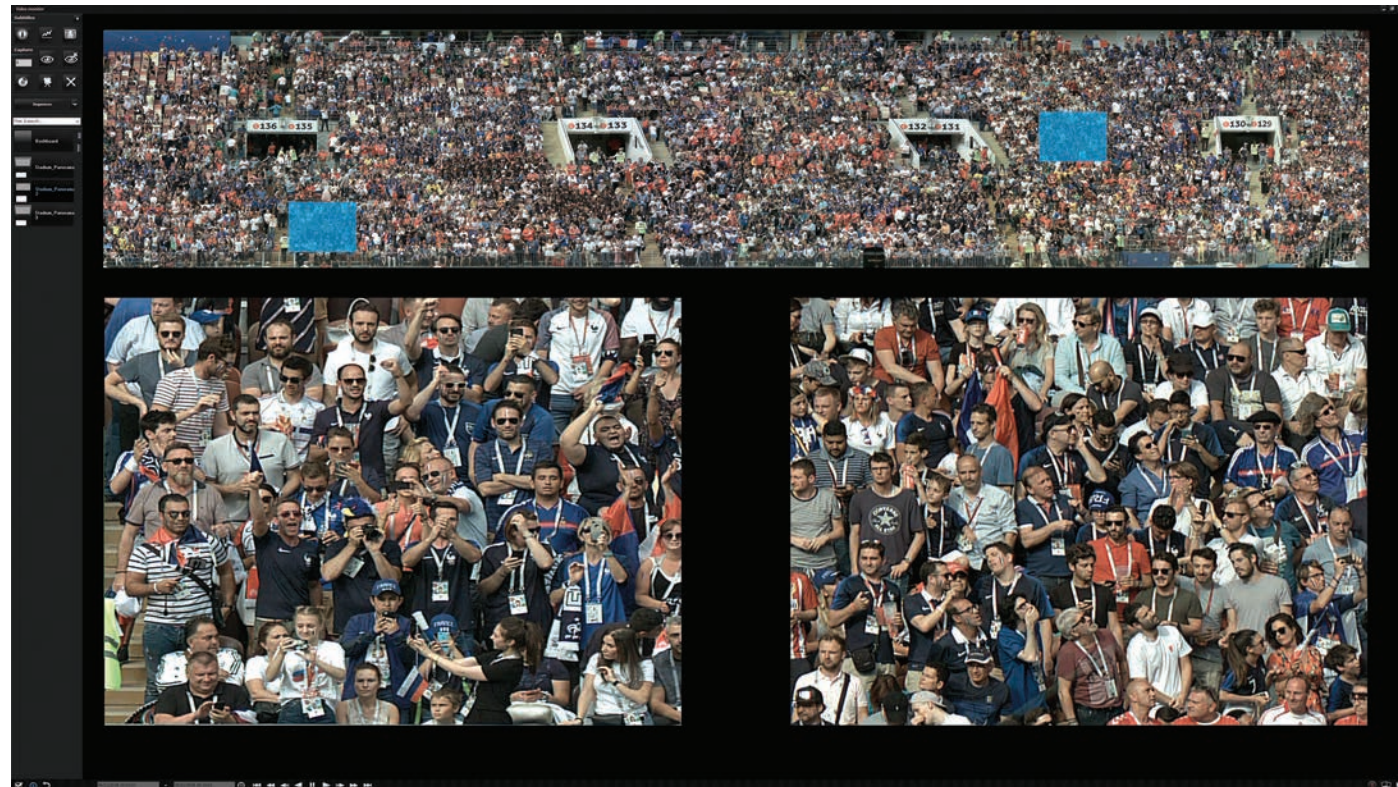


## IN THE MONITORING ROOM

### Monitoring with the Panorama cameras

Operators use the Logipix Control Center VMS in the monitoring room. They can utilize the full resolution of the panoramic images as the system applies the JPEG2000 compression standard. It enables image resolution scaling, which allows to transmit the panoramic images in screen

optimized resolution, but simultaneously send zoom areas from the full image in high resolution. This way operators can monitor selected areas in full resolution and in parallel they also see the panoramic image.



### Controlling the PTZ cameras

PTZ control is simple and convenient in the Logipix Control Center. Operators use mouse controlled joystick emulation to pan, tilt and zoom with the PTZs and they can also use the PointIT control function clicking or selecting the desired area on the PTZ image. To control PTZ cameras in the seating area, operators utilize the Panorama

and PTZ camera cross mapping feature. They just simple select the area of interest on the panoramic image and the proper PTZ camera turns to and zooms in immediately. PTZ zoom history and PTZ bookmarks that maps previously defined areas also facilitate PTZ control.



### Archive search

Operators can retrieve the Logipix footage after events to investigate situations and they can also use archive functions on the fly to get more information on current incidents. Archive and live images can be displayed in the Video Monitor at the very same time.

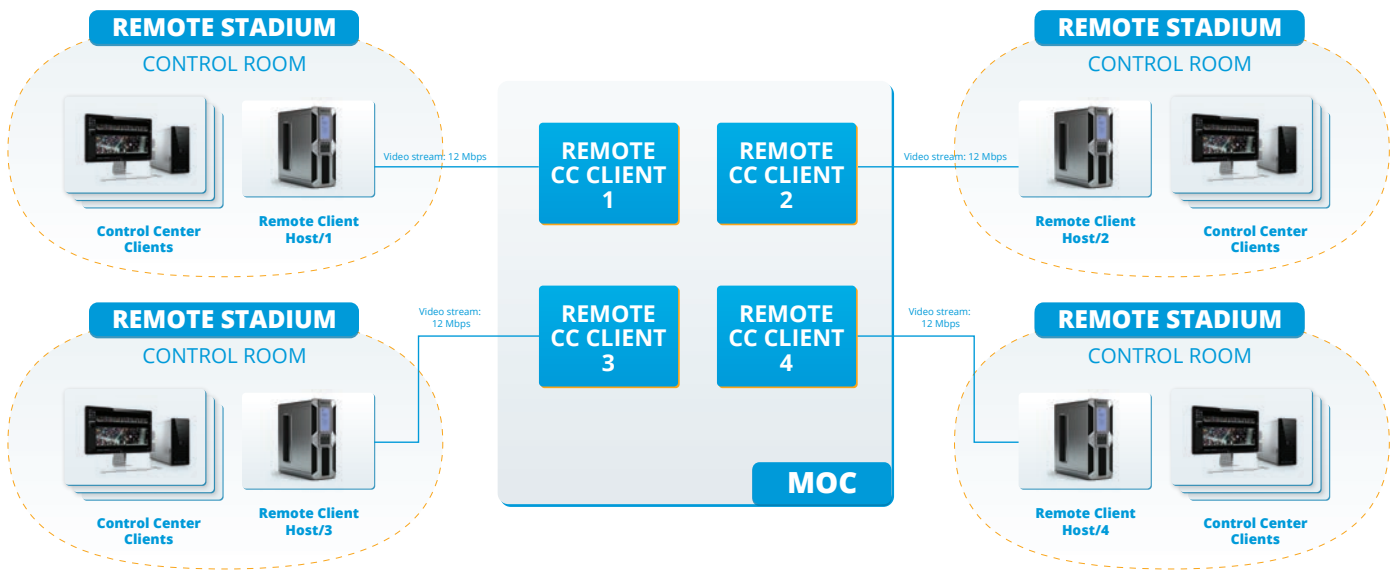




# MATCH OPERATION CENTER

The Match Operation Center (MOC) is a centralized monitoring solution that can be installed when multiple stadiums are equipped with the Logipix stadium system across the city or the country and surveillance should be available from a

centralized monitoring room too. Using the MOC all the stadiums are remotely accessible with full functionality using a simple client application. The solution allows to manage multiple stadiums at the same time.



# INTEGRATION POSSIBILITIES

In case security cameras are already installed in the stadium, which for example monitor the internal corridors or the gates, they don't have to be wasted. Logipix seamlessly integrates any ONVIF standard cameras. Their images are going to be displayed on the customizable monitor profiles of the Logipix Control Center and their functions will be available according to ONVIF directives.

# KEY SYSTEM COMPONENTS

- Logipix Virtual Panorama Camera System with 20 MP cameras
- Logipix 6 MP PTZ cameras
- Logipix 2 MP PTZ cameras
- Logipix Network Video Recorder, 4<sup>th</sup> generation
- Logipix Control Center Professional with Stadium Features







## TECHNOLOGICAL STRENGTHS OF THE SOLUTION

- **Adaptable camera structure** - The Logipix Virtual Panorama is built from the images of individually installed cameras. Thanks to this solution, the panoramic system can be tailored to any stadium in any size, and easily restructured in case of future developments.
- **Decreased number of camera feeds** - The seating area is covered by only a few large panoramic images, therefore operators do not lose focus between too many camera feeds.
- **Face recognition at all seats** - The Virtual Panorama delivers video streams with 120-300 MP resolution, allowing face recognition at all seats in the stadium. Additional PTZ cameras further extend the available resolution, providing 1000 ppm resolution in the seating area.
- **Easily controllable zoom windows** - Operators can control the zoom windows of a stitched panoramic image as if it were taken by a single sensor camera. Zooming in and

panning through stitching borders are smooth with the advanced Logipix technology.

- **Panorama and PTZ camera cross mapping** - The worldwide unique PTZ control function that allows operators to control the PTZ via the panoramic image makes monitoring more convenient. Operators can get fine details of all incidents in no time.
- **Dual system configuration** - Dual configuration of the system makes it possible to operate in a storage-effective way. The

cameras work with full performance during the events, but with moderate settings between events.

- **Health report** - The system monitors its own condition and reports early warnings in case it measures any suspicious values. This way major failures can be easily avoided.
- **Possibility for remote monitoring** - Thanks to the Logipix Match Operation Center multiple stadiums can be managed from a distant, centralized monitoring room.





## SITUATIONAL SCENARIO

In the following a potential incident and the process of handling the situation will be described. A prestigious football game attracted 80 thousand football fans and all the seats are taken in the stadium. The spectators excitement reaches fever pitch when the visiting team scores a goal.

Watching the panoramic stream, an operator spots something suspicious in the sector of home fans. He zooms in on the 200 MP panoramic image and realizes that three people are grappling. Reacting to this situation he informs the closest security guards, describes all individuals in details and guides the guards to the exact spot. By the time they arrive and take control of the situation, one of the three fans has already left the spot. But he doesn't get far, as the operator continuously tracks his motion by a PTZ camera and instructs another guard to intercept the disorderly football

fan. In just a few short minutes, all three individuals are removed from their seats and the escalation of the dangerous situation is prevented.

After the match, operators review and analyze the archive footage to investigate what transpired and to retrieve high-quality images of the individual's faces, which can be used as irrefutable evidence in a legal proceeding. While stepping the archive frame-by-frame, the initial reason of the fight is revealed. The fan who tried to escape was intending to light a firework, but the two others prevented him. That was the key moment that led to the fight.

Thanks to Logipix Stadium Video Surveillance Solution operators can react quickly to defuse situations like this, investigate the case thoroughly, and make sure that disorderly individuals are handled expediently.



## CONCLUSION

The Logipix Stadium Video Surveillance Solution increases security operational awareness by delivering 120-300 MP panoramic videos during both real-time and archive operations. With Logipix, the security staff is able to handle security incidents quickly, effectively and appropriately, and can also provide irrefutable video or still image evidence in court. Spectators know that utilizing the capabilities of the video surveillance system, authorities can easily identify them with unmatched accuracy. Deploying the Logipix system ensures that vandalism and critical incidents are kept at bay, creating a safe and welcoming stadium experience for everyone.





## ABOUT LOGIPIX

Logipix Technical Development Ltd. is a privately held company established in 1996 in Budapest, Hungary. Since then, Logipix has grown into the international company that it is today – one of the most innovative, end-to-end video surveillance solution developers and manufacturers. Today the main profile of the company is to provide specially designed, high-end video surveillance solutions considering the various characteristics of different application areas.

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