



# Integrating Safety & Security Systems in Assembly Occupancies

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## Case study of Stadiums

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## Course Description

### Integrating Safety & Security Systems in Assembly Occupancies – Case study of Stadiums

In the middle of our busy life style, we take time off to watch a football match, go to a movie or take a vacation to visit some Holy places or tourist destinations.

If we look around, it seems that all the above entertainment and peaceful venues are becoming places of grief and sorrow due to loss of valuable lives because of overcrowding, stampede or security lapses.

We will take the case study of Stadiums which are coming into prominence with regional events like Expo 2020 in Dubai and FIFA 2022 in Qatar.

It will give us details of Safety & Security issues from the Parking Area to the Playing Arena.

For example; the Inner perimeter from the Safety point of view where we can save lives by using Systems (locks, Turnstiles) which are suitable for escape routes that can provide a smooth egress in case of an Emergency & Panic situations.

Or the outer perimeter from the Security point of view by using body and equipment scanners, bomb proof, bullet proof and Vandal resistant readers etc.

Also, how a Single Card can give you Access to:

Parking, Ticketing, Hospitality, Fan Shop, Viewing the stands.

And how One system should give you Control over:

Access (Parking, Perimeter, Stadium); CCTV, Burglar Alarm, Fire, Escape routes, Building Management, Ticketing, Payment Solutions.

How can we, as professionals, contribute in making the Stadiums an entertaining and a Safe place?



## Presenter

Nusrulha has completed his Diploma & Bachelors in Instrumentation Engineering. He started his career in Factory/Industrial Automation where he got the knowledge of MESSUNG & MITSUBISHI ELECTRIC PLCs (Programmable Logical Controllers), Control Panels and HMI (Human Machine Interface) Panels. His experience in Factory Automation Systems was augmented with Building Automation Systems when he joined Johnson Controls International.

Nusrulha is competent in BMS, CCTV, Access Control System (Smart Cards & Mobile Key Technologies using low power Bluetooth), Fire Alarm System, Perimeter Protection, ELV, Wireless Telecommunication (P2P & P2MP), PLC, SCADA and RTU.

Nusrulha is well versed with Building Management System and Access Control Systems.

He also has a Certification of Honeywell - Notifier **Fire Alarm System**, Certification of Lenel's **Access Control System & Digital Video-CCTV Certification**. Allen Bradley's - **PLC & SCADA Programming**. For **Wireless Communication** – Point to Point & Point to Multipoint, he is Netronics **Certified System Specialist**.

He has worked for different verticals & industries like Infrastructure, Hospitality, Airport, Oil & Gas.

Currently Nusrulha is working with DORMA as a Product Marketing Manager - PMM to provide the customers a Premium Access Solutions.



## Learning Objectives

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1. Case Studies: What went wrong ?
  - a. National Stadium Disaster – Peru
  - b. The Kathmandu Disaster - National Stadium, Nepal
  - c. Hillsborough Disaster (Sheffield)
  - d. Ohene Djan Stadium, Accra, Ghana
  - e. Air Defense Stadium – Egypt
  
2. Analysis based on the History of 100 years.
  
3. Contingency Plan - the related Security & Safety Risks, and solutions.
  
4. How can System Integration help Safety & Security issues ?

The purpose of this presentation is to convey technical knowledge to the conference participants.

The presentation also contains slides with text that summarises the content of the presentation and the main learning objectives.

These may be used to update CPD records for relevant organisations including the Chartered Institute of Building (CIOB).



## National Stadium Disaster – Peru

(24 May, 1964 - Peru vs Argentina. At least **328 killed** & above **500 Injured**)

- Pitch Invasion
- Panic and an attempt at a **mass exit** to avoid the gas.
- Cause of death was mostly from internal **haemorrhage** or **asphyxia**.
- **No standard gates** available. (The stadium had solid **corrugated steel shutters**)
- In the street, the crowd caused destruction on private property around the stadium.







## The Kathmandu Disaster - National Stadium, Nepal

(12 March, 1988 - Janakpur Cigarette Factory Ltd Vs Liberation Army of Bangladesh.

At least **93 killed** & more than **100 Injured**)

- Structure : **No proper Roofing**
- Fans attempted to flee from a hailstorm inside the stadium.
- **Exit doors were closed.**
- Spectators rushed to the stadium's **eight exits** but found **only one open.**





(15 April, 1989 - Liverpool Vs Nottingham Forest . At least **96 killed** & **766 Injured**)

- Structure : **Standing Terraces**
- **Overcrowding** outside the ground before kick-off.
- **Entry** was possible only via **one of seven turnstiles**
- **Barriers** installed **did not meet** official safety **standards**.
- Firefighters with cutting gear had difficulty getting into the ground
- Cause of death was mostly from compressive **asphyxia**.







## Ohene Djan Stadium, Accra, Ghana

(9 May, 2001 - Accra Hearts of Oak Sporting Club Vs Asante Kotoko)

At least **127 killed** & **Hundreds Injured**)

- **Disappointed** fans throwing plastic seats and bottles onto the pitch
- **Panic** and a resulting stampede.
- Cause of death was mostly from compressive **asphyxia**.
- Some **gates were locked**, preventing escape.







## Air Defense Stadium – Egypt

(8 Feb, 2015 - Zamalek Vs Enppi, **22 killed & Dozens Injured**)

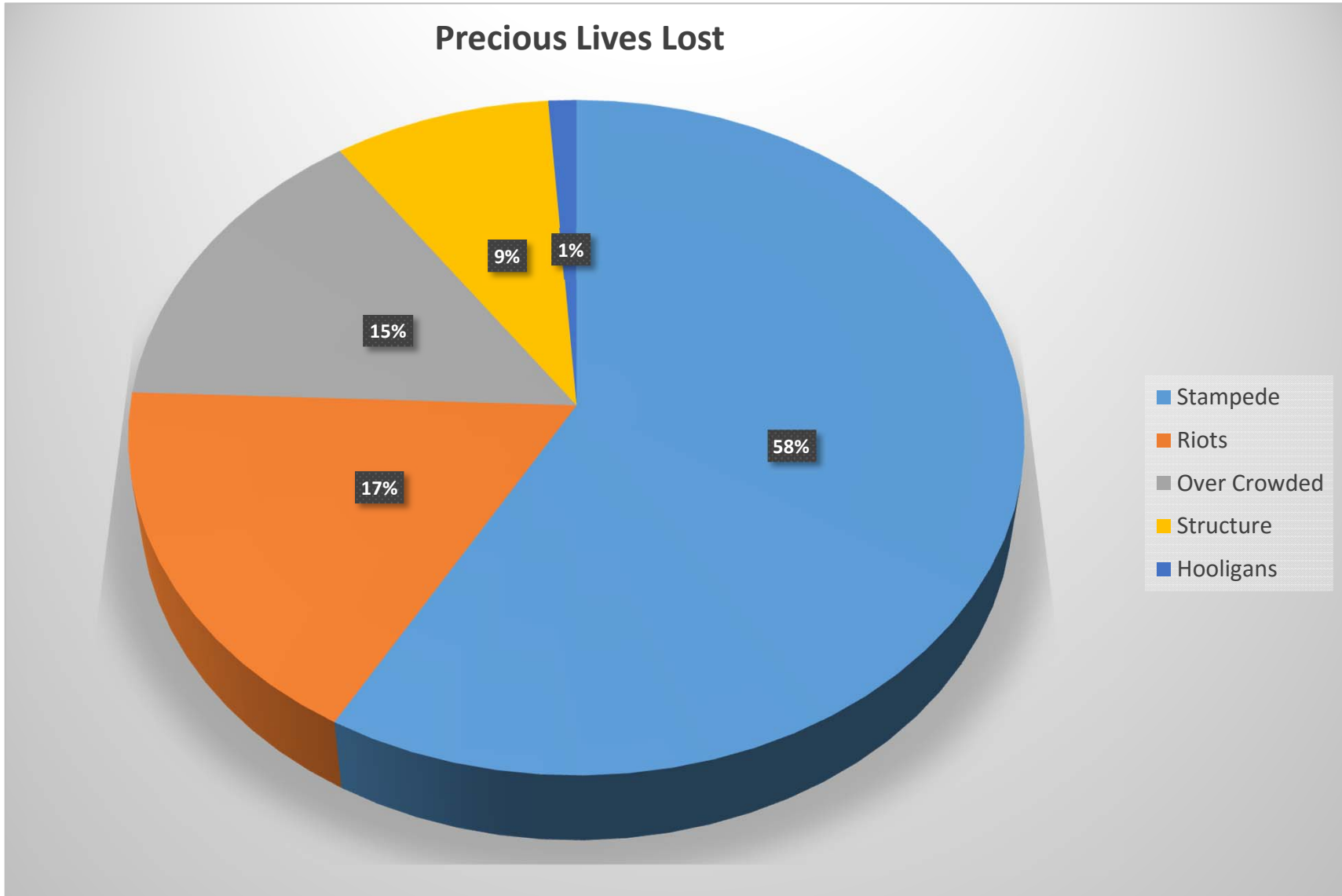
- No proper check on the no. of tickets issued and no. of fans gathered
- No proper Access Control System – fenced-in passageway
- Instead of a Turnstiles a customized Iron cage was put for Access Control
- No Crowd Management
- No proper Fencing - Forced Entry
- People were crushed in a stampede.





### Cause of the Incidents - Analysis based on the 100 years of History

Precious Lives Lost





## Contingency Plan

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- a) Fire
- b) Terrorist attack
- c) Buildings and services
- d) Safety equipment failure
- e) Crowd control
- f) Emergency evacuation (by section or the entire stadium)
- g) Severe adverse weather (such as hail storm, lightning strikes, flash floods, high winds, hurricanes)
- h) Natural disasters (such as typhoons, earthquakes, volcanic eruptions)
- i) Strategy if a match is abandoned, postponed or delayed





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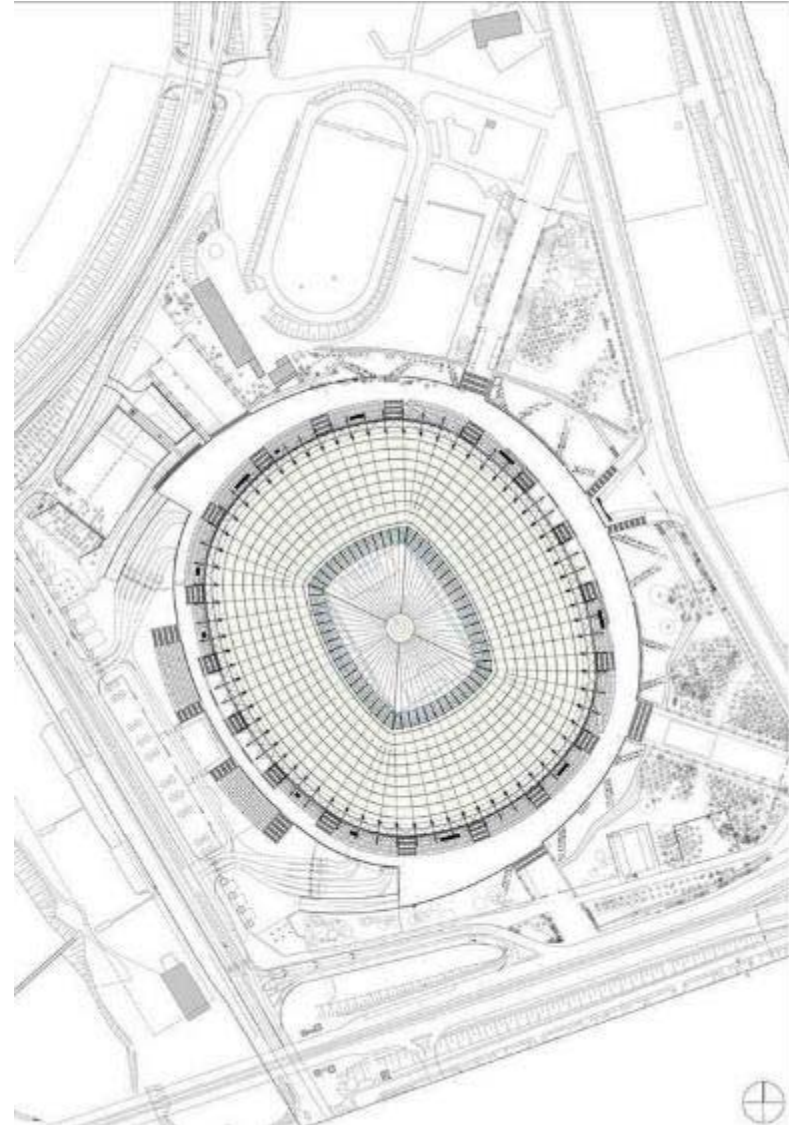
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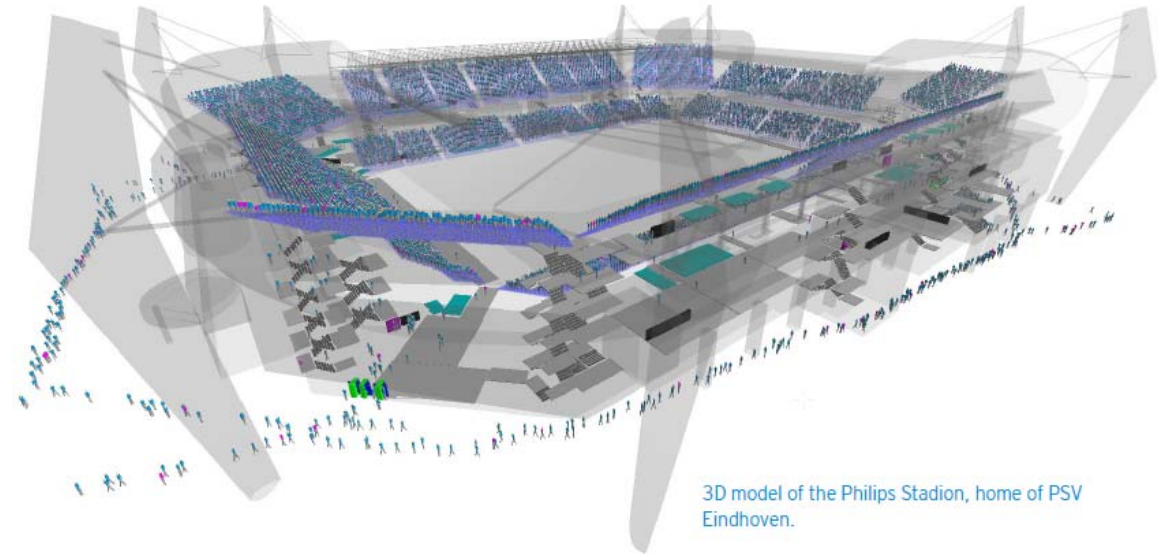






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3D model of the Philips Stadion, home of PSV Eindhoven.







## The main Risks for an Event:

### A. Before the Event

1. Ticketing
2. Ingress
3. Fan Separation
4. Structure Design (The View from the Crowd)
5. Extremism

### B. During the Event

1. Excited Moments (a Goal, a Foul, a Penalty, a Wrong decision etc)
2. Weather / Natural Calamity (Hailstorm, HVAC, Rain, Earthquake etc)
3. Riots
4. Egress due to Emergencies

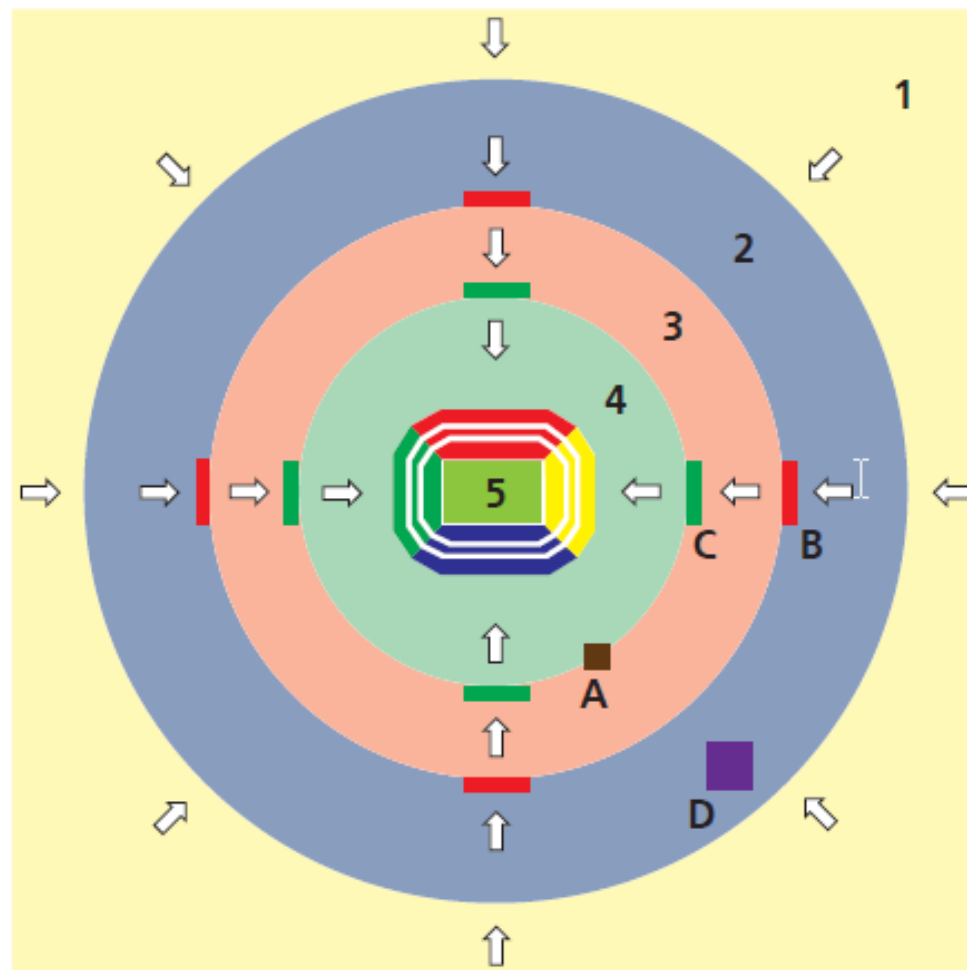
### C. End of the Event

1. Egress ( Access Control and Escape Route Systems needs to be balanced)
2. Alternative means of Egress.
3. Crowd Management – Based on Behavior of the winning team fans and losing team fans





Stadiums used during FIFA events are divided into five distinct perimeters, as follows:



- 1. The public zone
- 2. The exclusive zone
- 3. Outer perimeter (visual ticket check)
- 4. Inner perimeter (electronic access control)
- 5. The stands
- A. TCP
- B. Mags & bags
- C. Turnstiles
- D. STC

**Notes:**

TCP: Ticketing clearing point  
 STC: Stadium ticketing centre



## Air Defense Stadium – Egypt : Access Control System - Zones

### ■ The Public Zones

Check points- Few Kms away from the Stadium

### ■ The Outer Perimeter

Check points- Few 100 meter away from the Stadium

### ■ Inner Perimeter (Access Control System)

Check points- Stadium wall or inside the Stadium







Case Study : Air Defense Stadium: Egypt **Access Control System**

**Public Zone**

- Check points- away from the Stadium
- Checking of Cars, No. plate recognition
- Checking people and bags etc







Case Study : Air Defense Stadium: Egypt **Access Control System**

■ **Outer Perimeter**

Check points- Few meters away from the Stadium or Stadium Material





## Case Study : Air Defense Stadium – Egypt

### Access Control System – Outer Perimeter

- Checking of tickets, Manually & Mobile or Handheld devices
- Check points – Few meters away from the Stadium
- CCTV with Video Analytics
- Body & Bag Scanners
- Tickets issued and no. of fans gathered







Case Study : Air Defense Stadium – Egypt

Access Control System

■ Inner Perimeter

Check points-  
Stadium wall or Few  
meter away from the  
Stadium





## Access Control System - Inner Perimeter

### 1. Main Entrances

- Turnstiles, barriers and revolving doors - **control throughput**
- An Intelligent Ticketing System

### 2. Internal Doors, Stands & Virtual Fences

- Hardware for the protection of the Doors and walls against heavy impact
- Delayed action as standard for ease of access
- Electro-mechanical hold-open function for single-leaf fire / smoke control doors

### 3. Exit or External Doors

- Door locking system and door terminal for electronic escape route control system





**Access Control System - Inner Perimeter**

**1. Main Entrances**

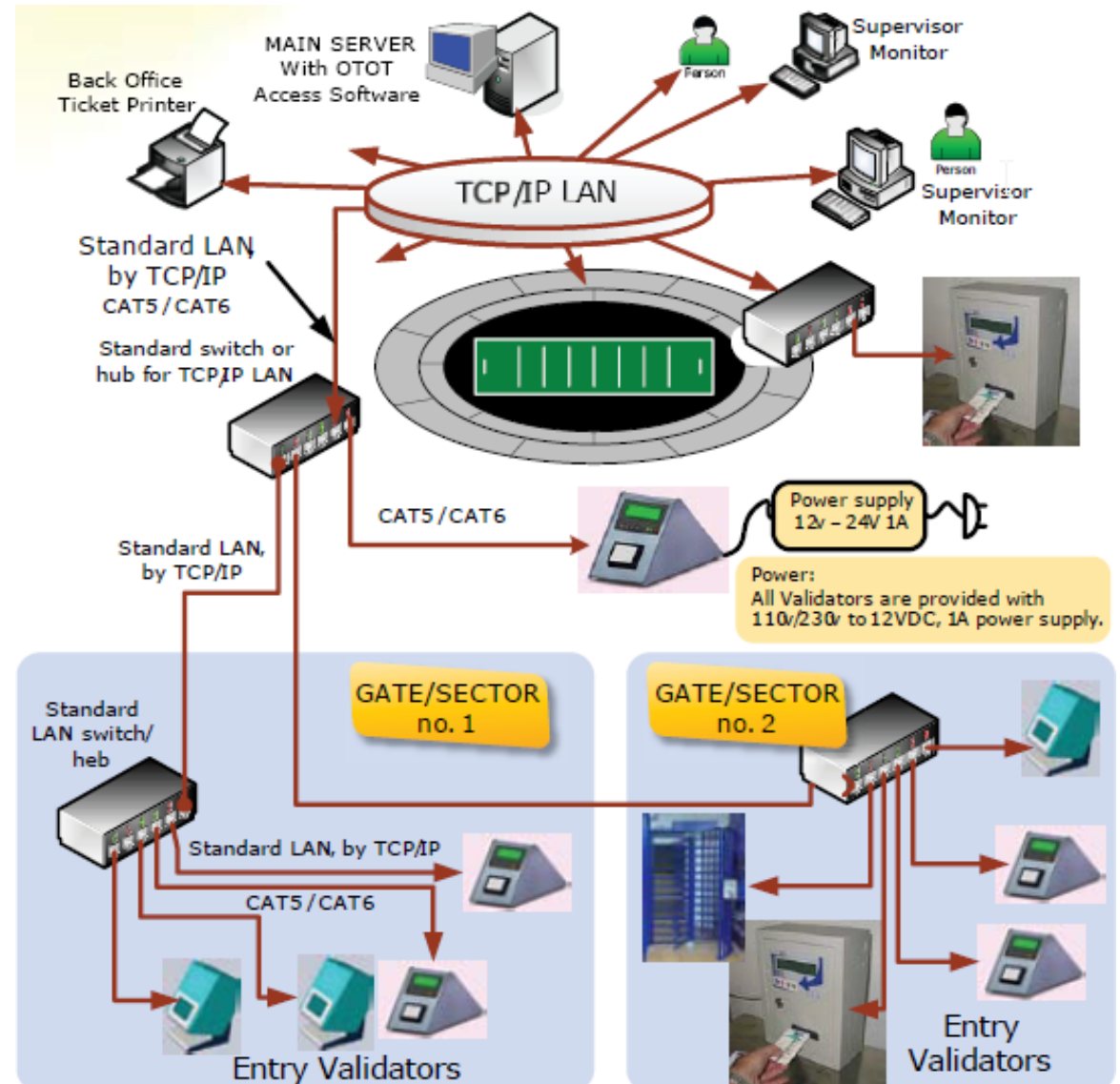






## Integration of ACS with the Ticketing System

- System has to **count the people** per block .
- Ticketing System should give **an alarm**, if the maximum number is reached.
- Fan **Seperation**.



All network is standard TCP/ IP LAN, By CAT5/6 cables or WiFi or Fiber Optic, etc.



## Access Control System - Inner Perimeter

### Main Entrances – Half Height Turnstiles

1. Turnstiles needs Integration with the Ticketing System.
2. While monitoring visitor nos. the speed on entry should increase.
3. Integration should use a multitude of technologies & Facilities from bar code scanning to biometrics & **hospitality, conferencing to hotel facilities.**
4. Turnstiles, barriers and revolving doors - **control throughput**
5. Vandal Proof & Bullet Proof readers



Vandal Proof  
Access Card Readers







## Access Control System - Inner Perimeter

### Main Entrances – Full Height Turnstiles

- For High Security
- Control and regulate throughput







## Access Control System - Inner Perimeter

### Main Entrances –

- Half Height & Full Height Turnstiles for people with Special Needs
- Way to Carry Trolleys





## Access Control System - Inner Perimeter

### Main Entrances – Carpark Control

- Physical protection of cars/lorries,







## Access Control System - Inner Perimeter

### Main Entrances – VIP

- Elegant design as per the entrance areas
- Adaptable design
- Matches the Aesthetics of architectural design
- Silent







## Access Control System - Inner Perimeter

### Main Entrances – Other Areas

- Fan shop
- Press Center
- Office Areas





## Access Control System - Inner Perimeter

### 2. Internal Doors, Stands & Fences

- No solid fence between fan block and playing field
- Fan Separation, through security people & ACS.
- One seat per fan, no standing fangroups.
- Restriction of numbers of fans per entrance block
- Counting of fans by singularisation at the entrance to the blocks
- Entrance via card for a certain block.







## Access Control System - Inner Perimeter

### 2. Internal Doors

- Equipped with adjustable **back-check** as standard
- Protects the wall and door against heavy impact
- Optionally with delayed action for ease of access – also for fire and smoke control doors
- Electro-mechanical hold-open function for single-leaf fire / smoke control doors



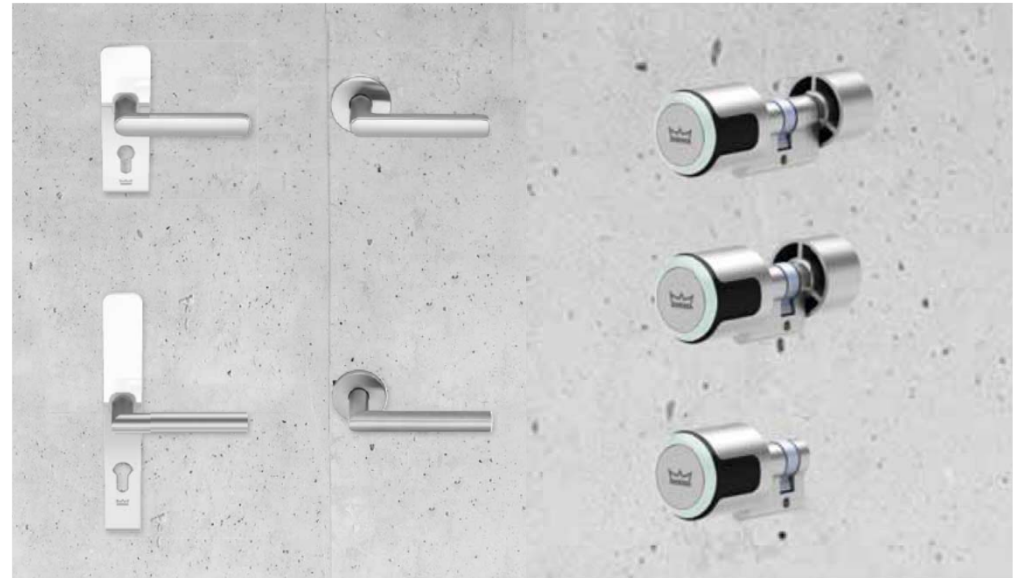




## Access Control System - Inner Perimeter

### 2. Internal Doors

- In the VIP Areas Convenience and flexibility for visitors
- Locker Rooms & Changing Facilities
- Electronic Cylinders, Fittings & Readers





**Access Control System - Inner Perimeter**

**3. Exit or External Doors**







## Access Control System - Inner Perimeter

### 3. External Doors – Emergency Exit Doors

- Panic Bars with Magnetic Latch Retraction (MLR) function for immediate Egress
- Should be Remotely operable for Magnetic Dogging
- Delayed Egress Panic bars (also EMDE) for delayed Egress



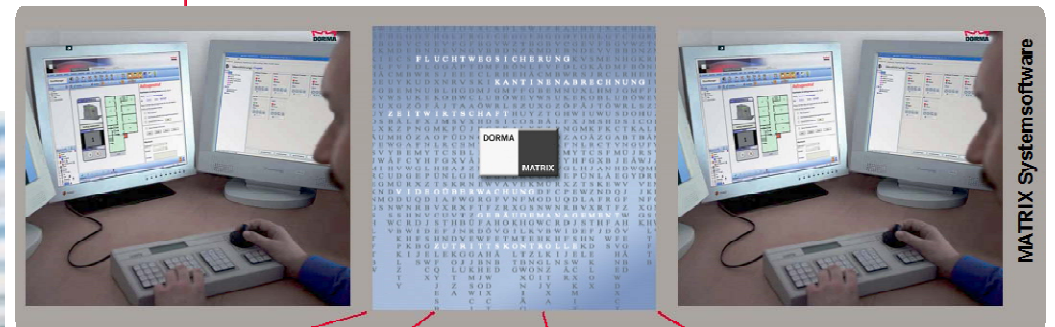
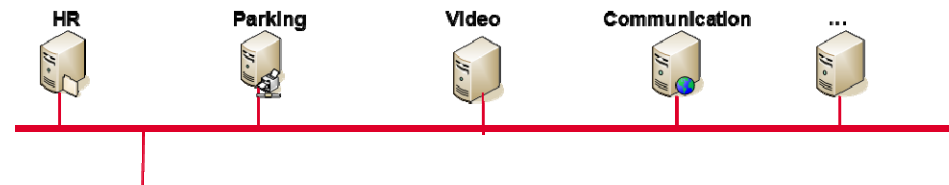




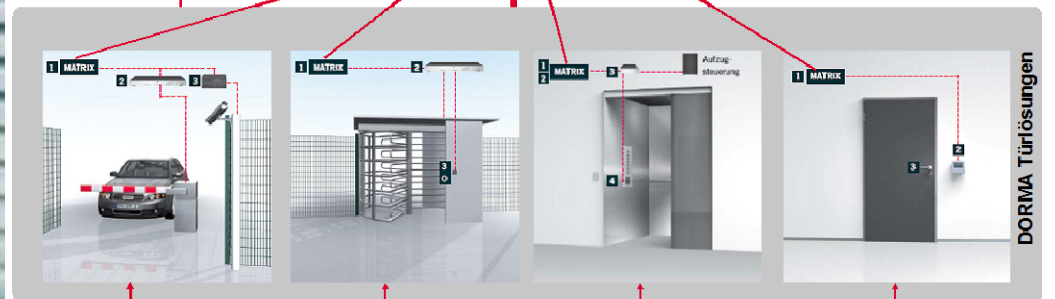
# Access Control System - Inner Perimeter

## 3. External Doors – Emergency Exit Doors

- Door Management System for electronic escape route control.
- Door locking system
- Door terminal for electronic escape route control system



MATRIX Systemsoftware  
DORMA security application



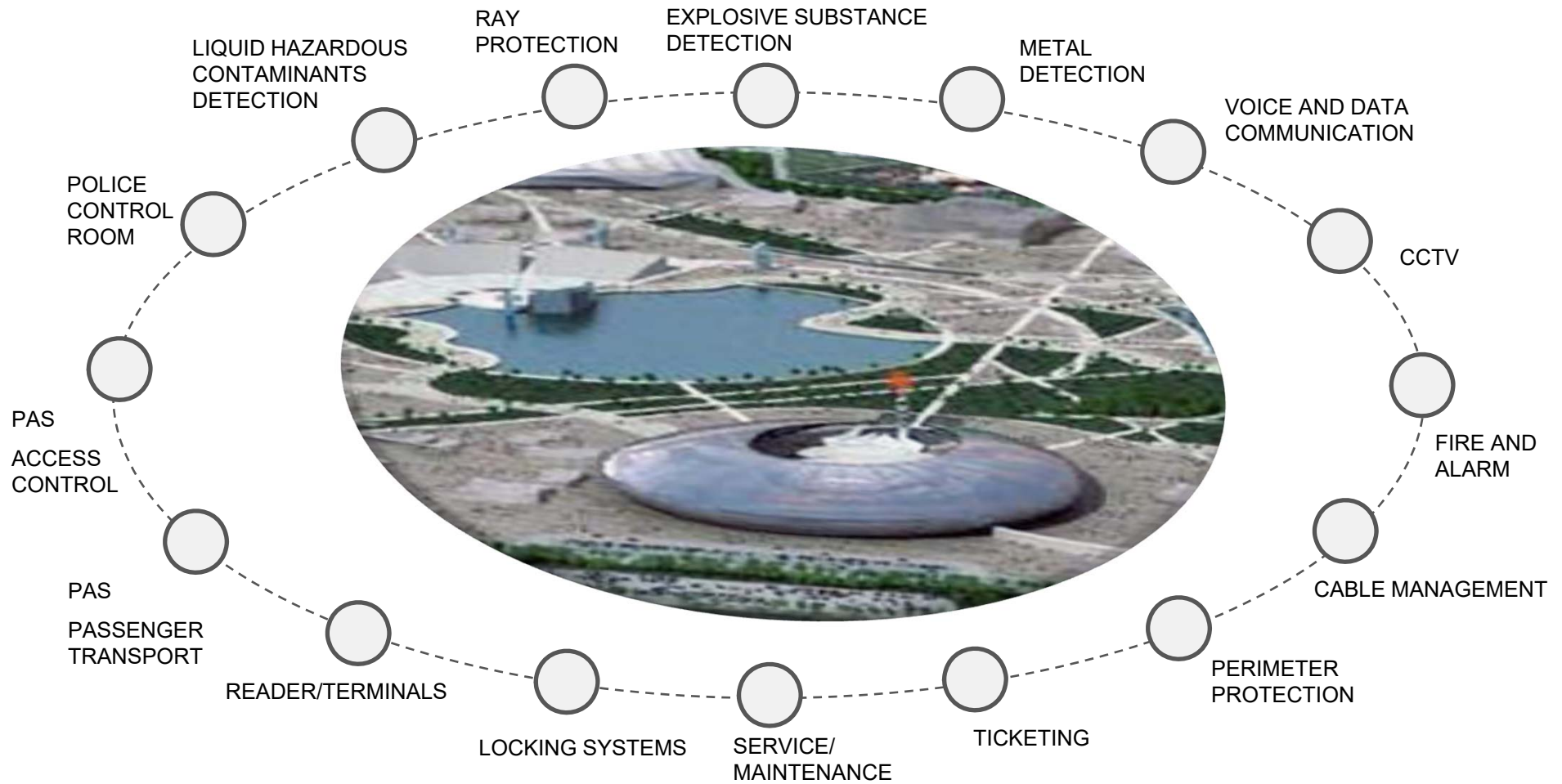
DORMA Türlösungen



Magnet, Mifare, Legic, Legic Advant, Mifare DESFire, Trovan, Incaia, EM



**Total Solution CCC : Safety, Security & BMS as an Integrated System**

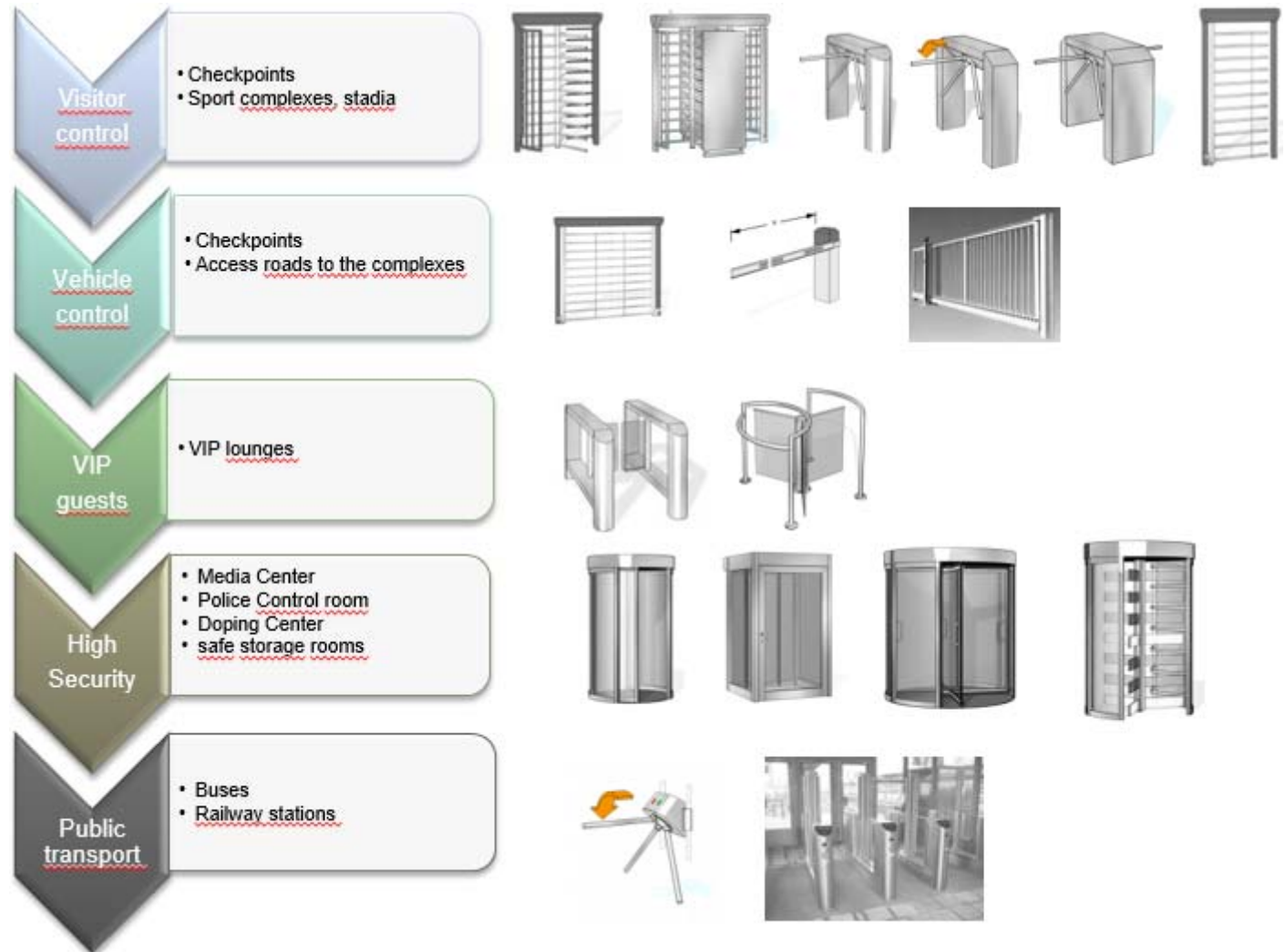




## Access Control System - Inner Perimeter

### One card can give you access to:

1. Parking
2. Hospitality
3. Fan Shop
4. Viewing the game



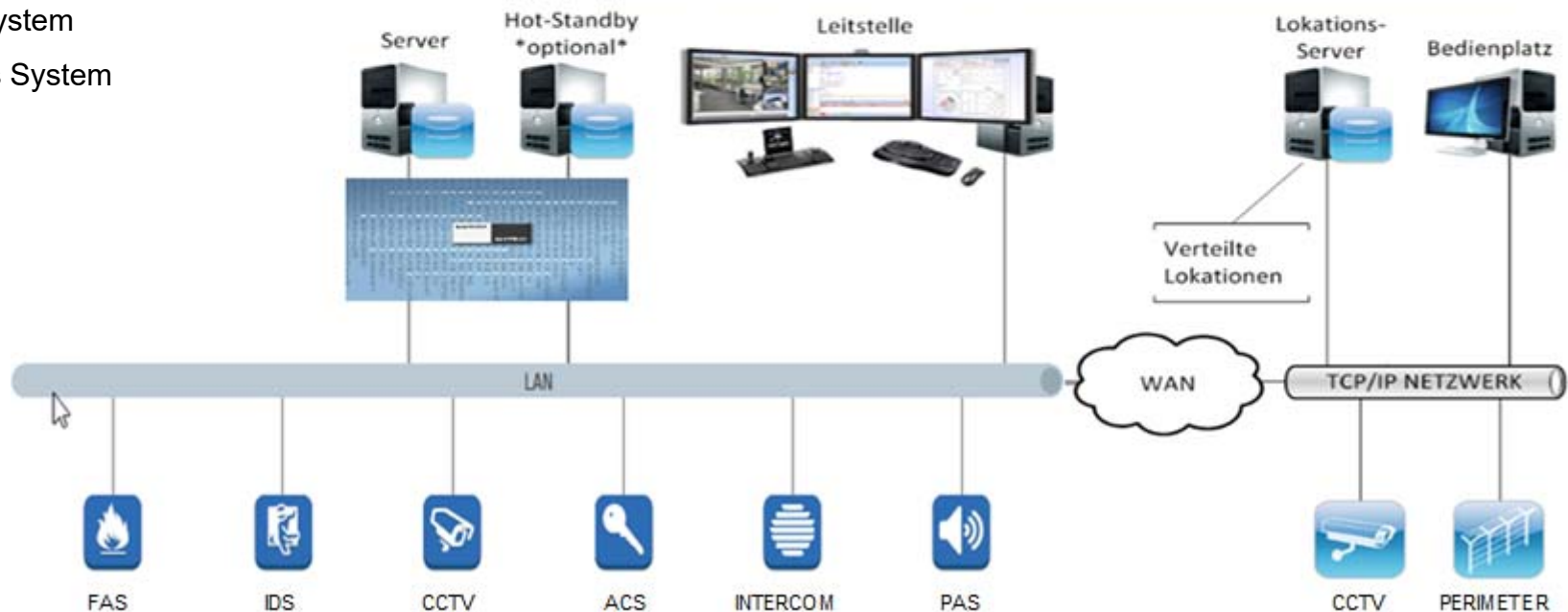


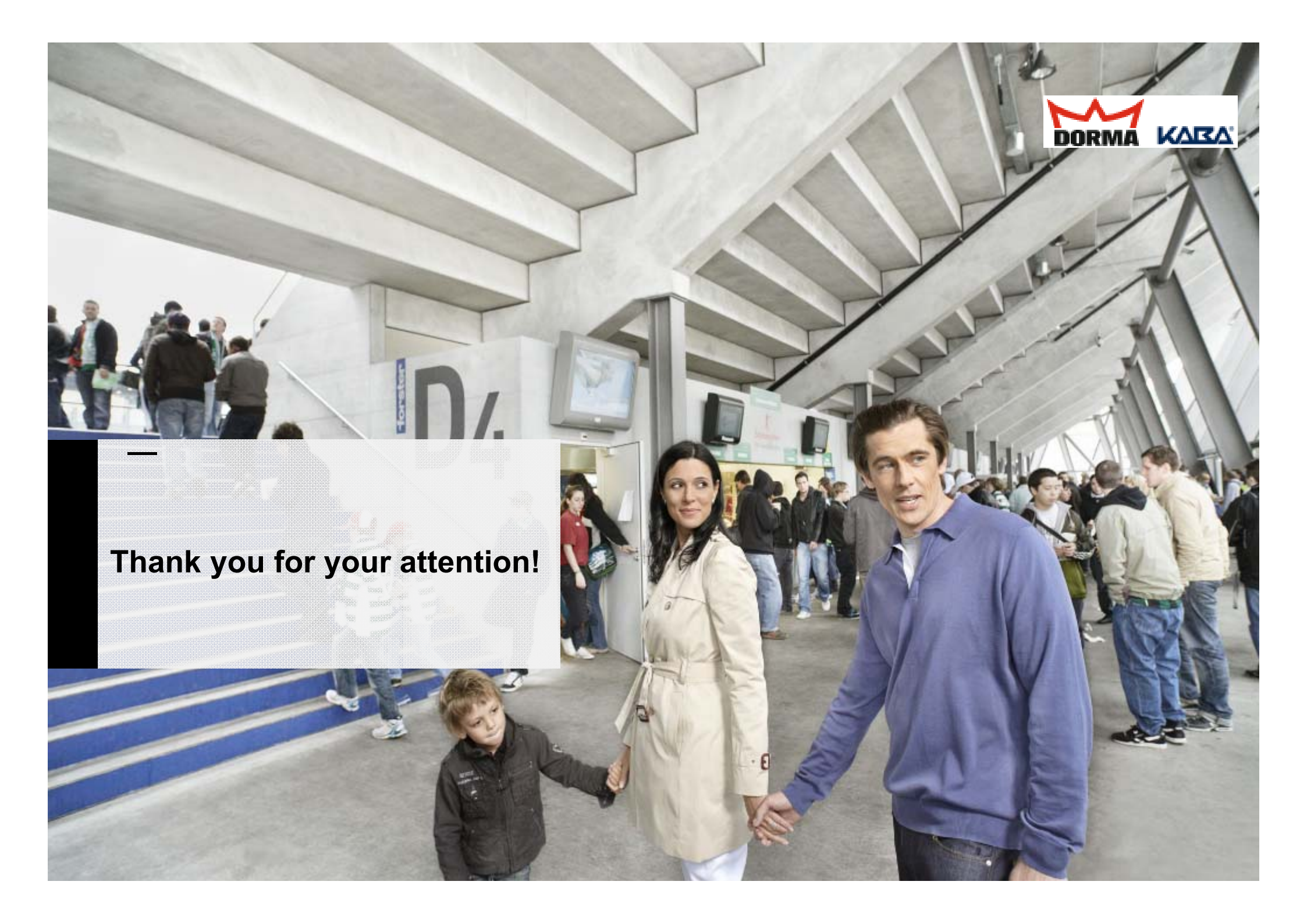


## Access Control System - Inner Perimeter

### One system can give you control over:

1. Access (Parking, Perimeter, Stadium)
2. Fire Alarm System
3. Escape Route System
4. Building Management System
5. CCTV
6. Intrusion / Burglar Alarm System
7. Ticketing System
8. Payment Solutions
9. INTERCOM System
10. Public Address System



A family consisting of a man in a blue sweater, a woman in a beige trench coat, and a young boy in a dark jacket are walking through a modern transit station. They are holding hands. The station has a high ceiling with concrete beams and a blue staircase. Other people are visible in the background.

**Thank you for your attention!**