

# INTEGRATING SAFETY & SECURITY SYSTEMS IN ASSEMBLY OCCUPANCIES

Access/Egress in Stadiums





## LEARNING OBJECTIVES

1. Case Studies 5 tragic events in stadiums.
2. Contingency Plan - the related Security & Safety Risks, and solutions.
3. Access Control - How can System Integration help Safety & Security issues?

# Assembly Occupancy

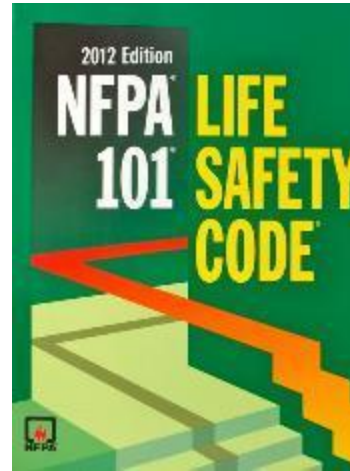
## 6.1.2 Assembly.

For requirements, see Chapters 12 and 13.

**6.1.2.1\* Definition — Assembly Occupancy.** An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load.

**A.6.1.2.1 Assembly Occupancy.** Assembly occupancies might include the following:

- (1) Armories
- (2) Assembly halls
- (3) Auditoriums
- (4) Bowling lanes
- (5) Club rooms
- (6) College and university classrooms, 50 persons and over
- (7) Conference rooms
- (8) Courtrooms
- (9) Dance halls
- (10) Drinking establishments
- (11) Exhibition halls
- (12) Gymnasiums
- (13) Libraries
- (14) Mortuary chapels
- (15) Motion picture theaters
- (16) Museums
- (17) Passenger stations and terminals of air, surface, underground, and marine public transportation facilities
- (18) Places of religious worship
- (19) Pool rooms



- (20) Recreation piers
- (21) Restaurants
- (22) Skating rinks
- (23) Special amusement buildings, regardless of occupant load
- (24) Theaters

## Hillsborough Disaster (Sheffield)

(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**.

Video



## 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.**



## 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.

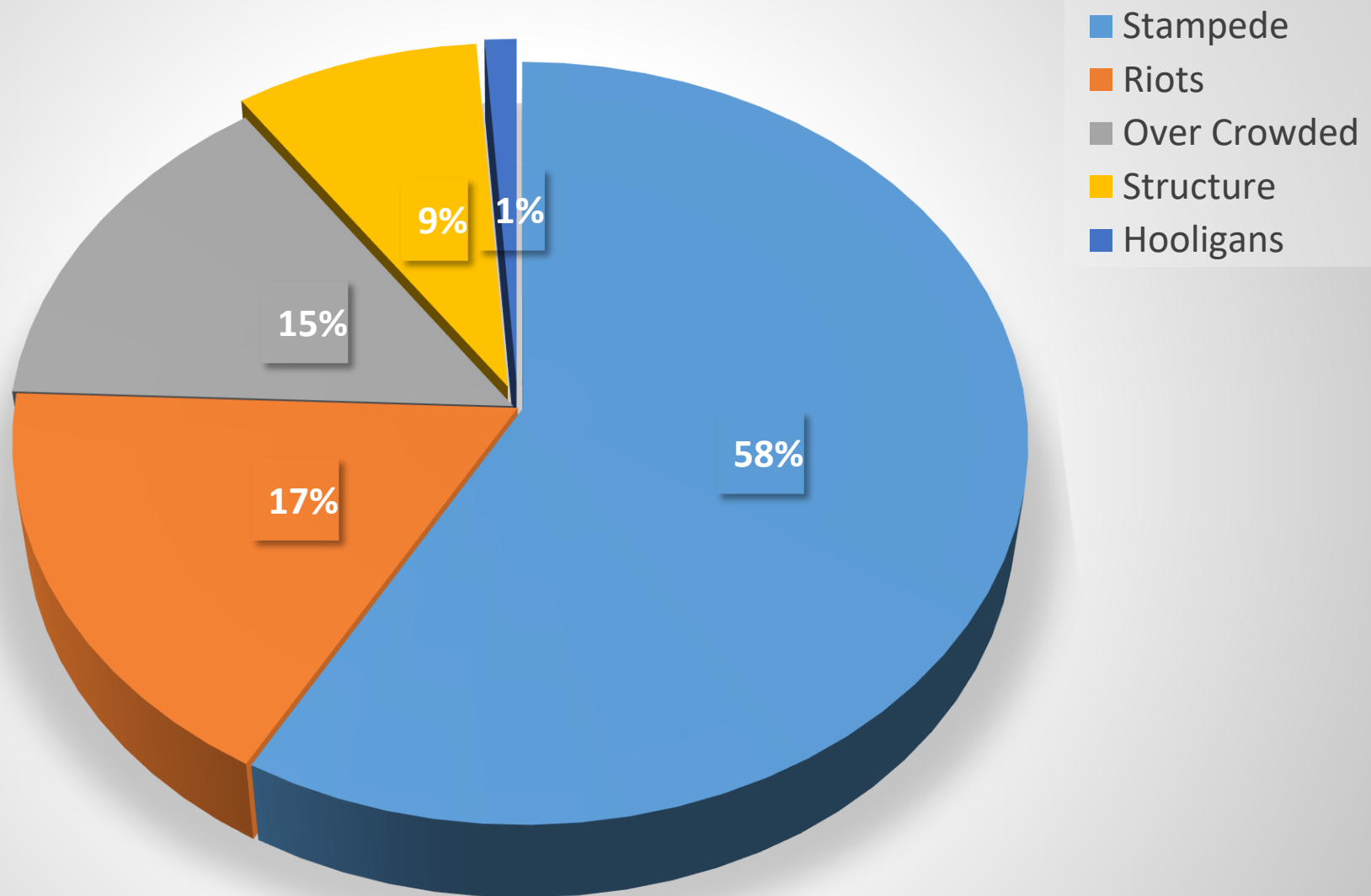






# Cause of the Incidents - Analysis based on the 100 years of History

Precious Lives Lost



## 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

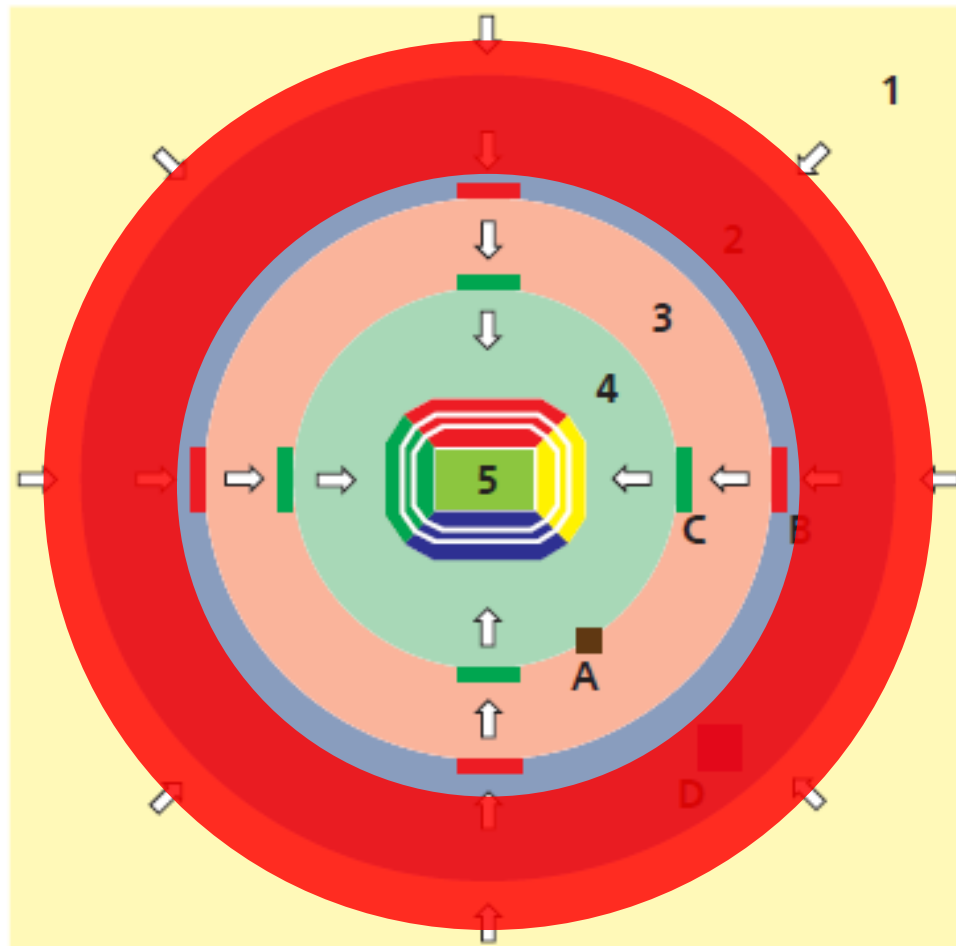


# Contingency Plan



# Stadium Areas & Zones

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

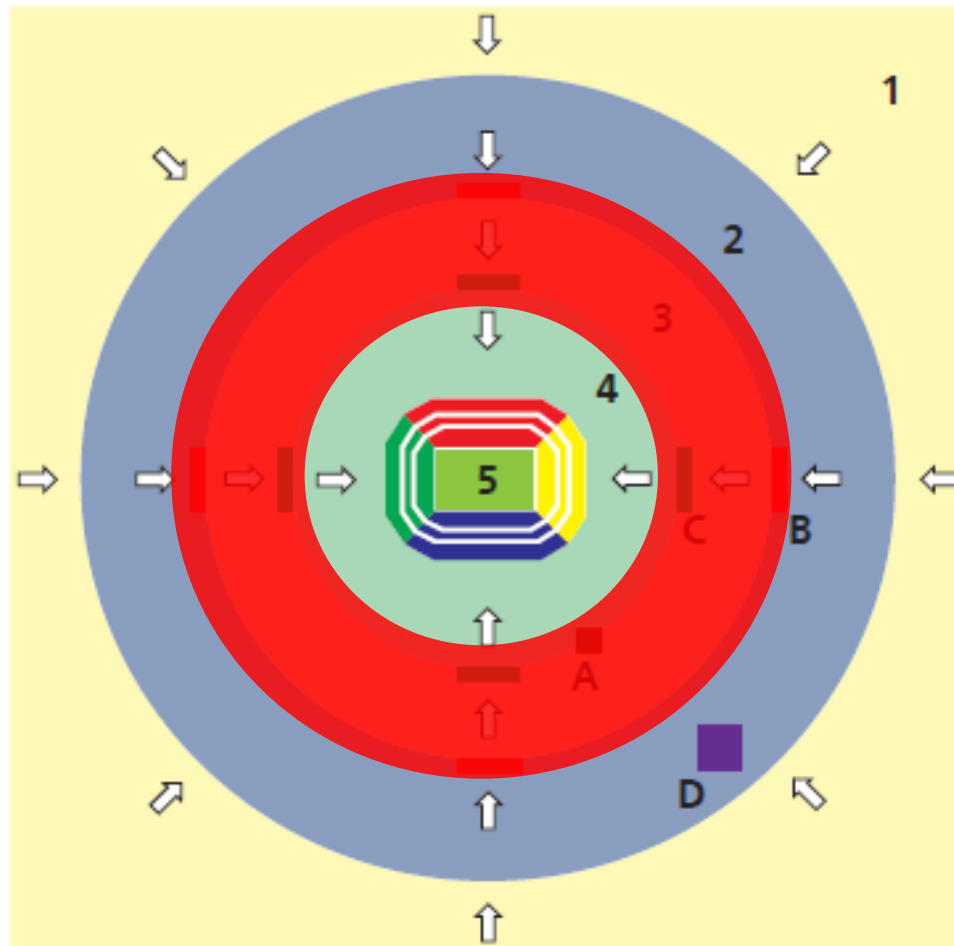


- 1. The public zone
- 2. The exclusive zone
- 3. Outer perimeter (visual ticket check)
- 4. Inner perimeter (electronic access control)
- 5. The stands
- A. TCP
- B. Mags & bags
- C. Turnstiles
- D. STC

**Notes:**  
 TCP: Ticketing clearing point  
 STC: Stadium ticketing centre

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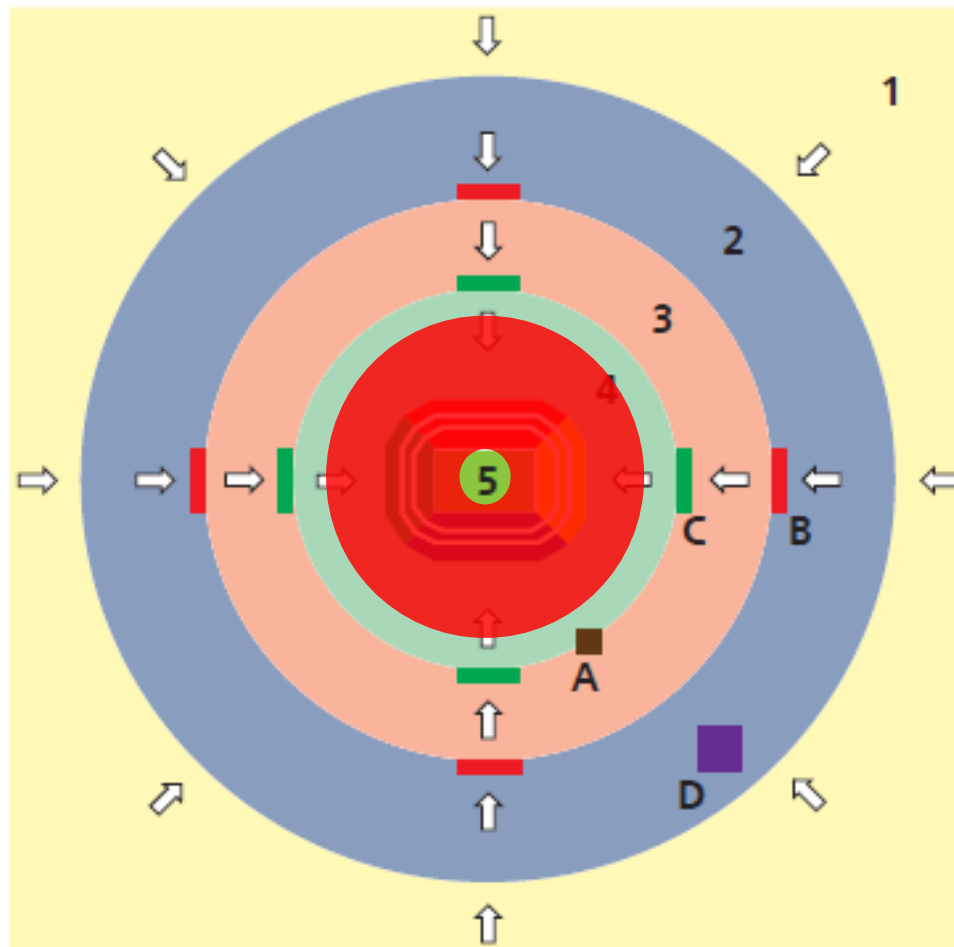
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# Stadium Areas & Zones

## Public Zone

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



# Stadium Areas & Zones

## 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





# Stadium Areas & Zones

## Inner Perimeter

### 1. Main Entrances

- Turnstiles, barriers and revolving doors.
- 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

## 1. Main Entrances – Turn Stiles





# Access Control System

## Full Height Turnstiles

- For High Security
- Control and regulate throughput



## Access Control System

Main Entrances –

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





# Access Control System

## Main Entrances – Carpark Control

- Physical protection of cars/lorries,





# Access Control System

## Main Entrances – VIP

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



## Access Control System

No. of Turnstiles depending on the capacity of the Stadium.

Approximate Stadium Capacity: 40,000 persons  
Considering the Turnstile throughput: 10 persons per min.

Assumed time to fill the stadium: 60mins

No. of turnstiles required = = **66.66 or 67 turnstiles**  
(40,000 persons/ 10 persons per minute/ 60 minutes)

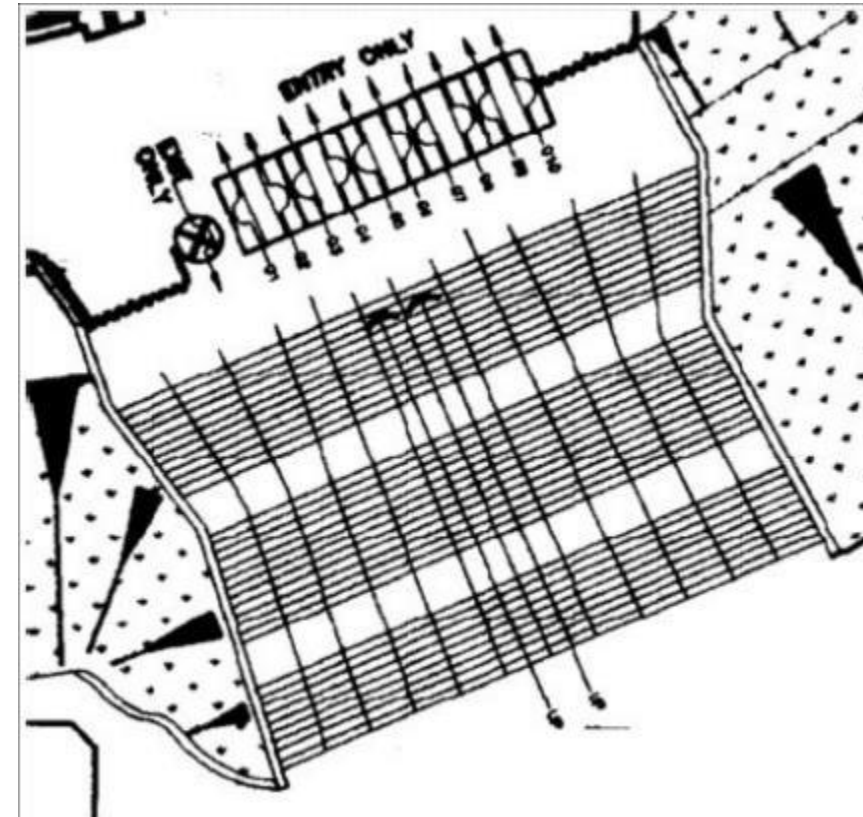
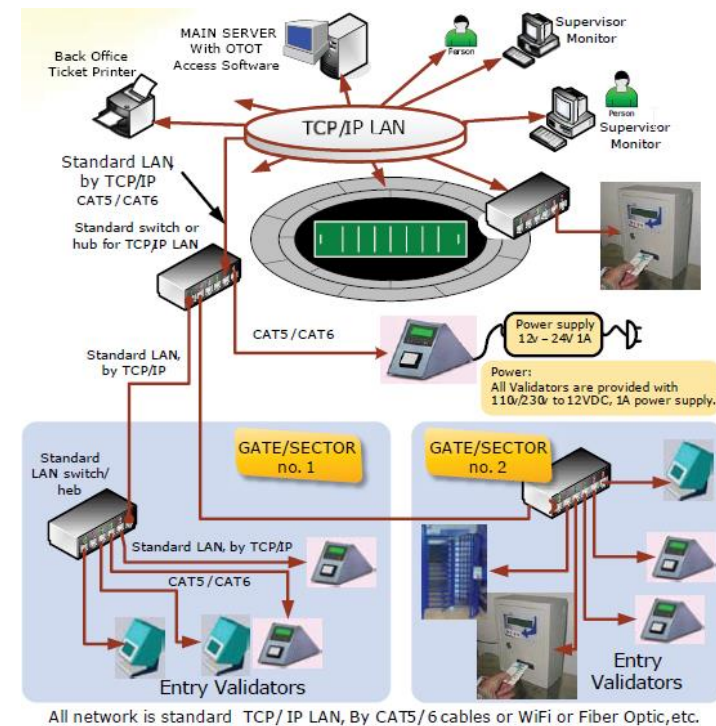


Figure 42 - Plan of gate G and turnstiles (Left = 1, Right = 10)

# Access Control System

## 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 **Separation**.





# Access Control System

## Main Entrances – Access Points or Readers

### 1. Vandal Proof & Bullet Proof readers



Bullet & Vandal Proof  
Access Card Readers



# Access Control System

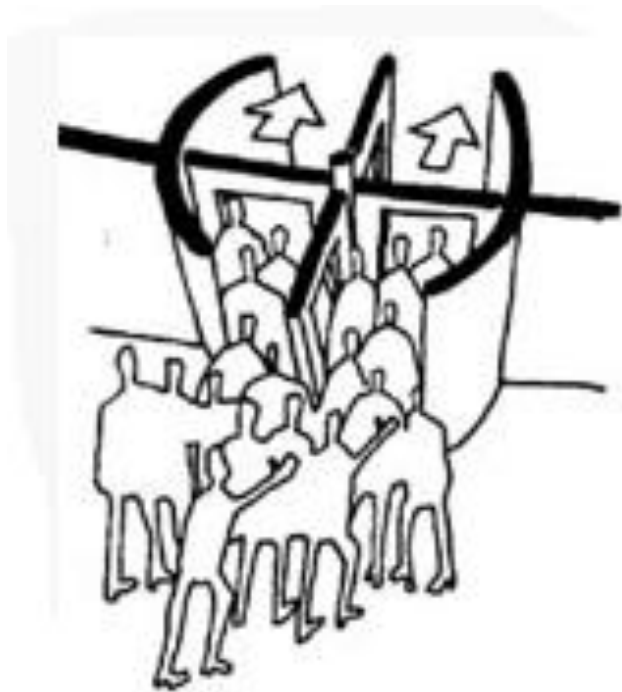
## Main Entrances – Other Areas

- Fan shop
- Press Center
- Office Areas

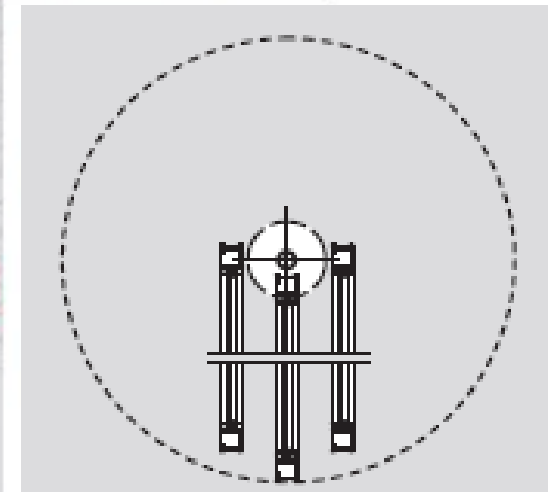
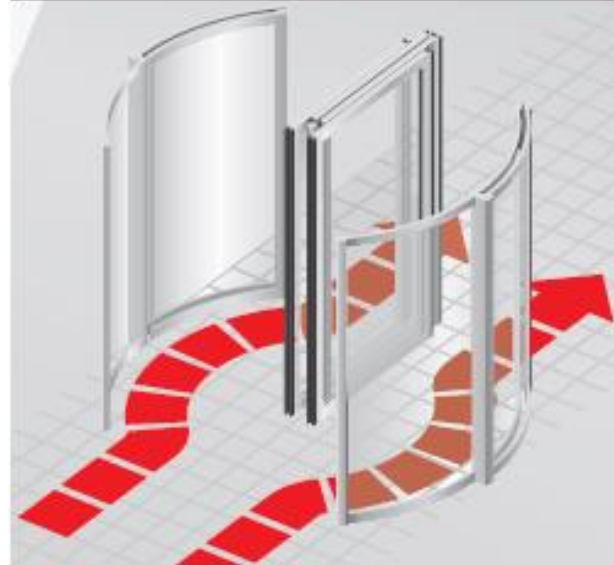


# Access Control System

## Automatic Revolving door with Breakout Function



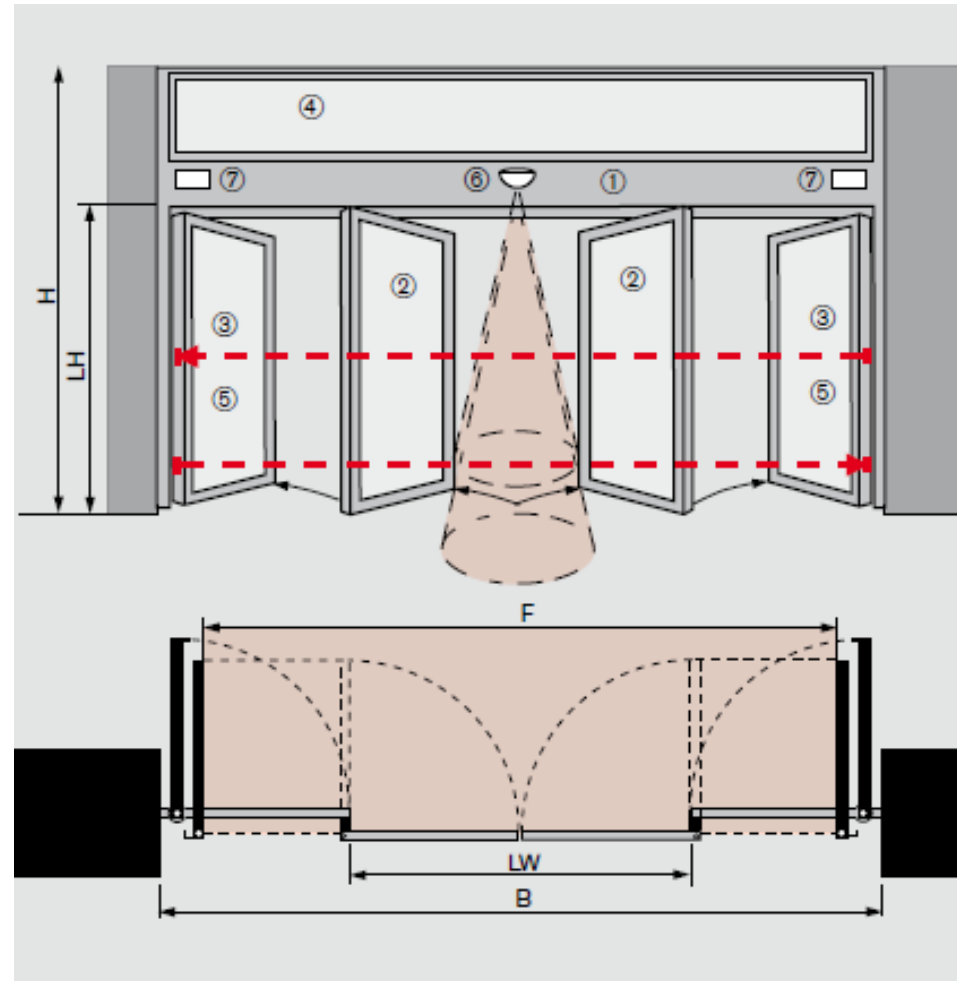
Escape route





# Access Control System

## Automatic Sliding Door with Breakout Function



# Access Control System

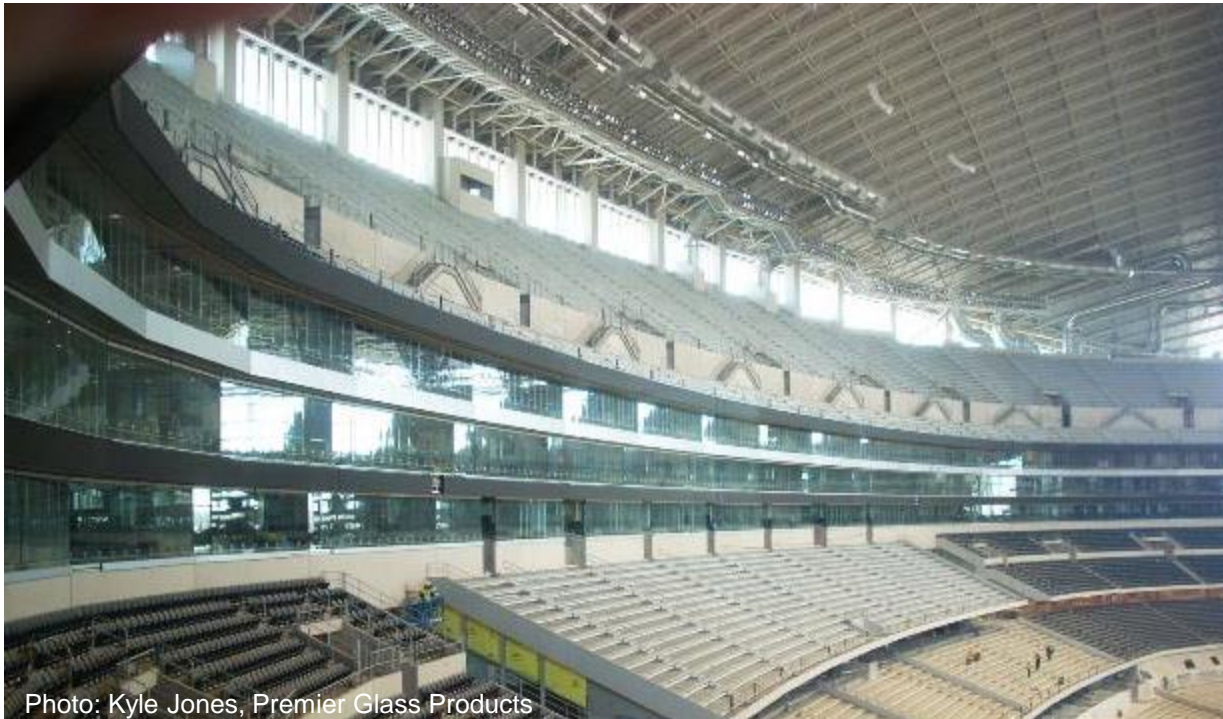
## Internal Doors, Stands & Fences

- 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
- Entrance via card for a certain block.



## Access Control System

Transparency and flexibility for VIP boxes



# Access Control System

## 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

## 3. Exit or External Doors





# Access Control System

## 3. External Doors – Emergency Exit Doors

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

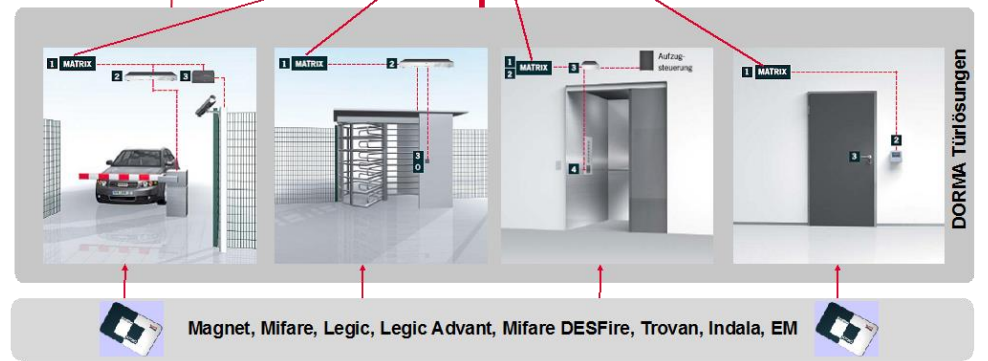
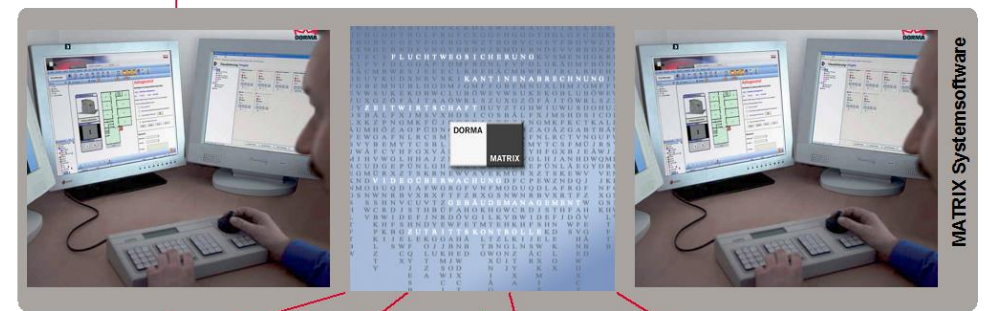
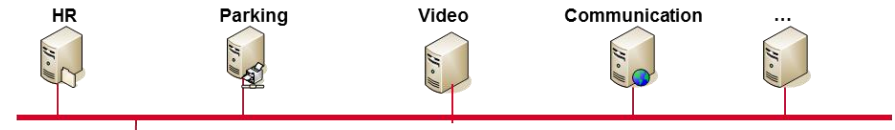




# Access Control System

## 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

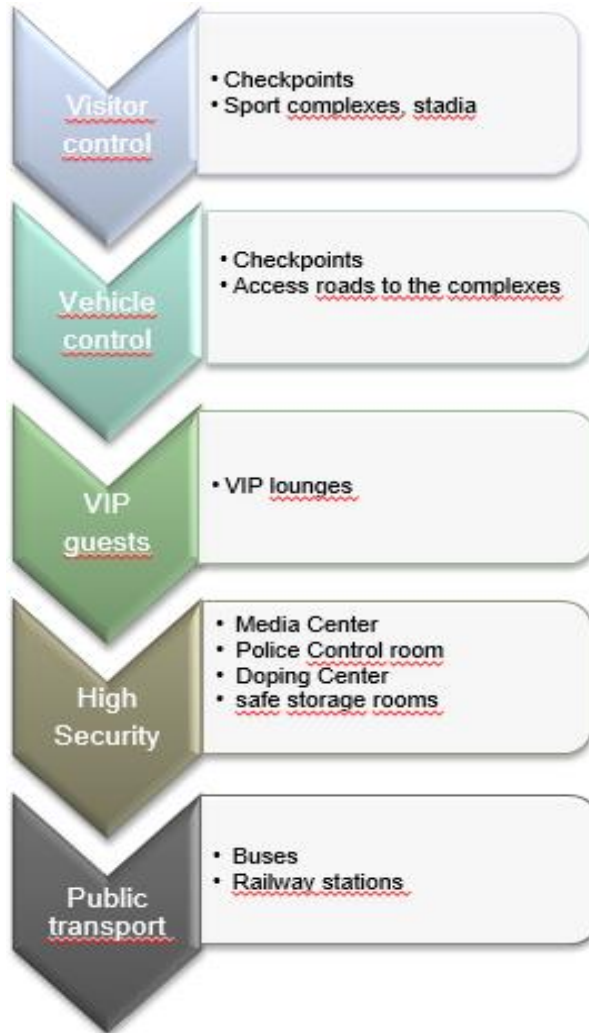




# Access Control System

## One card can give access to:

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



# Access Control System

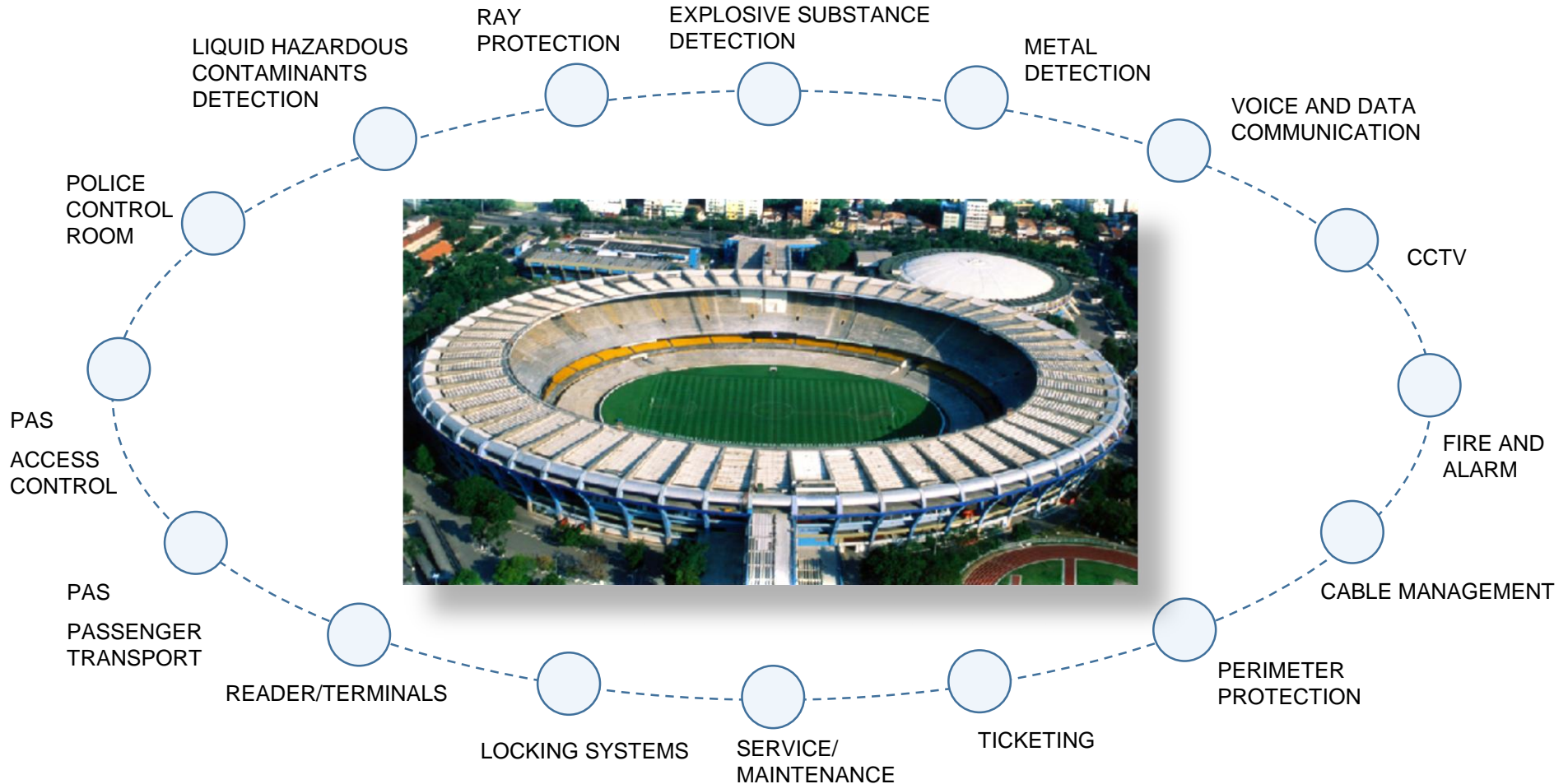
## ACS should be Integrated to:

- Fire Alarm System
- Escape Route System
- Building Management System
- CCTV
- Intrusion / Burglar Alarm System
- Ticketing System
- Payment Solutions
- INTERCOM System
- Public Address System .....



# Total Solution:

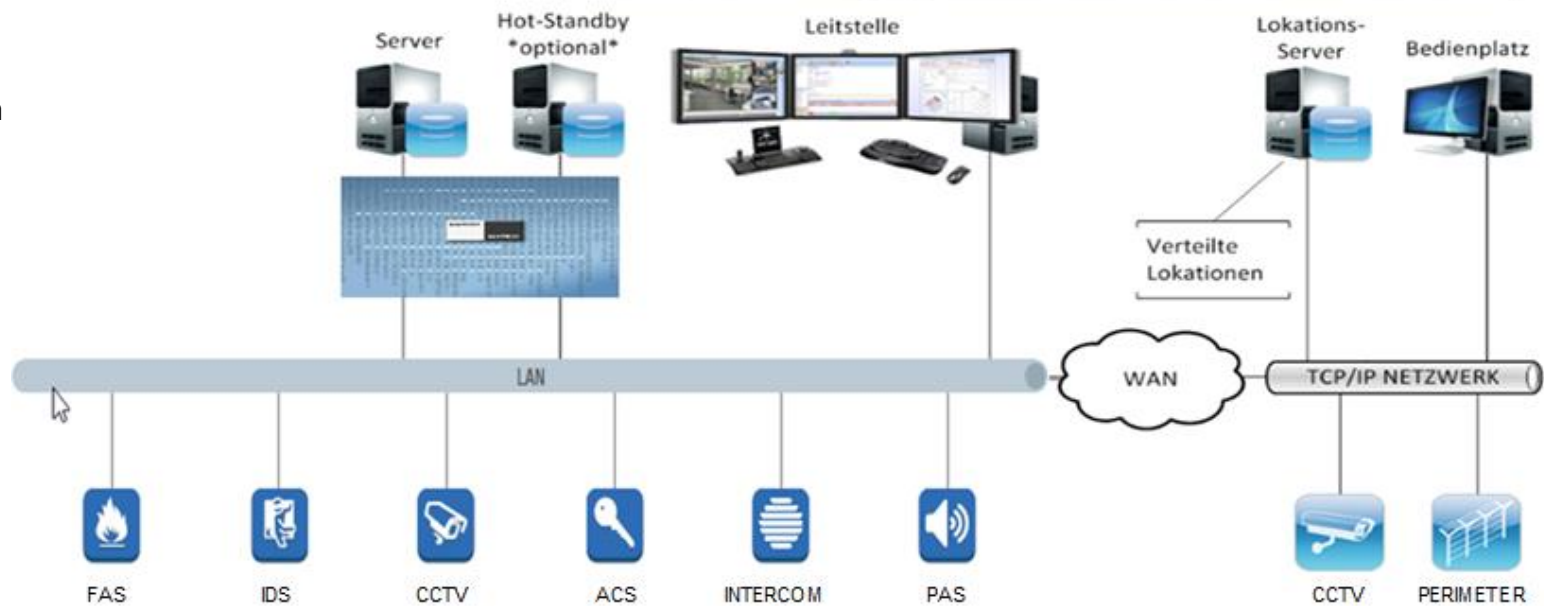
## Safety & Security Systems as one Integrated System



# Common Control/ Command Center

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



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Video







# Thank you

dormakaba 

