A Fire Elevators (Escalators & Travelators) Management System in the International Airport of Rome Fiumicino

FEMS

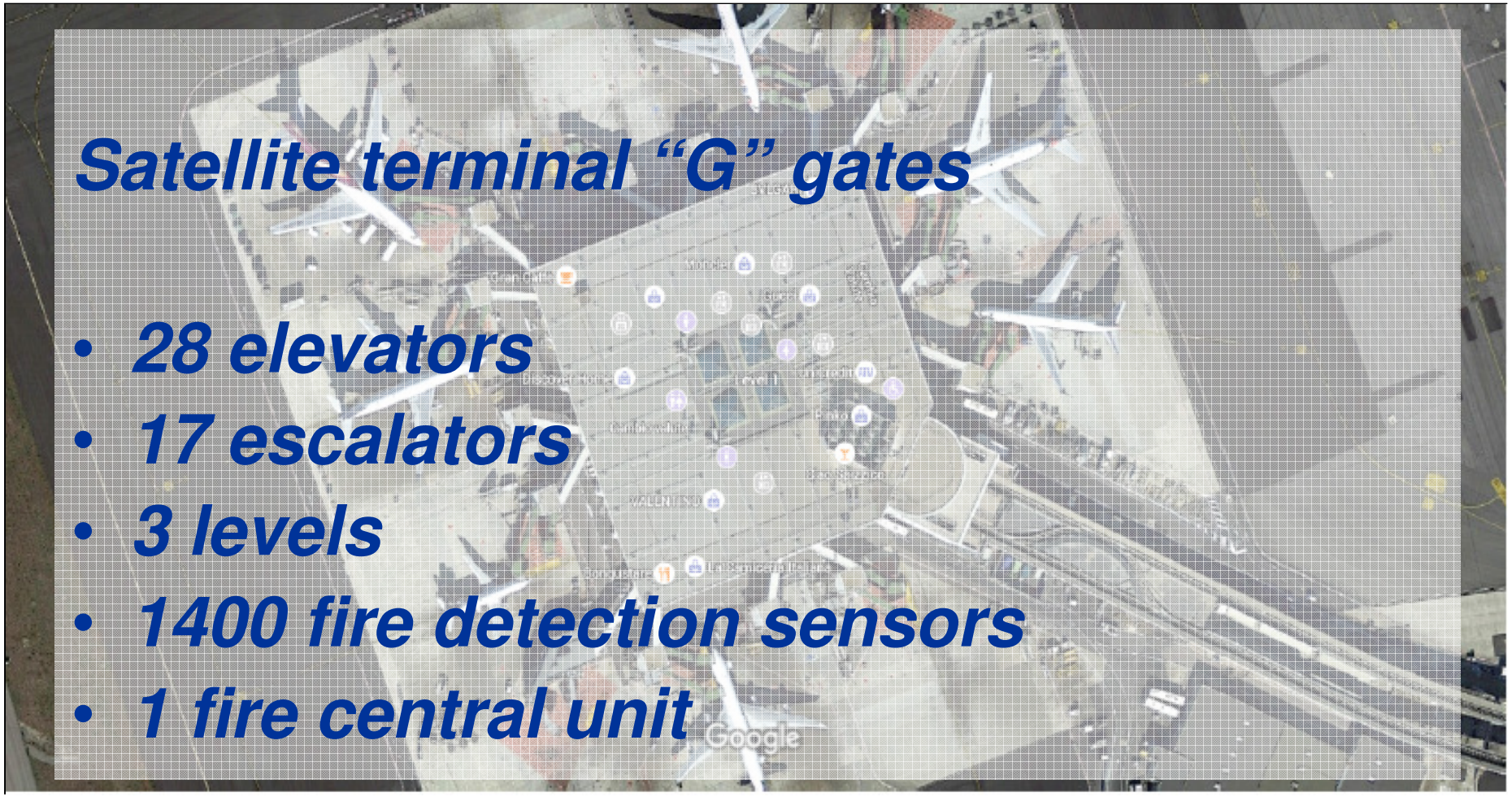
EN 81-73 :

"Safety rules for the contruction and installation of lifts.

Particular applications for passenger and goods passenger lifts

Part 73 : Behaviour in case of fire"

In January 2014 Aeroporti di Roma S.p.a. (ADR) decided to implement a safety system similar to EN 81 – 73 to elevators, escalators and travelators in the International Airport of Rome Fiumicino (FCO) starting from G gates Terminal (SATELLITE)



Satellite terminal "G" gates

- 28 elevators
- 17 escalators
- 3 levels
- 1400 fire detection sensors
- 1 fire central unit

Main system requirements of ADR were :

- ***Open*** *Hardware and Software architecture;*
- ***Fully automatic*** *procedure start;*
- ***High*** *system reliability (at least SIL 2);*
- *Minimize probability of "**fake**" alarms*

Fems procedure for elevators:

1. ***"x"*** *fire sensors in alarm at the* ***same floor*** *or in* ***specific zone****;*
2. *Select (* ***automatically****) evacuation floor;*
3. ***Ignore / cancel*** *calls (in / out);*
4. *Bypass photocell (* ***not door safety contacts*** *!);*
5. *Go to evacuation floor, open doors and* ***STOP***

Fems procedure for elevators:

Evacuation floor *is variable and* ***not always*** *the lowest floor;*

For example : in the multi-level Parking buildings of the Airport the ***safest floor*** *could be the* ***top level floor*** *with an emergency fire-resistant stair-way*

Fems procedure for escalators & travelators:

1. ***"x"*** *fire sensors in alarm at the* ***same floor*** *or in* ***specific zone****;*
2. ***STOP*** *escalators & travelators in the zone;*
3. *If* ***necessary*** *&* ***possible*** *(slowly) stop and* ***invert*** *sense of running;*

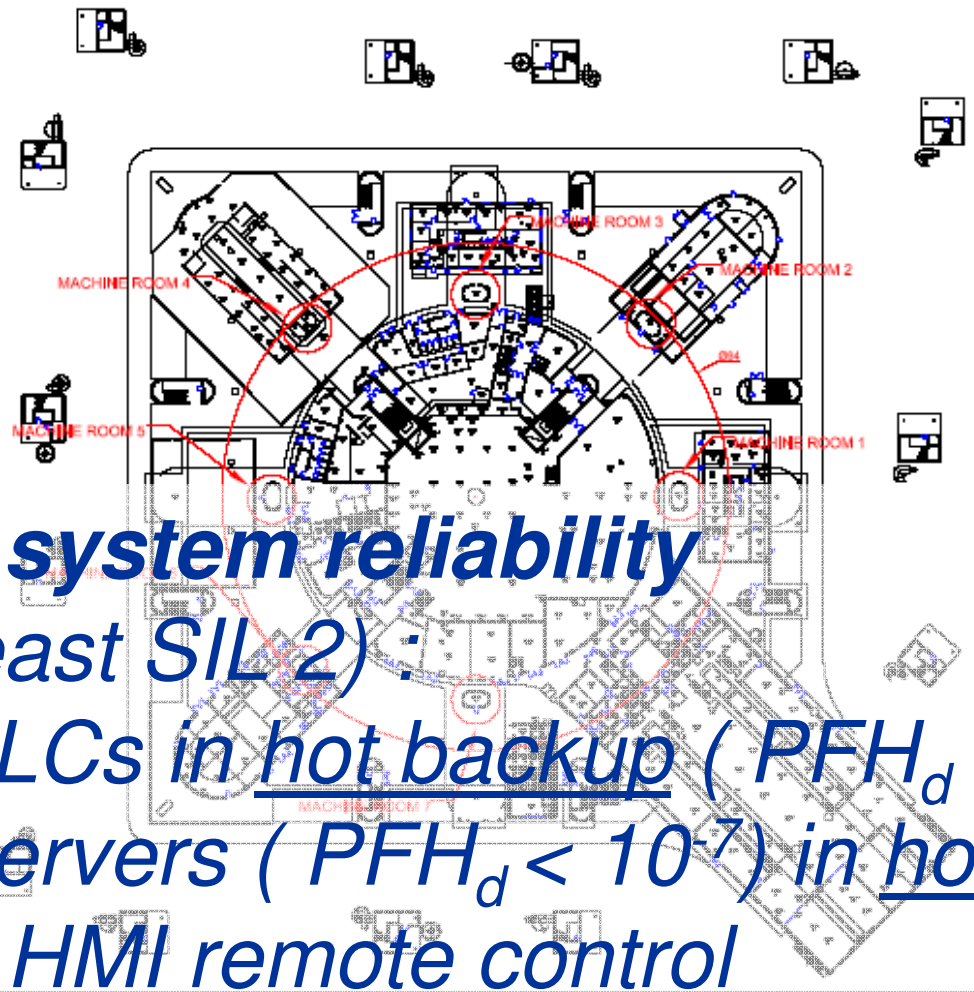
Open h/w & s/w architecture requirement :

- *2 industrial Schneider PLCs with 7 I/O modules;*
- *Open firmware for PLCs with standard communication protocol (MODBUS TCP/IP);*
- *Open interface modules (Elettroquadri & Hydroware) with elevators / escalators;*
- *Open SCADA (Intouch system platform by Wonderware by Schneider Electric)*

Fully automatic procedure start :

- *If a **pre-determined** number of fire sensors are in alarm at the **same floor** or in a **specific area**, in the same time, the FEMS procedure starts **without any human supervision (un-supervised system)***

Satellite terminal layout
Level 2,0 m



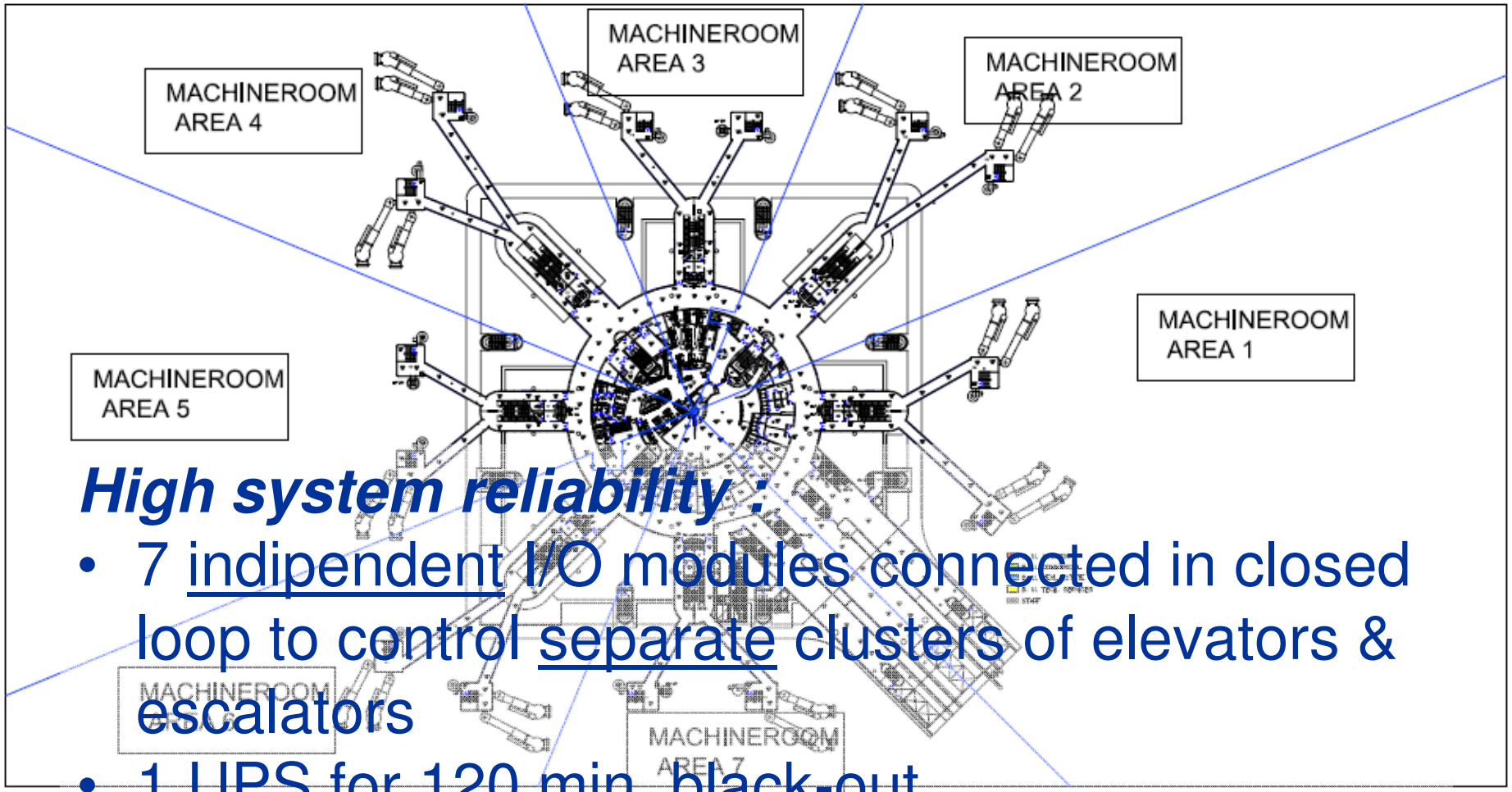
MACHINE ROOM	ELEVATORS	INSTALLATION
1	ELV 174 ELV 175	PLC / MODULE IO / UPS
2	ELV 172 ELV 173	MODULE IO
3	ELV 170 ELV 171	MODULE IO
4	ELV 168 ELV 169	MODULE IO
5	ELV 166 ELV 167	PLC / MODULE IO
6	ELV 164 ELV 165	MODULE IO
7	ELV 162 ELV 163	MODULE IO

High system reliability

(at least SIL 2) :

- *2 PLCs in <u>hot backup</u> ($PFH_d < 10^{-7}$)*
- *2 Servers ($PFH_d < 10^{-7}$) in <u>hot backup</u>*
  + 3 HMI remote control

Satellite terminal layout
Level 6,50 m

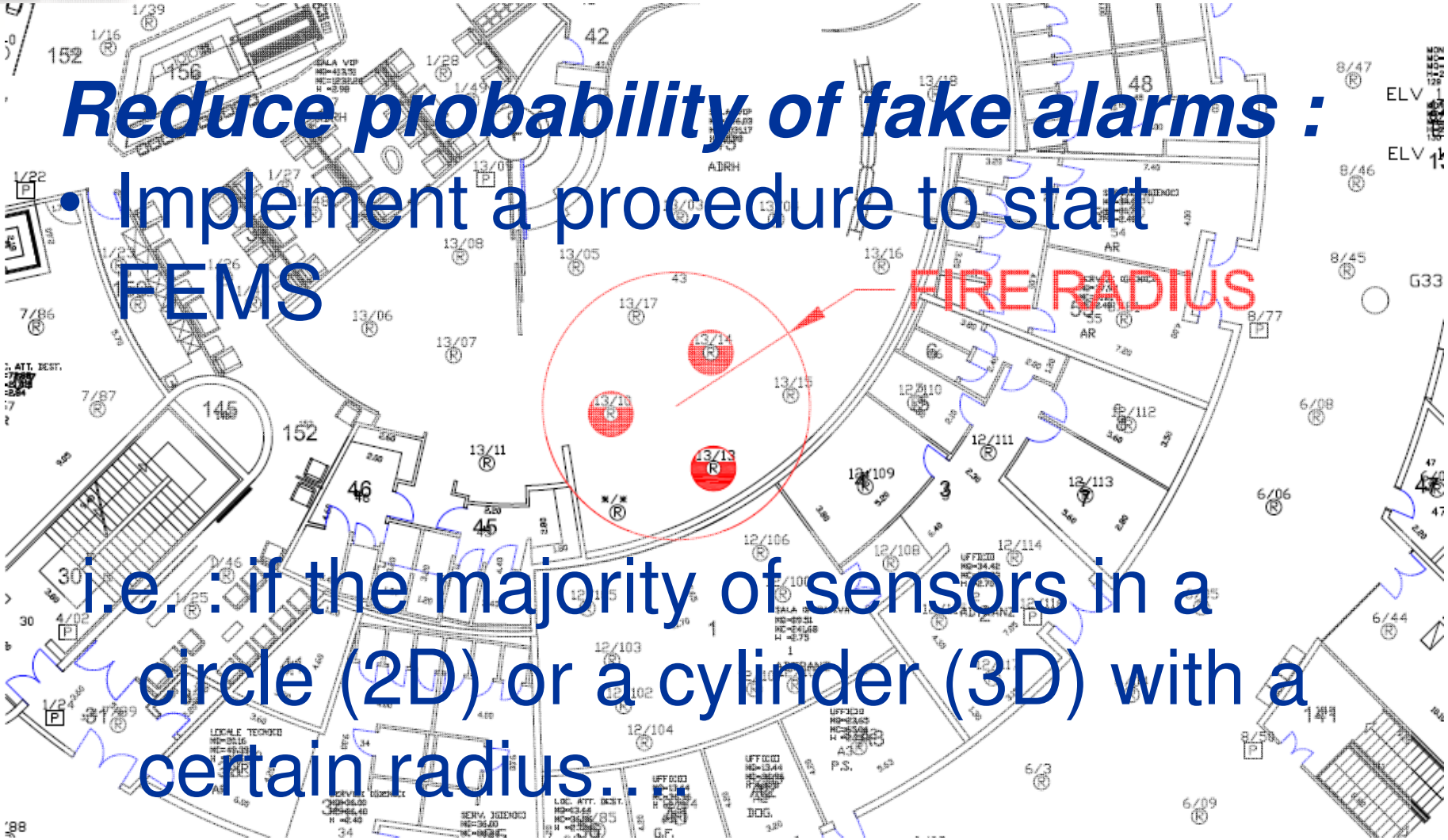


High system reliability :

- 7 <u>indipendent</u> I/O modules connected in closed loop to control <u>separate</u> clusters of elevators & escalators
- 1 UPS for 120 min. black-out

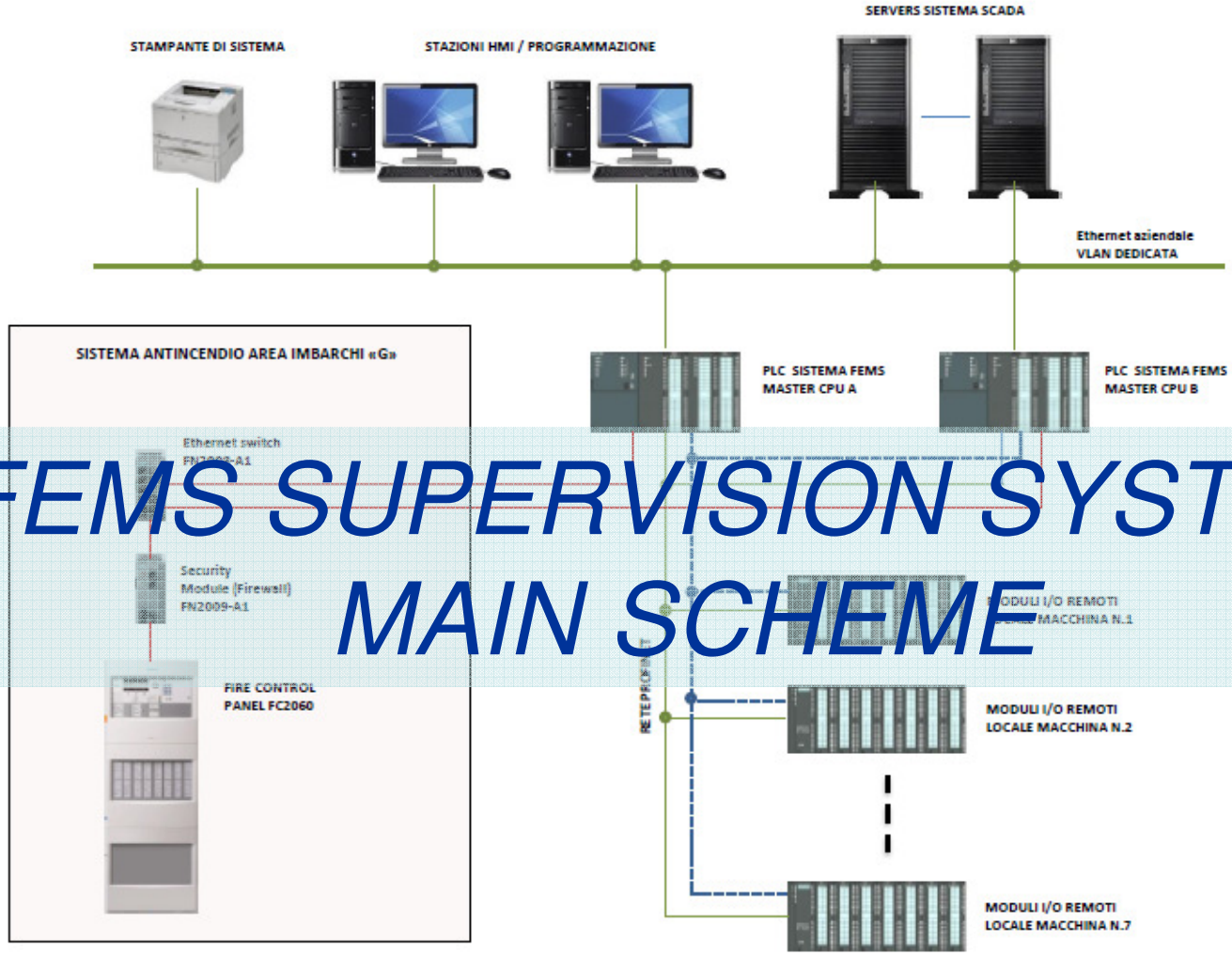
Reduce probability of fake alarms :

- Implement a procedure to start FEMS

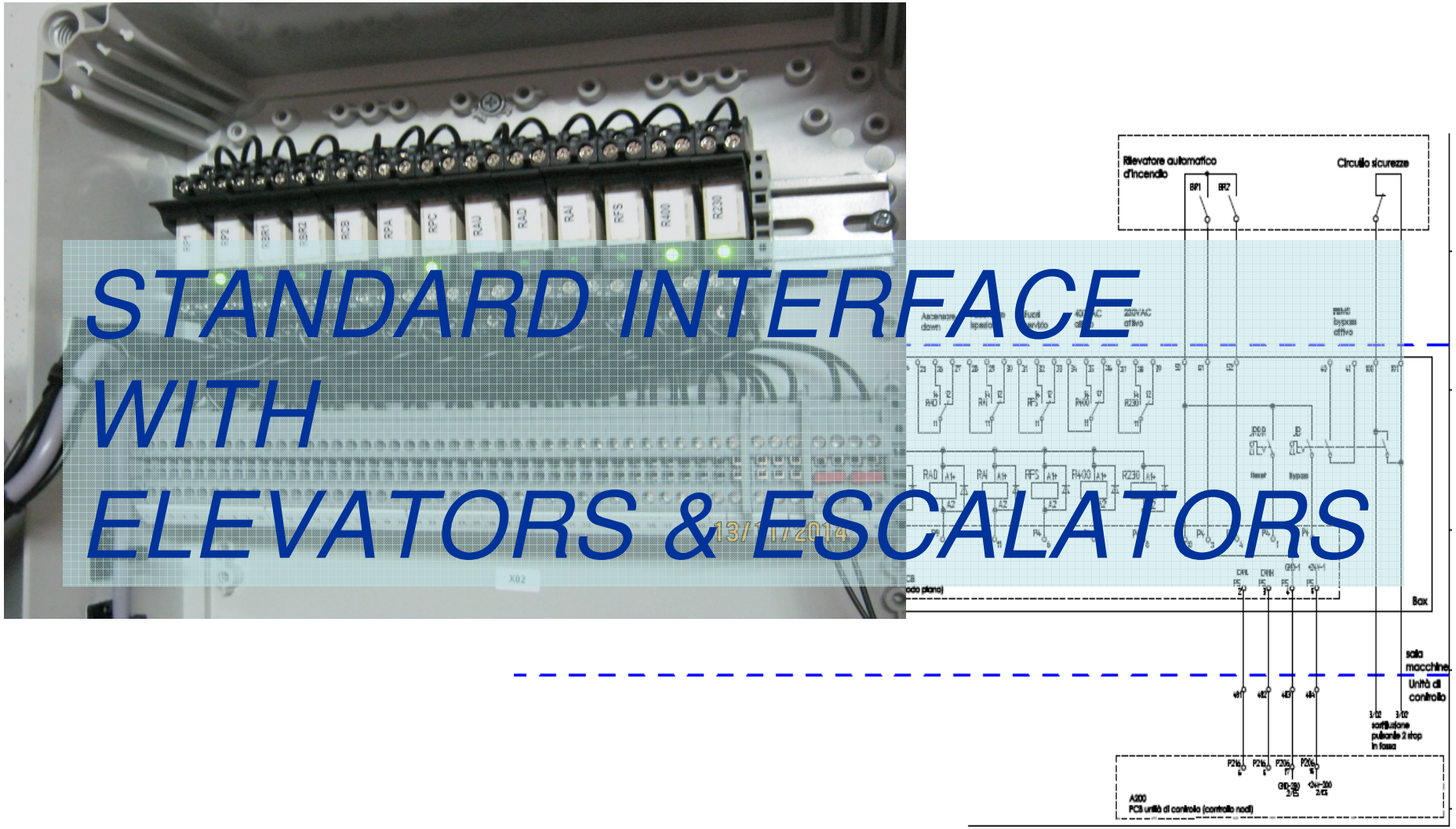


i.e.: if the majority of sensors in a circle (2D) or a cylinder (3D) with a certain radius…

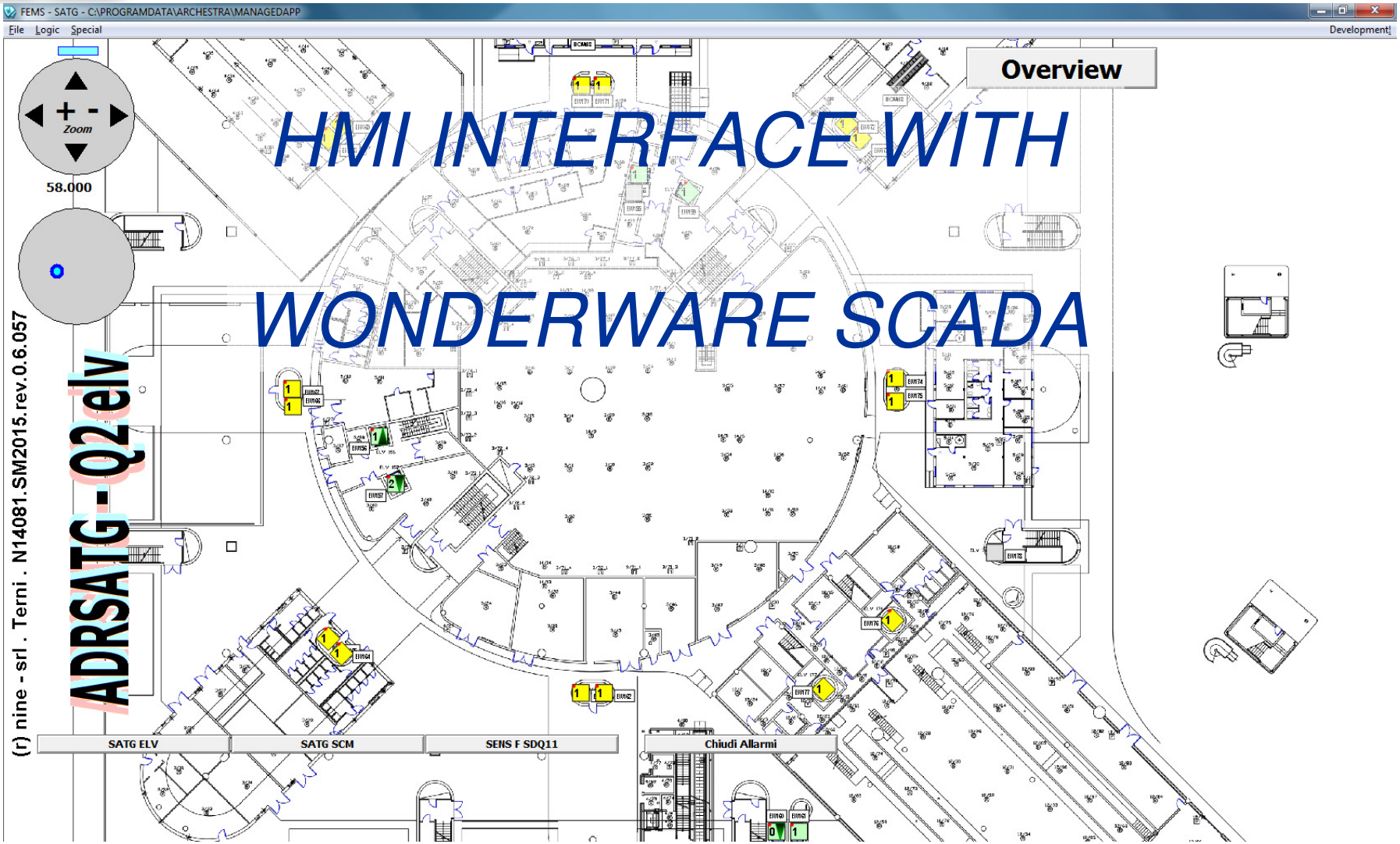
FEMS SUPERVISION SYSTEM MAIN SCHEME

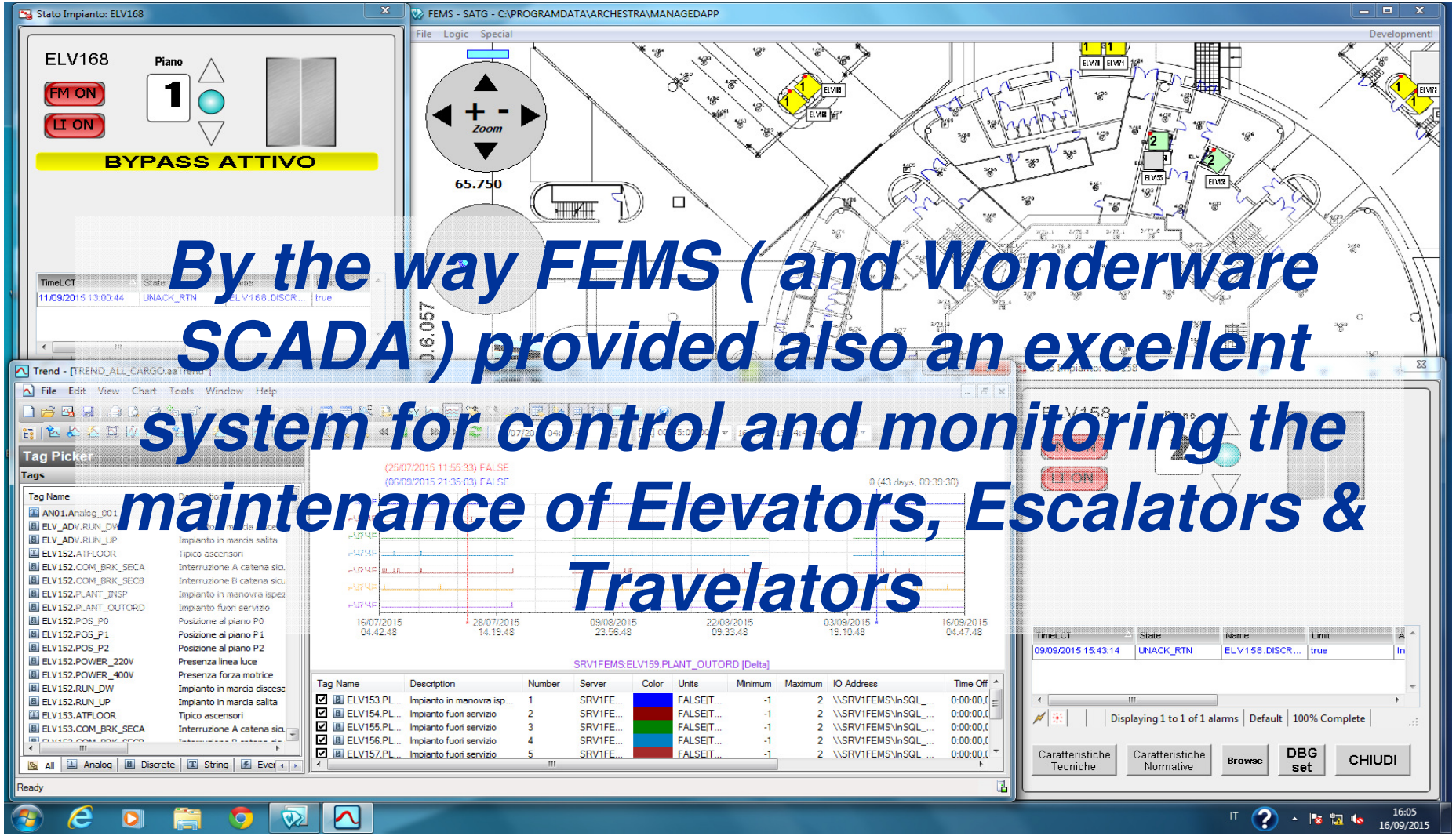


STANDARD INTERFACE WITH ELEVATORS & ESCALATORS



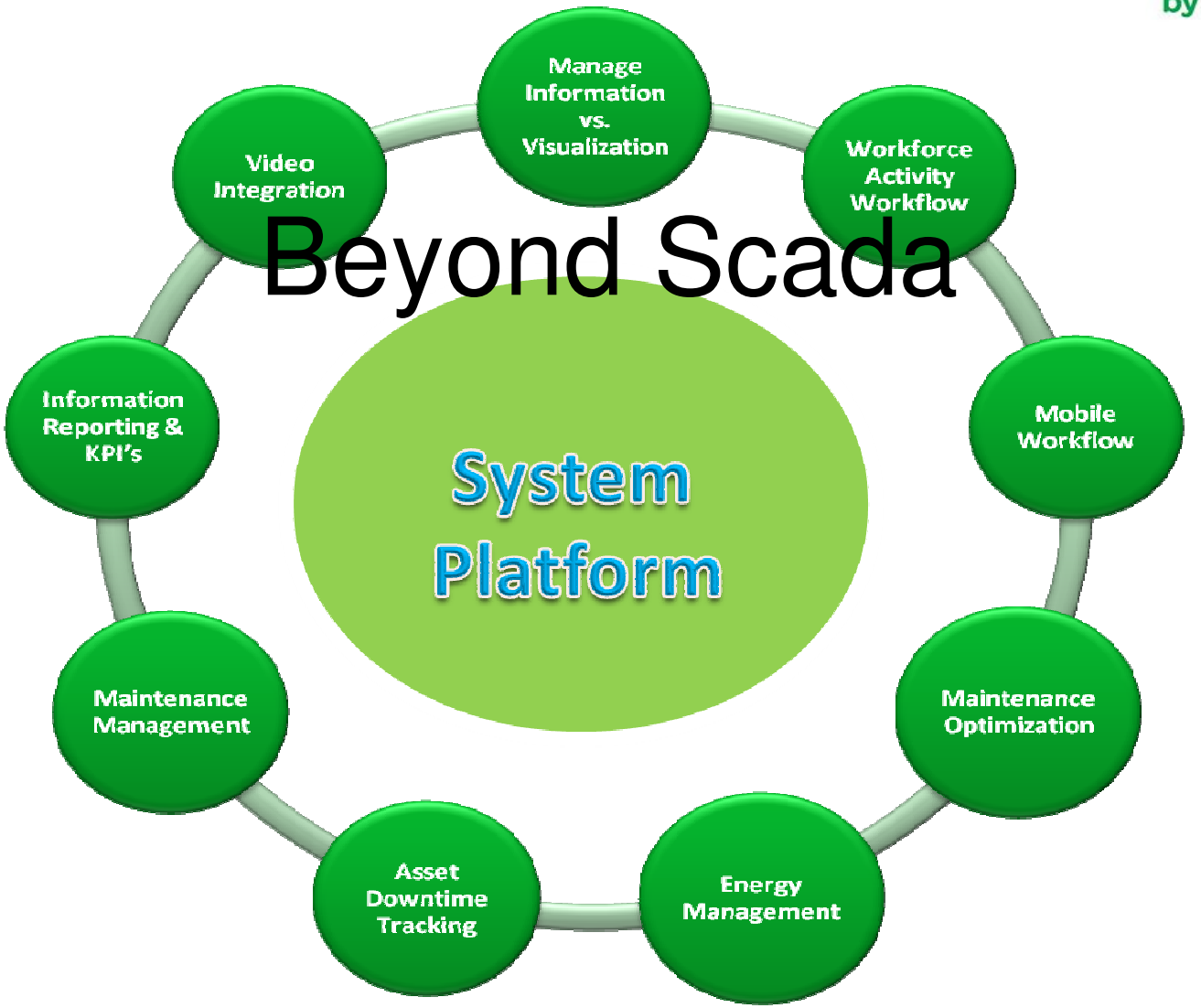
HMI INTERFACE WITH WONDERWARE SCADA



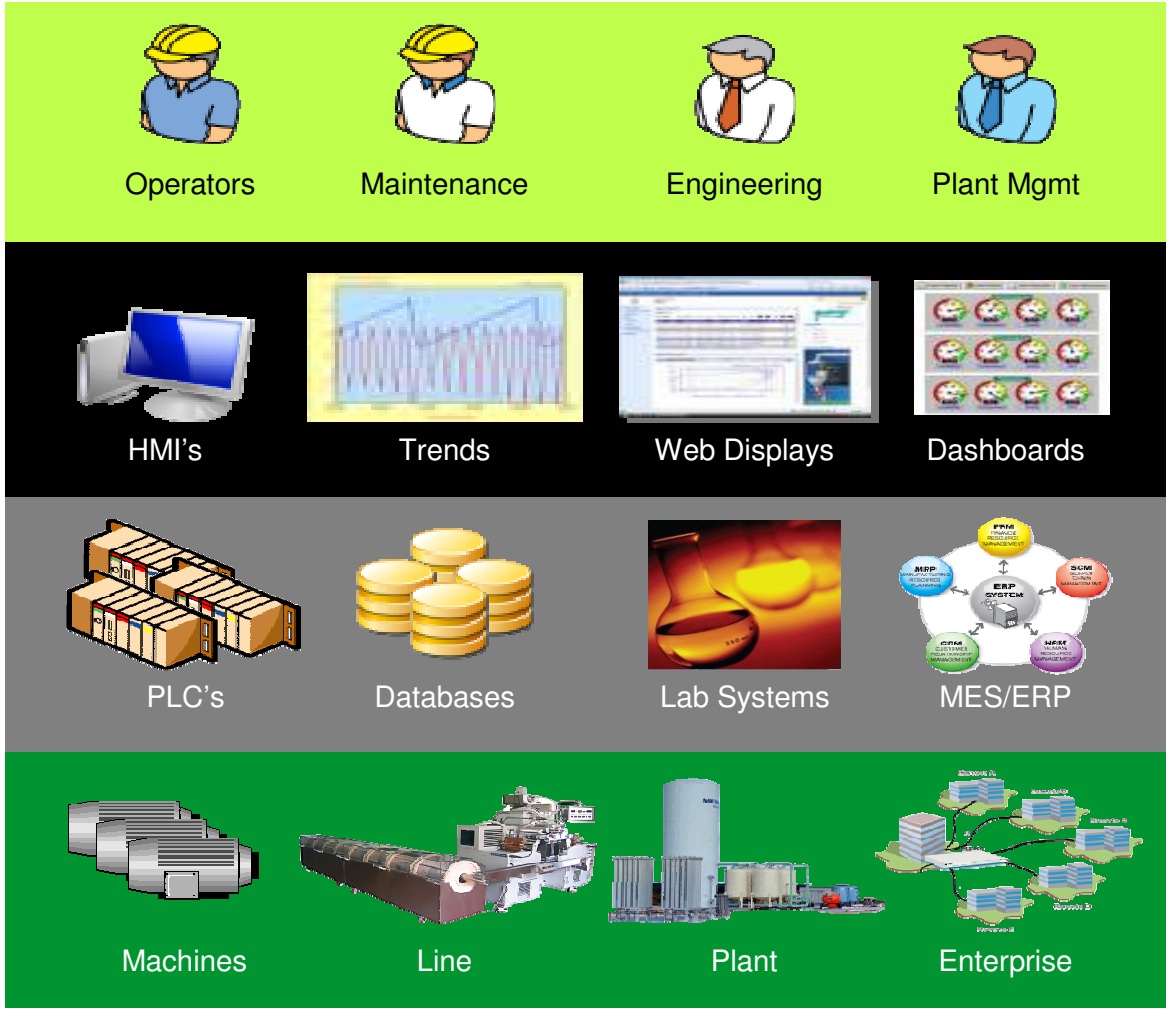


By the way FEMS (and Wonderware SCADA) provided also an excellent system for control and monitoring the maintenance of Elevators, Escalators & Travelators

Beyond Scada



– **Main functions**
  - **Data exchange (AOS)**
  - **Supervisory Engine (AOS)**
  - **Information Accessibility (HMI)**
  - **Context & Aggregation (AOS)**
  - **Data Storage (Historian)**
  - **Analysis**
    - » **Real-Time (InTouch Wonderware Information Server, Historian Trend)**
    - » **After-the-Fact (WIS, Historian Clients)**



The FEMS will be installed in the other Terminals and Areas of the International Airport of Rome Fiumicino

The FEMS will control about :

-170 elevators

-100 escalators & travelators

with signals coming from about 18.000 fire detection sensors

My personal thanks and appreciation to :

- ***ANACAM Lift Association***
- ***Aeroporti di Roma S.p.a.***
- ***Wonderware by Schneider Electric***