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Rail High Probability Low Impact protection

Technology solutions

João Carlos Silva / REFER Telecom
jcsilva@refertelecom.pt

INTERNATIONAL UNION OF RAILWAYS

REFER

COMBOIOS DE PORTUGAL

What are security HPLI events?

High Probability Low Impact

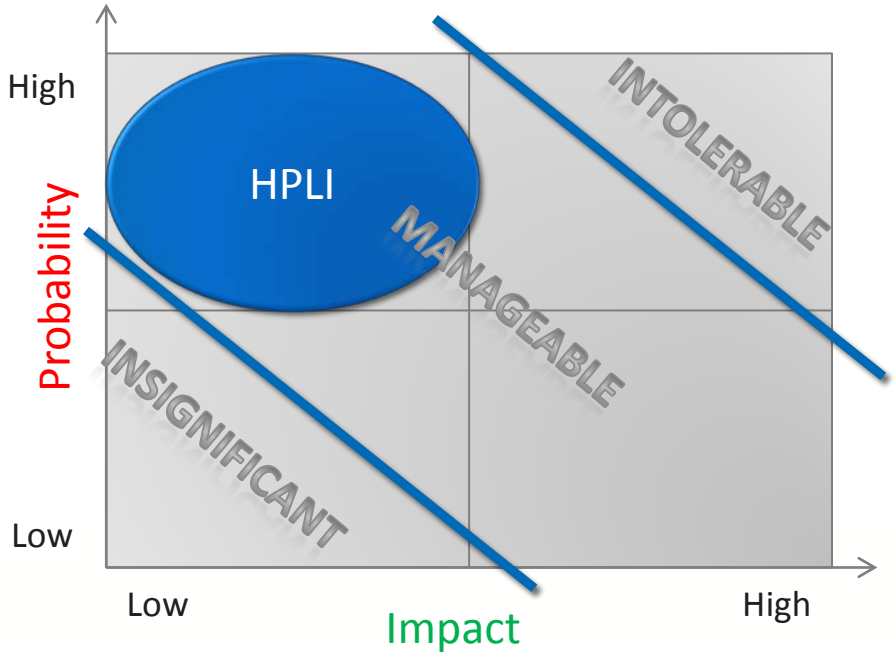
Probability is the measure of expected occurrences over the entire system or a part of the system during the foreseeable planning period.

Impact is the contribution of a single occurrence on the assets lifespan, service performance, customer experience or organizational reputation.

For security and safety, the impact is measured as the lowering of the system resilience and stability and the potential consequences for the stakeholders

What are security HPLI events?

High Probability Low Impact

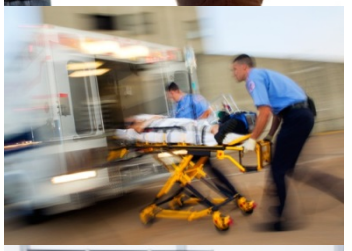


HPLI and risk management

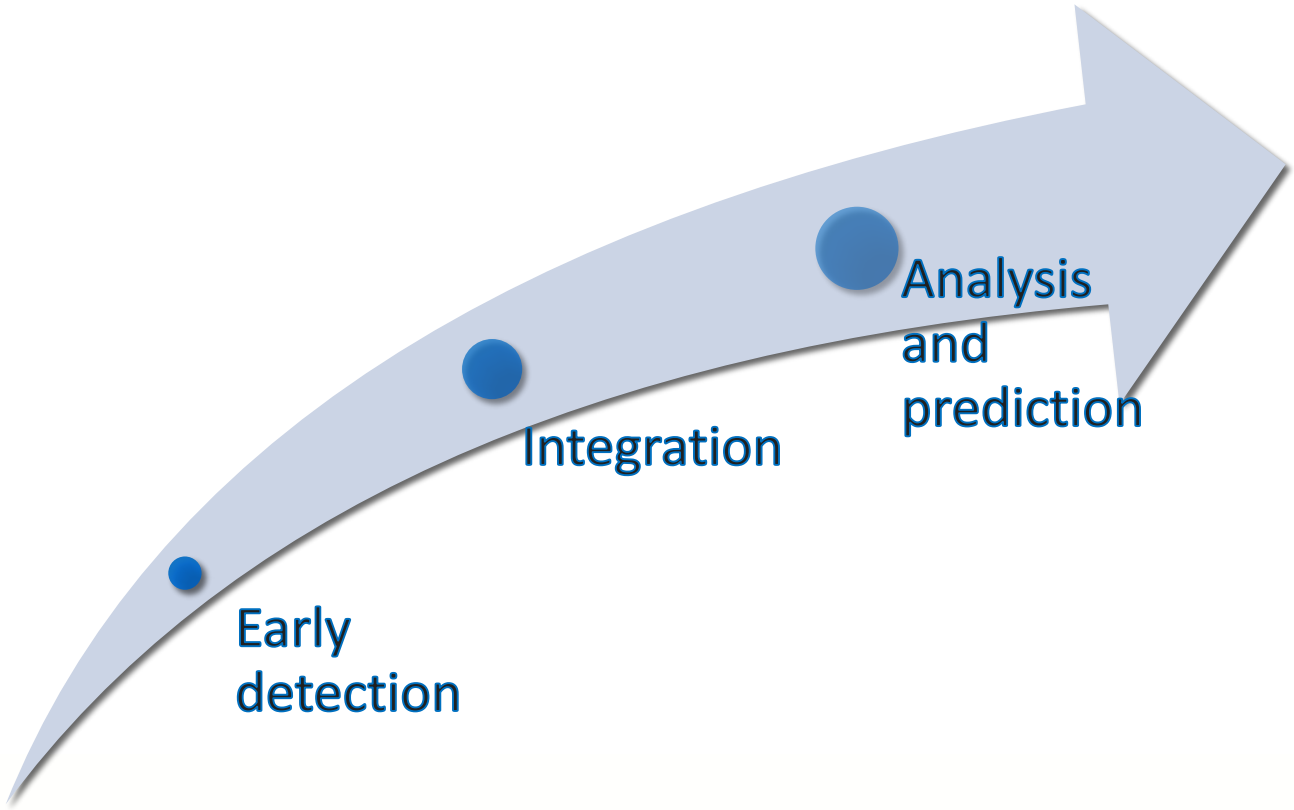
Some consequences of HPLI events:

- Graffiti
- Non precious metal theft
- Vandalism
- Free-riding of passengers
- Pick-pocketing and theft
- Passenger dispute
- Medical assistance of passengers
- Lost or abandoned luggage




Rail HPLI handling and prevention

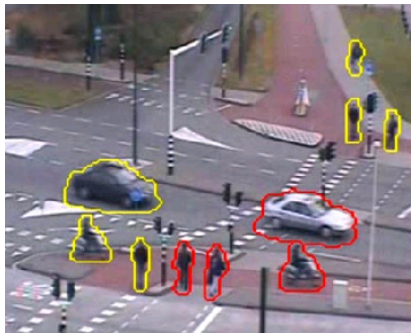


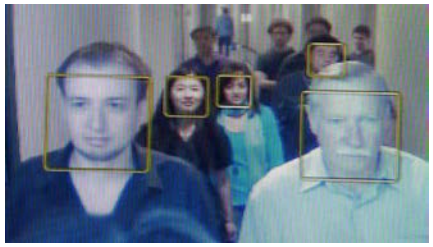
Early detection / Sensor technologies

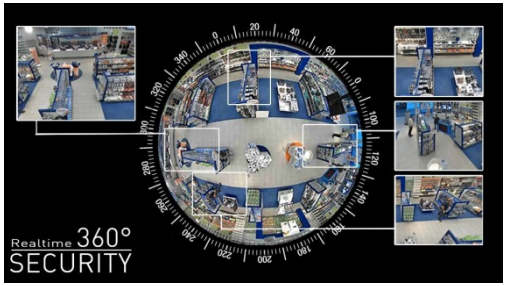
- On board sensors
  - door blocking, person counters, flame detector, chemical tracer, location/kinetic
- Infrastructure sensors
  - trespassing, falling rocks detection, level crossing obstruction, tunnel and bridge monitoring, geotechnical monitoring, vehicle weighting/profiling
- Asset operation sensors
  - jamming, overheating, wear & tear, near failure, power loss, tampering, heartbeat
- Environmental sensors
  - weather, light, temperature, humidity, flooding, fire detection, animal detection

Early detection / Video technologies

- Video fencing/motion
- Crowd detection
- Abandoned objects detection
- Face recognition
- License plate reading
- Stereo 3D imaging
- Omnidirectional imaging







Early detection / Information Technologies

- Passenger report/complaint
- Social events/gatherings
- Public order disturbances
- Emergency events
- Maintenance operations
- Survey statistical trends

Integration

Communicate sensor event data in real-time

- I/O Sensors, Sensor Webs, BUS Data and SCADA
- Legacy system conversion and translation
- Internet of Things (IoT) enabled devices
- Network transmission of event data

Enhance sensor information

- Location (GPS/fixed location)
- Time
- Context data

Distribute event data through SOA architecture

- Gathering of statistical data
- Brokering of event data for notification and analysis

Analysis and prediction

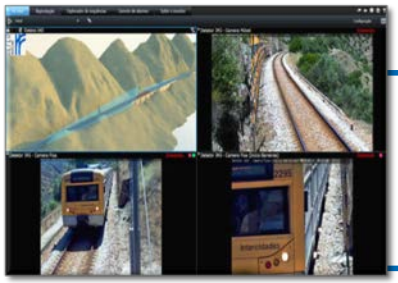
- Management and fusion of event data into actionable risk information

Bayesian belief networks	Statistical Forecasting	BIG Data	Business Intelligence (BI)
Probabilistic	Handles long series of event data	Handles large sets of data	Multi-dimensional representation of data
Causal inference of relations between events	Adequate for trend and cluster analysis	Highly parallel execution	Slice and dice of information
Returns probability of resulting event	Large set of mathematical models available	Allows complex prediction algorithms	Adequate to integrate with other business data

Main benefits of HPLI processing

- Increased attractiveness of the rail transport
- Reduction of operational costs
- Lower level of service disruption
- Longer lifespan of assets and reduced TCO

Case References REFER Group



Falling Rocks Detection System

interail

INTERAIL - Integrated track inspection system

Obstacle Detection System at railways level crossings

PEDDIR

PEDDIR - Dynamic weighting and wheel fault detection

GRAIL

GRAIL2 – GNSS based Enhanced Odometry for Rail

Q&A
Thank you

João Carlos Siva / REFER Telecom
jcsilva@refertelecom.pt