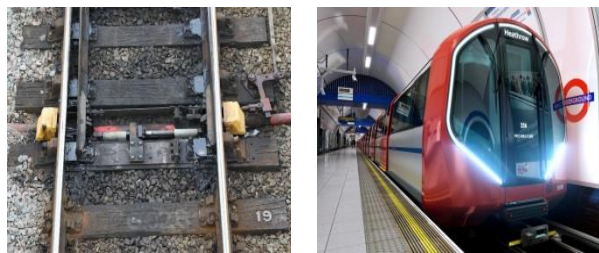


Background

Three asset families considered: railway points, rolling stock and lifts.

The health state of the asset (or individual components of the assets) is determined by monitoring selected parameters (e.g. air pressure in lift doors).



Objective

To estimate the risk of hazardous events occurring in the operation of the considered asset, considering the current health of the asset, projected operational usage, inspection and maintenance policies.

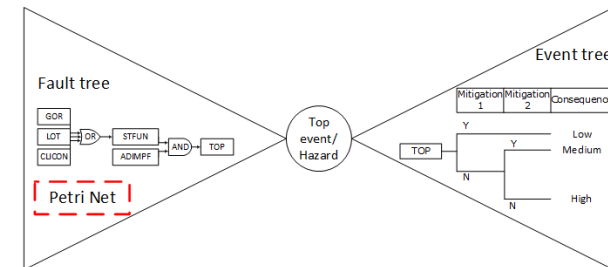
Methodology

Whole system risk

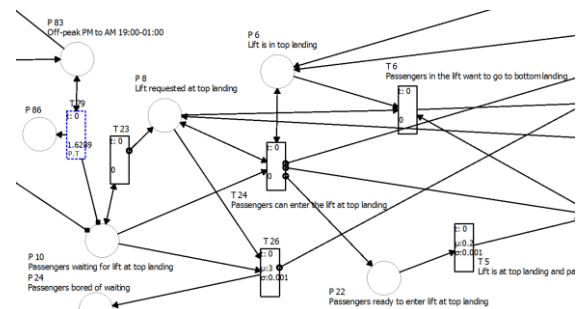
$$R = \sum_{i=1}^N (P(H_i) \times C(H_i))$$

Bow – tie model extended with a Petri Net

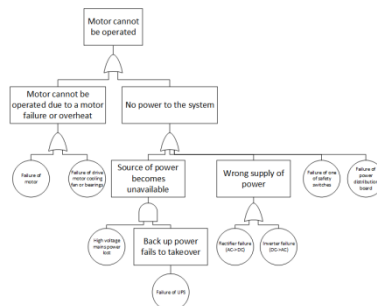
$P(H_i)$ is the probability (or frequency) of the occurrence of hazard, $C(H_i)$ are the consequences of hazard, N number of hazards



Petri Net to model the operation of asset and get statistics of component failures



Fault tree to evaluate the probability of a hazardous event



Event tree to evaluate the consequences of a hazardous event

Passengers in lift	Does the air conditioning system in lift work? N/Y	Lift stuck in between landings? N/Y	Fault Sequence Frequency (Events/year)	Consequences	Risk
N	Y	Y	10.5	No accident	
Y	Y	Y	5.5		0.275
Y	Y	N	1.75		0.875
Y	N	Y	0.175		0.175
Collective risk =					1.325