



# IRSC 2022

INTERNATIONAL RAILWAY  
SAFETY COUNCIL

SEVILLA, OCTOBER 16-21, 2022



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# STRENGTHEN SAFETY CULTURE IN THE ASPECTS OF CONSEQUENCE, COMPLIANCE, COMMUNICATION AND COMPETENCE



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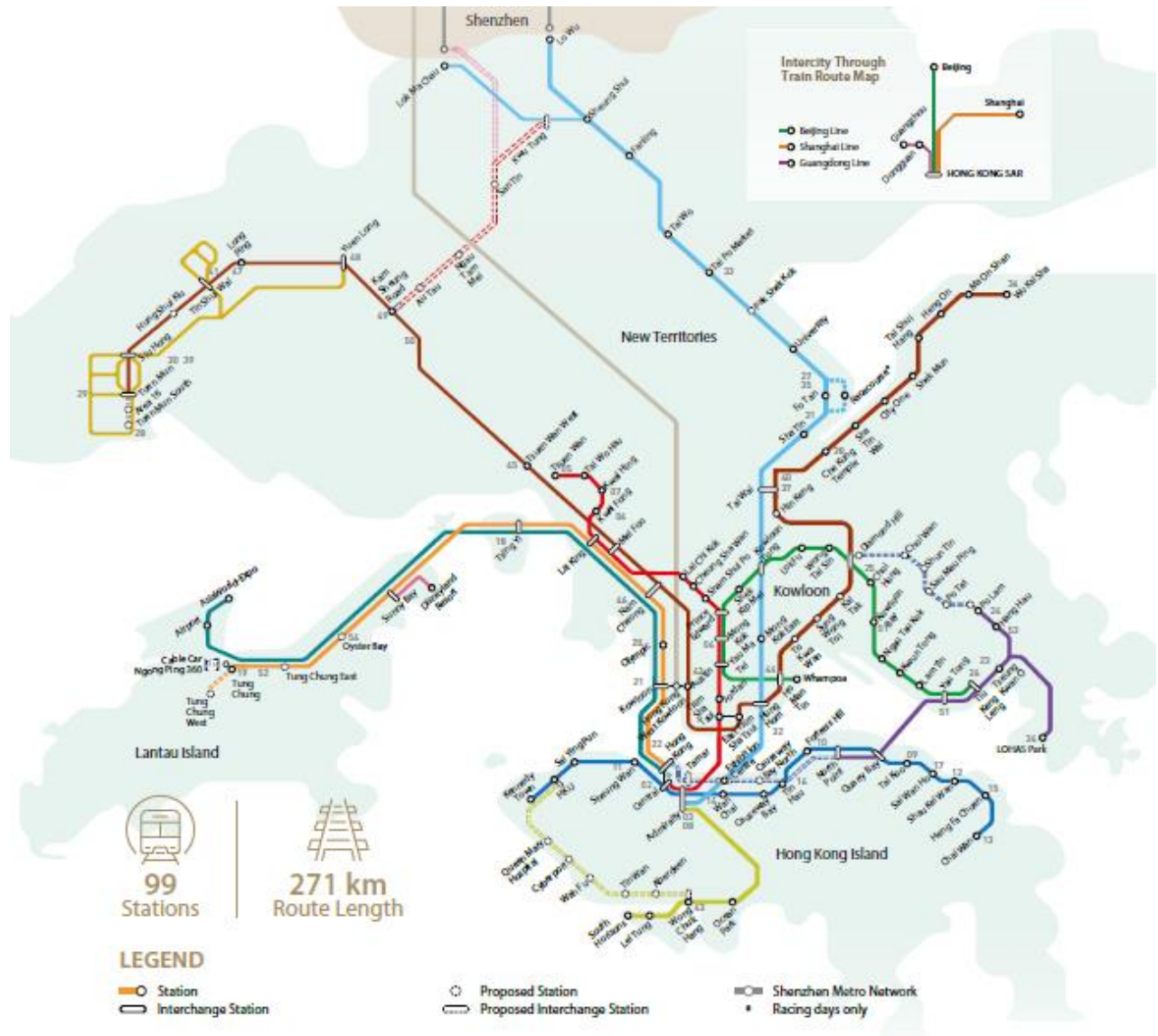
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### Intelligence Safety for Risk Mitigation



# CHAPTER 1

## Background



# OUR NETWORK

HONG KONG OPERATING NETWORK WITH FUTURE EXTENSIONS

## MTR DNA

1. Safety First
2. Train Punctuality > 99.9%
3. Continuous Improvement



### EXISTING NETWORK

- Airport Express
- Island Line
- Tuen Ma Line
- Tsuen Wan Line
- Disneyland Resort Line
- Kwun Tong Line
- South Island Line
- Tung Chung Line
- East Rail Line
- Light Rail
- Tsuen Kwan O Line
- High Speed Rail

### POTENTIAL FUTURE EXTENSIONS

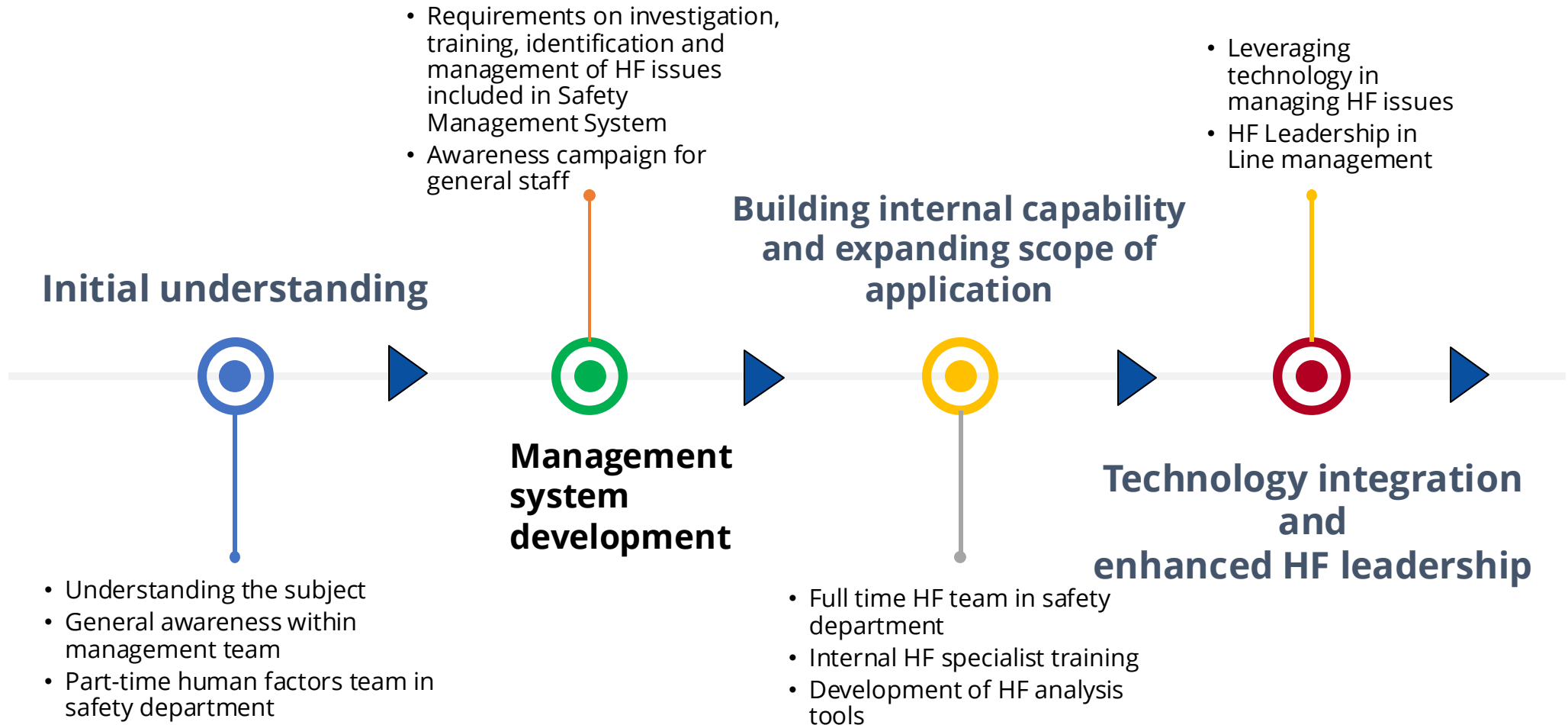
- Tung Chung Line Extension
- East Kowloon Line
- Hung Shui Kiu Station
- Tuen Mun South Extension
- South Island Line (West)
- Pak Shok Kok Station
- Northern Link and Kwu Tung Station
- North Island Line
- Airport Railway Extended Overrun Tunnel
- Northern Link Spur Line
- Oyster Bay Station



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# Development of Human Factors Management in MTR





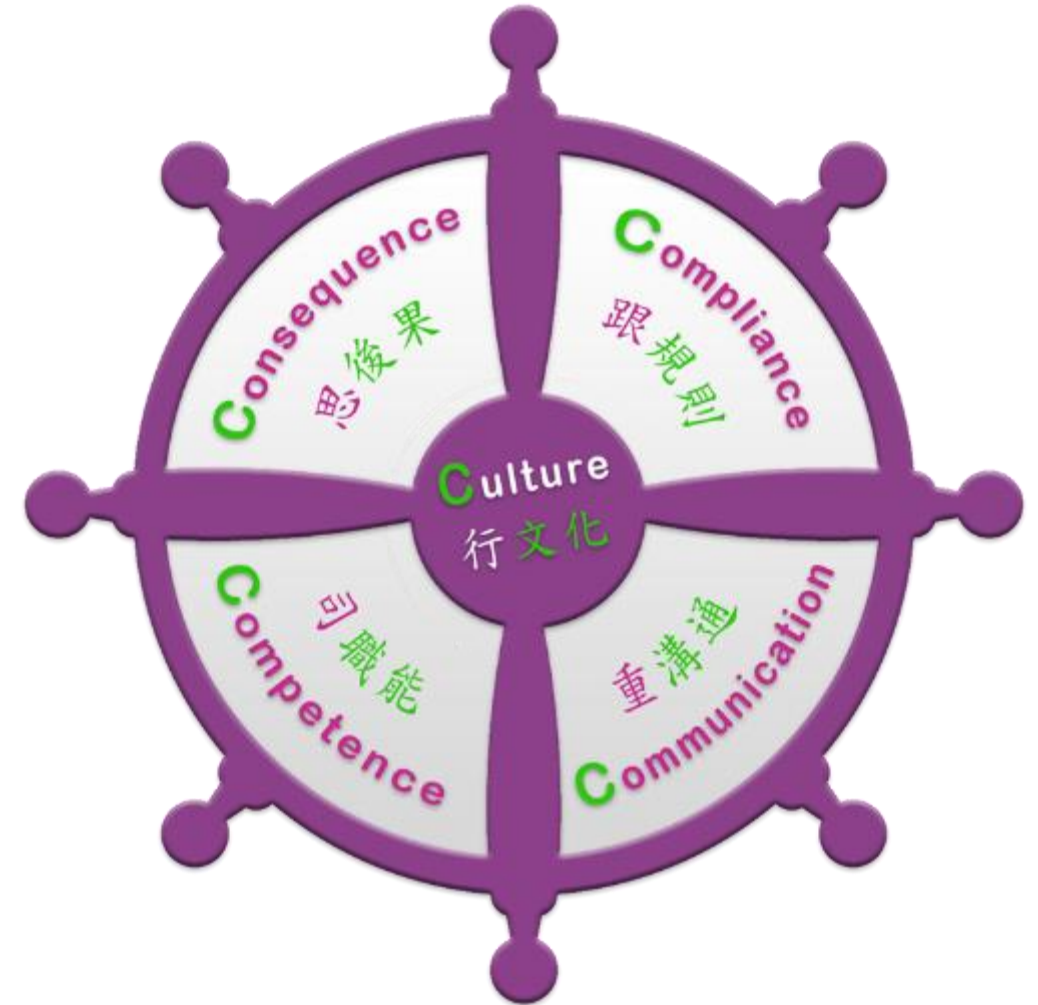
## CHAPTER 2

### The 5C concept



## 5C Concept launched

- Staff culture and implementation are key to safety and quality works
- **5C** launched to reinforce our Safety First Quality Always culture
- Serves as a common language easily understandable by all
- Not just promotion and communication, but extensive implementation in daily works e.g.
  - pre-work safety briefing
  - incident review & lessons learnt



## Think of the Consequence before starting a work

- What are the risks and consequences of failure to meet job requirements?
- Look into **COMPLIANCE** , **COMMUNICATION** & **COMPETENCE**
- Any of the above-mentioned not doing well or not fulfilling the requirements · there could be serious consequences on **Safety, Operations and Personnel**
  - Safety: Causing injuries / casualties
  - Operations: Affecting train operations and work progress, or even leading to suspension of service or work
  - Personnel: May be summoned by court and subject to legal liabilities





## Always ensure COMPLIANCE at work

- Accidents are often caused by non-compliances. If you don't want it happen, you must know clearly what work procedures, guidelines and legislative requirements are in place, and ensure that they are fully complied with.
- When conducting lifting operations:
  - Lifting appliances and lifting gear must be inspected regularly and examined & tested thoroughly
  - The load shall not exceed the safe working load
  - Ensure that the load to be raised or lowered by the lifting appliance is safe and secure



## Reinforce Communication for teamwork

- Understand the roles and key points to be communicated at work
- Most of our daily works are carried out in the form of teamwork. There must be mutual understandings between work partners. It requires standard protocols and consensus on work requirements to ensure accurate and effective communication to complete work smoothly and safely.
- **be proactive to clarify any doubts, and avoid assumptions**





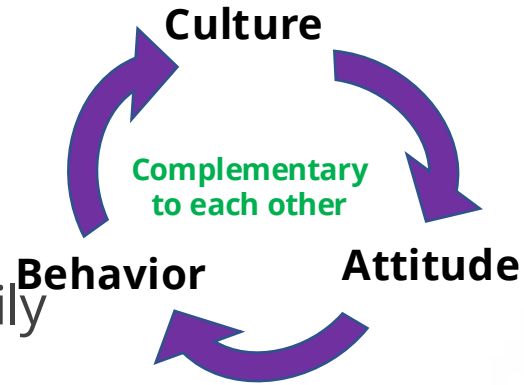
## Possess qualifications and maintain Competence

- Competence refers to the necessary **qualifications** and **abilities** and **skills** that staff should possess
- regular review with staff to identify knowledge and/or skill gaps
  - attend adequate trainings and refresher courses
  - possess valid qualifications for work implementation, including relevant work experiences
  - receive proper guidance and update on changes in process or working environment
  - handle critical tasks under good health conditions



# Achieving a Safety First and Quality Always Culture

- How can we achieve Safety First Quality Always?
- The key is implementing the aforementioned 4C's satisfactorily
  - Have you thought Consequence before work?
  - Have you checked Compliance during work?
  - Have you maintained Communication at work?
  - Have you ensured Competence for the work?
- To build our safety Culture, we must promote it, do it and realize it.



Culture affects Attitude. Attitude affects Behavior. Behavior affects Culture

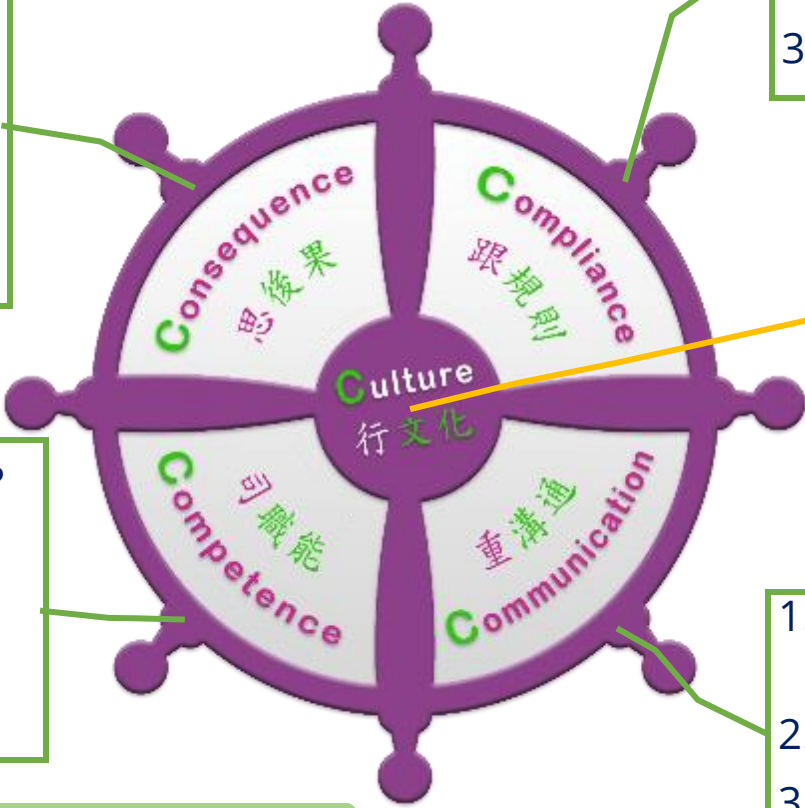




# 5C Incident Review Checklist

1. Any impact (or potential impact) to safety, operation or personnel?
2. What's the staff understanding to change, if any?
3. Any relevant risk assessment conducted?

1. Have work procedures, guidelines, rules/ legislation requirements strictly followed?
2. Are records duly documented?
3. Should the procedures be practical and clear?



1. Any missing steps of the procedure?
2. Are staff with adequate knowledge and skill?
3. Are staff with relevant valid qualification?

- Any gap in performing safety acts?
- Common culture/ attitude:**
- ◆ Be careful
  - ◆ Stop unsafe act
  - ◆ Report the abnormality
  - ◆ Don't take shortcuts
  - ◆ Be cautious
  - ◆ Courage to improve

1. Is there sufficient or adequate communication?
2. Any communication protocol?
3. Has the communication conducted in right timing?

**Improvement action: Individual and System**

5C Form

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Work type:  Pre-work Preparation / Briefing  Inspection / Observation  
 Post-work Meeting / Review  Others: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Version: 3 (Issue Date: 29 Sep 2020)

Safety First Quality Always Portal  
安全第一 質量至上 網站
Lesson Learnt Sharing

Train derailment at Guizhou, Mainland China, 4 June 2022

**The Incident**

At around 10:30am on 4 June 2022, two coaches of a bullet train from Guiyang, Southwest China's Guizhou Province, to Guangzhou, South China's Guangdong Province, encountered a mudslide that intruded into the rail track at the Yuezhai tunnel entrance of Rongjiang station in Guizhou. The train was planned only to pass-by Rongjiang station so there was no speed reduction when entering the station. The driver spotted an abnormal rail track when the bullet train ran through the tunnel. Although the emergency brake was quickly activated, the train rushed through the mud pile ahead and slid from the tunnel entrance to Rongjiang station (for more than 900 meters) before it stopped. The front of the train rushed onto the platform and was badly damaged. Two train cars derailed.

Preliminary investigation revealed that the mud from an expressway above the Yuezhai tunnel, which was under construction, slid due to rains and "submerged" the rail track within 2 or 3 minutes.

The accident led to the death of the driver. One train attendant and ten passengers sustained non-life-threatening injuries, and had received proper treatment.

Safety reminder based on 5C

**Consequence**

Derailed accident could result in serious injuries / fatalities to staff and passengers, as well as severe damages to infrastructure.

**Competence**

In addition to the inspection by competent NTR railway protection staff to identify on-rail situation of construction sites within Railway Protection zone, NTR slopes are provided with drainage system and are approved by Civil Engineering and Development Department (CEDD). Real time monitoring of ground water level is also being trialed at one of the construction sites for provision of alarm notification once the readings reach the Alert, Advice, and Alarm (AAA) Level.

**Compliance**

The intrusion risks should be identified with corresponding mitigations implemented to prevent occurrences. Changes of these risks should be monitored and relevant rules and regulations for the railway protection zone should always be adhered.

**Communication**

Effective communications between construction company / contractor and O&M teams on the approved mitigation measures are crucial to ensure railway safety.

**Culture**

Foster Safety First Culture to ensure all safety requirements are strictly followed.

Key Safety Message

Staff should always be vigilant on any changes to intrusion risks from construction sites within the railway protection zone.

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## Think 5C before you act

Q: What is **5C**

A: 5C is a thinking tool that allows colleagues to think about and analyze potential issues related to a work in a simply way to avoid mistakes.

Q: Why do we need **5C**

A: We hope all O&M colleagues of different Segments/Departments to have a common 'language' (thus understanding) for communicating and analyzing work-related issues

Q: What's so special about **5C**

A: The 5C programme is not for short-term promotion but continual safety culture development. It is also a relatively simple and easy tool for daily implementation by shopfloor colleagues.

Strong management leadership and commitment



# CHAPTER 3

## Intelligence Safety for Risk Mitigation



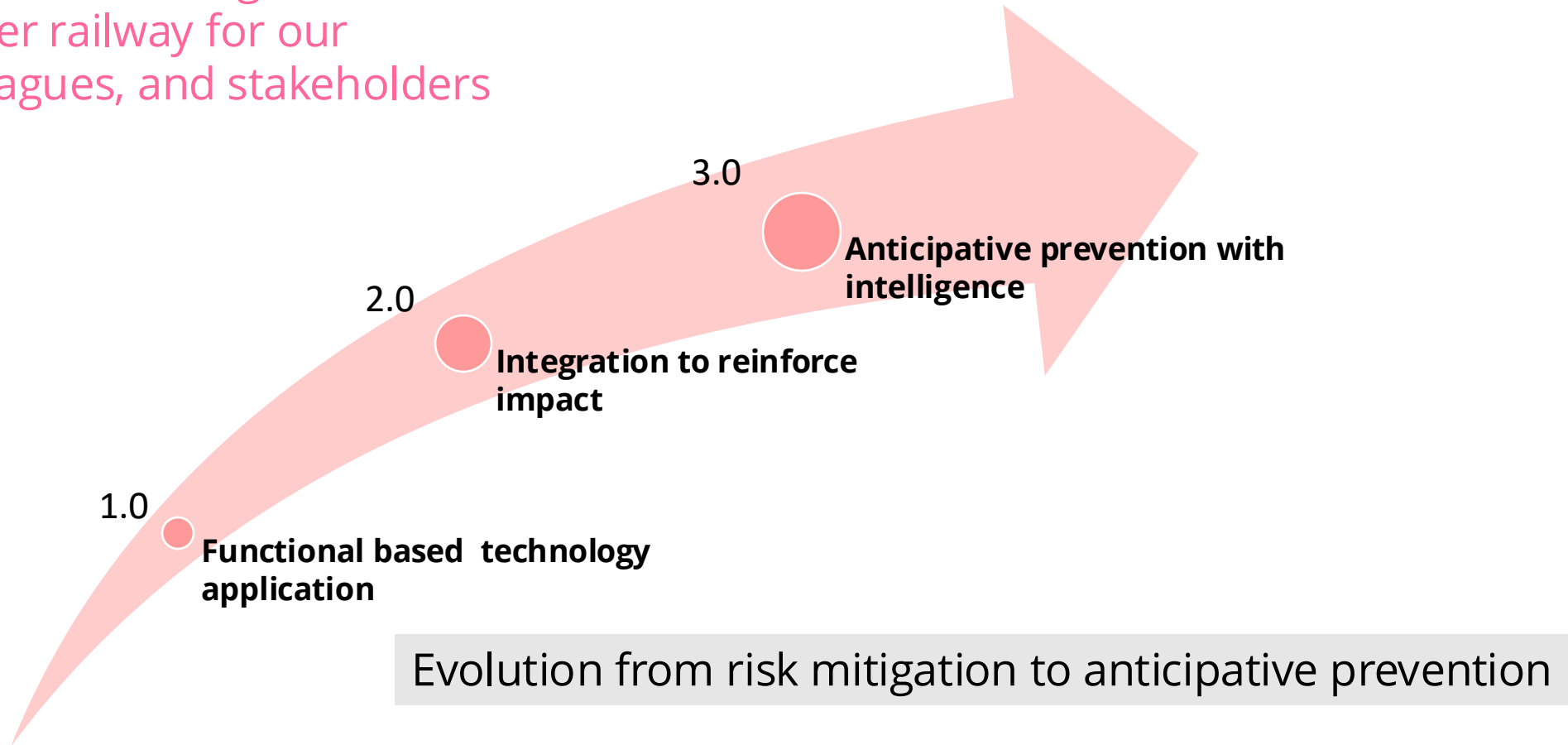
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# Intelligence Safety

makes use of appropriate technology, system integration and intelligence to bring an even safer railway for our passengers, colleagues, and stakeholders





# Intelligence Safety 1.0

## - Functional based technology application

Individual System A

Individual System B

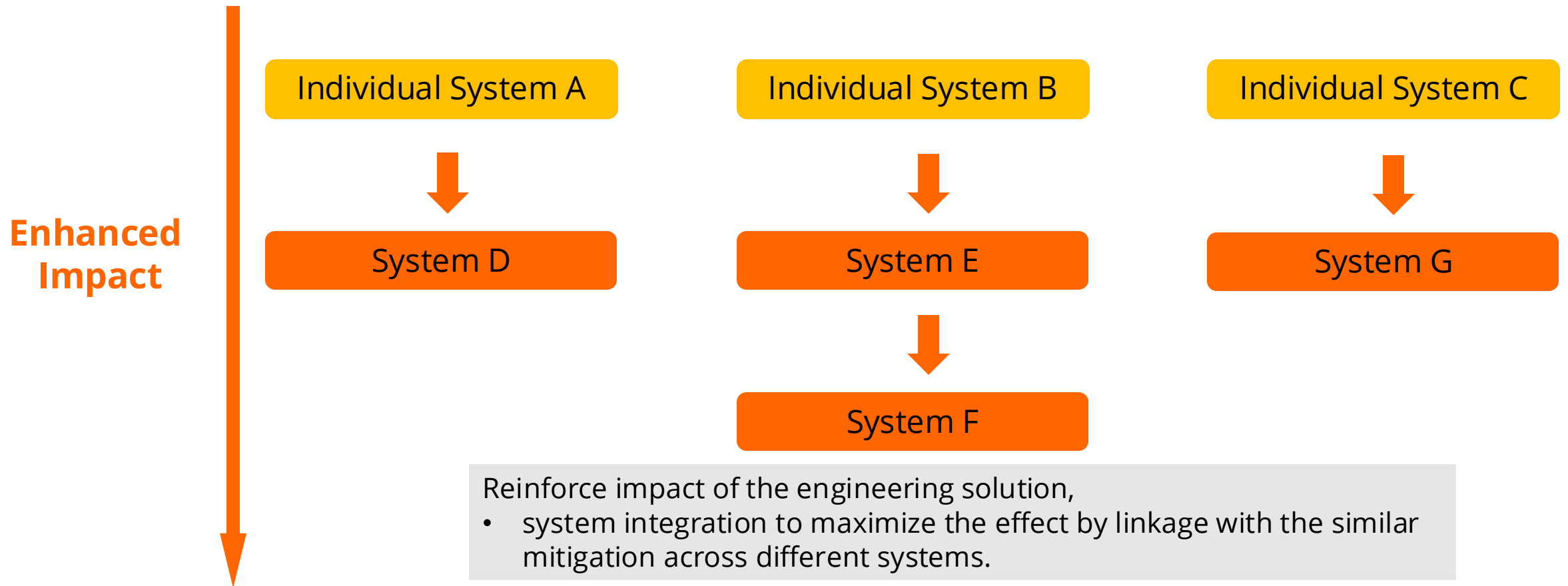
Individual System C

Managing risks to reduce the frequency of happening

- Individual solution is designed to focus on specific risk mitigation using ALARP approach.

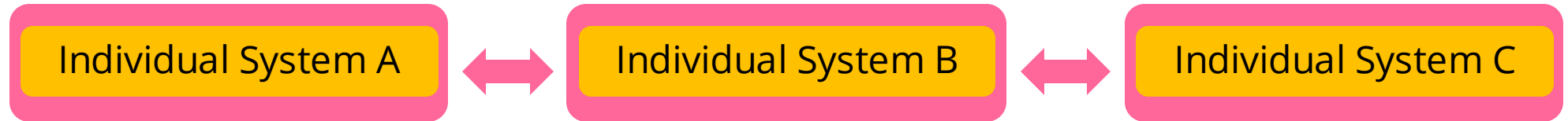
# Intelligence Safety 2.0

## - Integration to reinforce impact



# Intelligence Safety 3.0

## - Anticipative prevention with intelligence

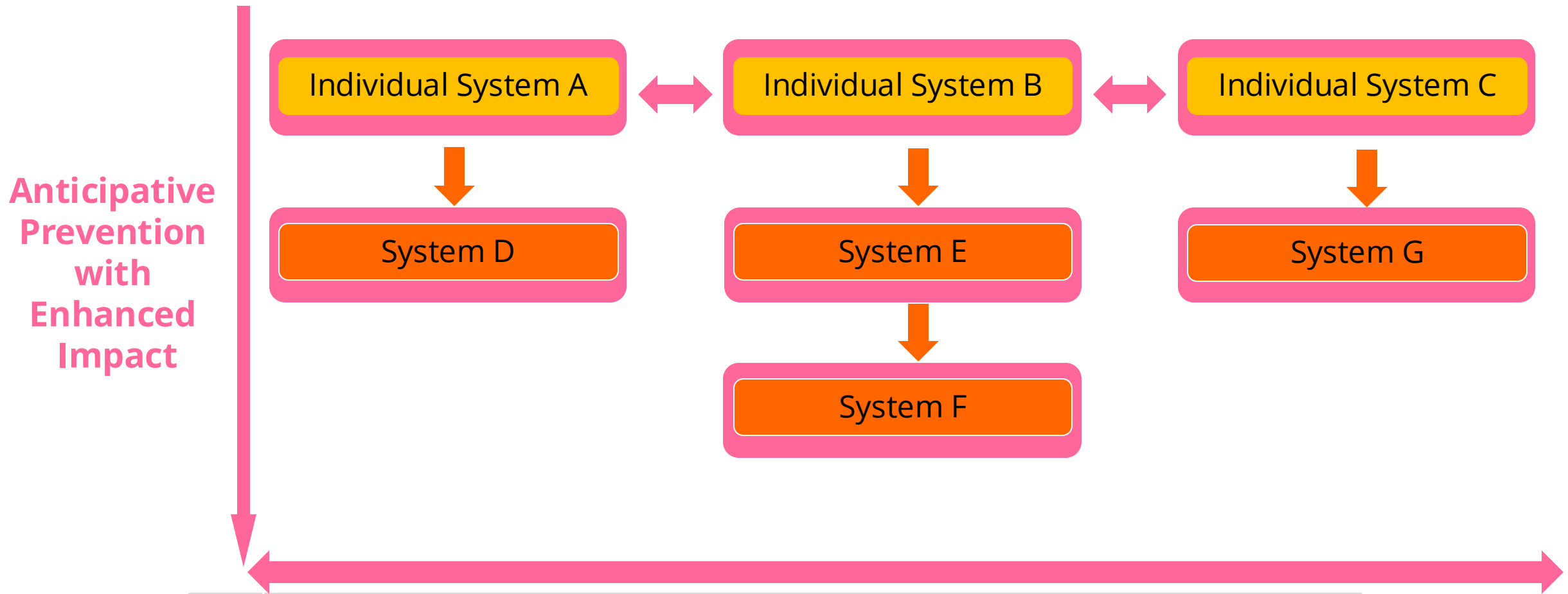


- Advancement of digitation and connectivity across different systems
- System intelligence could be interchanged and collaborated
- New era of anticipating prevention with intelligence to provide multi dimension insight



# Intelligence Safety 3.0

## - Anticipative prevention with intelligence



# Intelligence Safety 1.0

## - Functional based technology application

Integrated Speed & Position Supervision System (iSPS)

Provide **intelligent & integrated digital solution** to enhance driving safety of Light Rail with



Speed  
Supervision



Platform  
Management



Turnout  
Management



Fleet  
Management

# Intelligence Safety 2.0

## - Integration to reinforce impact

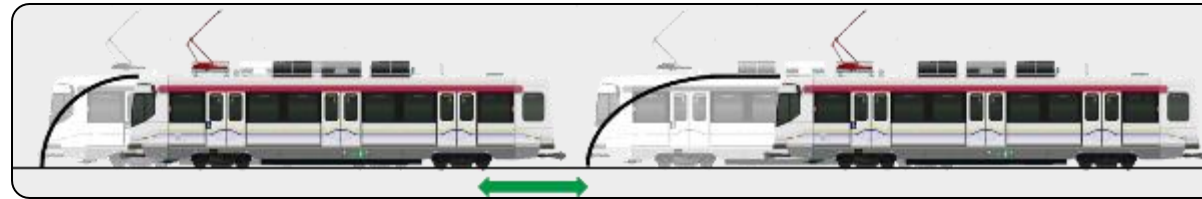
### Integrated Speed & Position Supervision System (iSPS)

#### Intra-system Integration

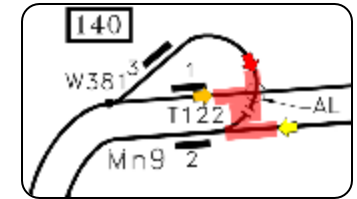
- Integrating iSPS data from multiple LRVs to provide enhanced functions



Close-up  
Monitoring



Conflicting  
Movement



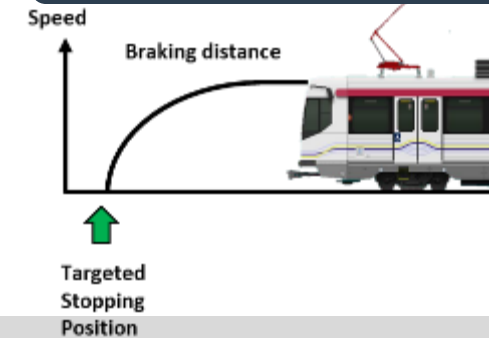
#### Inter-system Integration

- System integration to provide enhanced functions

Automatic Train Bell



Automatic Braking



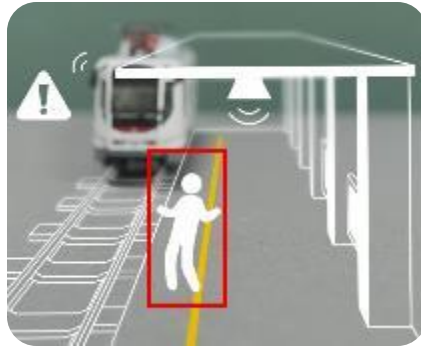
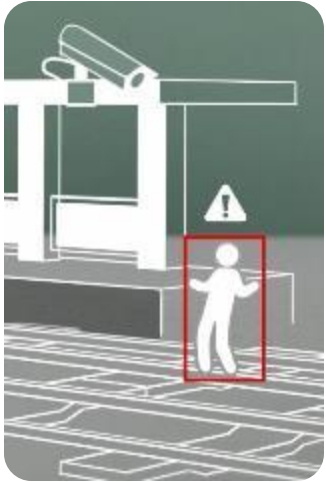


# Intelligence Safety 3.0

## - Anticipative prevention with intelligence

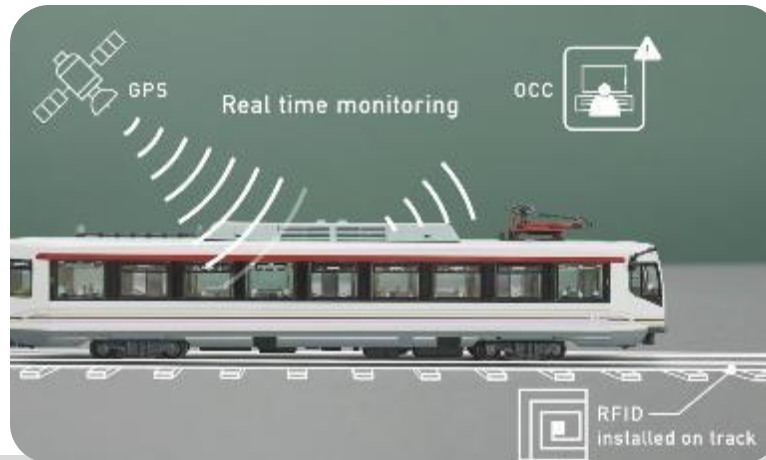
### Smart Junction & Platform Analytics

- **Video analytics to detect track intrusion**



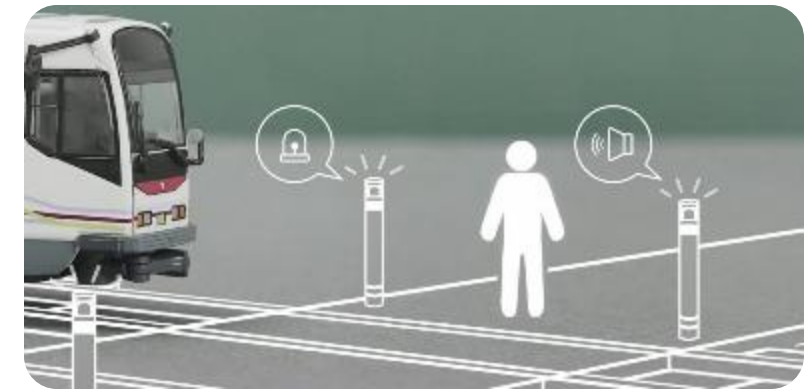
### iSPS

- **Multiple driving alerts enhancing safety**
- **Early warning and anticipative prevention against track intrusion with analytics results**



### Pedestrian Flashing Bollard

- **Visual and audio alert, with on-ground LED strip to enhance pedestrian awareness**
- **Early warning and anticipative prevention of pedestrian dashing out with iSPS LRV data**



# Intelligence Safety 3.0

## - Anticipative prevention with intelligence



Platform Analytics

Automatic PA reminder



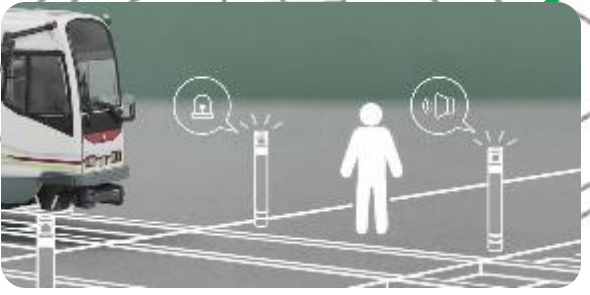
Smart Junction



Early warning based on VA results

iSPS Driving Reminders

Automatic Bell Triggering & Braking

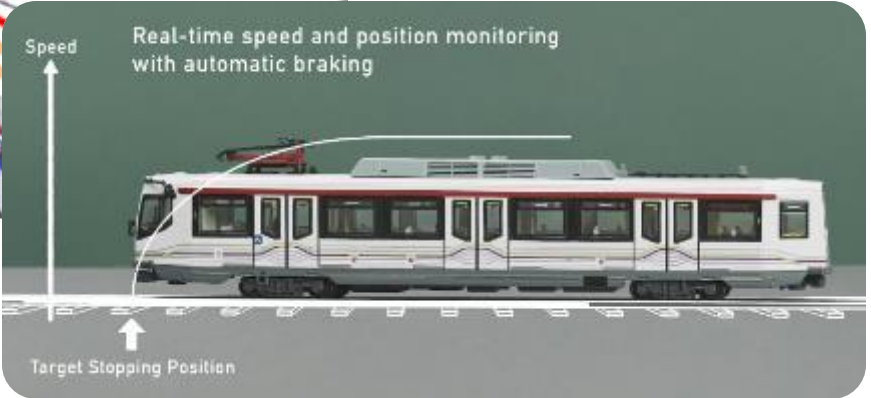


Early warning based on iSPS LRV data

Pedestrian Warning Bollard



A4

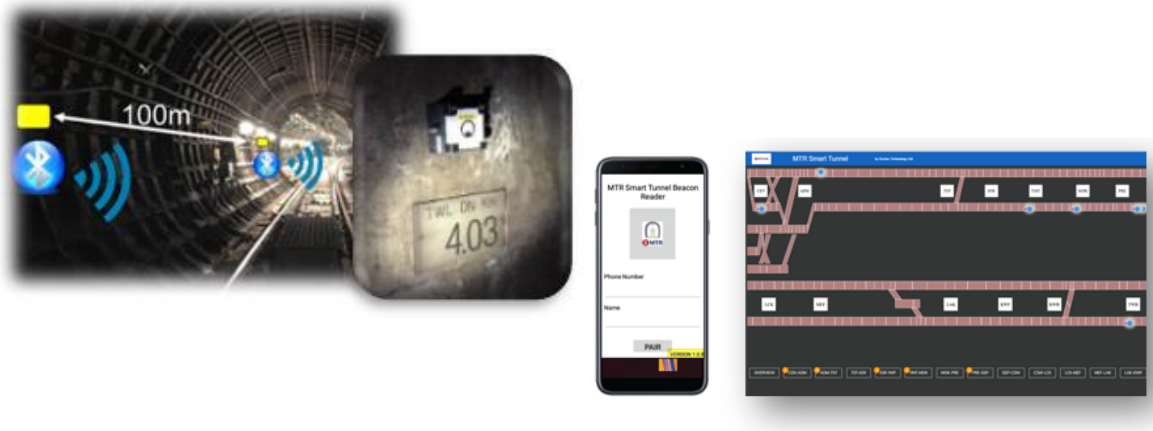


# Intelligence Safety 1.0

## - Functional based technology application

### Smart Tunnel

- *Indoor positioning along Tunnel*
- *Overview of real-time positions of all workers*
- *Enhancing trackwork safety*



### Trackside Access Door Detection System (TADDS)

- *Real-time trackside door status*
- *Intrusion detection and access control*



### Remote Flashing Light Remote-Control System (eRFL)

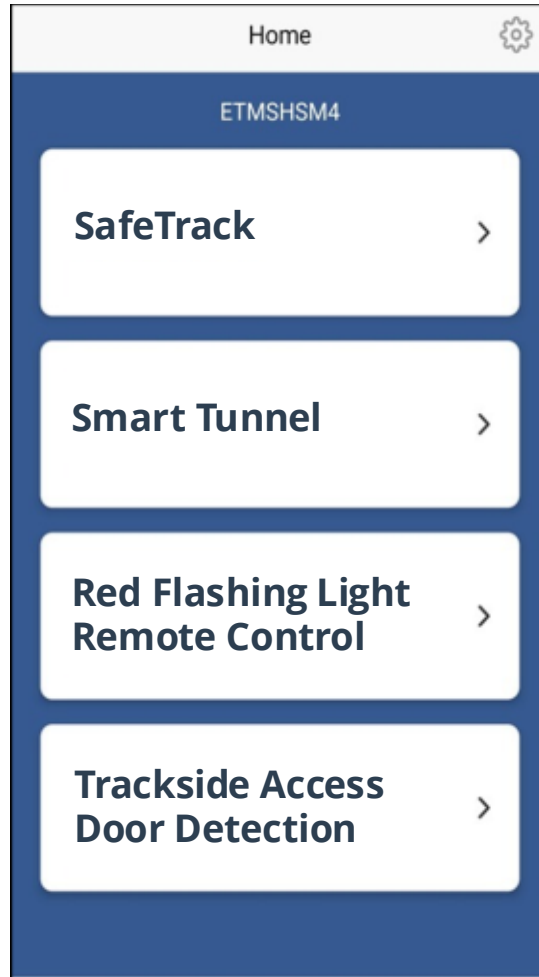
- *Enhancing efficiency and maximizing maintenance window with remote control of flashing light*
- *Enhancing safety with real-time status of flashing light*





# Intelligence Safety 2.0

## - Integration to reinforce impact



## System Integration

- ***One-stop shop user interface to allow track workers switching between functions seamlessly on mobile***
- ***Real-time status available on hand***
- ***Enhanced efficiency with digitalized workflow with electronic records***



# Intelligence Safety 3.0

- Anticipative prevention with intelligence

Cross-Platform AI as Validation and Verification Interlocking to Ensure Safety

Smart Tunnel

Trackside Access Door Detection System (TADDS)

Remote Flashing Light Remote-Control System (eRFL)

**Smart Authorization:** book-on and off through one-stop platform

**Smart Protection:** remote set up and turn off flashing light via eRFL

Non-Traffic Hours (NTH)

**Smart Supervision:** trackside worker overview along Tunnel

**Smart Access Control:** real-time trackside access door status

Traffic Hours

Traffic Hours



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