

# KAVACH

## Automatic Train Protection System

Indian Institute of Technology, Hyderabad.

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# Introduction

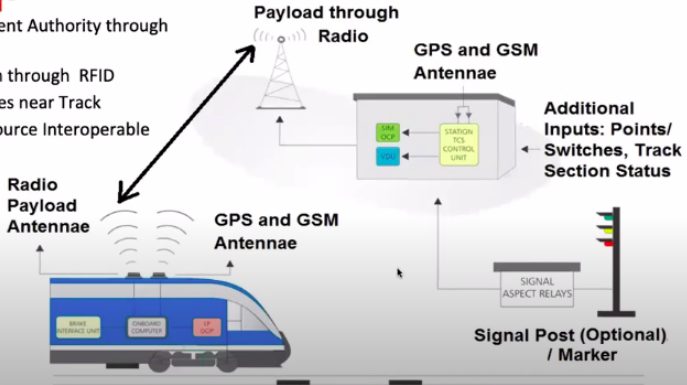
- Automatic Train Protection (ATP) systems are designed to enhance railway safety by providing a fail-safe mechanism that ensures trains can only travel at safe speeds and maintain safe distances between each other.

# Basics of Automatic Train Protection

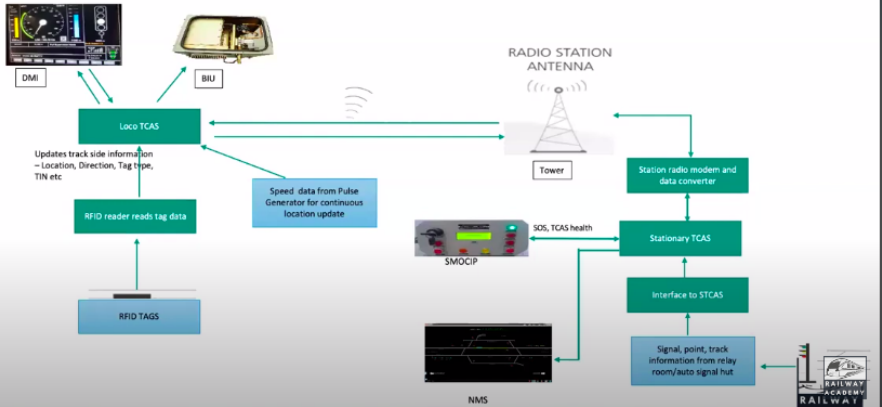
## ❖ Kavach Functional Block Schematic

Kavach with ETCS Level 2

- 1) Movement Authority through Radio.
- 2) Location through RFID
- 3) No Cables near Track
- 4) Multi-Source Interoperable



# KAVACH – The Data Flow



# Need of Train protection system

- **Preventing collisions:** ATP systems can detect when a train is approaching another train or obstacle on the tracks and can automatically apply the brakes to prevent a collision.
- **Enhancing safety during emergencies:** In the event of an emergency, ATP systems can be used to stop the train and ensure that passengers and crew are safe.
- **Improving efficiency:** ATP systems can help trains run more efficiently by enabling them to travel at faster speeds without compromising safety. This can reduce travel times and increase the number of trains that can be operated on a given line.
- **Compliance with regulations:** Many countries require the installation of ATP systems to comply with safety regulations and ensure that trains operate within safe limits.

# Basic Operations

- The TCAS comprises of two sub systems, namely Loco TCAS and Stationary TCAS. The communication between the Stationary TCAS and Loco TCAS is radio communication over the air.
- The Stationary TCAS gathers information about the current statuses of all signal aspects, Berthing Track Circuits and Point Status within the Station. Based on this information Stationary TCAS calculates the Movement Authority for each Loco within its vicinity. This information is transmitted to the Loco TCAS through Radio communication.
- The Loco TCAS controls its speed and supervises the train movement and other on board operations in accordance with the data received from the Stationary TCAS and section speed received through RFID tags. In the event of emergency situations, the system applies brakes thereby preventing any catastrophic accidents.

# Basics of ATP and ERTMS / ETCS

## ❖ User of Signalling Gears Onboard : Loco Pilots (Train Drivers)



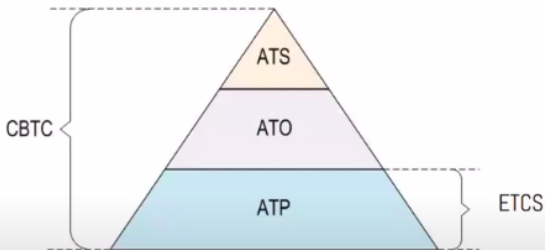
Train Transport is characterized by large braking distances.

- Therefore, it is essential to transfer signalling information from ground to onboard to enable timely action by onboard.
- If signalling information is made available to onboard machine, it provides aid to Loco Pilots/ Motorman / Train Drivers by application of brake in case they inadvertently miss to control the train. It gives confidence to LPs / Motormen / Train Drivers apart from enhancing safety.



# Basics of ATP and ERTMS / ETCS

## Automatic Train Control (ATC) Systems

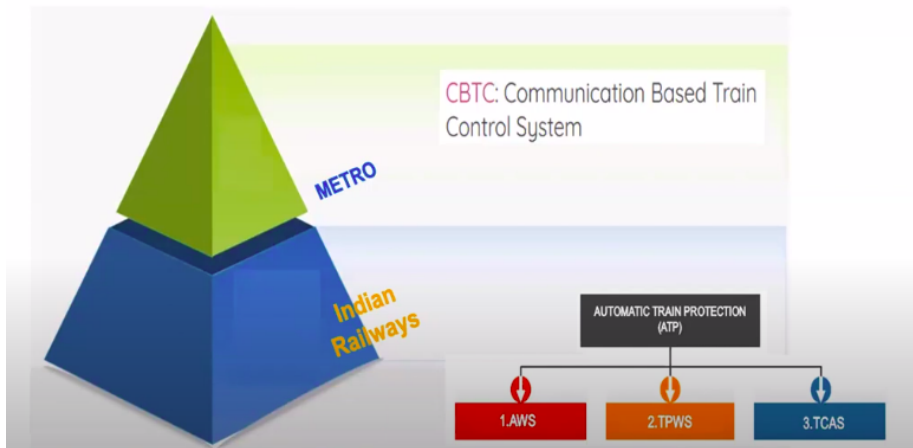


**CBTC:** Communication Based Train Control System  
**ETCS:** European Train Control System

**ATC:** Automatic Train Control  
**ATP:** Automatic Train Protection  
**ATO:** Automatic Train Operation  
**ATS:** Automatic Train Supervision



# Basics of ATP and ERTMS / ETCS



# ERTMS / ETCS

ERTMS A Signalling Standard

## OBJECTIVE

**A NEW ATC SYSTEM FOR THE EUROPEAN NETWORKS TO ENABLE ALL TRAINS TO RUN THROUGH WHOLE EUROPE WITH A SINGLE SIGNALLING SYSTEM.**



## ERTMS

Most Proven  
TRAIN CONTROL  
SYSTEM which  
brings significant  
advantages in  
term of

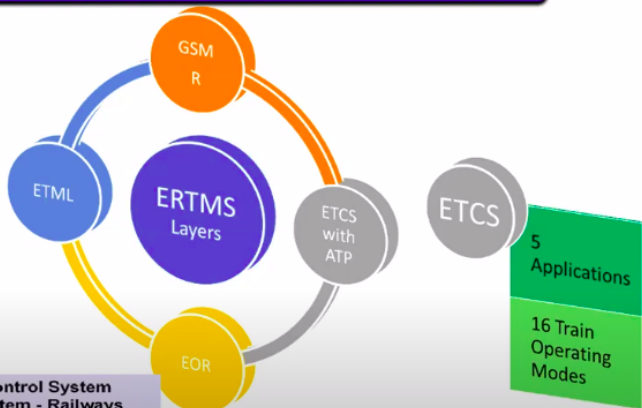
SAFETY

RELIABILITY

PUNCTUALITY

TRAFFIC CAPACITY

# ERTMS sub layers



- ETCS : European Train Control System
- GSM R:Global Mobile System - Railways
- EOR : European Operating Rules
- ETML:European Traffic Management Layer

# What is NMS ?

## Basic idea

- NMS stands for Network Monitoring System .
- Based on Specification No. RDSO/SPN/196/2020-NMS.
- [Architecture](#)

