



**THE PWI**  
THE INSTITUTION FOR RAIL  
INFRASTRUCTURE ENGINEERING

SWITCHES & CROSSINGS: From manufacture to maintain

**In2Track3 – Network Rail Innovations**

12 July 2023, Birmingham

## *Shift2Rail JU Vision*

To deliver, through railway research and innovation, the capabilities to bring about the most sustainable, cost-efficient, high-performing, time driven, digital and competitive customer-centred transport mode for Europe.

<https://shift2rail.org/about-shift2rail/mission-and-objectives/>



# Innovation Programmes

IP1



Cost-efficient and reliable trains, including high capacity trains and high speed trains

IP2



Advanced Traffic Management & Control Systems

IP5



Technologies for Sustainable and Attractive European Rail Freight

IP4



IT Solutions for Attractive Railway Services

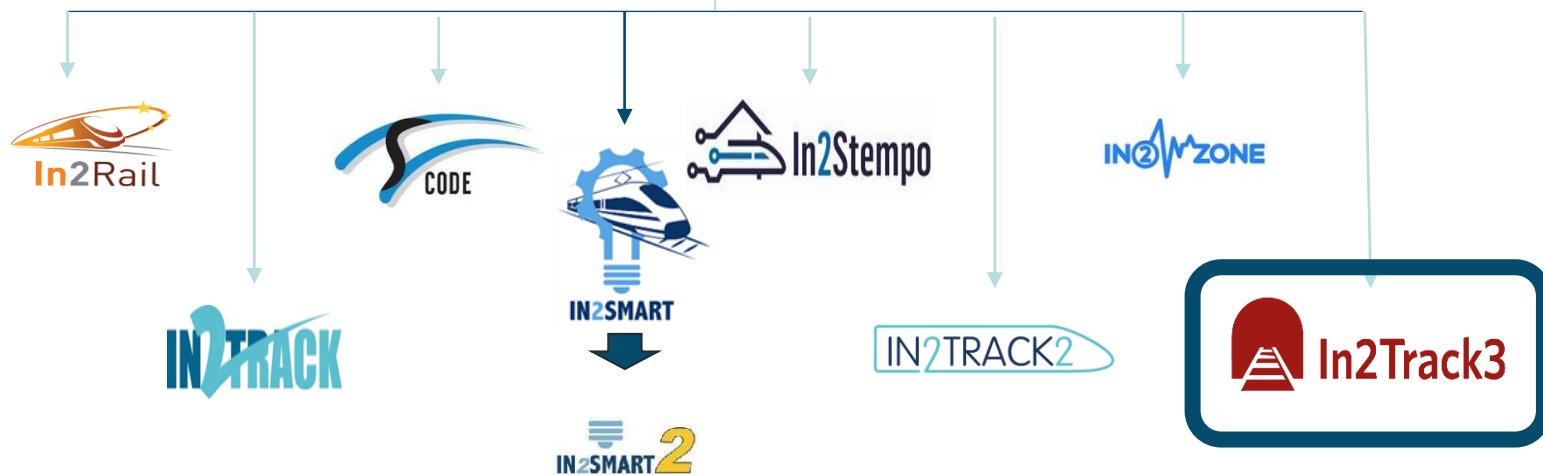
IP3



Cost Efficient and Reliable High Capacity Infrastructure



Delivering Integrated System Demonstrators (up to TRL7)



Technology Readiness Levels (TRLs)

Rail Industry Readiness Levels (RIRLs)

## *In2Track3 Technical Work Packages:*

### ***Switches and Crossings***

**WP1: Enhanced S&C System  
Demonstrator**

**WP2: Next Generation S&C**

### ***Plain Line Track***

**WP3: Enhanced Track**

**WP4: Next Generation Track**

### ***Structures***

**WP5: Assessment and  
Improvement of Tunnels and  
Bridges**

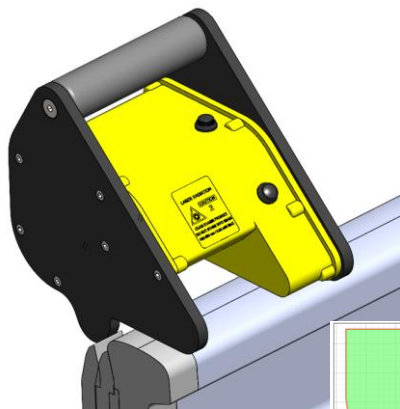


## Work Package 1 Innovations – Enhanced S&C System



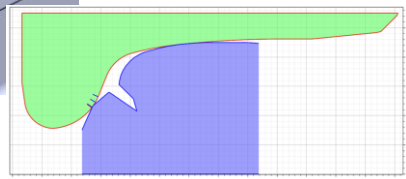
### *Crossing sensor system*

- Measuring impact forces across the wheel transition zone.



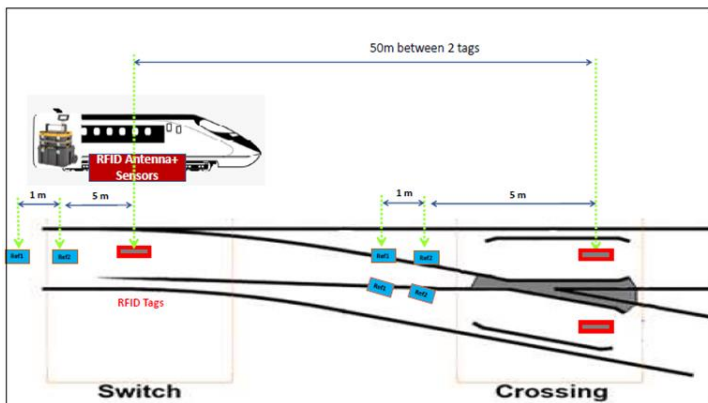
### *Hand-held switch rail laser scanner*

- P8 Wheel profile derailment hazard check.



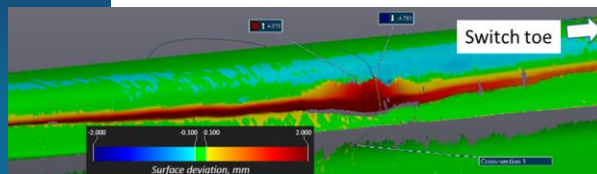
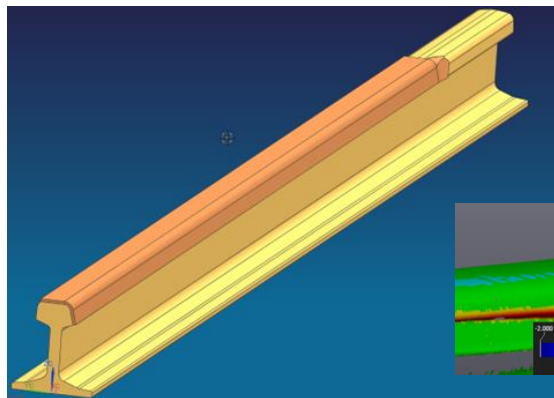


## Work Package 1 Innovations – Enhanced S&C System



### *RFID Tags for S&C Positioning*

- Identify the start and finish point of an S&C unit.
- Link to S&C unit information; eg design, 1:50 drawings etc

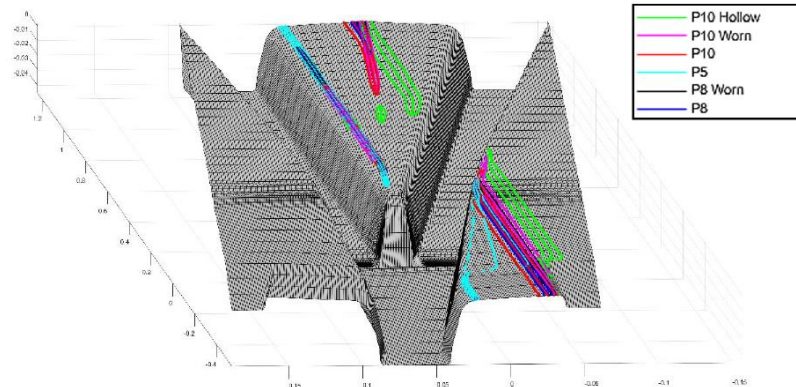
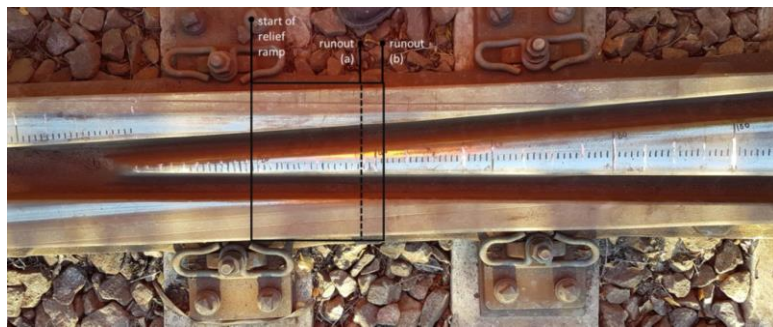


### *Cladding of switch rails*

- Potential to improve the wear resistance of switch rails.



## Work Package 1 Innovations – Enhanced S&C System

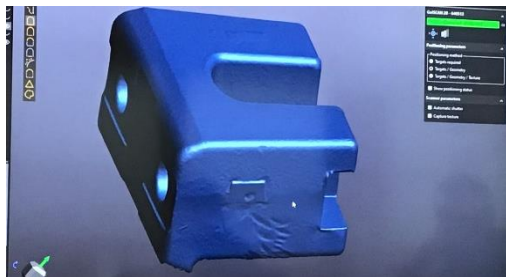


### *Optimised profile for NR56V crossings*

- improved crossing performance through optimising the profile in the wheel transfer area

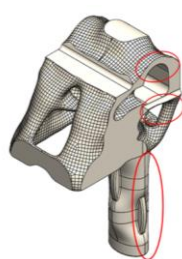
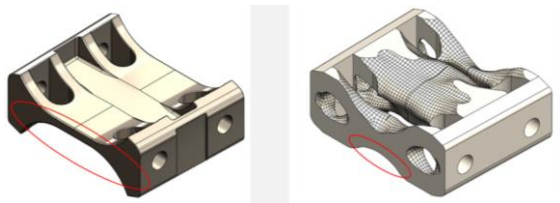


## Work Package 2 Innovations – Next Generation S&C



### *3D printing of S&C components*

- Improved availability of bespoke components with reduced lead time.

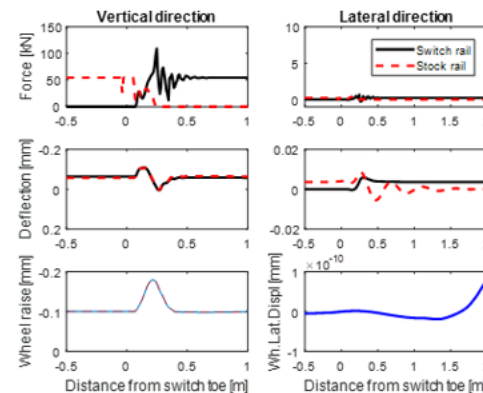
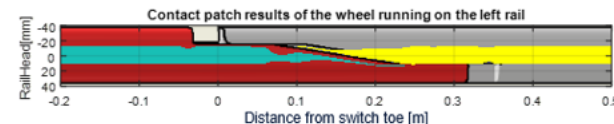
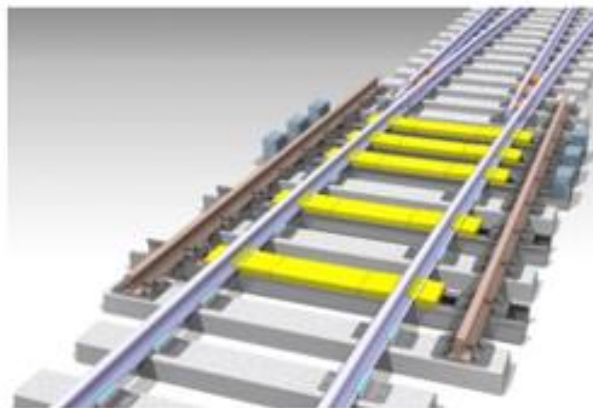




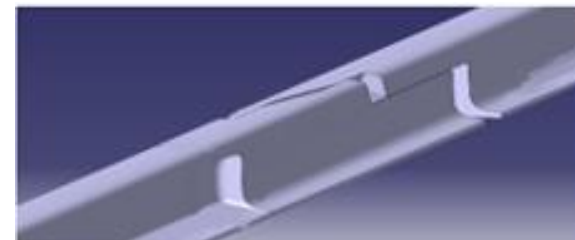
## Work Package 2 Innovations – Next Generation S&C



In2Track3



**Further development of the Repoint Concept**  
– changing the way vehicles move across tracks.

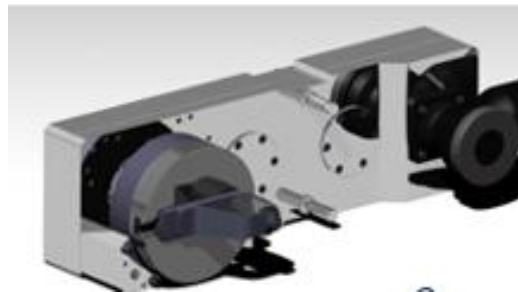
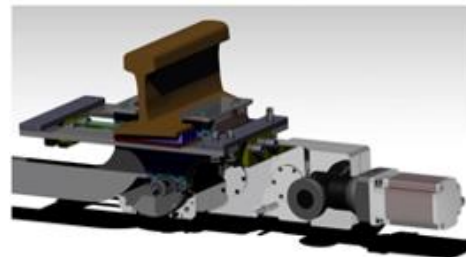
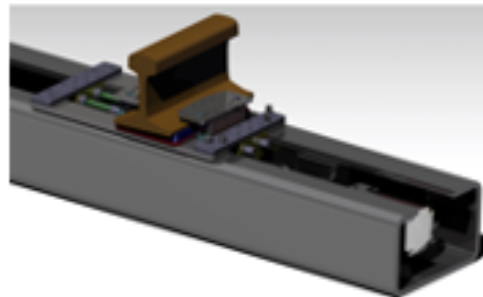
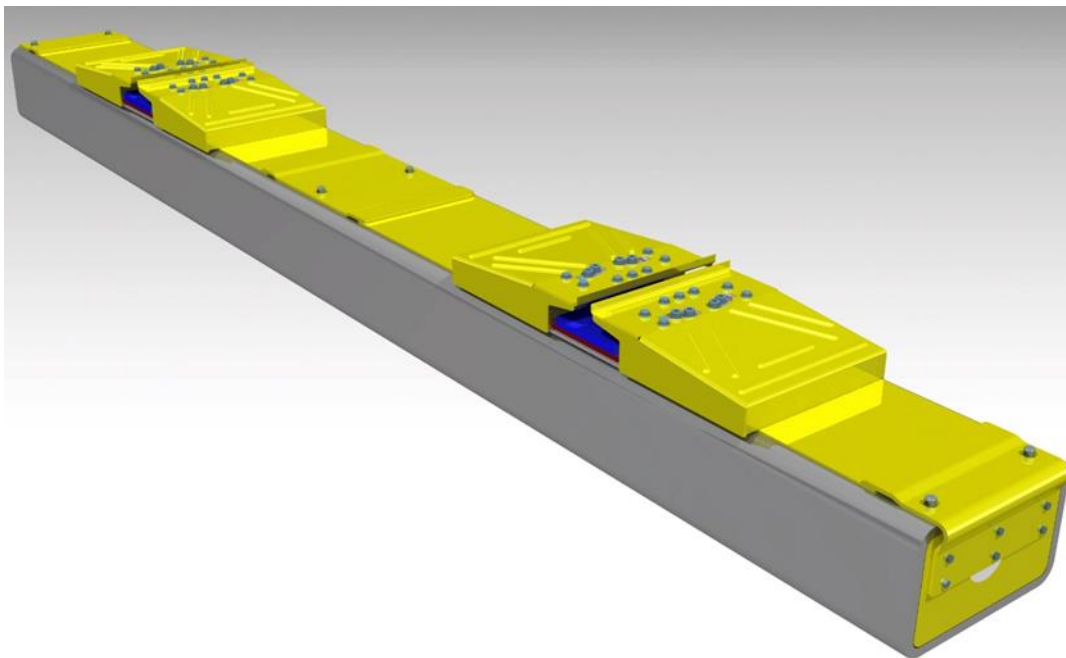




## Work Package 2 Innovations - Repoint



In2Track3



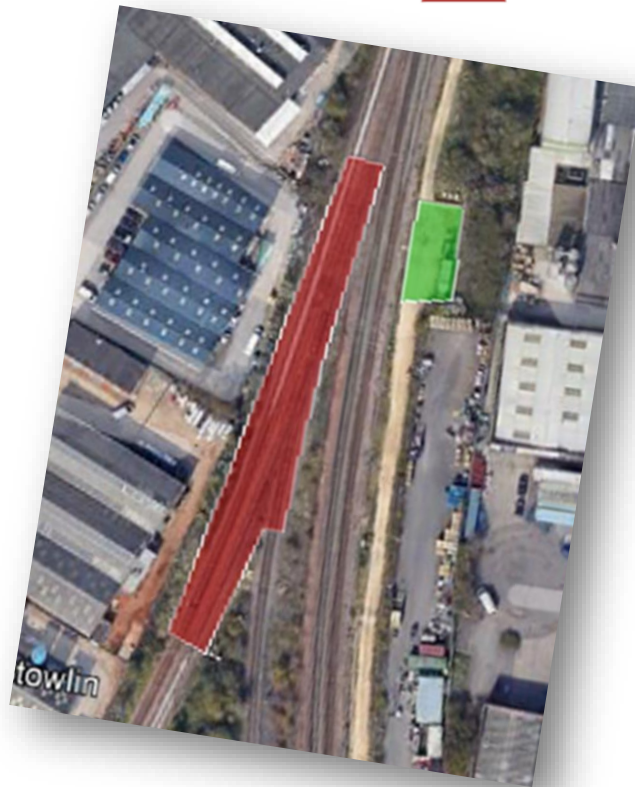
***Further development of the Repoint Concept  
– changing the way vehicles move across tracks.***



## Work Package 2 Innovations – Next Generation S&C



In2Track3



*Drone Inspection of  
Switches & Crossings*



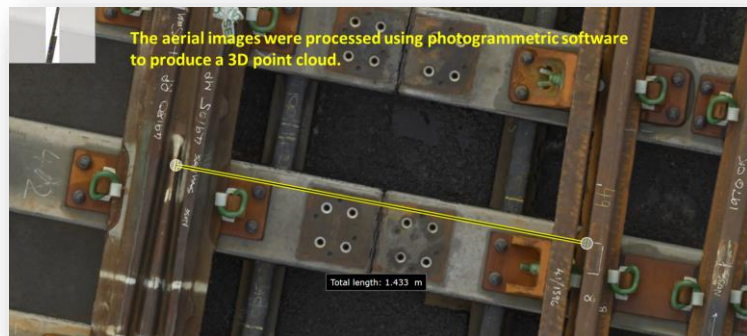
## Work Package 2 Innovations – Next Generation S&C



In2Track3

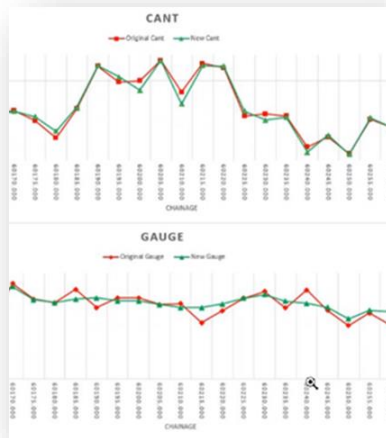


Orthographic and Pointcloud data

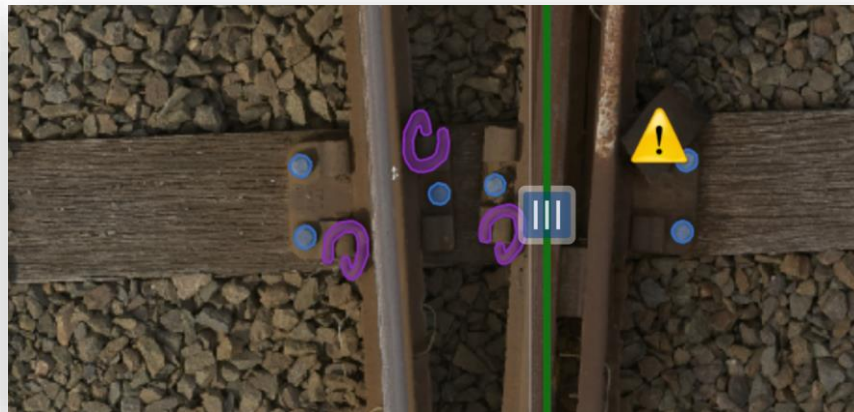


Dimensions

## Drone Inspection of Switches & Crossings



Geometry



Changes in condition



# Work Package 2 Innovations – Next Generation S&C



# In2Track3

Network Rail In2Track3

**Plowman Craven**

Railway survey

- 8 high-risk changes
- 85 medium-risk change

| Object | Count before | Count after |
|--------|--------------|-------------|
| Bolts  | 724          | 724         |
| Clips  | 433          | 433         |

Toggle detection results

24/04/2023

**TICKETS**

SURVEY DATE: 24/04/2023

SEARCH:

| TITLE           | CATEGORY | SEVERITY | CREATED    | LATITUDE   | LONGITUDE  |
|-----------------|----------|----------|------------|------------|------------|
| test title      | Crack    | Red      | 03/05/2023 | 0.00932279 | -7.4798064 |
| Damaged sleeper | Rail     | Amber    | 26/04/2023 | 0.00933043 | -7.4797833 |
| Missing bolts   | Rail     | Green    | 26/04/2023 | 0.00913829 | -7.4797876 |
| Clip moved      | Shoe     | Red      | 26/04/2023 | 0.00932287 | -7.4797968 |
| Missing bolt    | Shoe     | Amber    | 26/04/2023 | 0.00926233 | -7.4798001 |

Example Portal

Network Rail In2Track3

**LOCATIONS (4/4)**

STATUS: All

SEARCH:

| LOCATION    | ELR  | LAT        | LONG        | STATUS    | MODIFIED            |
|-------------|------|------------|-------------|-----------|---------------------|
| Points 1245 | ELR  | 51.8121914 | -0.3852632  | New       | 20/04/2023 01:00:00 |
| Points 565  | ELR1 | 51.8828223 | -0.41522526 | In Review | 20/04/2023 11:34:09 |
| Points 565  | ELR1 | 51.7817486 | -0.3272728  | Accepted  | 20/04/2023 11:34:09 |
| Points 565  | ELR2 | 51.7817486 | -0.3272728  | Accepted  | 20/04/2023 11:34:09 |

**Drone Inspection of  
Switches & Crossings**



## Work Package 2 Innovations – Next Generation S&C



In2Track3



***Crossing Restoration  
Machine***





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THANK YOU

e: [youremail@here.com](mailto:youremail@here.com)

T: if required