



Solving Complex Problems

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>>>>> Session Outcomes

- >>>>> Understand what a problem is.
- >>>>> Be able to understand that a problem needs to have a solution.
- >>>>> Understand the importance of lateral thinking and how to use it for solving problems.
- >>>>> Use critical thinking, problem solving skills, good teamwork and communication skills to complete a task as a group.

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What is a problem?

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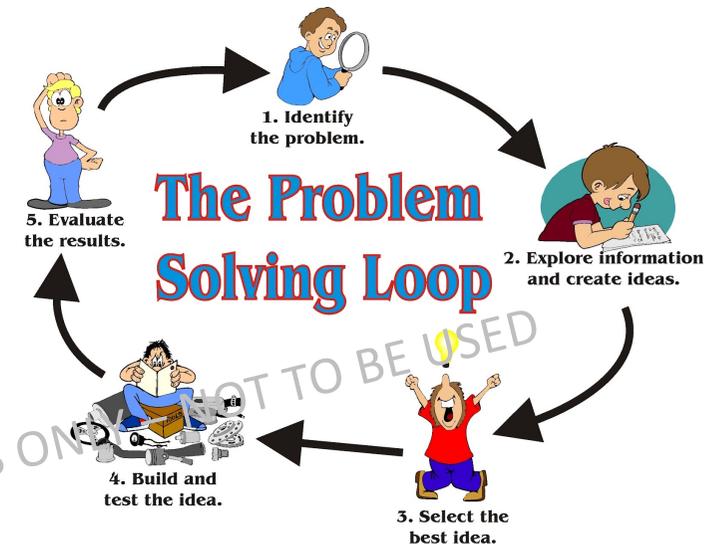


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Problems Need Solutions

1. Identify the problem.
2. Explore information and create ideas.
3. Select the best idea.
4. Build and test the idea.
5. Evaluate the results.



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>>>>> Lateral Thinking

Lateral thinking is solving problems through an indirect and creative approach, using reasoning that is not immediately obvious and involving ideas that may not be obtainable by using only traditional step-by-step logic.

As a class you will need to solve the problems!

For each problem you are allowed to ask up to 20 questions – these will be answered with **yes, no or irrelevant.**

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>>>>> Lateral Thinking

Five pieces of coal, a carrot and a scarf are lying on the lawn. Nobody put them on the lawn but there is a perfectly logical reason why they should be there.

What is it?

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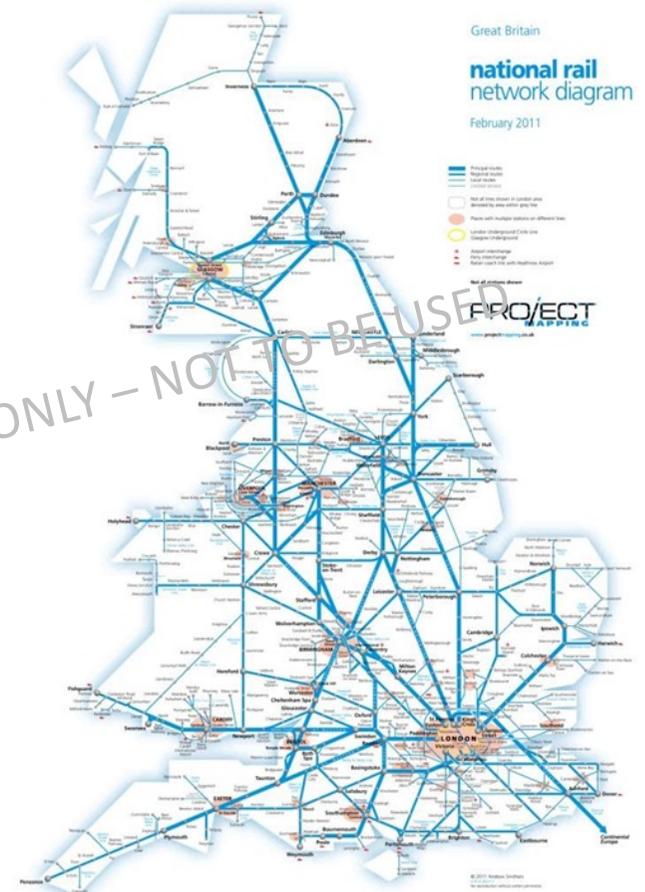
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What problems are there in Rail?



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>>>>> Timetable Challenge

Resonate are a software company working to solve the problem of scheduling and traffic management.

They have set you the challenge of reading some information from some of their timetables!

In teams of 4, complete the timetable challenge.

Remember to answer in 24hr format!



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The Future

It is estimated that passenger journeys will triple by 2050.

- Railways are a great option for future transport with more capacity and greater energy efficiency than other vehicles.
- Magnetic levitation and the much publicised but so far hypothetical hyperloop train are regarded as the ideas to watch!
- But you are the people who will make the future of rail travel possible!



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>>>>> Your Challenge

Your team are responsible for doing the first test of the new hover-bullet train.

Key skills you will need:

- Creativity
- Researching Skills
- Team Working
- Emotional Intelligence
- Risk Management
- Decision Making



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A freak lightning strike has brought the hover-bullet train down in the ocean!

What four items will you grab as you swim to a nearby island?



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Designing for Inclusive Travel

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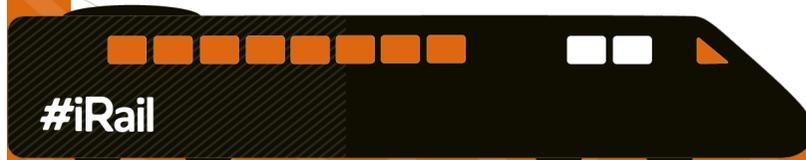


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>>>>> Session Outcomes

- >>>>> Understand the effect of different kinds of disability and why the rail industry need to be creative to meet needs of disabled people.
- >>>>> Understand about the *inclusive design* process and how 'innovation' can improve rail travel for all.
- >>>>> Use good teamwork and communication skills to complete a task as a group.
- >>>>> Show solid presentation skills when sharing your idea with the audience at the end of the session.

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What is Inclusion?

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>>>>> Inclusion

Inclusion is an attempt to embrace all people irrespective of race, gender, disability, medical or other need. It is about giving equal access and the removal of barriers.



It affects all aspects of life, especially transport and access.

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>>>> Inclusive Design

Inclusive design is about not leaving any one out.

It should be possible to make anything work for people with disabilities.

Can you think of any thing in your building that could be made inclusive if it had been designed differently?

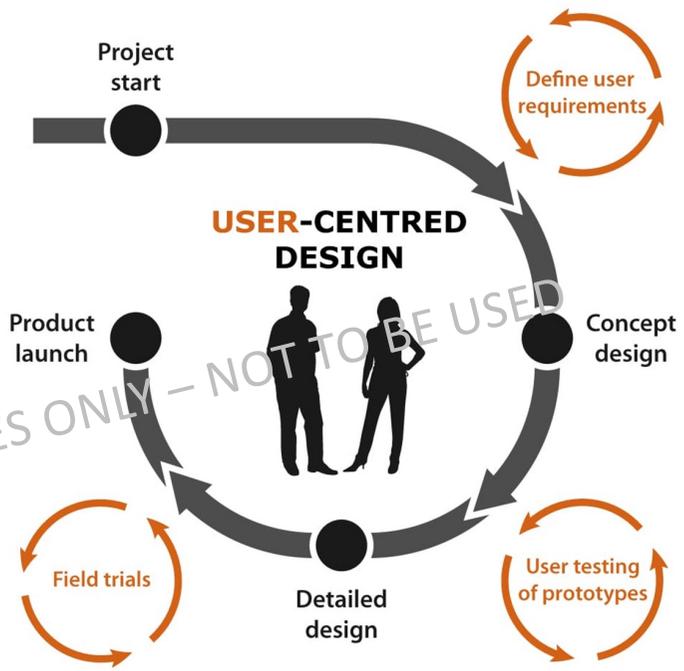


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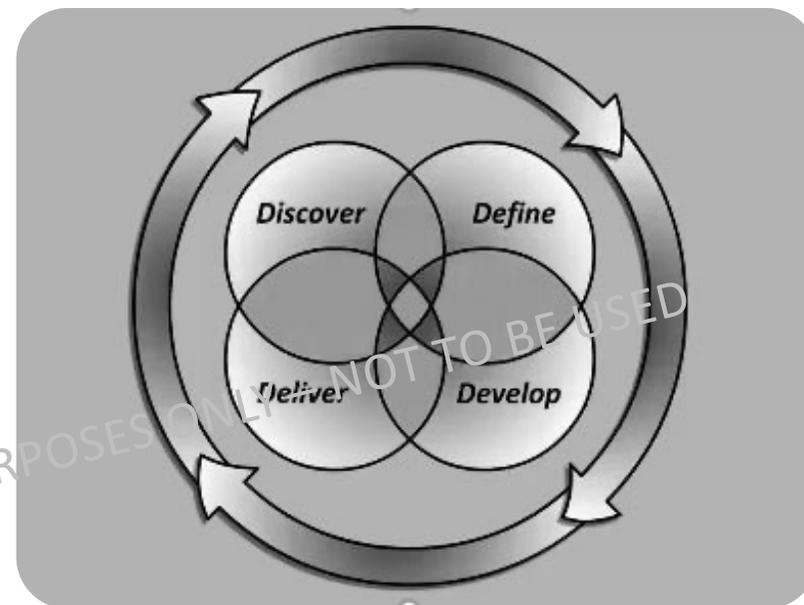
Universal Design



>>>>> Design Challenge

You and your team are now going to design and deliver your very own innovative solution to inclusive travel.

- Each team will have a different area to focus on.
- You must draw your design and complete the task sheet!



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**Remember,
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good design.**

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>>>> Real Life Examples



Way marked flooring on Porterbrook's innovation hub – a train full of innovative solutions!



Resonate use programming and data to inform customers before they travel – information such as seat availability and congestion can be useful for people with disabilities.





Careers in Rail

There are a wide range of careers and apprenticeships across the rail industry.

There's lots of benefits to a career in rail...

- Good pay - average full-time salaries in rail are more than 5% higher than the national average, and apprentices and graduates earn significantly more in rail than other sectors.
- Job security.
- Technology driven.
- National and worldwide industry.
- Diverse and enjoyable careers.

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Careers in Rail

Morson is the UK's No.1 technical, aerospace and rail recruiter. They offer extensive support for those looking to get into the rail industry; Including offering an apprenticeship programme that gives learners a wide variety of experience in all aspects of the rail industry.

[Click here for videos from people in the rail industry!](#)

The Morson Group Makerspace at the university of Salford is a high-tech facility training the next generation of engineers.



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Right First Time

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>>>>> Session Outcomes

- >>>>> Understand what tolerance is and how it is important in the rail industry.
- >>>>> Understand how big and complex rail is in the UK.
- >>>>> Use good teamwork and communication skills to complete a task.
- >>>>> Show creativity and accuracy in solving a rail industry problem.
- >>>>> Find out more about some of the ways that the UK rail industry are planning to solve the shortfall in people/staff that can make it right first time and safe.

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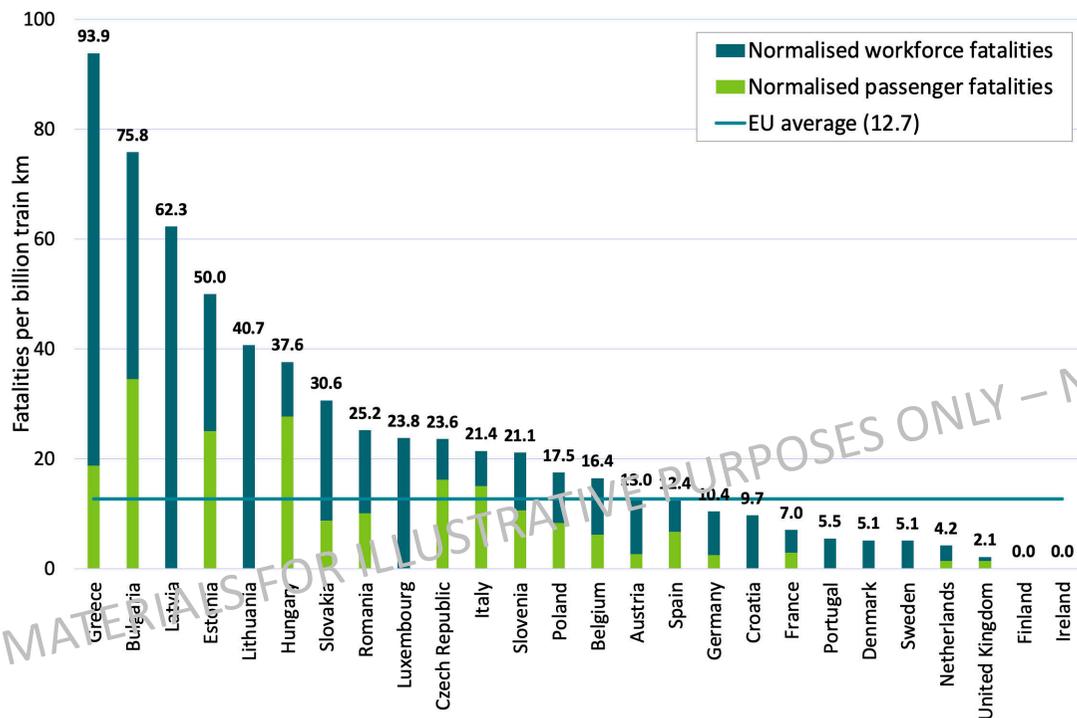
What is Tolerance?

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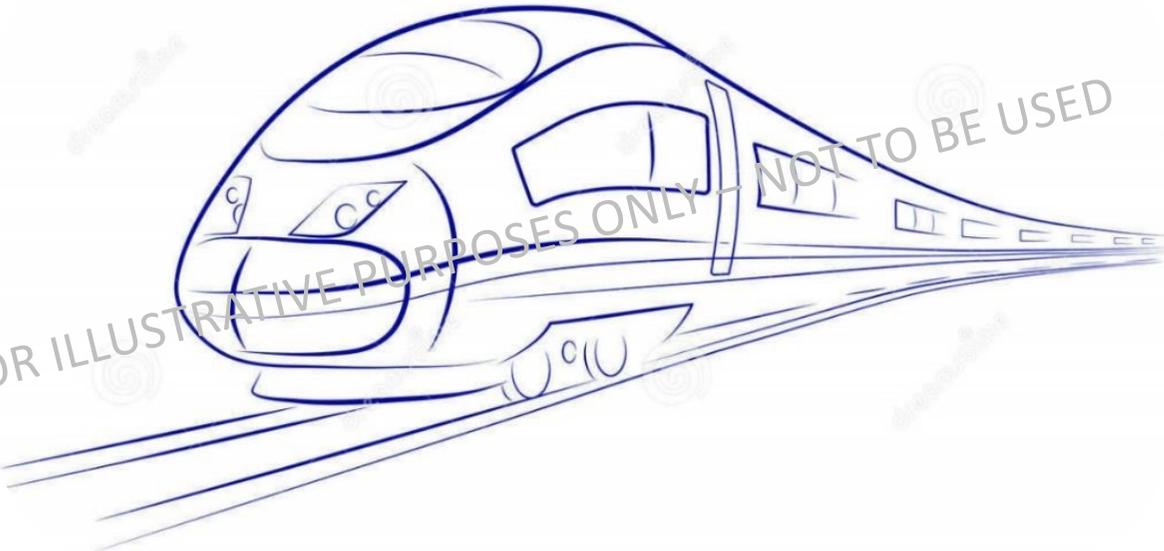
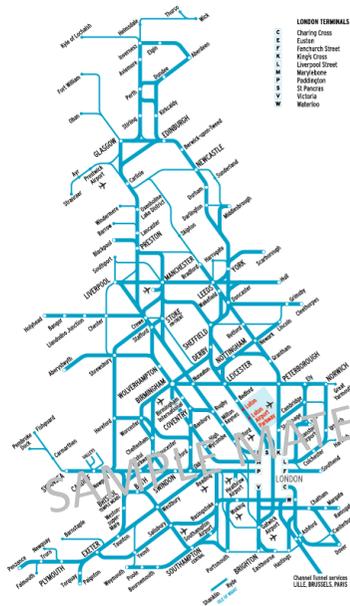


Comparison of Passenger and Workforce Fatality Rates Across Europe (Source ORR, 2013)

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>>>>> UK Railway Network



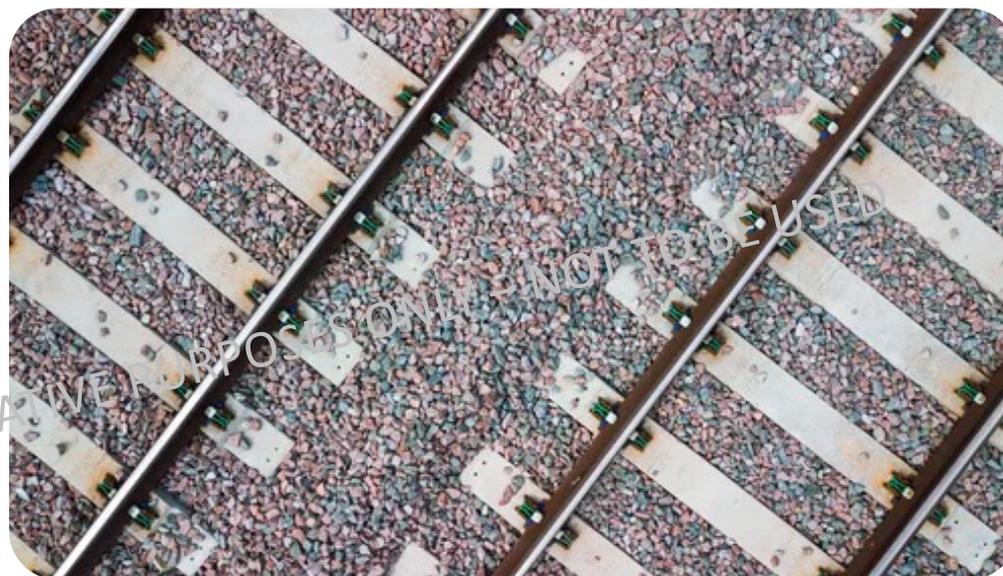
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>>>>> Track Tolerances

Trains run on tracks; a ballast track is made up of rails fixed to sleepers that sit on ballast.

If a track is more than 8mm out of line this could cause serious issues!



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>>>>> Track Tolerances

To ensure that tracks remain within the correct tolerances they need to be regularly inspected.

Bridgeway use their problem solving and teamwork skills to cover many aspects of civil engineering including:

- Inspecting and maintaining track
- Inspecting tunnels, bridges and other structures – including underwater and working at height.



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>>>>> Not Just The Track!

The rolling stock needs to also fit tolerances, if the tracks are perfect, but each carriage has wheels that are not to tolerance then the accidents could still happen!

Porterbrook ensures their rolling stock meet tolerances with extensive testing and innovation.

It's not just the track that needs to be kept to strict tolerances!



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>>>>> Not Just The Track!

Once the trains are on the tracks there also needs to be tolerances of how close they can get to each other!

Companies such as Resonate use specially designed software, problem solving and communication skills to manage rail traffic.

It's not just the track that needs to be kept to strict tolerances!

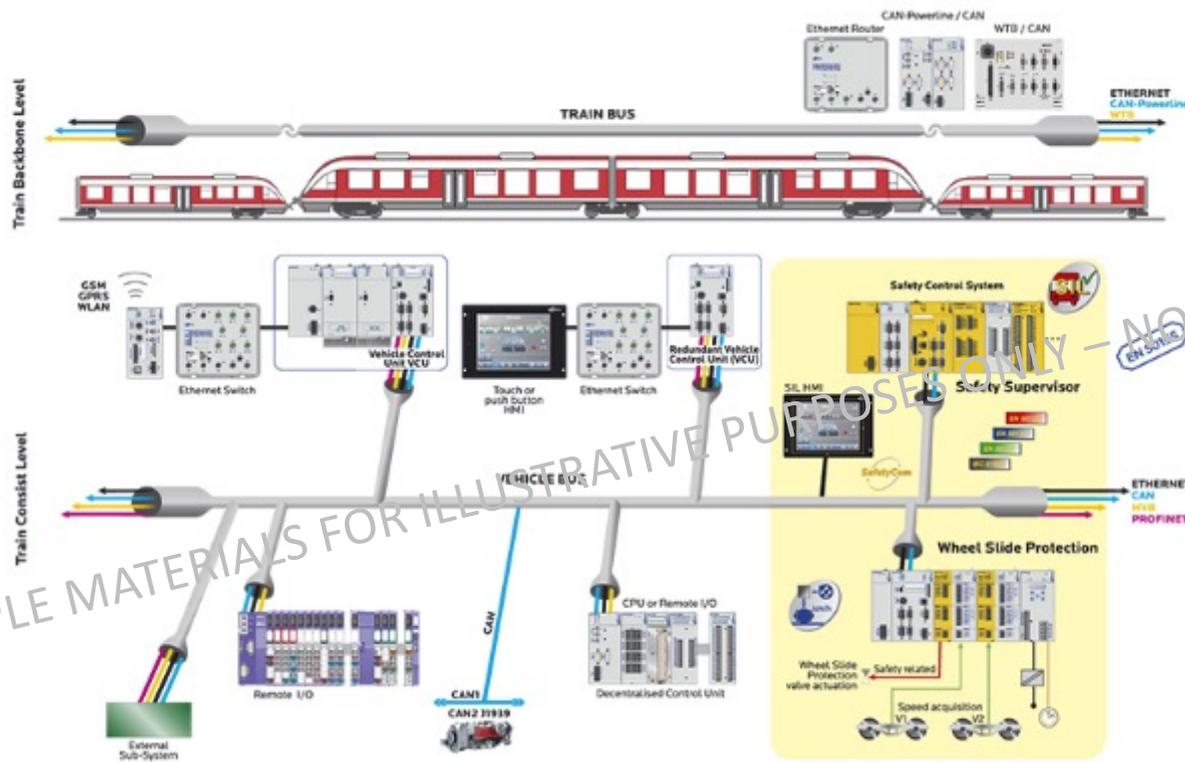


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Railway Electrification



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Your Challenge

- You and your team must now work together to create the circuits you will see on the next slide.
- You must draw out the circuit diagram as well as making the circuit!
- Once you have completed the circuit make sure it gets checked!

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Circuit Challenge

1. A circuit that has a light bulb that can turn on and off;
2. A circuit with a lit bulb and a bulb controlled by a switch;
3. A circuit that includes a lamp and an LED;
4. A circuit that can launch a flying disc into the air;
5. A circuit that has a siren and an LED.

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