The digital railway brings together systems, technology and business change in an integrated way.

It will focus on areas that offer **best value for money**, balancing benefits with affordability.

**European Train Control System (ETCS)**
allows trains to run closer together and to travel at their best speeds whilst maintaining safe braking distances.

**Traffic Management (TM)**
maximises performance as trains flow across the network, maximising the throughput that existing track can support and adapting in real-time as network conditions change to aid rapid recovery.

**Connected Driver Advisory Systems (CDAS) + Automatic Train Operation (ATO)**
provides decision support to drivers in the cab so that they have the information they need at the right time to boost performance and safety.

**Telecoms + Data**
through FTN and GSM-R, will underpin and connect all these systems.

**Industry Readiness**
builds capacity and capability and develops expertise. Enables the workforce and industry to adopt new technologies and ways of working, build digital capabilities and maximise the benefits of the overall systems.
The digital railway enables us to manage and operate the railway in a very different way

The digital railway programme will…

**Manage and control trains better**

We can **safely and cost effectively** cater for increasing demand for rail travel and freight paths, automating control of trains to smooth the flow and **improve performance**.

It also enables the industry to…

**Manage our physical infrastructure better**

The system provides data that can be used to operate and maintain these assets in a **predict and prevent** way, aligning with the future operating model for how the industry will work together to maintain and operate the railway.

**Provide better information**

The open data generated by a digital railway will allow other parties to **provide better, more targeted information** about delays. It will provide greater level of real-time detail about the locations of trains between stations.
Key Digital Railway Technologies

1. **Connected Driver Advisory System (C-DAS)**
   - In-cab digital decision support tools give drivers the information they need at the right time.

2. **European Train Control System (ETCS):**
   - Scalable digital signalling which is easier than conventional signalling to deploy and which enables more trains to run safely on the track.

3. **Traffic Management (TM):**
   - TM maximises network performance by managing the movement of trains more effectively.

---

Traffic Management (TM):
- TM maximises network performance by managing the movement of trains more effectively.

Operations and Planning:
- Operations Planning
  - Integrated Traffic Mgt (TM) System
  - Algorithms
  - Interlockings

Business Systems:
- C-DAS
- GSM-R
- Balls
- Axis counters

Onboard:
- MMI
- GSM antenna
- EVC
- GPS antenna 2
- VIM

Operations Floor:
- Operations Planning
- Integrated Traffic Mgt (TM) System
- Algorithms
- Interlockings

Railway Operations Centre (ROC)

External Environment:
- C-DAS
- GSM-R
- Balls
- Axis counters

Business Systems:
- CIS
- TRUST
- TOPS

Data
- Stock and Crew
- TOC systems

Trackside:
- Track Worker Safety
- GSM-R network
- GSM-R
- Balls
- Axis counters

Operations Planning:
- Operations Planning
- Integrated Traffic Mgt (TM) System
- Algorithms
- Interlockings

Business Systems:
- C-DAS
- GSM-R
- Balls
- Axis counters

External Environment:
- C-DAS
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Operations Floor:
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Railway Operations Centre (ROC)
## Readiness

### Technology readiness level

<table>
<thead>
<tr>
<th>Outcome</th>
<th>ETCS L2</th>
<th>TM</th>
<th>C-DAS</th>
<th>ETCS L3</th>
<th>COMPASS</th>
<th>ATO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Improved safety</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>2. Improved capacity</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>3. Better customer information</td>
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<td>●</td>
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<td>●</td>
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<tr>
<td>4. Better connectivity</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>5. Better business information</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<td>●</td>
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<tr>
<td>6. Improved performance</td>
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<td>●</td>
<td>●</td>
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<tr>
<td>7. Increased network availability</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>8. Reduced journey time</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>9. Better environmental sustainability</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>10. Lower whole industry / whole life costs</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>11. Increased global leadership and skills</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

| Technology readiness level                      | 7       | 7  | 5-7   | 3       | 3       | 3   |

**Key:**
- ● Limited relevance
- ○ Medium relevance
- ● High relevance

**Technology readiness level:** Estimate of technology maturity from a low score of 1 (basic principles observed and reported) to a high score of 9 (active technology proven through successful use in an operational environment).
Why is Digital Railway Required?
Britain’s railways are in high demand

Passenger numbers have doubled since 1996 and are set to double again over the next 25 years.

And the DfT’s Rail Freight Study also shows the growing demand for rail freight services in recent years.

We are running more trains and adding more carriages, but with these changes alone we cannot meet projected demand.
The railway is full, which affects performance

This gradual decline in train performance is likely to continue as the railways get busier and busier, unless we find a way to run more trains and improve how we manage our existing network.

* The public performance measure (PPM) shows the percentage of trains which arrive at their terminating station on time. It combines figures for punctuality and reliability into a single performance measure. It is the industry standard measurement of performance.

More passengers standing in the vestibule and getting on and off means the train takes longer to stop, set down, pick up and depart at platforms.

When the system is above capacity, if a train misses its allocated time at several stations on the route, passengers are significantly late getting to their destination and the delay ripples to other parts of the network throughout the day. As passenger numbers grow, overall train punctuality will decline.

Meanwhile, the practical reality for drivers involves driving on yellows/double yellows, and the adoption of defensive driving techniques that (rightly) prioritise safety over shorter headways.
Long-term trends mean that this problem is most acute in some of our major urban areas.

Long term demographic trends like population growth and urbanisation mean more people travelling within and between major cities and city regions. People in urban areas use public transport to get to work…

… but major stations like Birmingham New Street, Kings Cross, Leeds, Euston, Manchester Piccadilly, Paddington, London Victoria and London Bridge which connect into and between our major urban areas are already full at peak times.

Better performance and additional capacity will enable more people to travel more reliably into and between cities.
Options to improve capacity are increasingly limited

There are broadly four ways of improving capacity on the railway. But as the analysis below shows, two of the options are no longer available where the problems are most significant. Our roads are very congested, and we have exhausted options that lengthen trains and platforms where it is most needed. Building new tracks into our biggest, busiest cities would be hugely expensive and disruptive (and in some places is simply not possible). We need to find a way to get more performance out of our existing railway and manage our network more efficiently.

We have four options...

1. Do nothing to address capacity challenges, rely on other modes of transport e.g. road
2. Less disruptive conventional enhancements e.g. lengthen trains
3. System upgrade: Digital technologies and enabling conventional e.g. grade separation
4. Highly disruptive conventional enhancements e.g. build a new track

In the most congested areas major roads are full and we have already done what we can with conventional options like lengthening trains.

In these areas we now face a choice:

3. Digital + Enabling Conventional system upgrade
4. Major Conventional
Our studies show digital railway interventions and enabling conventional is the clear option to address the challenge on our network.

Where capacity is needed and we have exhausted low disruption conventional enhancements, a system upgrade of digital + enabling conventional works is the best option to address the challenge. Our case studies show it will deliver capacity and performance improvements sooner and at comparable or lower cost than conventional only works. It does this through unlocking the maximum capacity potential through system upgrade.

Cost of delivering capacity

We are here:
In most places where capacity is needed we have already done what we can

Now we face a choice:
System upgrade (Digital + Enabling Conventional) or Major Conventional

Do nothing to address capacity challenges: rely on other modes of transport

Conventional only:
Lengthen trains and platforms, infrastructure interventions

System upgrade:
Digital: ETCS, TM, C-DAS, ATO
Enabling Conventional*: e.g. Junctions, grade separation

Major conventional:
Major infrastructure programmes and network configuration e.g. building new viaducts

1920 - 1995
1995 – 2015
Future

*DR needs to be accompanied by other measures to generate the benefits that have been obtained in a metro context. For example new and uniform train-fleets designed for shorter dwell times, junction improvements to reduce conflictions, station works etc. Digital Railway will therefore need to work closely with industry partners to realise its benefits.
Team members selected based on knowledge and experience and cross industry teams formed to support seven work streams:

1. Traffic Management
2. Cost Reduction
3. ERTMS Specification Review
4. ERTMS Capacity Proof
5. ERTMS Ready Spec
6. Working together
7. Trans Pennine Upgrade

Each work stream has a team leader appointed from the supplier nominations.

The work streams are tasked with completing their work between October and December 2016.
Procurement Approach
Collaborative Strategy

Supply Selection

Stage 1
- OUTPUT: INITIAL DEVELOPMENT TO ESTABLISH SCOPE, SCHEDULE & RISK

Stage 2
- OUTPUT: DETAILED DEVELOPMENT & DEPLOYMENT
  - COST PLUS ARRANGEMENTS
  - Appoint Suppliers
  - Negotiation

Stage 3
- OUTPUT: IN-LIFE SUPPORT, MAINTENANCE & SYSTEM UPDATES
  - Agreed Schedule of Rates
  - Set Target Cost
  - Incentivised Target Cost Contract
  - SCHEDULE OF RATES WITH PERFORMANCE BASED PROFIT INCENTIVE
Typical Packaging Strategy
Relationship Structure

Collaborative Relationship

- Data
- Prog Mngt
- System Integration
- Business Change
- GMS-R
- FTNx
- ETCS, TM & C-DAS
- Compass
- Enablement
- Civils
- Level Crossings
- Removals
- Train Fitment
- Freight Fitment
- OTM Fitment

Relationship Management Plan

Client
• Digital Railway website – [www.digitalrailway.co.uk](http://www.digitalrailway.co.uk)
  • Source of materials and background info on previous events
  • Notice of regular digital railway supplier events
  • Programme news stories

• Industry groups & bodies
  • Rail Delivery Group
  • Rail Supply Group
  • Railway Industry Association

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