A Technical Strategy for Britain's Railways

Francis How

Technical Director, Railway Industry Association

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What I am going to cover

- A little about the Railway Industry Association
- Why our industry needs a Technical Strategy
- What the Strategy is trying to achieve
- The principal components of the Strategy
- Integration with industry planning processes

About the Railway Industry Association (1)

About us:

- The principal trade association for the UK railway supply industry
- 170+ member companies *(membership is voluntary)*
- Members supply to GB national rail, LUL, light rail, exports *(and many also engaged in other industry sectors)*
- c.100% membership growth in the last fifteen years
- Includes bulk of rail sector by turnover
- Independent: funded by its members
- Small team of ~14 people, based in London

About the Railway Industry Association (2)

Members include:

- Passenger train manufacturers/systems integrators
- All major signalling and most major rail telecomms firms
- All track contractors and many civil engineers
- Major suppliers and other contractors
- Component manufacturers
- Numerous consultants and specialist service providers

About the Railway Industry Association (3)

Activities:

- Representing suppliers interests to government and major clients
- Representing suppliers on cross-industry groups
- Working with the industry on areas of common interest :
  - *Cost reduction*
  - *Technical strategies / R&D*
  - *Skills*
  - *Innovation and collaboration*
  - *Supplier assurance*
  - *Safety*
  - *Sustainability*
  - *Industry planning*
- Supporting GB companies in worldwide exports
- Providing information and insight to members on key issues relevant to their business

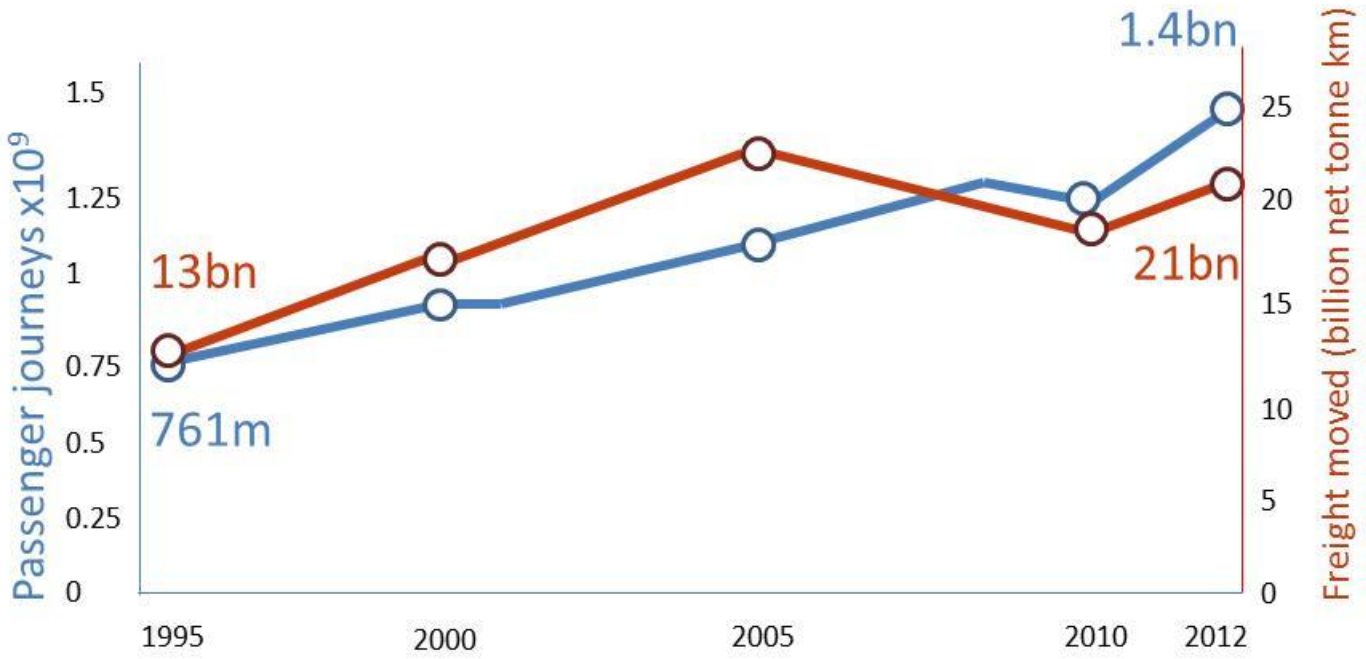
Four pressing issues for the industry

- The COST of running the GB national railway is too high
- We are running out of CAPACITY to cope with the persistent and predicted growth in usage
- CUSTOMER expectations continue to rise and we must meet them
- We must reduce the industry's CARBON emissions significantly over the coming year

"We need transformational change"
- Tim O'Toole, CEO, First Group and Chair, RDG

Capacity demand

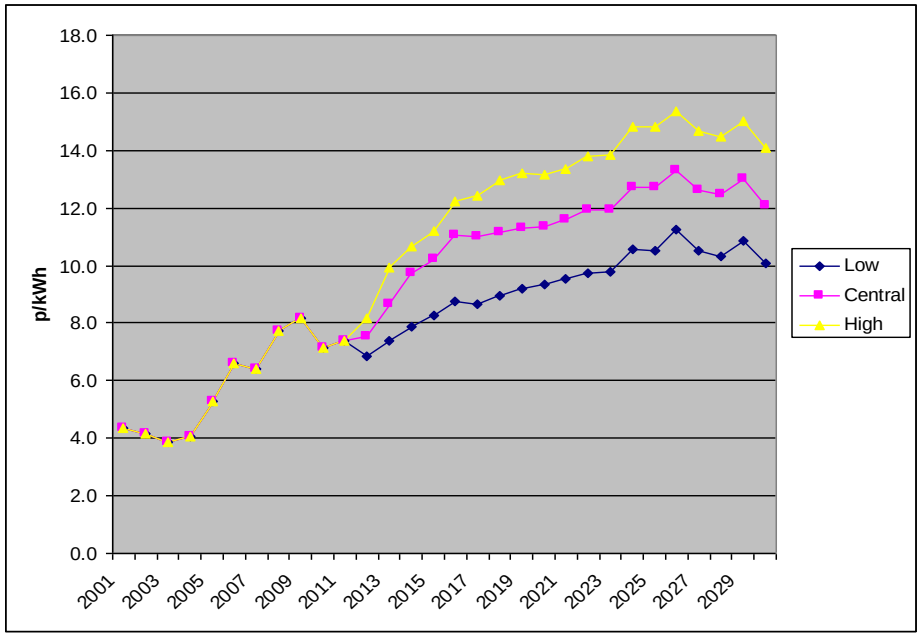
- Significant growth in passenger and freight markets since privatisation, and set to continue
- No spare capacity on some routes to meet peak demand
- Building more infrastructure isn't an option (with a few exceptions!)

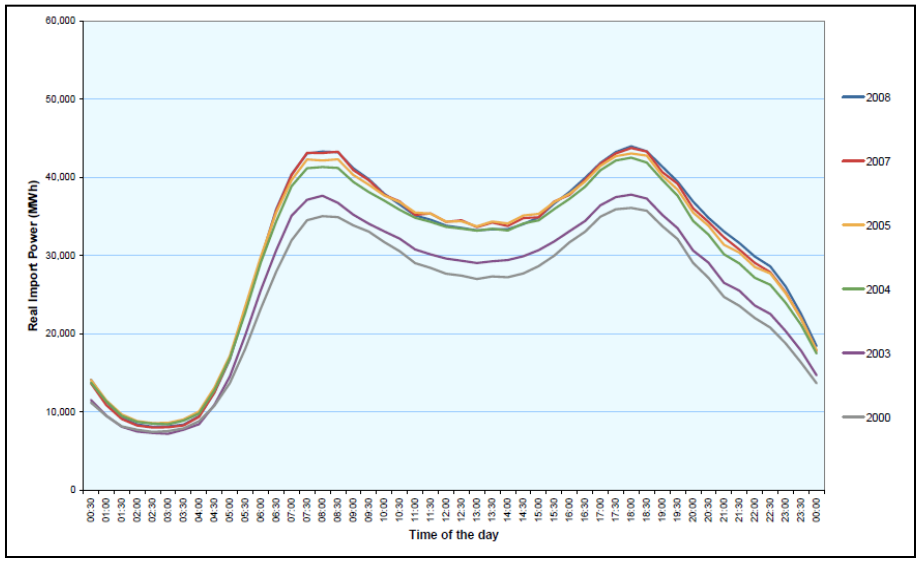


Cost and Carbon

- Energy is getting more expensive
- We're using more of it
- Reducing carbon emissions is challenging

Energy prices/forecasts 2001-2030





Daily energy demand profiles, 2000 - 2008

Railway Industry Association

Customer expectations

The customer's experience are based on:

Information	Trains	Stations	Journey	Value

Less obviously, their impressions will be shaped by:

Track	Energy	Structures	Control & Comms

The RTS attempts to improve all these things and so improve the customer's experience.

"What's good enough today won't be tomorrow"

Rail Technical Strategy 2012

- Developed by the rail industry over 2 years
- Applies to the GB national rail network (not LUL)
- Takes a 25+ year view of the railway
- Launched in mid-December 2012
- Endorsed by Rail Delivery Group
- To be supported by funding in CP5 (technology demonstrators)
- Needs to be integrated into industry planning processes

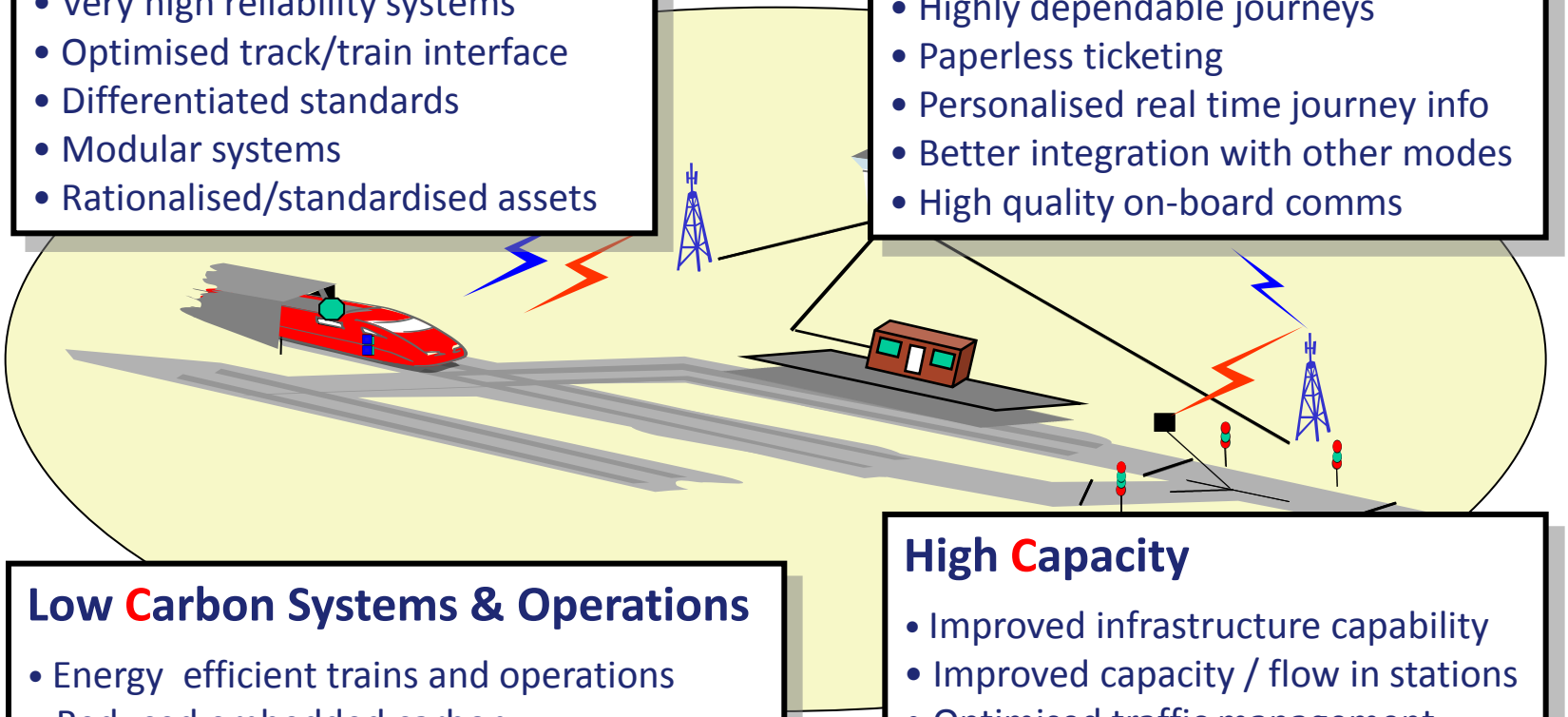
The 4C vision

Significantly Lower Costs

- Very high reliability systems
- Optimised track/train interface
- Differentiated standards
- Modular systems
- Rationalised/standardised assets

Excellent Customer Service

- Highly dependable journeys
- Paperless ticketing
- Personalised real time journey info
- Better integration with other modes
- High quality on-board comms



Low Carbon Systems & Operations

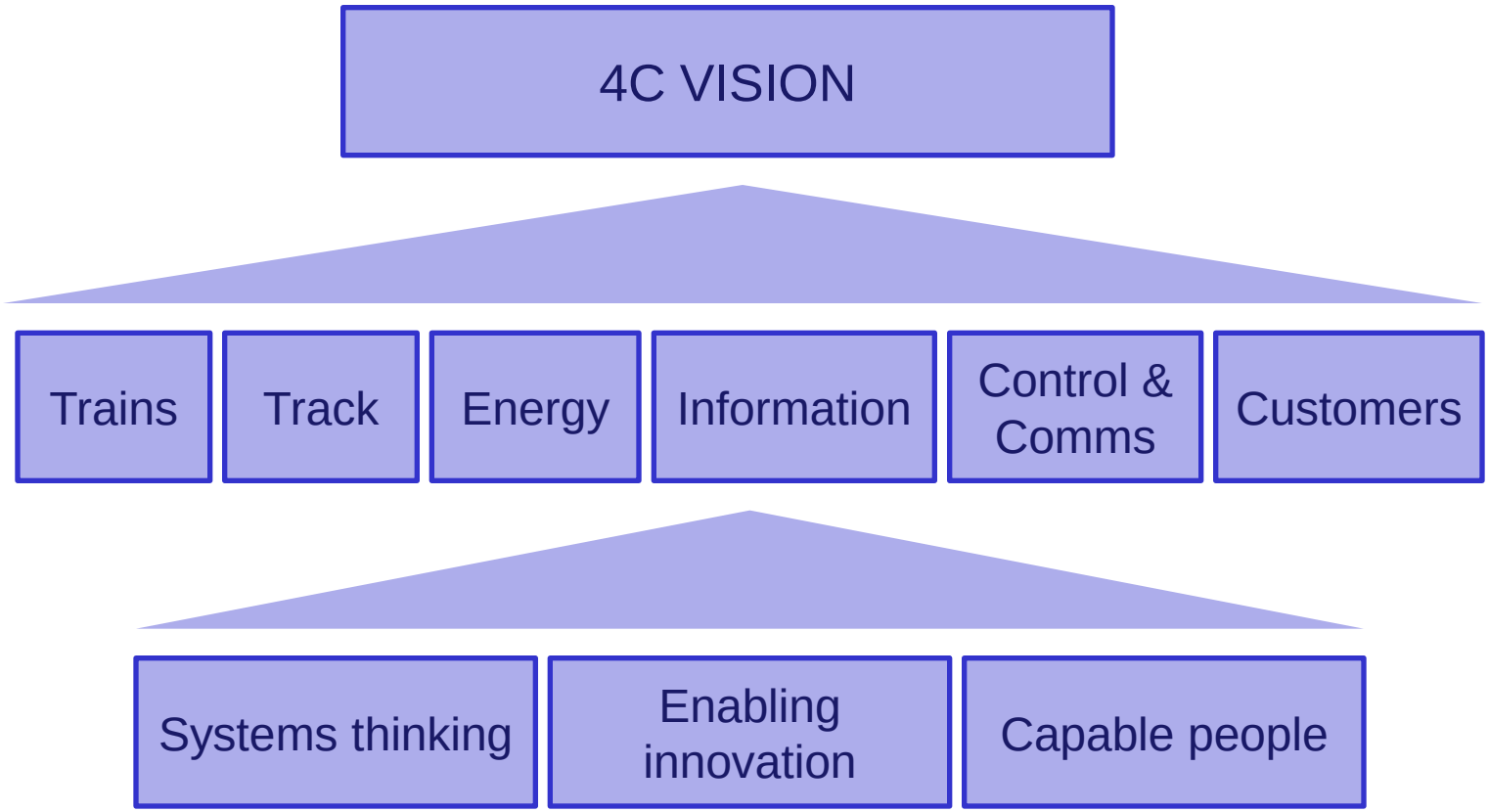
- Energy efficient trains and operations
- Reduced embedded carbon
- All electric railway
- Portable fuel sources

High Capacity

- Improved infrastructure capability
- Improved capacity / flow in stations
- Optimised traffic management
- Optimised utilisation of trains
- 7 day railway

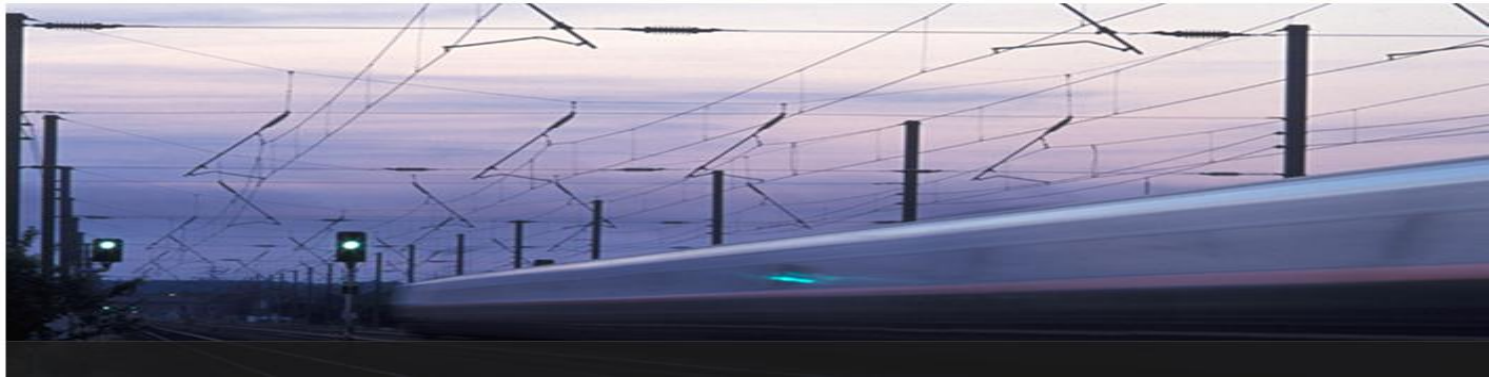
RTS – the approach and structure

- Vision
- Technology-centric themes
- Enablers



RTS – rolling stock (1)

- **Train mass**
  - Value of mass – what is to worth to take a tonne out of a train?
  - Alternative materials for lighter bodyshell, cab ends ...
  - Sub-systems re-design (bogies etc)
  - Trade-off with crashworthiness, capacity etc
- **Energy**
  - Electric trains (but won't eliminate all diesel trains in 25 years)
  - Reduced traction usage as a consequence of reduced weight
  - Reduced losses and hotel loads
  - Alternative energy sources for traction (batteries, hybrid...)



RTS – rolling stock (2)

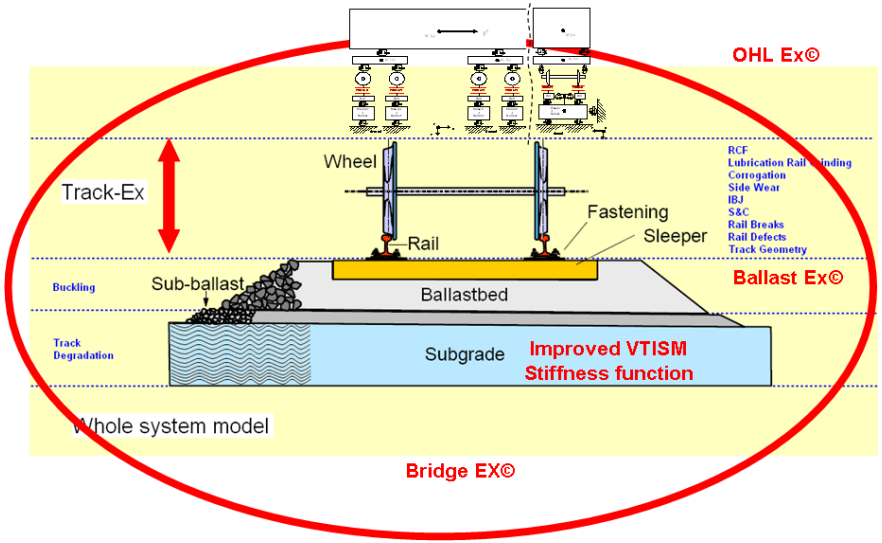
- **Design approach and features**
  - Fast freight trains (better intermixing with passenger trains)
  - Design for upgradeability and modification (more modular approach?)
  - Self-steering bogies – reduced wear / points re-design
  - Adaptive braking (linked to TMS for greater capacity)
  - Integrate diagnostics and remote condition monitoring
  - High capacity /high speed onboard comms for operators and customers
  - Smart approaches to gauge constraints – e.g. novel wagon concepts, mechatronics
  - Better all-route capability
  - Double-decker passenger trains? (not stated in the RTS)

BUT... Still steel wheels on steel rails

AND ... Need to recognise trains builders serve international markets, not UK alone.

Infrastructure (1)

- **Track construction and maintenance**
  - Composite materials, eg for structures to reduce carbon emissions and reduce asset maintenance activities
  - New form of ‘ballasted’ substructure for fast deployment that can be later converted to slab type
  - Better modelling of track to improve design and life expectancy.
  - Autonomous intelligent systems for track maintenance



Infrastructure (2)

- **Design**

- Infrastructure design to cope with climate change (major research project under way)

- Increase capacity and improve reliability by radical (?) new design of S&C

- Maximise passenger throughput at busy stations:

  - ✓ by optimising platform/train interfaces, station design and mobile phone apps.

  - ✓ Ticketing via e-business transactions to minimise the need for ticket gatelines.

Energy (1)

- The railway will always be an energy-intensive industry. How can it grow in an energy efficient, low-carbon and cost-effective way?

- **Good progress already being made:**
  - Regen braking
  - Energy metering
  - Driver training
  - Driver Advisory Systems
  - Major electrification programme
  - More efficient rolling stock
  - Renewable energy generation

- **The vision**
  - Energy efficient growth in network utilisation
  - Predominantly electric railway
  - Sustainable materials
  - Whole system, whole life approach

Energy (2)

Rolling stock

Right weight and power
Efficiency / lower losses
Regen/energy storage
Intelligent Hotel load mgmt
Alternative fuels

Infrastructure

AC Electrification
DC to AC conversion
Low carbon materials
Energy storage/ generation
Stations/depot energy mgmt

Operations

Intelligent traffic mgmt
(S-DAS➔C-DAS➔Futro)

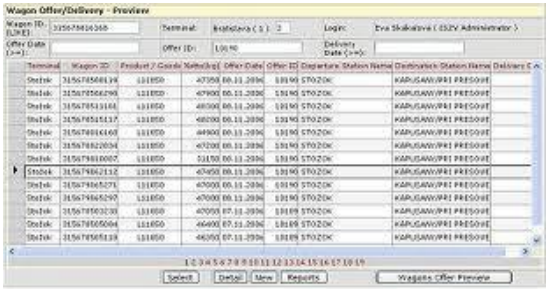
Monitoring

Pantograph condition
OLE condition
Smart grid

Information systems (1)

The problems with current systems:

- Large numbers
- Obsolete
- Cats-cradle of interfaces
- Silo systems
- Significant double-keying
- Unsophisticated
- Bespoke
- Inflexible
- Poorly understood
- Inefficient
- Expensive
- No common architectures, protocols or standards



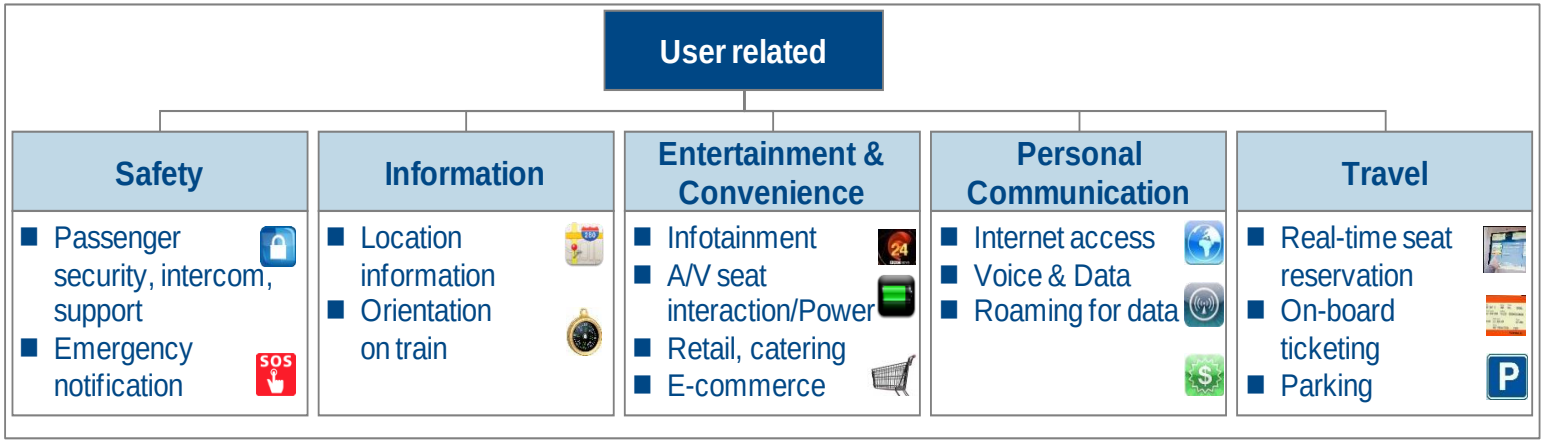
Information systems (2)

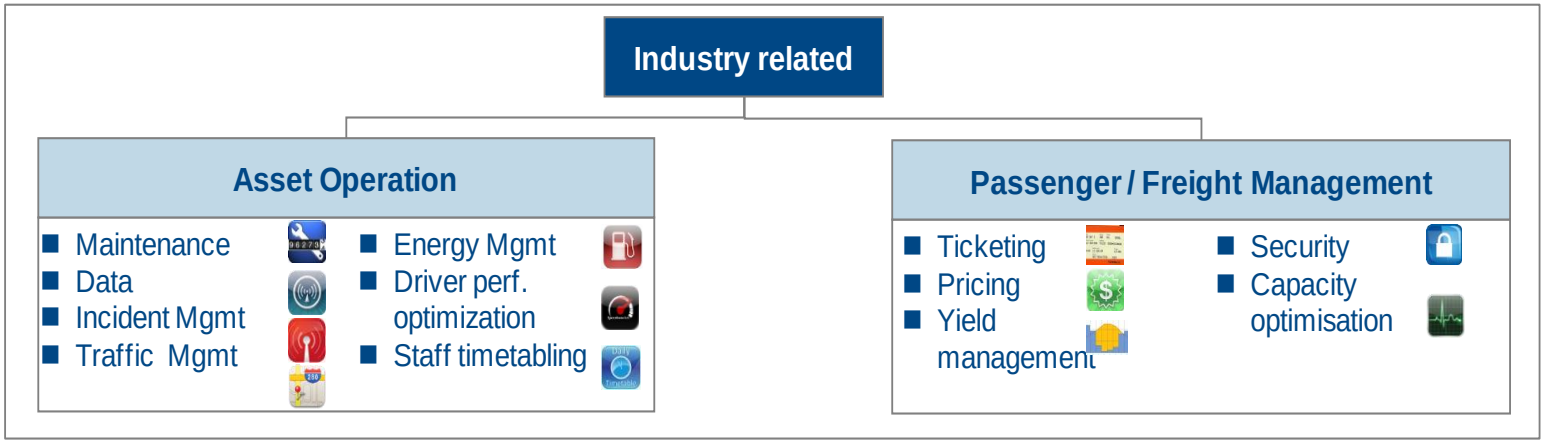
We need:

- Improved customer information services – for planning and execution of journeys (passengers and freight)
- Asset management systems which integrate diverse sources of information to generate better knowledge
- Reduced operating costs associated with systems
- Sharing of information across systems and “single source of truth”
- Open architectures that facilitate greater flexibility and long-term supportability
- Exploit rail information through commercial partnerships

Information systems (3)

The opportunities with onboard communications:





Customer experience (1)

The future vision

Rail is the preferred mode of transport for passengers and freight customers

The quality of personal experience retains existing customers and attracts new ones

A better overall service offering than the alternatives

Quality =	Trains & stations suited to customer needs, evolving as needs change
	Customers can rely on their journey happening as planned
	Information before, during and after their journey

Customer experience (2)

What is required to deliver the vision?

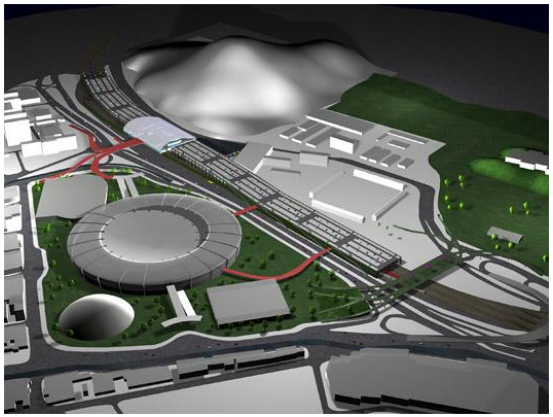
High reliability and high resilience assets and operations

Journey durations, frequency, conditions and timing better than the competition's

Evolving stations, ticketing and information systems support seamless, convenient journeys

Public spaces =

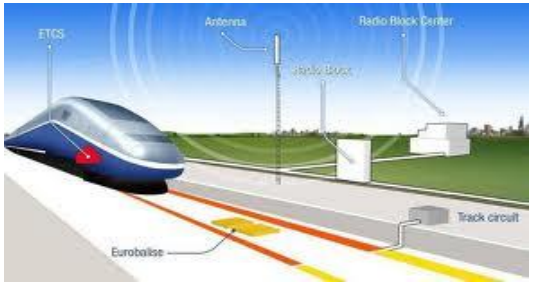
- Welcoming, can be adapted to meet evolving needs readily and well
- Support integration with other modes of transport
- Provide current, reliable information, living services, facilities, social hubs



Control and Communications (1)

Technology strategies

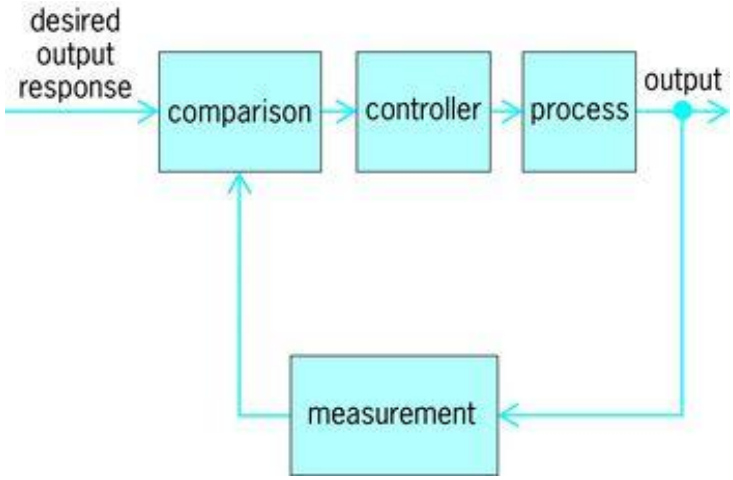
- In-cab Driver Advisory Systems (DAS)
- Centralisation of control
- Cab signalling using ERTMS Level 2/3 (lineside signals removed)
- Automatic train operation
- Intelligent, automated traffic management systems
- Driverless trains ... maybe?



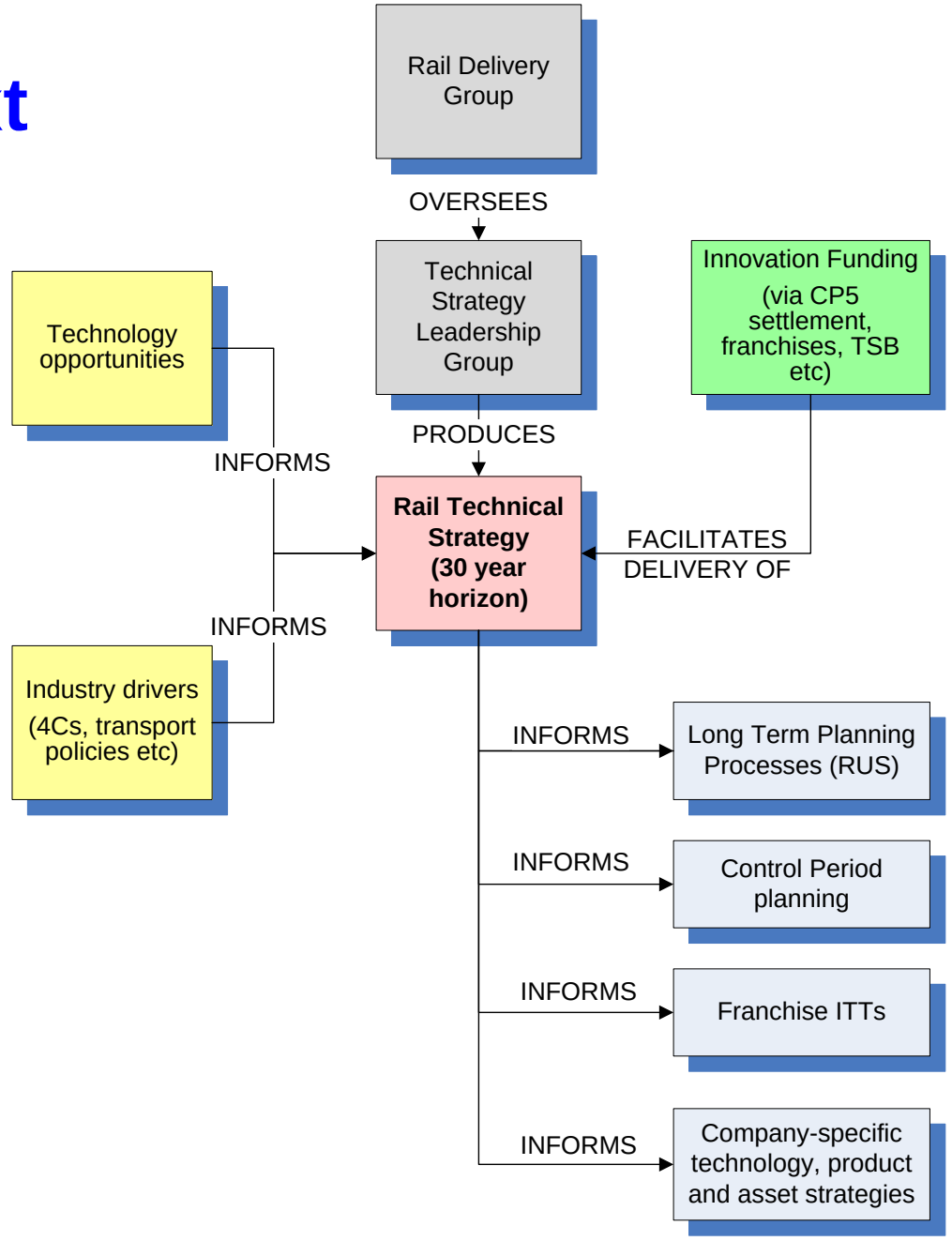
Control and Communications (2)

In the future, traffic management systems will:

- Optimise traffic movements to meet differing objectives
- Inform timetable improvements,
- Predict and resolve traffic perturbations over wide areas,
- Help reduce wear and tear on infrastructure and rolling stock
- Facilitate the energy-efficient running of trains
- Manage peak demand for electricity... And more



RTS in context



To conclude

- The RTS gives vision and direction
- Must form part of the overall planning of the railway's future
- Guaranteed that we won't do everything in it
- Must be accompanied by action
- Need overcome resistance to change
- Technology won't solve all the challenges