Future Communications Strategies

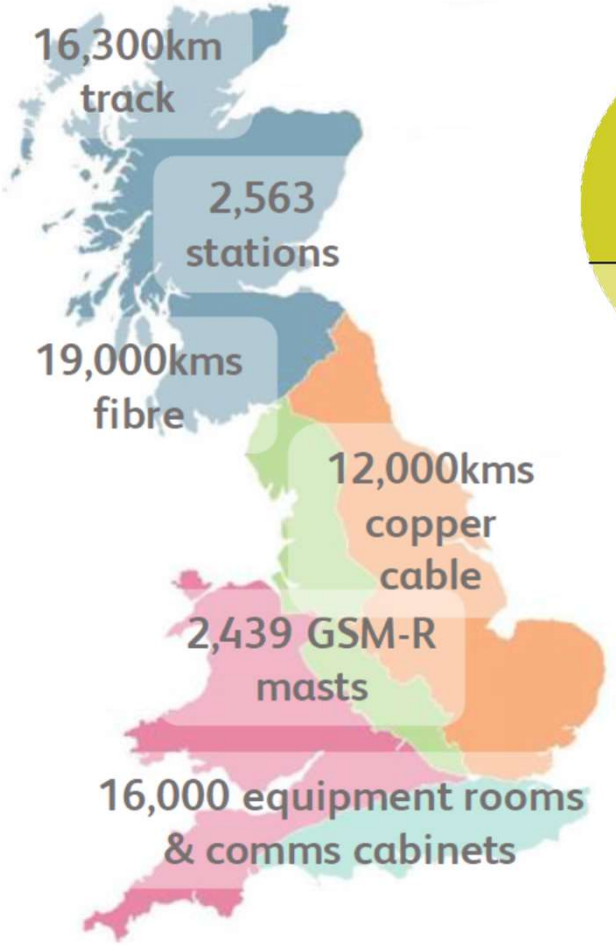
To Develop The Infrastructure Trackside And Deliver Connectivity For Real Time Operations

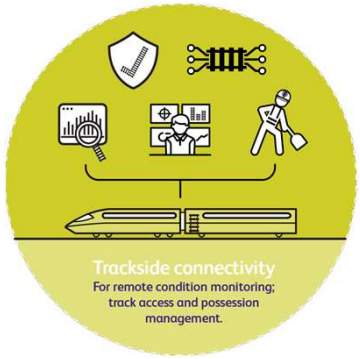
Rail Infrastructure Asset Management Summit
9-10th June 2021

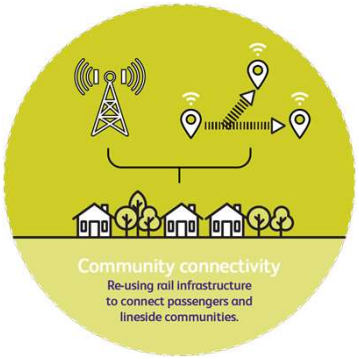
David Choda
Network Rail
Principal Engineer Telecoms

Providing technical leadership

Telecoms At-A-Glance







- Operate and manage a National Telecom network FTNx and GSM-R
- Connectivity services for over 300,000 operational railway assets
- 252,000 circuits managed

The Target 190plus Programme

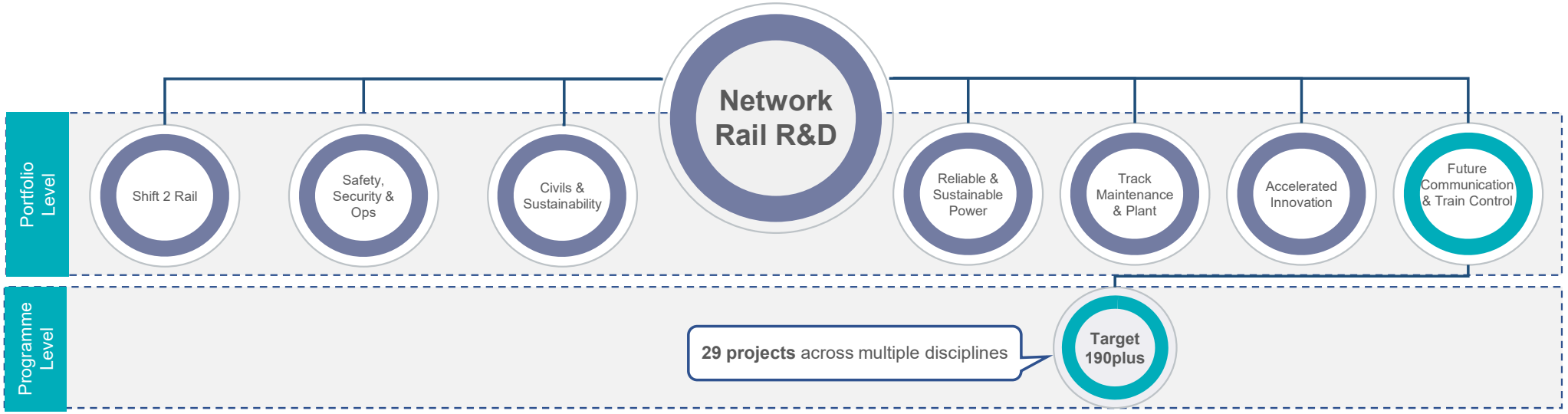
T190plus - Programme

T190plus is a **Network Rail led Research & Development (R&D) programme** which aims to provide the capability to enable **safe**, **affordable** and **deliverable** signalling to meet the future demands of the railway.

T190plus - Projects

The programme is comprised of **29 R&D projects** which will provide the capabilities to deliver sustainable signalling.

These projects have a long-term view, looking to enable a step change that facilitates the capability change needed in the Future Control Command & Signalling (F-CCS) environment. **They are not focused on incremental improvements for the current railway.**



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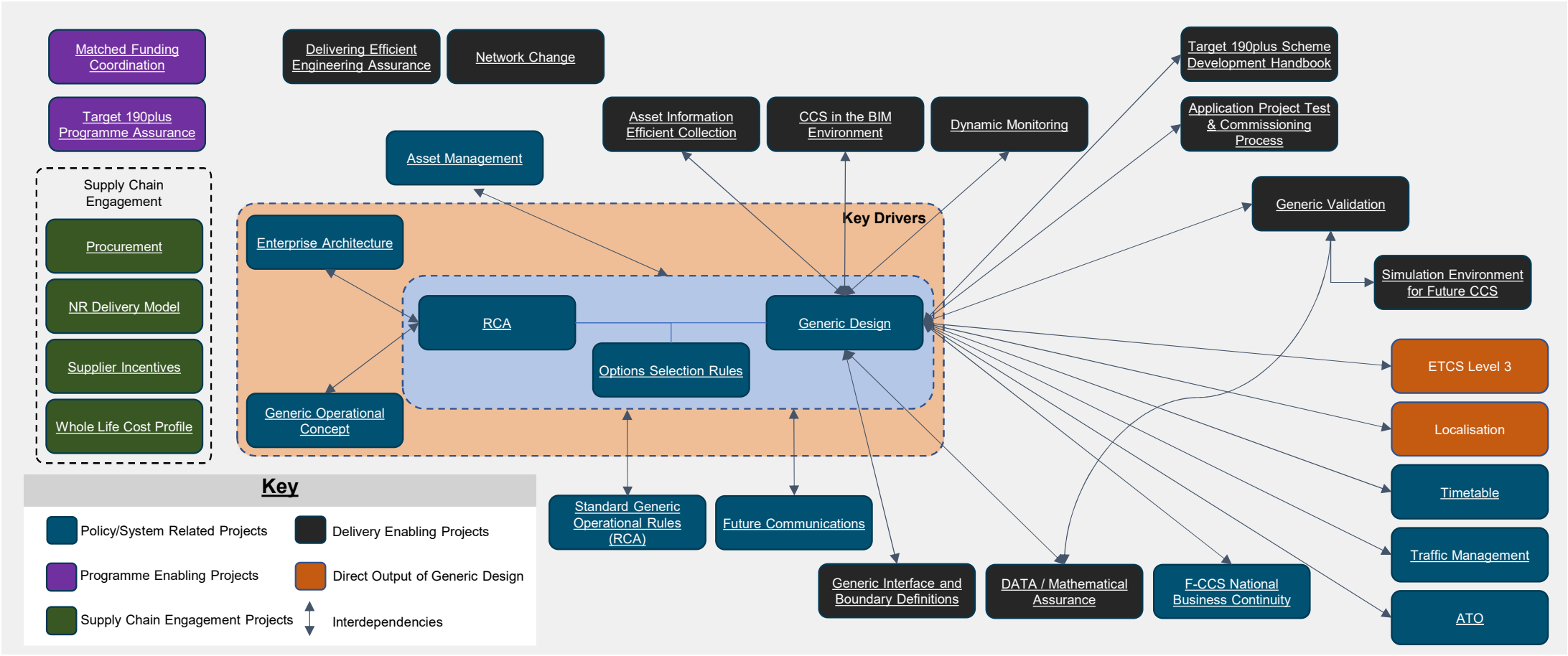
Target 190plus Projects

The 29 projects of the programme are all underpinned through an **Enterprise Architecture** approach to ensure a consistent and coherent language.



Target 190plus Future Communications

The Industry challenge: It is essential that the telecoms network can deliver application-based information in a timely and readily available manner to operate the railway safely and reliably. The end of support for GSM-R planned by 2030 and the expected increase in communication demands due to growth in passenger and freight transport, means current communications are at risk in the long term and vendors are advising clients to prepare for GSM-R replacement between 2025 - 2035.

Inputs this project is considering

- ✓ F-CCS Strategy
- ✓ Long Term Deployment Plan
- ✓ Digital Railway deliverables
- ✓ RCA
- ✓ Shift2Rail IP2 deliverables
- ✓ FTNx architecture and security
- ✓ OFCOM (Spectrum)
- ✓ T190plus ATO and Interface and Boundary Definition projects

Key Collaborators

NRT / Network Services; System Suppliers; Digital Railway; RIDC (PoC); Standardisation bodies (UIC, ETSI, 3GPP, CEPT); Shift2Rail partners

What is the Industry opportunity?

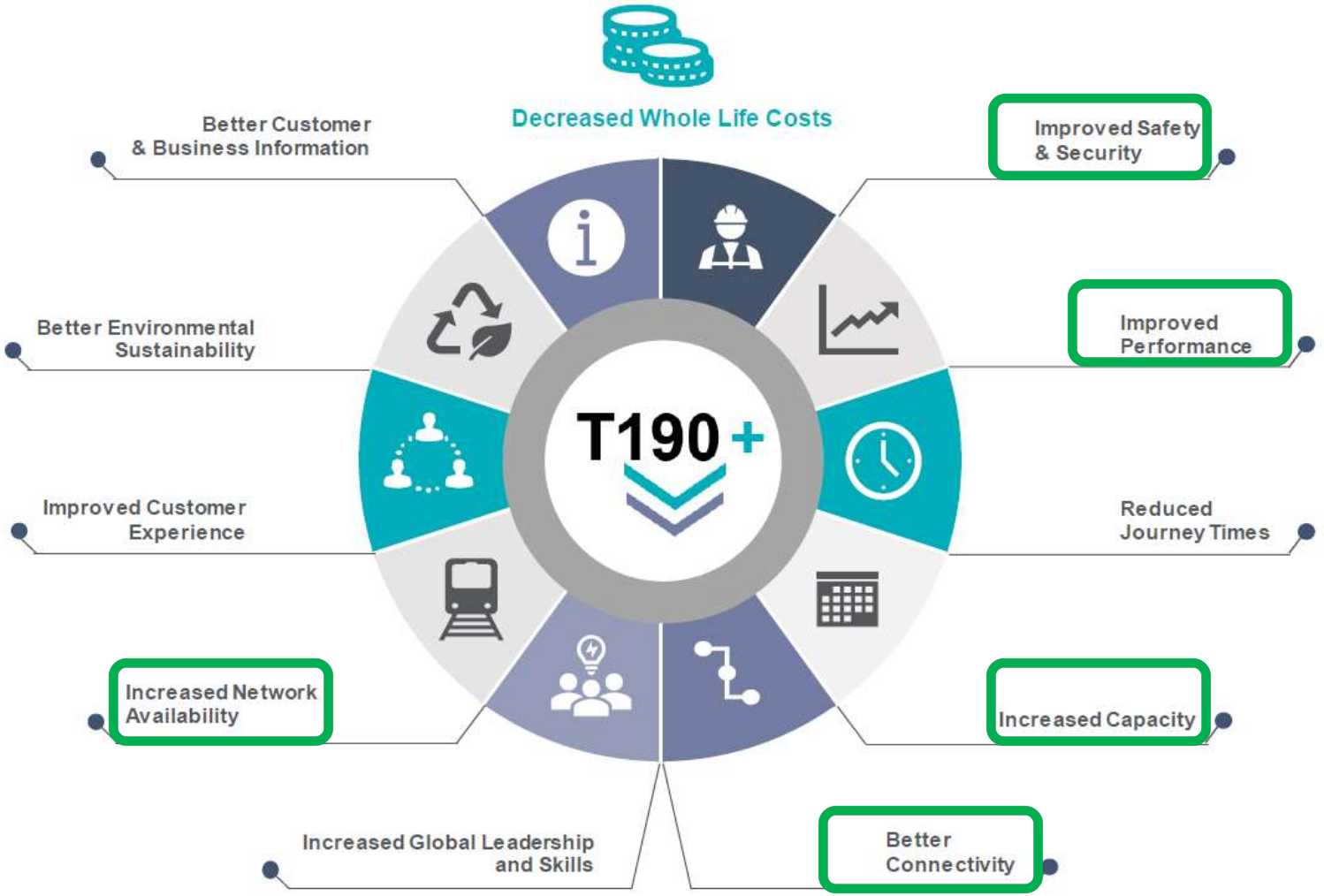
Future Railway Mobile Communication System (FRMCS) is the successor of GSM-R offering the opportunity to:

- ✓ Deliver a future proof communication system for railway based on 5G technology.
- ✓ Decrease the cost of communication.
- ✓ Provide more capacity in a safe and reliable way by delivering application-based information in a timely and readily available manner.

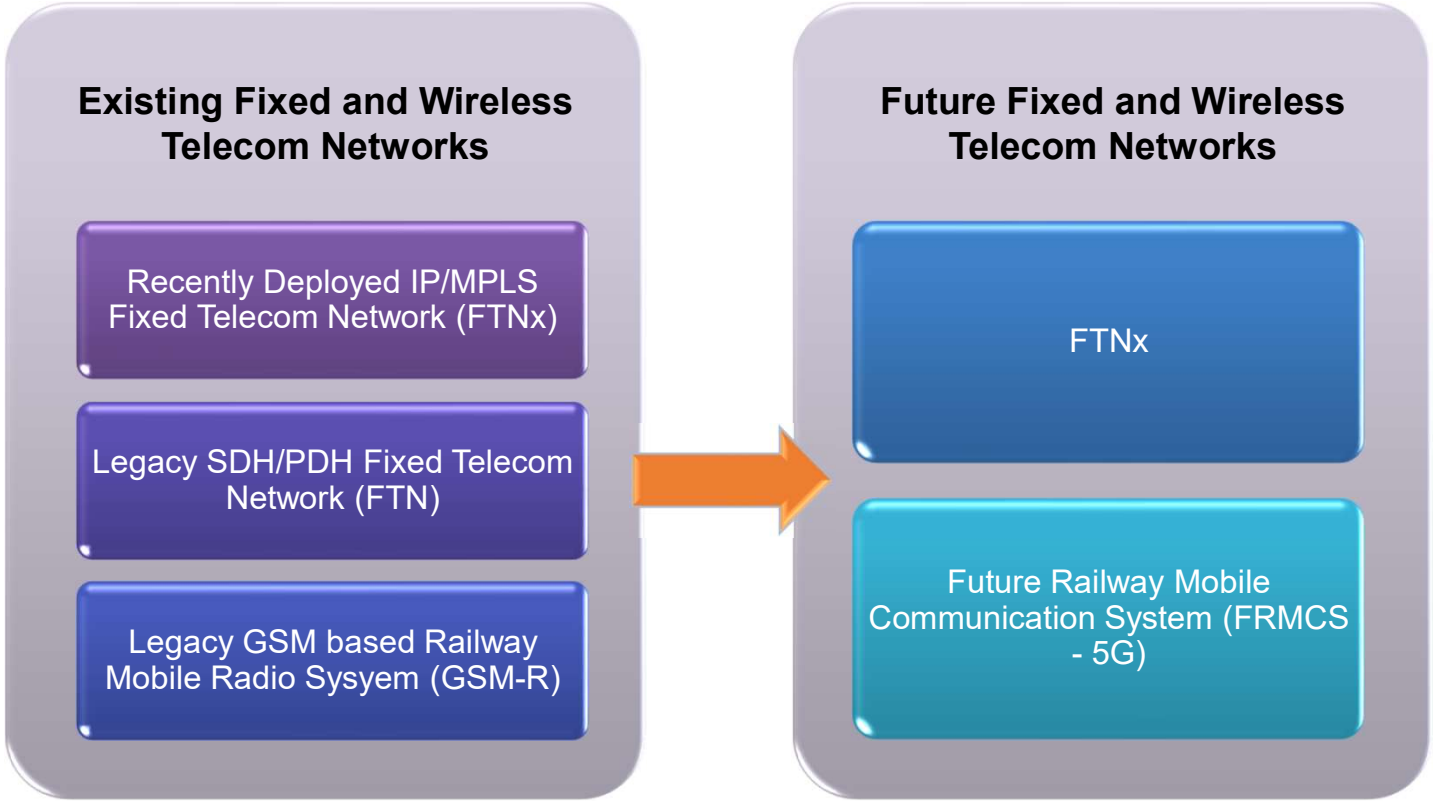
Initial outputs this project is delivering

- ✓ FTNx compatibility and risk assessment to support FRMCS technologies (e.g.: IPv6, synchronisation) including the integration across access, distribution and core FTNx layers (2020)
- ✓ FRMCS migration strategy (on-board and trackside) and independent bearer strategy (2021)
- ✓ Suite of standards and guideline document for the new telecommunications technologies (2022)
- ✓ 5G FRMCS Proof of concept with ETCS / ATO (2023)

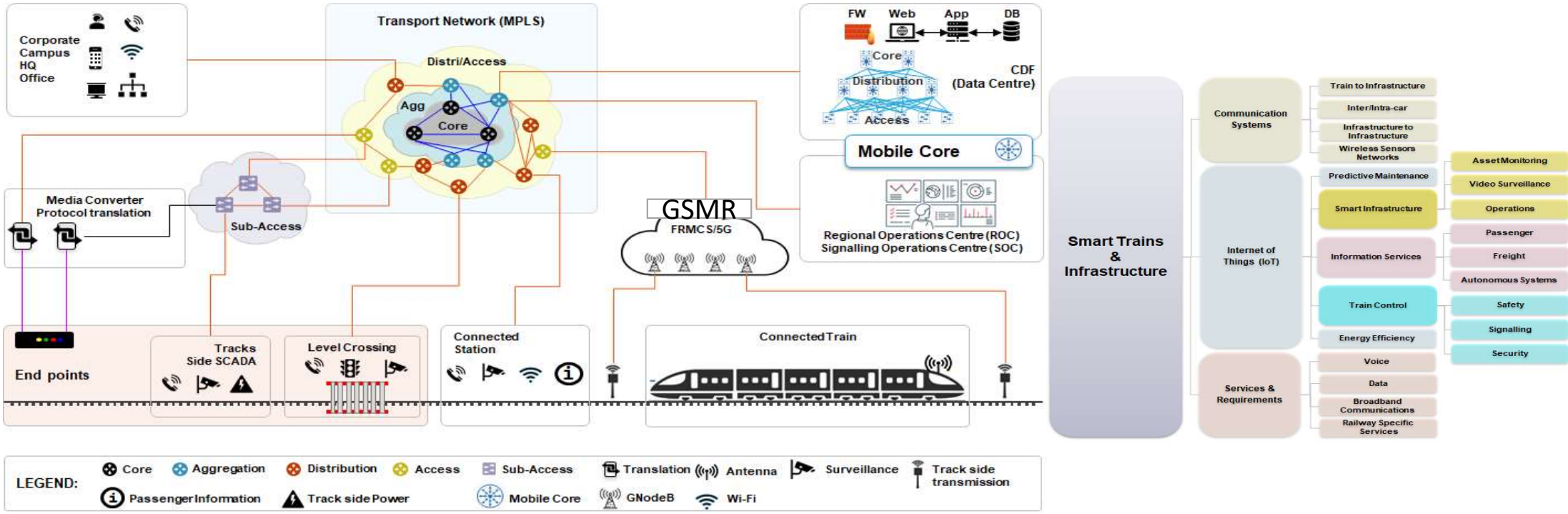
Potential Benefits - Future Communications



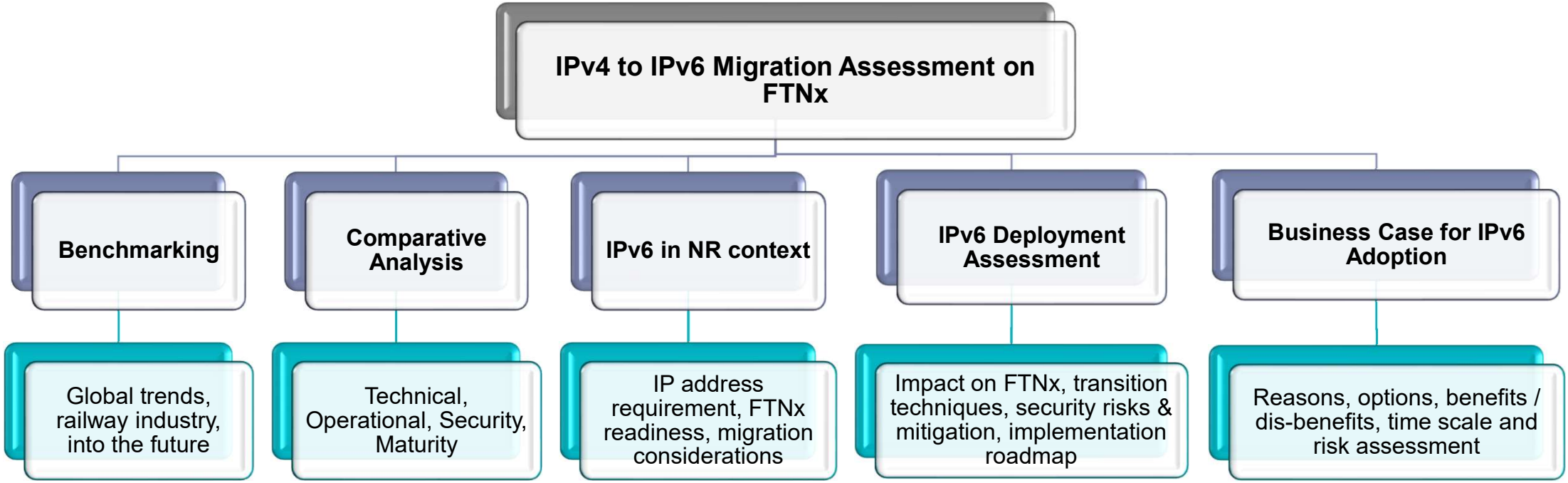
Network Rail Existing and Future Fixed & Wireless Telecom Networks



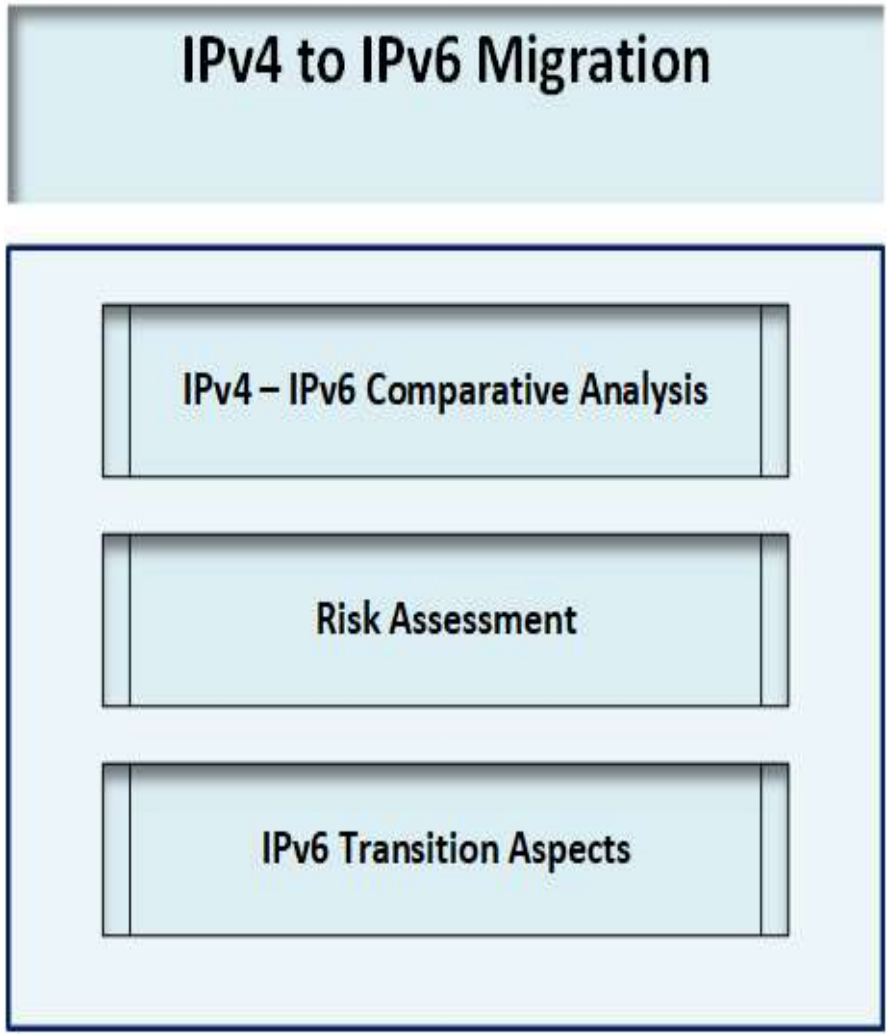
Trackside Connectivity



Phase I: Areas of Focus - IPv4 to IPv6 Assessment



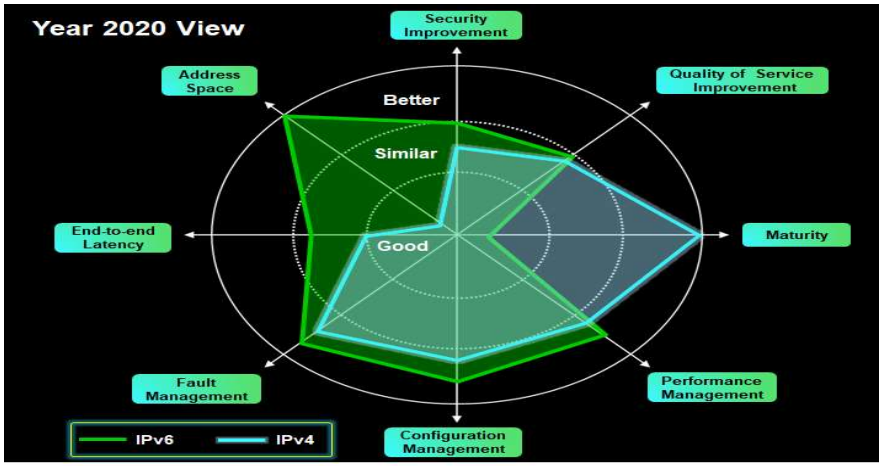
IPv4 to IPv6 Migration

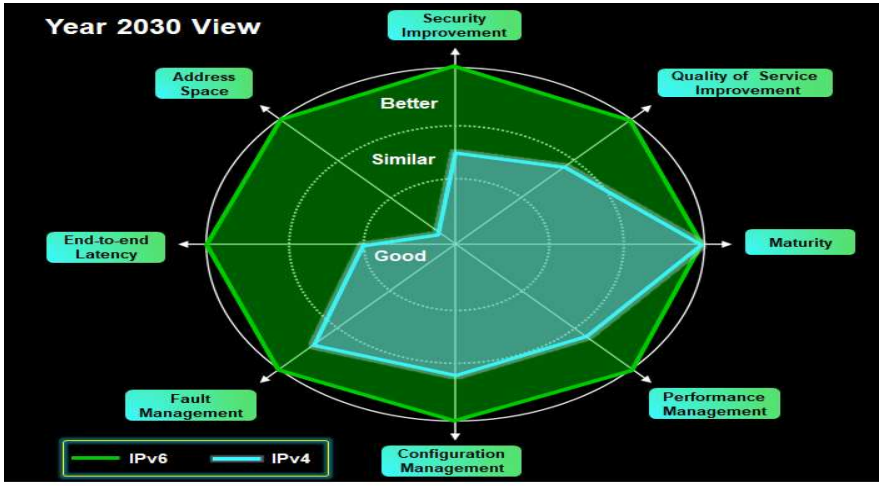


IPv4 to IPv6 Migration - Analysis & Recommendations

IPv4 to IPv6 Migration

- IPv4 – IPv6 Comparative Analysis
- Risk Assessment
- IPv6 Transition Aspects





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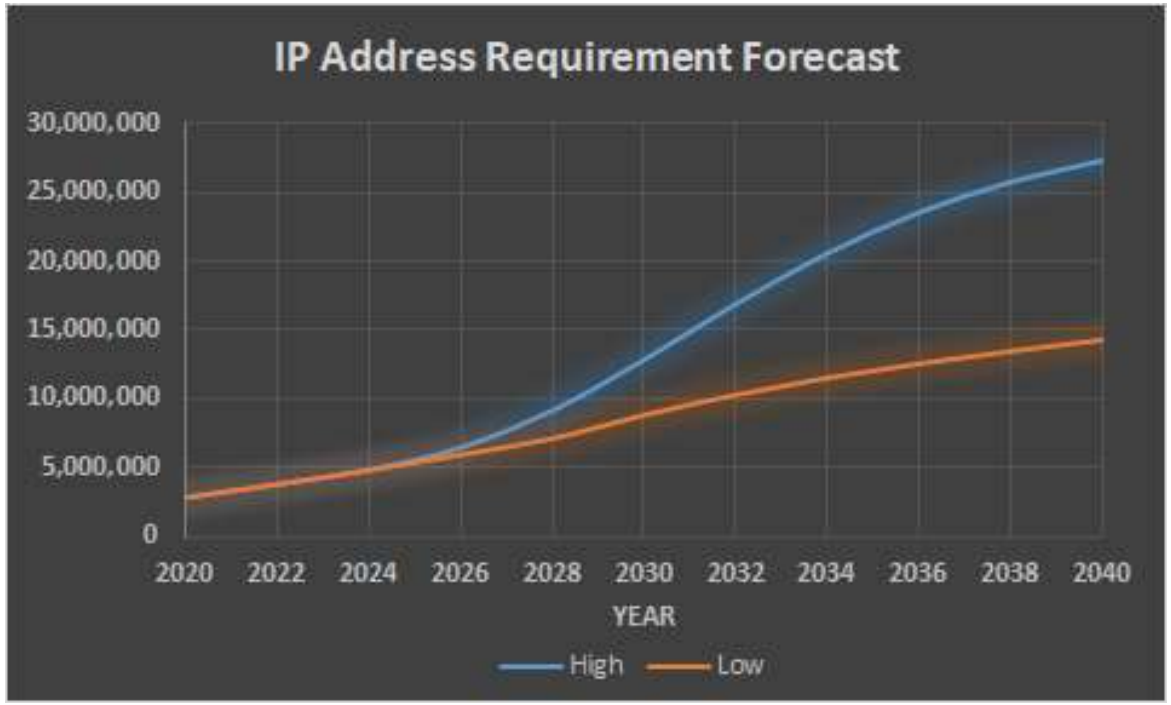
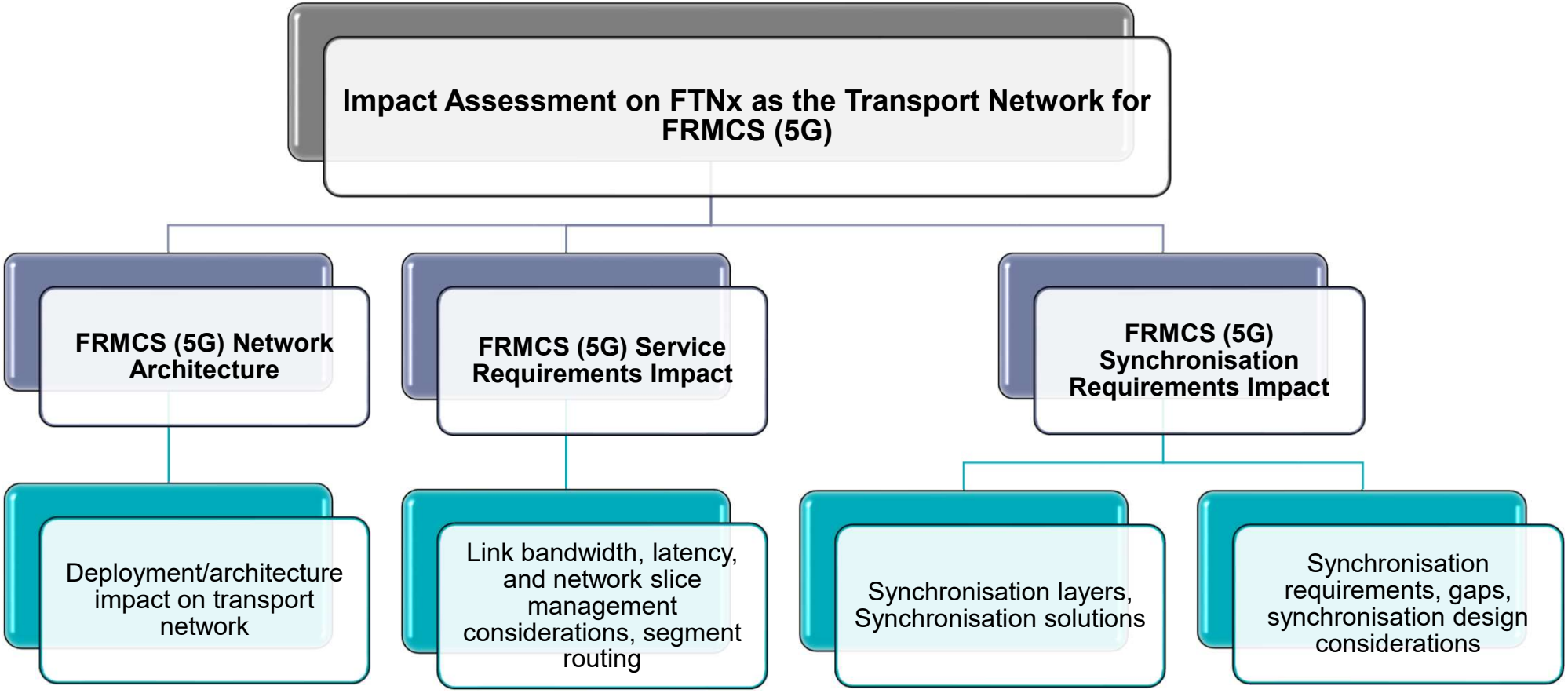


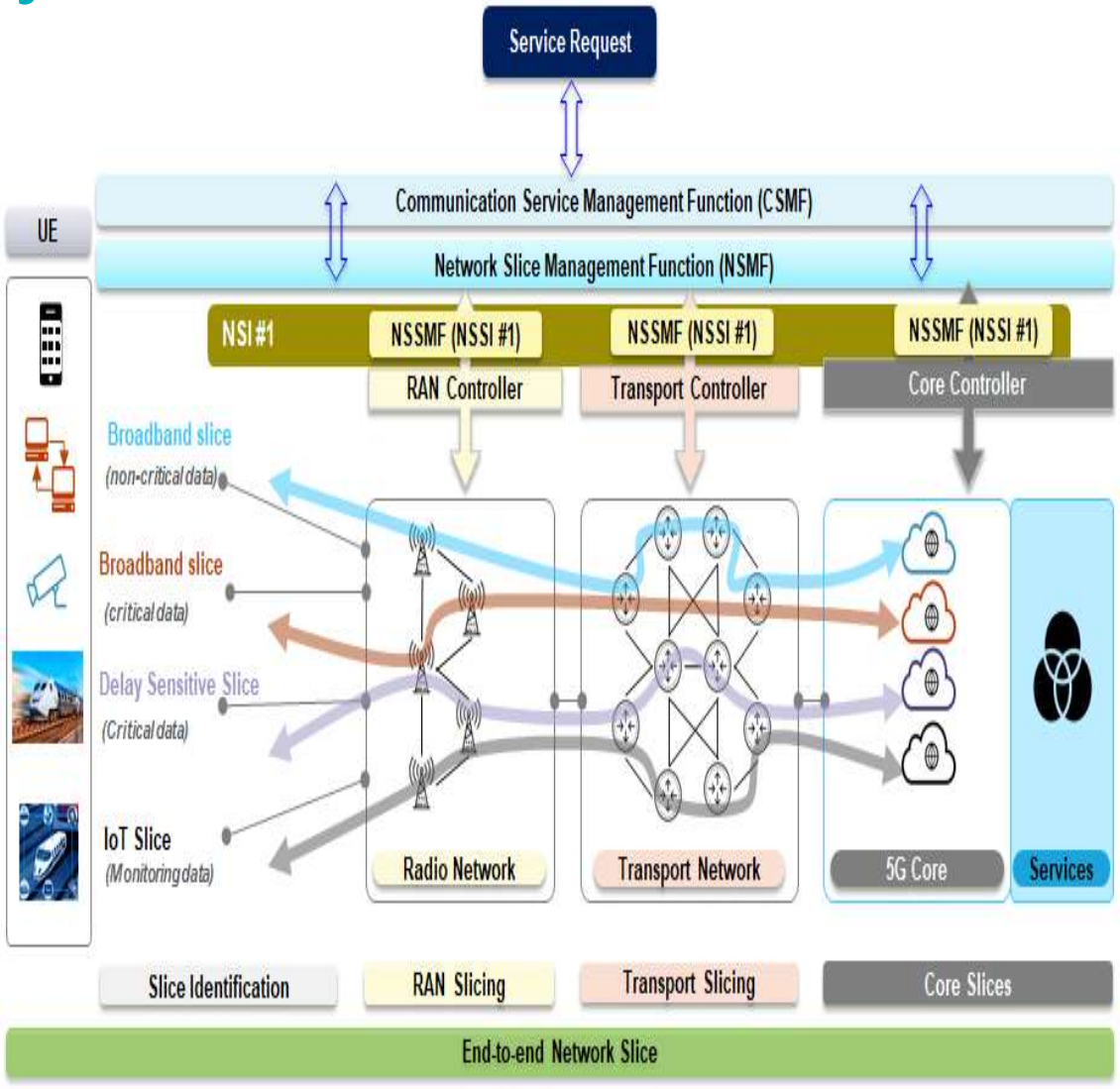
Phase I: Areas of Focus - FRMCS Impact Assessment



Synchronisation - Analysis & Recommendations

FRMCS (5G) Synchronisation Requirements

- FRMCS (5G) Architecture
- Synchronisation Accuracy Boundaries
- Synchronisation Solutions



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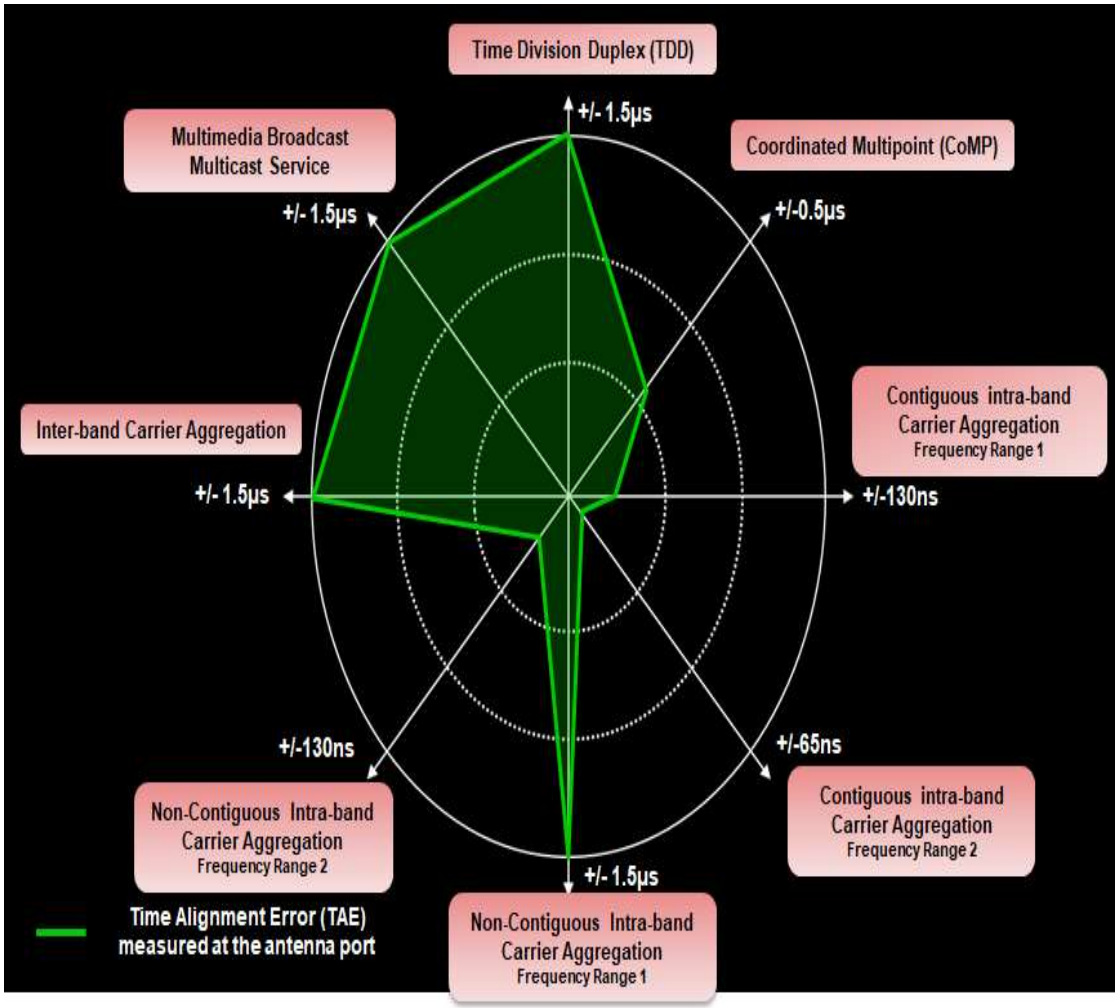

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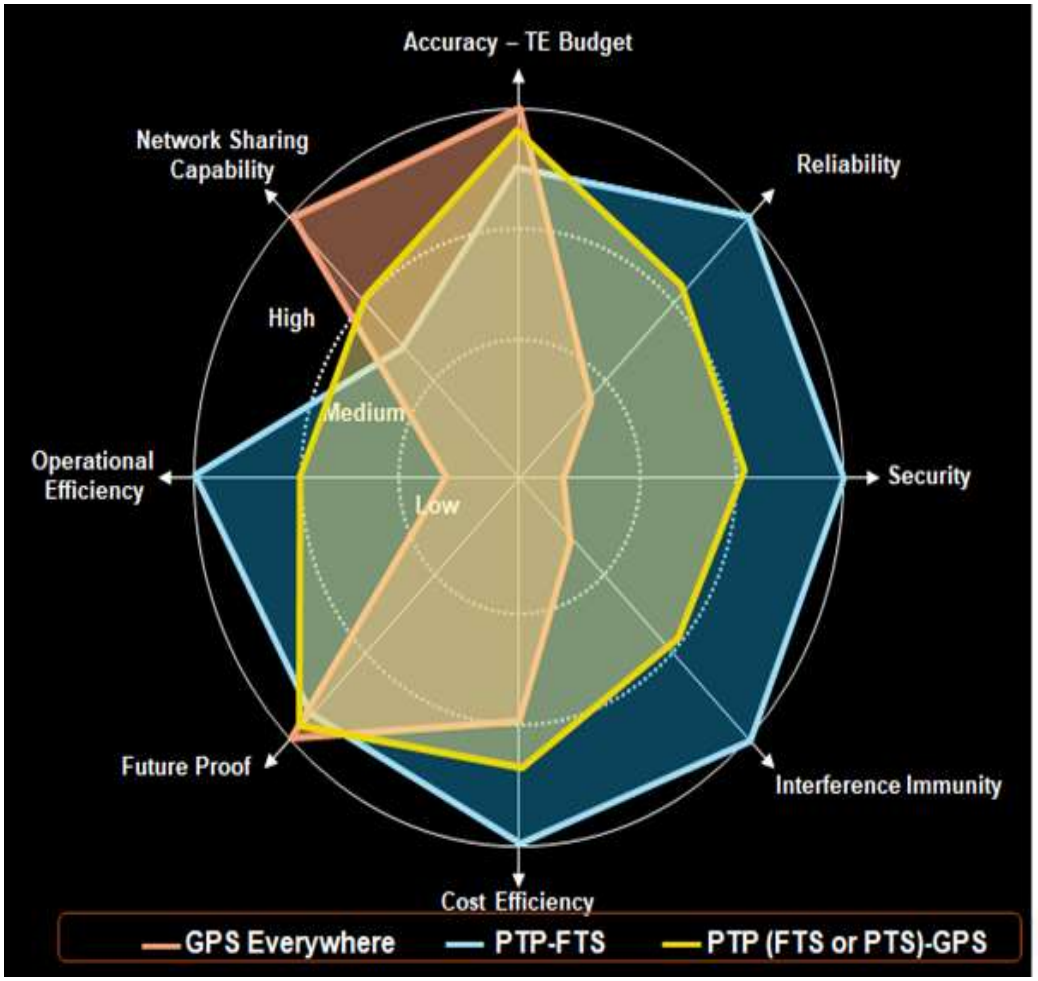

Phase II - Transition Aspect Areas of Focus

Services

- Detailed level of operational services
- Categorisation of services
- KPIs and operational requirements
- Replacement/ Enhancement Roadmap
- Security aspects

Endpoints

- Type and quantity per service and variation
- HW/SW, protocols (IP, non-IP, etc.)
- Existing design approach/s to transition endpoints to IP
- Replacement plan / roadmap / design approach
- Security aspects

Interfaces

- Integration per service to FTN and FTNx and variation
- Replacement / transition plan
- Service connectivity type
- Security aspects

Next Steps: Phase 2 Study

Telecoms Network Sharing

Identifying various options and examining how various network sharing options may apply to use cases identified considering KPIs (TBD).

Security and Safety will be thoroughly examined.

Telecoms Architecture Options

Based on the sharing options and dedicated network, analyse various architecture options and their implications and needs.

The use cases KPIs, and traffic models will be accordingly examined in relation to various options.

In addition, some preliminary views on Spectrum needs will be analysed.

Technologies Interworking, Services & Applications

Depending on the architecture options, how various technologies may interwork will be examined by analysing.

End-to-end architecture impacts and operational implications including safety and security.

Services and applications will be analyzed considering Core Architecture.

Thank You !

NetworkRail

everyone
home safe
every day

Technical Authority

Providing technical leadership

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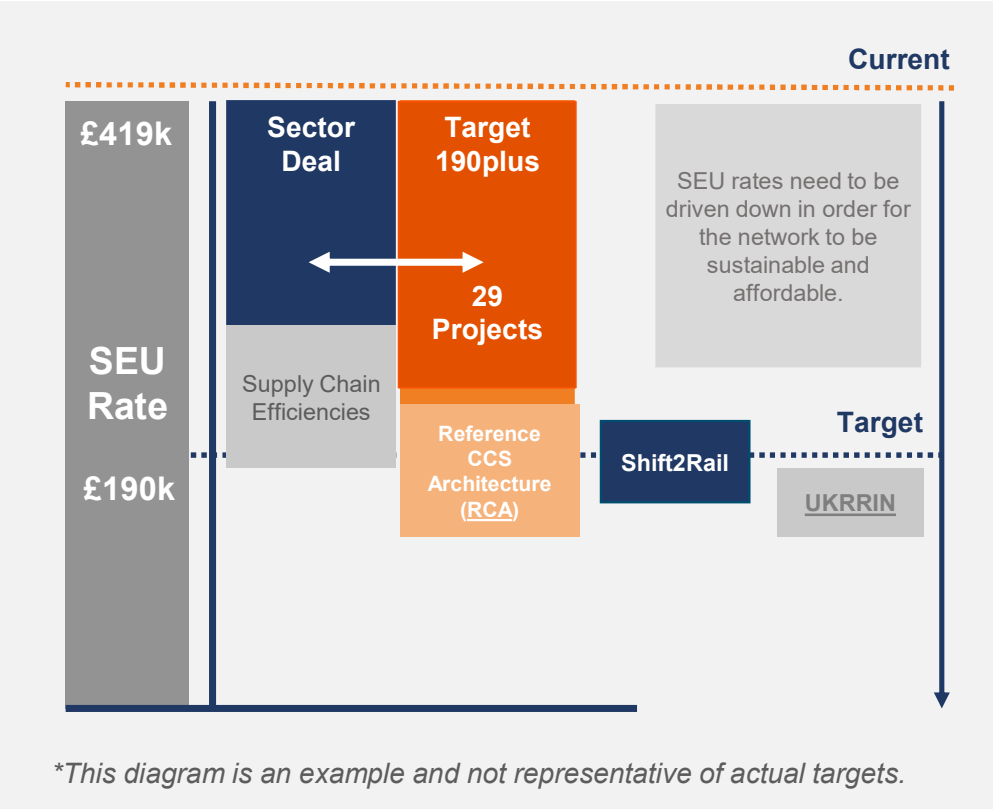
Back-up Slides

Target 190plus Industry Alignment

T190plus is focused on enabling the infrastructure-aspects of the F-CCS future state to make sure the network is sustainable and future changes are affordable.This includes enabling the successful delivery of the Sector Deal outcomes.

By investing in R&D to drive down unit costs, it will be possible to deliver the Long-Term Deployment Plan, to the funding available.

As part of this we will work collaboratively to support the realisation of the Rail Sector Deal outcomes which will not only allow the sustainability of network capability but also equip the railway for its strategic role as a driver of economic growth and to provide a positive experience for passengers and freight users through this century and beyond.



**This diagram is an example and not representative of actual targets.*

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Acronyms

3GPP	3rd Generation Partnership Project
5G	Fifth Generation Mobile Networks
ATO	Automatic Train
CDF	Critical Datacenter Facility
CEPT	Conference of European Posts and Telegraphs
DB	Database
ETCS	European Train Control System
ETSI	European Telecommunications Standards Institute
F-CCS	Future - Control & Command Signalling
FRMCS	Future Railway Mobile Communication System
FTN	Fixed Telecommunication Network
FTNx	Fixed Telecommunication Network New Generation
FW	Firewall
GPS	Global Positioning System
GSM-R	Global System for Mobile Communications – Railway
IoT	Internet of Things
IP	Internet Protocol
MPLS	Multiprotocol Label Switching
NRT	Network Rail Telecommunication
PoC	Proof of Concept
RAN	Radio Access Network
RCA	Reference Control & Command Signalling Architecture
RIDC	Rail Innovation & Development Centre
SCADA	Supervisory control and data acquisitio
SEU	Signalling Equivalent Unit