



Digital Railway – GB Generic Customer Requirements Specification for Operations & Maintenance

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JM-250319-0002

Date: 25/03/2019

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RNG-250319-0082

Date: 25/03/2019

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Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Electronic file reference: <https://digitalrailway.ipss-hdms.co.uk/DigitalRail/Search/QuickLink.aspx?n=153819-NWR-PLN-ESE-000014&t=3&d=&sc=Global&r=01&i=view>

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Version History

Issue	Date	Comments
0.1	20.08.2018	First draft for internal review
0.2	29.10.2018	Updated following Level 1 review comments on v0.1 addressing levelling of requirements and harmonisation with SoS CRS and Basis of Design
0.3	21.11.2018	Updated following Level 1 review comments on v0.2
1.0	28.11.2018	Updated following Level 1 follow up review comments on v0.3
1.1	12.02.2019	Updated following Technical Author's comments on v1.0
1.2	28.02.2019	Updated following DRIIAT, Ricardo, and two safety related RIC comments
1.3	21.03.2019	Issued for Change Request meeting
2.0	25.03.2019	Issued for v2.0 following Change Request meeting

Exclusions

These are items currently missing from this version of the document that should be included in a later publication.

1. For a list of open points, please refer to section 4.1.
2. Best endeavours have been used during the development of this specification to align it to the relevant Concepts of Operations documents which have been updated in parallel. Final

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assurance of the complete alignment of this specification with the relevant industry-endorsed Concepts of Operations will be achieved in a later version.

3. This document has been submitted for Level 3 assurance in accordance with the System Management Plan [RD30]. A response has been received showing no Category 1 comments (i.e. there is no issue associated with a fundamental concern, error, omission or question that has a direct bearing on the acceptability of the document). Other comments will be addressed in a future revision of this document.

Assumptions

These are items upon which the validity of this document relies and which will be delivered by others. Non-delivery of these items will necessitate a change to this document.

1. This O&M document assumes that the National Asset Accountability Matrix for the Digital Railway System is being developed. This document will be updated when it is published.

Dependencies

These are items upon which the validity of this document depends. Any changes to the referenced document may require further changes to this document.

1. For a list of dependencies, please refer to section 4.3.

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ABBREVIATIONS, ACRONYMS AND DEFINITIONS

Abbreviations and Acronyms are explained in full on first use within this document. A comprehensive list of abbreviations, Acronyms and definitions is contained in the Glossary [R11]. Here is the list of abbreviations/acronyms and glossary which have not been included in the Glossary [R11].

Abbreviation/Acronyms	Definition
CMS	Competence Management System
DEMS	Defect and Event Management System
DOTE	Defective On Train Equipment
FAT	Factory Acceptance Testing
IPR	Intellectual Property Rights
ISA	International Society of Automation
LC	Level Crossing
LCC	Life Cycle Costing
NISD	Network and Information Security Directive
NRSP	National Rail Security Programme
O/S	Operating System
OEM	Original Equipment Manufacturer
PRAMS	Performance, Reliability, Availability, Maintainability and Safety
S&T	Signalling & Telecoms.
SAMP	Strategic Asset Management Plan
SAT	Site Acceptance Testing
SMTH	Signalling Maintenance Testing Handbook
SPT	Signal Post Telephone
SWTH	Signalling Works Testing Handbook

Glossary

Definition

Area of Control	The portion of railway which is being controlled by a single operator.
Asset Accountability Matrix	Asset accountability matrix details the roles and responsibilities to maintain the assets.
Asset Type	Grouping of assets having common characteristics that distinguish those assets as a group or class.
Competence Management System	A process to develop and maintain staff competence that includes risk assessments of activities, selecting suitable standards and using procedures and appropriate methods to carry out competence management, maintaining records, carrying out verification, audits and reviews of the system and feeding back recommendations to improve the system.
Condition-based Maintenance	A form of preventive maintenance performed continuously or at intervals governed by observed condition to monitor, diagnose or trend a structure, system or component's condition indicator.
Digital Railway System	Refer to the Digital Railway System of Systems.
Intrusive Maintenance	Intrusive maintenance is any scheduled or unscheduled maintenance activity which impacts the operational railway.
Level of Repair Analysis	Level of Repair Analysis (LORA) is an analytical methodology used to determine where an item will be replaced, repaired, or discarded based on cost considerations and operational readiness requirements. For a complex engineering system containing thousands of assemblies, sub-assemblies, components, organized into several levels of indenture and with a number of possible repair decisions, LORA seeks to determine an optimal provision of repair and maintenance facilities to minimize overall system life-cycle costs.
Life Cycle	Series of identifiable stages through which an item goes from its concept to disposal.
Local Operating Instructions	Instructions and Procedures for O&M that are applicable to a single defined location.
Operating Model	Operating model describes how an organisation structures themselves to operate and maintain the Digital Railway System.
Reliability-Centred Maintenance	Disciplined logic used to identify those cost effective and technologically feasible maintenance tasks that realise the inherent reliability of equipment at a minimum expenditure of resources over the life of the equipment.
Risk-based Maintenance	Risk-based maintenance prioritises maintenance resources toward assets that carry the most risk if they were to fail. It is a methodology for

determining the most economical use of maintenance resources. This is done so that the maintenance effort across a facility is optimised to minimise any risk of a failure.

Real-time Used to describe the way in which a computer system receives data and then communicates it or makes it available immediately.

SAMP It is documented information that specifies how organizational objectives are to be converted into asset management objectives, the approach for developing asset management plans, and the role of the asset management system in supporting achievement of the asset management objectives.

Supply Chain A Supply Chain is a network between a company and its suppliers to produce and distribute a specific product, and the supply chain represents the steps it takes to get the product or service to the customer.

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REFERENCES

Dependent References

An update to one of these references requires an update to this document.

- RD1 Digital Railway – Integrated Concept of Operations, 000000-NWR-PLN-MPM-000005, v1.0
- RD2 DR Integration Fundamentals Handbook, 153819-NWR-GDN-MPM-000001, v1.0
- RD3 Digital Railway – System of Systems Basis of Design, 153819-NWR-REP-ESE-000002, v2.4
- RD4 Digital Railway – System of Systems (SoS) System Definition, 153821-NWR-REP-ESE-000002, v6.0
- RD5 Digital Railway – Customer Requirements Specification – Requirements Management Plan, 153819-NWR-PLN-ESE-000006, v2.0
- RD6 Digital Railway – GB Generic System of Systems Customer Requirements Specification, 153819-NWR-SPE-ESE-000003, v5.0
- RD7 Digital Railway – GB Generic Customer Requirements Specification for ETCS Onboard, 153821-NWR-SPE-ESE-000008, v3.0
- RD8 Digital Railway – GB Generic Customer Requirements Specification for ETCS Trackside, 153821-NWR-REP-ESE-000007, v3.0
- RD9 Digital Railway – GB Generic Customer Requirements Specification for Traffic Management Systems (TMS), 153821-NWR-SPE-ESE-000011, v3.0
- RD10 Digital Railway – GB Generic Customer Requirements Specification for Connected-Driver Advisory System, 153821-NWR-SPE-ESE-000010, v3.0
- RD11 Digital Railway – GB Generic Interface Requirements Specification, 153821-NWR-SPE-ESE-000013, v3.0
- RD12 Digital Railway Programme Security Assurance Document, 147883-NWR-REP-MPM-000001, v1.0
- RD13 Alarm Management Standard, ISA 18.2
- RD14 Digital Railway – Reliability, Availability Maintainability (RAM) Management Plan, 147883-NWR-PLN-ESS-000001, v3.0
- RD15 Digital Railway – System Assurance Plan, 147883-NWR-PLN-ESS-000004, v2.0
- RD16 Digital Railway – System Safety Plan, 147883-NWR-PLN-MPM-000008, v4.0
- RD17 DR Preliminary Hazard Analysis Report, 147883-NWR-REP-ESS-000007, v2.0
- RD18 Digital Railway – Maintenance Framework, 153821-NWR-REP-EMN-000001, v2.0
- RD19 Digital Railway – TM System Definition, 153821-NWR-REP-ESE-000004, v2.0
- RD20 DR Data Specification, 153831-NWR-SPE-ESE-000001, v1.0
- RD21 DR Linx & Data Management, ORBIS, v1.0
- RD22 Developing and maintaining staff competence, Railway Safety Publication 1

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- RD23 Digital Railway – C-DAS System Definition, 153821-NWR-REP-ESE-000009, v2.0
- RD24 Digital Railway – ETCS Trackside System Definition, 153821-NWR-REP-ESE-000006, v3.0
- RD25 Digital Railway – ETCS Onboard System Definition, 153821-NWR-REP-ESE-000005, v2.0
- RD26 Change Manual, 153832-NWR-MAN-MAN-000001, v1.0
- RD27 Cambrian - Lessons Learned Supplementary Review Report, 158875-NWR-REP-OPP-000001, v1.0
- RD28 Digital Railway – Customer Requirements – Requirements Change Control Process, 153819-NWR-SPE-ESE-000004, v1.0
- RD29 ETCS System Requirement Specification, Subset 026, v3.6.0
- RD30 System Management Plan, 153819-NWR-PLN-MPM-000002, v8.0
- RD31 CCS TSI Application Guide – Informative specifications, European Union Agency for Railways

Informative References

These references have no material bearing on the content of this document but are referenced within it. Unless otherwise specified, the latest version should be used.

- RI1 Digital Railway – Glossary of Terms & Abbreviations, 153810-NWR-SPE-ESE-000001
- RI2 ETCS Baseline 3- GB Operational Sub-system Requirements Specification, NEPT/ERTMS/REQ/0009, v2.0
- RI3 RDG - Rail Cyber Security Strategy, v1.1
- RI4 Digital Railway – Introduction to the Requirements Structure, 153819-NWR-PLN-ESE-000012, v1.0

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1 Introduction

1.1 Purpose

The purpose of this document is to set out the generic Customer Requirements that apply to the Operations and Maintenance (O&M) activities for Digital Railway solutions when they are deployed on the GB national railway network. These generic Customer Requirements are intended as a baseline to ensure that the O&M solutions adopted on any individual deployment project will integrate and be compatible across route boundaries.

All deployment projects will use this document as a basis of their requirements suite for their O&M activities.

1.2 Scope

This document provides the generic Customer Requirements for the O&M, including functional, non-functional and process requirements. It is aligned to the Digital Railway (DR) – Integrated Concept of Operations (ConOps) [RD1], which describes how GB's railway is intended to operate where Digital Railway solutions are deployed.

Acceptable solutions to the Customer Requirements in this document will be constrained by Digital Railway Requirements for the C-DAS, ETCS and TMS. The relationship between the Customer Requirements and other elements of the overall Requirements Structure for Digital Railway is explained further within the Introduction to the Requirements Structure document [RI4].

DR system deployments may adopt different combinations of systems to meet their route needs. However, regardless of the configuration of the specific system configuration chosen, O&M activities are necessary to manage the DR system. The overall System of Systems architecture is set out in the DR – System of Systems (SoS) System Definition [RD4]. This document supports, the GB Generic National System of Systems Customer Requirements Specification (CRS) [RD6].

The O&M system boundary is set out in the DR SoS System Definition [RD4], which also describes the generic environmental context in which the system is expected to exist. Additionally, the System Definition Documents [RD19], [RD23], [RD24], and [RD25] address aspects of the human interface with the DR System.

This document does not contain details of any deployment project-specific requirements. These may be found in deployment project-specific documentation, which is subordinate to this document.

Section 2.2 of this document sets out how a deployment project will identify which of the requirements in this document are relevant to its needs.

Nothing in this document obviates any legal requirement with which the parties using it must comply.

This O&M CRS forms part of a suite of requirements specifications and therefore for a complete understanding of Digital Railway operation, should be read in conjunction with the CRSs for:

- Digital Railway – GB Generic System of Systems Customer Requirements Specification [RD6]
- Digital Railway – GB Generic Customer Requirements Specification for ETCS Onboard [RD7]
- Digital Railway – GB Generic Customer Requirements Specification for ETCS Trackside [RD8]

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- Digital Railway – GB Generic Customer Requirements Specification for Traffic Management Systems (TMS) [RD9]
- Digital Railway – GB Generic Customer Requirements Specification for Connected-Driver Advisory System [RD10]
- Digital Railway – GB Generic Interface Requirements Specification [RD11]

The acceptance criteria applicable to the Customer Requirements within this document will be documented separately in a Verification and Validation Matrix. Where they relate to the ETCS, the O&M Requirements sit within a legal framework of the European Interoperability Directive (translated into UK legislation via the Railway Interoperability Regulations) and the Technical Standards for Interoperability of which the Control, Command and Signalling (CCS) TSI is relevant to this document [RD31].

1.3 Business Need for this Specification

There are many potential solutions for implementing the Digital Railway Strategy and realising the visions set out in the ConOps [RD1]. However, if left totally unconstrained, there is a risk that different deployment projects could independently generate solutions that were sufficiently different as to create technical or operational compatibility issues at the railway system boundaries. Compatibility issues of this nature would inhibit the GB railway's ability to meet the objectives set out above and must, therefore, be avoided. Examples of compatibility issues could include:

- One project's Traffic Management System (TMS) solution being unable to provide a second project's TMS solution with all the information needed for effective management of train services crossing the boundary between them; or,
- a train driver having to learn and apply different sets of operational procedures relating to the same underlying system across different geographical areas.

The generic Customer Requirements are intended to promote the development of technically, operationally and environmentally compatible solutions which are safe and secure, and which could be deployed across the GB rail network in order to maximise the benefits which the industry can reap from the adoption of digital technologies. The generic Customer Requirements contribute to achieving this by setting out what capabilities the solutions must possess and what processes must be followed.

This document is one of a suite of generic Customer Requirements Specifications for the core Control, Command and Signalling (CCS) systems and is subordinate to the generic SoS Customer Requirements Specification [RD6].

1.4 Document Maintenance

This document is owned by the DR Programme's Head of System Requirements and Integration (SR&I). Updates may be instigated, as necessary, as indicated below:

- To incorporate any changes arising from industry consultation
- To incorporate any lessons learnt
- In response to formal change proposals
- In response to changing constraints in applicable legislation, standards or associated Digital Railway Requirements
- In response to changes in objectives set out in the Business Requirements or Concept of Operations
- At the direction of the Head of SR&I as the document owner
- When the disbanding of the SR&I team is planned, in order to transfer ownership of the document, if it is still necessary, to an alternative organisation

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Potential proposers of change include, but are not limited to, duty holders, deployment project teams, suppliers and asset owners.

Proposed changes to the requirements within this document will be managed in accordance with the Requirements Change Control Process [RD28].

2 Application of this Specification

2.1 Requirements Presentation

All requirements are in the following form:

<i>Safety</i> Requirement text.	Unique-Identifier
------------------------------------	--------------------------

Source: Identifies where the requirement originated

Status: Normative or Application-Specific (See Section 2.2)

Rationale: Shows applicability of the requirement, including why the requirement exists, who it is for, what industry benefit could be achieved, what the constraints are, and any other essential detail. Note: Cross-referencing has been used to avoid over-lengthy rationales.

Guidance: Supplementary information to support Requirement interpretation and satisfaction

2.1.1 Safety Requirement

Where a requirement has been associated with a Safety Measure, this is identified and referenced to the hazard record number.

2.1.2 Unique Requirement Identifier

Each requirement has been identified uniquely. The requirement numbers have been generated within the Dynamic Object-Oriented Requirements System (DOORS) database, which means that the requirement numbering may be neither sequential nor gap-free.

2.1.3 Requirement Status

Each requirement within this document is identified as either 'Normative' or 'Application-Specific'.

Normative requirements are mandatory for all deployment projects.

Application-specific requirements are mandatory for all deployment projects on which the issue or subject addressed by the requirement occurs.

2.2 Identification of Applicable Requirements

The generic Customer Requirements in this document are intended to cover the vast majority of circumstances that will be encountered on GB's rail network. However, not all circumstances will be encountered by every deployment project; similarly, some deployment projects may encounter local issues that are not covered by the generic Customer Requirements Specification.

Consequently, each deployment project must ensure that it establishes and documents the appropriate set of Customer Requirements for its circumstances. The process for doing so is covered in detail within the DR Integration Fundamentals Handbook [RD2] and may be summarised as follows:

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1. The starting point is the generic Customer Requirements Specification (i.e. this document for O&M).
2. All normative requirements within the generic Customer Requirements Specification are applicable to every deployment project.
3. Any application-specific requirements which relate to circumstances that do not apply to the deployment project in question may be deleted.
4. New Customer Requirements may be generated to address local issues which only apply to a specific deployment project but are not covered in the generic Customer Requirements Specification, provided that they do not compromise the achievement of cross-boundary compatible solutions.

Appendix A contains a template which deployment projects can populate to indicate which of the application-specific requirements are applicable to their particular circumstances (step 3 above).

Appendix B contains a template which deployment projects can use to record any new customer requirements they generate for their particular circumstances (step 4 above).

Note that a deployment project is not permitted to:

1. amend the wording of an existing generic Customer Requirement; or,
2. replace an existing generic Customer Requirement with a differently worded requirement relating to the same issue.

These restrictions are necessary to prevent the risk of generating a project-specific set of Customer Requirements that may not achieve a cross-boundary compatible solution.

If a deployment project considers that the wording or status of an existing Customer Requirement is incorrect, or wishes to add a new requirement to cover any local issues which apply to the deployment project but are not covered in the generic Customer Requirements Specification, then this should be raised with the document owner via the change request process for consideration at a national level, as described in section 1.4 and in detail in the Digital Railway Customer Requirements Change Control Process [RD28].

3 Customer Requirements

3.1 Functional Requirements

This section sets out functional requirements that define, where applicable, what the Operations and Maintenance (O&M) activities need to accomplish. The functions have been described in the SoS System Definition [RD4]. They are the tangible characteristics, features or specifications that a consumer expects to be fulfilled in the system. These characteristics/ features/specifications can be measured, and determined as having been achieved, because of their tangible nature. These requirements do not place any constraints on 'How' the function is to be achieved. Where any constraint is essential to ensure that technically, operationally and environmentally compatible solutions are achieved by different implementations, it is recorded in the corresponding Digital Railway Requirements document(s).

3.1.1 Language

None

3.1.2 Health and Status Monitoring Functionality

The Digital Railway System shall provide asset performance and health monitoring information to maintainers in real-time.

CRS-O&M-37

Source: Scenarios-based workshop

Status: Normative

Rationale: To maximise the maintenance efficiency of the DR system.

Guidance: Effective monitoring of asset performance and health is essential for good asset management. A robust measurement framework includes measures and indicators that relate to the performance and health of assets and the DR systems.

Remote diagnosis will enable prediction of failure or deterioration of condition where it is cost-effective to do so. This assessment needs to consider the safety argument for reducing the exposure of workers to trackside hazards, limiting the need for travelling to site for diagnostics and reducing the need for trackside investigation.

A wide range of infrastructure components can be monitored, including applications, services, operating systems, network protocols, system metrics, and network infrastructure.

The implementation of this requirement should take consideration of [CRS-O&M-11] and any interfaces defined in [CRS-O&M-96].

The Digital Railway System shall be capable of interfacing with any health monitoring systems in use to display real-time equipment health status to DR System maintainers.

CRS-O&M-96

Source: SoS Requirements Maintenance Brainstorm

Status: Normative

Rationale: To support the operations and maintenance decision-making process.

Guidance: Achieving DR System business outcomes is dependent upon digital information linked to any online/remote condition-monitoring systems.

A robust measurement framework includes measures and indicators that relate

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to the performance and health of assets and could lead to a partial or complete failure of the DR System.

The Digital Railway System shall provide all self-test data to the relevant maintenance management system.

CRS-O&M-97

Source: SoS Requirements Maintenance Brainstorm

Status: Normative

Rationale: The benefits of the DR SoS can only be realised through efficient maintenance and pro-active reporting.

Guidance: The DR System should be able to self-report any outcomes from self-test, built-in test, or user-initiated test functions within the DR system. Such self-reporting should be made to the relevant fault reporting system for faults that require action, or to the relevant maintenance management system of the Infrastructure Manager (IM), Railway Undertaking (RU), and/or supply chain partners responsible for the maintenance of the system concerned, in accordance with the National Asset Accountability Matrix [CRS-O&M-20]. Where possible, the provision of self-test data should be automatic.

The Digital Railway System shall report the geographic location of assets to maintainers upon an error occurring.

CRS-O&M-99

Source: SoS Requirements Maintenance Brainstorm

Status: Normative

Rationale: To support the maintenance decision-making process.

Guidance: System errors can occur repeatedly in the same location; effectual trend analysis and response to failure will only be effectively managed if supported by location of the error occurrence.

The Digital Railway System shall be capable at all times of receiving information relating to rolling stock and/or crew.

CRS-O&M-100

Source: SoS Requirements Maintenance Brainstorm

Status: Normative

Rationale: To provide the DR System with the accurate status of rolling stock and/or crew.

Guidance: The Current Plan will need to adjust for short-term rolling stock and/or crew unavailability. Control instructions must only be given in the event that both rolling stock and crew are available.
The DR System will require functionality to receive short-term rolling stock and/or crew availability information. This information could come from several sources, including, but not limited to:

- Fault control
- Maintenance engineers taking rolling stock out of service
- Automatic reports via any on-board condition-monitoring systems
- RU Crew & Stock Systems

3.2 Non-functional Requirements

This section sets out intangible features that a customer expects/requires from a system. The non-functional requirements are those relating to performance, reliability, security, competence, and training which, where applicable, place constraints on the design or implementation of the Digital Railway System.

3.2.1 System Performance

None

3.2.2 Reliability, Availability, Maintainability (RAM)

None

3.2.3 Safety

None

3.2.4 Security

Infrastructure Managers and Railway Undertakings shall have a Security Management Plan for the Life Cycle of the Digital Railway System.

CRS-O&M-16

Source: Scenarios-based workshop

Status: Normative

Rationale: To prevent unauthorised physical or cyber access to the DR System and its data and to comply with legal requirements (the Network & Information Systems Directive and National Rail Security Programme) as cited in the Digital Railway Programme – Security Assurance Document [RD12].

Guidance: A Security Management Plan aligned with the Digital Railway Programme – Security Assurance Document [RD12], and the Rail Cyber Security Strategy [R13], for the Life Cycle of the DR System will detail the steps necessary to identify, mitigate and manage risks while remaining compliant. An effective security management plan is comprehensive and dynamic, with the flexibility to respond to any type of security threat, such as unauthorised access or cyber-attack.

The security management plan will define and prioritise information assurance and security initiatives that IMs and RUs must undertake to enhance the protection of information and related technology. Ideally, IMs and RUs should consolidate previously identified and implemented projects (where possible), provide scope and definition for each of the identified efforts, and detail the general risks addressed by the initiative. Additionally, to support higher-level evaluation of initiatives that can be undertaken when required, the security strategy planning process needs to identify any significant dependencies associated with the initiative.

3.2.5 Information Management

None

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3.2.6 Ergonomics and Human Factors

None

3.2.7 Electromagnetic Compatibility and the Environment

None

3.2.8 Health & Safety

None

3.2.9 Operational Readiness

The Deployment Project Team shall have the necessary competent personnel and resources to define the operational and maintenance needs of the rail industry for the Life Cycle of the Digital Railway System.

CRS-O&M-1

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable that the necessary competence and resources to be put in place.

Guidance: Best practice is to develop and implement a competence framework for the Deployment Project.

Infrastructure Managers and Railway Undertakings shall implement the Digital Railway System Operating Model defined by the Deployment Project Team.

CRS-O&M-6

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable realisation of the Business Case benefits.

Guidance: This will need to include allocation of roles to specific job descriptions. The DRP Change Management Team are developing a variety of templates, guidance documents, and role family profiles which can inform the implementation of the Operating Model. These will need to be customised to suit the Operating Model required by the SoS CRS [RD 6].
The implementation of this Operating Model should take into consideration the Strategy for Deployment [CRS-O&M-7].

The Deployment Project Team shall create a strategy for its deployment of the Digital Railway System.

CRS-O&M-7

Source: Scenarios-based workshop

Status: Normative

Rationale: To provide clear, consistent, and ongoing direction for Deployment Project Teams to enable the DR System to be deployed without impacting negatively on the operational railway.

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Guidance: The Strategy should reflect the potentially long time frames associated with DR System deployment and, as a minimum, include:

- a vision for how DR System deployment will achieve the Route strategic objectives defined within the Business Case;
- the transition sequence from the current state to the state defined in the Operating Model, including details of any interim transitional states;
- the outline of a robust approach for managing the transfer of responsibility for maintenance from the Deployment Project Team to the operational railway, addressing control centre, trackside, and on-board equipment;
- involvement of O&M staff during Factory Acceptance Testing, Site Acceptance Testing, and the final commissioning stage to aid knowledge management [CRS-O&M-12];
- a high-level outline of the approach for training and 'upskilling' all operational and maintenance staff to ensure competence prior to commissioning by aligning with the training and development framework [CRS-O&M-41];
- other strategic direction to allow a deployment to define how the Strategy is to be achieved; and
- a 'people strategy' to provide a competent resource base and resourcing plan.

Infrastructure Managers and Railway Undertakings shall develop a maintenance delivery plan(s) for the Digital Railway System. **CRS-O&M-30**

Source: Scenarios-based workshop

Status: Normative

Rationale: To address the effective, safe and efficient management of processes and resources necessary to carry out the selected regime.

Guidance: A maintenance delivery plan(s) should take into consideration the following areas (non-exhaustive list):

- Maintenance specifications and standards
- Asset inventory information
- Condition and performance information
- Techniques to determine the most appropriate bundling and scheduling of maintenance tasks
- Staff competence
- Reliability, Availability and Maintainability (RAM) analysis
- Level of Repair Analysis [CRS-O&M-27]
- Intrusive and non-intrusive maintenance

In addition, the following points regarding maintainability need to be considered:

- Where possible, track-based maintenance activities should be minimised to improve track worker safety.
- Safe access to assets that are located trackside should be provided when required.
- Maintenance of the DR System should be designed to be undertaken with the minimum disruption to normal operations.
- Access and transport requirements should be taken into account for heavy equipment.

Infrastructure Managers and Railway Undertakings shall have a management plan for material resources necessary for maintenance of the Digital Railway System. **CRS-O&M-31**

Source: Scenarios-based workshop



Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Status: Normative

Rationale: To make adequate provision for material resources to be available when required.

Guidance: Material resources include testing equipment, specialist tools, vehicles, facilities, and spares & inventory. For a human resource management plan, refer to requirement [CRS-O&M-43].
 A management plan for material resources includes analysis to determine the best way to create or procure the resources needed to achieve the asset management objectives and implement asset management plans.
 Spares & inventory holdings should take account of the following:

- Range and volume of spare parts, and
- Compatible and interchangeable spare parts across different DR systems.

Infrastructure Managers and Railway Undertakings shall develop a maintenance fault response plan for the Digital Railway System. **CRS-O&M-33**

Source: Scenarios-based workshop

Status: Normative

Rationale: To minimise the impact on operations of a DR system failure.

Guidance: The plan should address the response to faults, errors, failures and other events that require maintenance input. It should include, but not be limited to:

- Detection, identification and diagnostics;
- Route-cause analysis (including the capture of all relevant information);
- Use of standard responses;
- Temporary and permanent repair procedures (where relevant);
- Site access and hand-back, and
- The reporting and updating of asset information systems.

The maintenance fault response plan should align with requirement [CRS-O&M-84], where necessary (if failures cause operational impact).
 In reviewing the response to faults, lessons can be learnt that lead to improved processes and practices in line with the Defect Reporting and Corrective Action System (DRACAS) process [CRS-O&M-18].

Infrastructure Managers and Railway Undertakings shall review and update their existing enterprise asset management systems for the introduction of the Digital Railway System. **CRS-O&M-35**

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain accurate records of DR system assets.

Guidance: IMs and RUs should review their existing processes/standards to collect, store, process, and analyse the asset information that they require to manage the DR System Life Cycle.
 See Interface Strategy [CRS-O&M-13]
 The documents concerned include:

- DR Data Specification V1.0 [RD20]
- DR LINX & Data Management [RD21]

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Infrastructure Managers and Railway Undertakings shall develop a human resource management plan for those operating and maintaining the Digital Railway System.

CRS-O&M-43

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable adequate staffing, as required, throughout the Life Cycle of the DR System.

Guidance: The human resource management plan should be developed based on the Operating Model [CRS-O&M-6], which includes details of the number of specific posts required by the DR System to operate effectively. The plan will also address the importance of sharing competent staff across the rail industry to undertake cross-system activities, such as data interrogation.

Infrastructure Managers and Railway Undertakings shall review and update their Defective on Train Equipment (DOTE) contingency plans.

CRS-O&M-59

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain fitness for purpose of DOTE contingency plans with the implementation of the DR System.

Guidance: The DOTE contingency plans should be reviewed and updated in accordance with the Railway Group Standard GO/RT3437. The plans will also take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-61, EOPSS-63, EOPSS-156, and EOPSS-940.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

Railway Undertakings shall review and update the Driver User Procedure to take into account the Digital Railway System.

CRS-O&M-60

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain fitness for purpose of Driver User Procedure with the implementation of the DR System.

Guidance: The Driver User Procedure should be reviewed and updated to take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-62, EOPSS-66, EOPSS-156, EOPSS-58, EOPSS-772, EOPSS-919, EOPSS-132, EOPSS-910, EOPSS-911, EOPSS-912, EOPSS-922, EOPSS-973, EOPSS-984, and EOPSS-990.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

Infrastructure Managers shall review and update Local Operating Instructions to take account of the Digital Railway System.

CRS-O&M-62

Source: Scenarios-based workshop

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Status: Normative

Rationale: To maintain fitness for purpose of Local Operating Instructions with the implementation of the DR System.

Guidance: Local Operating Instructions should be reviewed and updated to take into account the following DR requirements:

- For ETCS [R12]: EOPSS-125, EOPSS-56, EOPSS-134, EOPSS-950, EOPSS-972, and EOPSS-986.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

3.2.10 Maintenance and Diagnostics

Infrastructure Managers and Railway Undertakings shall develop appropriate maintenance and inspection regimes for the Life Cycle of the Digital Railway System. **CRS-O&M-29**

Source: Scenarios-based workshop

Status: Normative

Rationale: To prevent deterioration of performance of the DR System in service.

Guidance: Operations and Maintenance decision-making will address the selection of appropriate maintenance and inspection regimes, taking into account the following considerations (non-exhaustive list):

- Recommended inspection & maintenance activities from Original Equipment Manufacturers (OEMs)
- Results from the Intelligent Infrastructure Programme or equivalent remote condition monitoring
- Existing industry best practice
- Reliability, Availability & Maintainability (RAM) analysis
- DRACAS outcomes

3.2.11 Competence and Training

The Deployment Project Team shall liaise with Infrastructure Managers (IMs) and Railway Undertakings (RUs) to identify roles that involve interaction with the Digital Railway System. **CRS-O&M-38**

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable identification of training needs for those who interact with the DR System.

Guidance: IMs and RUs should be able to identify all roles which will be impacted by the introduction of the DR System. These roles should take account of:

- those identified in the Operating Model [CRS-O&M-6];
- those role family profiles indicated in the DRP Change Management Framework [RD26]; and
- any other supporting functions.

Notes: This requirement is the first step towards developing competence and training: an example of best practice for developing a Competence Management System (CMS) in the railway industry appears in the following document: Developing and maintaining staff competence [RD22].

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The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to define the competence requirements for those operating and maintaining the Digital Railway System.

CRS-O&M-39

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable consistent definition and implementation of competency across IMs and RUs.

Guidance: The Basis of Design (BoD) [RD3] and DR Operating Model [CRS-O&M-6] should be analysed to identify activities that will be performed by those whose roles involve interaction with the DR system. They should also enable the appreciation of other roles.

This should take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-167
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers and Railway Undertakings shall review and update their Competence Management Systems (CMSs).

CRS-O&M-40

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain their appropriacy for DR System operations.

Guidance: IMs and RUs should co-ordinate the activities for reviewing and updating existing Competence Management Systems with the required skills, knowledge and experience.

The CMSs should be reviewed and updated against requirements: [CRS-O&M-39], [CRS-O&M-41], [CRS-O&M-42], [CRS-O&M-43], [CRS-O&M-44], [CRS-O&M-46], [CRS-O&M-47], [CRS-O&M-48], [CRS-O&M-49], [CRS-O&M-50], [CRS-O&M-51], [CRS-O&M-52], [CRS-O&M-53], [CRS-O&M-54], [CRS-O&M-55], [CRS-O&M-56], [CRS-O&M-57], and [CRS-O&M-58].

An example of best practice for developing a CMS in the railway industry appears in the following document:

Developing and maintaining staff competence [RD22].

Infrastructure Managers and Railway Undertakings shall develop a training and development framework for those operating and maintaining the Digital Railway System.

CRS-O&M-41

Source: Scenarios-based workshop

Status: Normative

Rationale: To provide adequate training and development for those involved in operating and maintaining the Digital Railway System.

Guidance: The training framework should cover, but not be limited to:

- Individual training session topics and their relevance to specific competence standards or leadership behaviour;

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- Normal training progression as part of career progression;
- Pre-requisite requirements for each training event, where applicable;
- Learning objectives for each training session based on knowledge of, and performance in, the relevant competence standards or leadership behaviour and relevant company instructions;
- Methods of assessment that are to be used during training;
- Statements of achievement derived from an assessment of each trainee against the learning objectives; and
- Any post-training mentoring and work experience requirements.

Infrastructure Managers and Railway Undertakings shall develop training sessions for those operating and maintaining the Digital Railway System.

CRS-O&M-42

Source: Scenarios-based workshop

Status: Normative

Rationale: To develop the knowledge of all relevant staff.

Guidance: For each training session, there should be (non-exhaustive list):

- A training plan, including learning objectives, delivery methodology, pre-requisite requirements, timetable, any specific requirements for trainer competence, details of any specific safety precautions that must be implemented during the training;
- Training material and courses of an appropriate level; and
- An assessment plan, including details of knowledge tests and practical assessment methods, and pass/fail criteria.

Infrastructure Managers and Railway Undertakings shall allocate roles to job descriptions to develop competence profiles for those operating and maintaining the Digital Railway System.

CRS-O&M-44

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable an adequate competence profile to be applied to each job description.

Guidance: Competence profiles will supplement each job description and form the basis for recruitment and selection, and will be used to identify individual training and assessment needs.

Infrastructure Managers and Railway Undertakings shall develop a training and assessment plan for those operating and maintaining the Digital Railway System.

CRS-O&M-46

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable individuals to acquire the necessary skills, knowledge and experience.

Guidance: This plan should identify:

- Individual name and job role;
- Training that the individual needs to receive;
- Planned date for attendance at each event; and
- Target date for initial assessment.

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Infrastructure Managers, Railway Undertakings and the Supply Chain shall provide the necessary training for those responsible for the design, installation, commissioning, and on-going modification of the Digital Railway System.

CRS-O&M-47

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable those responsible for designing, installing and commissioning the DR System, as well as those responsible for its ongoing modification, to acquire the necessary knowledge, skills and experience.

Guidance: The training for those with these responsibilities (Signalling and Design Engineers) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Safely Command a Train
- Provide Information to Signaller
- Interface with Adjacent non-Digital Railway Control Systems
- Manage Train Service Information
- Receive and act on information provided to Driver
- Identify Train and Location (Infrastructure)
- Identify Train and Location (Onboard)
- Incident management
- Safe Working Site Warning

The role of Signalling and Design Engineers includes the design of the equipment and signalling trackside and on board, and the testing and commissioning of the equipment during installation and commissioning.

The documents concerned include:

- Basis of Design [RD3]

Railway Undertakings shall provide the necessary training for those responsible for making train movements using the Digital Railway System.

CRS-O&M-48

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those making train movements using the DR System with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for making train movements (Train Drivers, Machine Operators, and any depot maintenance staff qualified for tasks involving the preparation and movement of trains) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Safely Command a Train
- Provide Information to Signaller
- Interface with Adjacent non-Digital Railway Control Systems
- Train Preparation
- Manage Train Service Information
- Safely Operate the Train
- Receive and act on information provided to Driver
- Optimise Train Movement
- Identify Train and Location (Infrastructure)
- Identify Train and Location (Onboard)
- Manage Incidents
- Manage Stock & Crew Information

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- Safe Working Site Warning

Tasks for those whose roles involve making train movements relate to the preparation to move or the train movement itself.

This should take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-124, EOPSS-909, EOPSS-914, EOPSS-987, EOPSS-989, EOPSS-157, EOPSS-158, EOPSS-159, EOPSS-160, EOPSS-161, EOPSS-163, EOPSS-164, EOPSS-168, EOPSS-169, EOPSS-170, EOPSS-171, EOPSS-174, EOPSS-175, EOPSS-176, EOPSS-177, EOPSS-178, EOPSS-180, EOPSS-181, EOPSS-183, EOPSS-185, EOPSS-187, EOPSS-190, EOPSS-192, EOPSS-193, EOPSS-196, EOPSS-198, EOPSS-199, EOPSS-201, EOPSS-206, EOPSS-208, EOPSS-209, EOPSS-210, EOPSS-214, EOPSS-217, EOPSS-219, EOPSS-220, EOPSS-221, EOPSS-222, EOPSS-223, EOPSS-224, EOPSS-225, EOPSS-226, EOPSS-228, EOPSS-791, EOPSS-793, EOPSS-794, EOPSS-797, EOPSS-798, EOPSS-799, EOPSS-800, EOPSS-801, EOPSS-802, EOPSS-803, EOPSS-805, EOPSS-806, EOPSS-817, EOPSS-818, EOPSS-819, EOPSS-821, EOPSS-825, EOPSS-828, EOPSS-829, EOPSS-830, EOPSS-831, EOPSS-832, EOPSS-833, EOPSS-834, EOPSS-839, EOPSS-841, EOPSS-842, EOPSS-844, EOPSS-8346, EOPSS-8349, EOPSS-850, EOPSS-851, EOPSS-852, EOPSS-853, EOPSS-854, EOPSS-855, EOPSS-856, EOPSS-857, EOPSS-858, EOPSS-861, EOPSS-864, EOPSS-874, EOPSS-877, EOPSS-883, EOPSS-887, EOPSS-890, EOPSS-891, EOPSS-894, EOPSS-895, EOPSS-913, and EOPSS-932

- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers shall provide the necessary training for those responsible for controlling train movements using the Digital Railway System.

CRS-O&M-49

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those controlling train movements using the DR System with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for controlling train movements (Signallers) should cover the following scenarios, defined in the BoD [RD3], but which are not exhaustive:

- Operate the Network to the Current Plan
- Receive and action Information Provided to Signaller
- Interface with Adjacent Non-Digital Railway Control Systems
- Manage Train Service Information
- Provide Information to Driver
- Optimise Train Movement
- Identify Train and Location (Infrastructure)
- Identify Train and Location (Onboard)
- Monitor Train Movements against Current Plan
- Manage Incidents
- Be aware of, and act on, Crew & Stock Information
- Optimise Current Plan
- Safe Working Site Warning
- Possessions Planning
- Manage Possession
- Short-Notice Possessions

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The role includes the task of signalling trains.

This should take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-916, EOPSS-942, EOPSS-157, EOPSS-160, EOPSS-164, EOPSS-166, EOPSS-173, EOPSS-184, EOPSS-187, EOPSS-190, EOPSS-192, EOPSS-196, EOPSS-197, EOPSS-202, EOPSS-203, EOPSS-204, EOPSS-205, EOPSS-209, EOPSS-215, EOPSS-216, EOPSS-222, EOPSS-797, EOPSS-860, EOPSS-875, EOPSS-877, EOPSS-878, EOPSS-896, EOPSS-917, EOPSS-995, EOPSS-996, EOPSS-998, and EOPSS-1000

• For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers and Railway Undertakings shall provide the necessary training for those responsible for overseeing the operational railway using the Digital Railway System.

CRS-O&M-50

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those overseeing the operational railway using the DR System with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for overseeing the operational railway (Controllers, Shift Signalling Managers) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Operate the Network to the Current Plan
- Provide Information to Signaller
- Interface with Adjacent Non-Digital Railway Control Systems
- Manage Train Service Information
- Provide Information to Driver
- Optimise Train Movement
- Identify Train and Location (Infrastructure)
- Identify Train and Location (Onboard)
- Monitor Train Movements against Current Plan
- Manage Incidents
- Manage Stock & Crew Information
- Optimise Current Plan
- Possessions Planning
- Manage Possession
- Short Notice Possessions

The tasks of staff whose role involves responsibility for overseeing the operational railway will include:

- optimising train services,
- implementation of the possession plan, and
- incident management undertaken by IMs and RUs within a Control Centre, Rail Operating Centre (ROC), Integrated Control Centre (ICC), Power Signal Box, National Operations Control, and Route Services Control.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers and Railway Undertakings shall provide the necessary training for those responsible for planning using the Digital Railway System.

CRS-O&M-51

Source: Scenarios-based workshop



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Status: Normative

Rationale: To equip those planning timetables and possessions, etc. using the DR System with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for planning (Capacity Planners, Control Centre staff planning short-term movements, Persons in Charge of Possessions (PICOPs), and Possession Planners) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Interface with Adjacent Non-Digital Railway Control Systems
- Manage Train Service Information
- Optimise Train Movement
- Manage Stock & Crew Information
- Possessions Planning
- Manage Possession
- Short-Notice Possessions

The role includes optimising the future plan.
This should take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-186
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers and Railway Undertakings shall provide the necessary training for those responsible for supporting train movements using the Digital Railway System.

CRS-O&M-52

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those involved in supporting train movements using the DR System with the necessary knowledge, skills and experience for the task.

Guidance: Training for those involved in supporting train movements (Guards, Station Dispatch staff, Level Crossing Attendants, Ground Frame Operators, Points Operators) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Operate the Network to the Current Plan
- Provide Information to Signaller
- Interface with Adjacent Non-Digital Railway Control Systems
- Train Preparation
- Manage Train Service Information
- Safely Operate the Train
- Provide Information to Driver
- Optimise Train Movement
- Identify Train and Location (Infrastructure)
- Identify Train and Location (Onboard)
- Monitor Train Movements against Current Plan
- Manage Incidents
- Safe Working Site Warning

The tasks of those involved in supporting train movements include: dispatch of trains from stations and protection of trains following failure, Operation of Points and Ground Frames, Operation of Level Crossings, Shunting, and any other task associated with supporting the movement of trains.
The training should also cover the following DR requirements:

- For ETCS [RI2]: EOPSS-179, EOPSS-116, EOPSS-799, and EOPSS-800
- For TMS and C-DAS, this CRS will be updated when relevant DR

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requirements are available.
The documents concerned include:
• Basis of Design [RD3]

Infrastructure Managers and Railway Undertakings shall provide the necessary training for those responsible for maintaining Digital Railway System on-board equipment.

CRS-O&M-53

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those maintaining DR System on-board equipment with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for maintaining on-board equipment (Engineers, Technicians and Operatives) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Provide Information to Signaller
- Interface with Adjacent Non-Digital Railway Control Systems
- Safely Operate the Train
- Receive and act on information Provided to Driver
- Identify Train and Location (Infrastructure)
- Identify Train and Location (Onboard)
- Safe Working Site Warning

The role of those responsible for maintaining on-board equipment involves:

- Testing, inspection, fault finding, and repair associated with the scenarios
- Receiving and acting on information from other roles associated with DR System operations

- Corrective /Preventative maintenance activities
- Maintenance specification and requirements, standards, rules, processes, procedures, priorities, failure rankings, and maintenance regime
- Operation of equipment
- Use of testing and diagnostic equipment
- Data integration
- Knowledge of, and information from/to, supporting infrastructure
- Knowledge of supporting organisations
- Knowledge of safety and criticality of the DR System

The training should also cover the following DR requirements:

- For ETCS [RI2]: EOPSS-218, and EOPSS-808
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers shall provide the necessary training for those responsible for maintaining Digital Railway System trackside equipment.

CRS-O&M-54

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those maintaining DR System trackside equipment with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for maintaining the trackside equipment (Engineers, Technicians and Operatives) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

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- Provide Information to Signaller
- Interface with Adjacent non-Digital Railway Control Systems
- Manage Incidents
- Safe Working Site Warning
- Possessions Planning
- Manage Possession
- Short-Notice Possessions

The role of those responsible for maintaining trackside equipment involves:

- Testing, inspection, fault finding, and repair associated with the scenarios
- Receiving and acting on the information from other roles associated with DR System operations

- Corrective /Preventative maintenance activities
- Maintenance specification and requirements, standards, rules, processes, procedures, priorities, failure rankings, and maintenance regime
- Operation of equipment.

- Use of testing and diagnostic equipment

- Data integration
- Knowledge of, and information from/to, supporting infrastructure

- Knowledge of supporting organisations
- Knowledge of safety and criticality of the DR System

The training should also cover the following DR requirements:

- For ETCS [RI2]: EOPSS-897
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers and Railway Undertakings shall provide the necessary training for those responsible for maintaining Digital Railway System control room equipment.

CRS-O&M-55

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those responsible for maintaining DR System control room equipment with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for maintaining control room equipment (Engineers, Technicians and Operatives) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Provide Information to Signaller
- Interface with Adjacent Non-Digital Railway Control Systems
- Manage Incidents
- Manage Possession
- Short-Notice Possessions

The role of those responsible for maintaining control equipment involves:

- Receiving and acting on the information from other roles associated with DR System operations

- Corrective /Preventative maintenance activities
- Maintenance specification and requirements, standards, rules, processes, procedures, priorities, failure rankings, and maintenance regime
- Operation of equipment

- Use of testing and diagnostic equipment

- Data integration
- Knowledge of, and information from/to, supporting infrastructure

- Knowledge of supporting organisations
- Knowledge of safety and criticality of the DR System



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The training should also cover the following DR requirements:

- For ETCS [R12]: EOPSS-191
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers shall provide the necessary training for those responsible for maintaining Digital Railway System supporting infrastructure.

CRS-O&M-56

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those responsible for maintaining DR System supporting infrastructure with the necessary knowledge, skills and experience for the task.

Guidance: The supporting infrastructure could be (non-exhaustive list) Electrification & Plant, building services, telecoms, train power systems, Global System for Mobile Communications – Railway (GSM-R), Fixed Telecoms Network (FTN), and FTN(x) (next generation FTN), IT infrastructure, etc.

The training for those responsible for maintaining supporting infrastructure (Engineers, Technicians and Operatives) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Provide Information to Signaller
- Interface with Adjacent Non-Digital Railway Control Systems
- Safe Working Site Warning
- Possessions Planning
- Manage Possession
- Short Notice Possessions

The role of those responsible for maintaining supporting infrastructure involves:

- Testing, inspection, fault finding, and repair associated with the scenarios
- Receiving and acting on the information from other roles associated with DR System operations
- Corrective /Preventative maintenance activities
- Maintenance specification and requirements, standards, rules, processes, procedures, priorities, failure rankings, and maintenance regime
- Operation of equipment
- Use of testing and diagnostic equipment
- Data integration
- Knowledge of and information from/to supporting infrastructure
- Knowledge of supporting organisations
- Knowledge of safety and criticality of the DR System

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers, Railway Undertakings, and the Supply Chain shall provide the necessary training for those responsible for the safety and compliance of the Digital Railway System.

CRS-O&M-57

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those responsible for the safety and compliance of the DR System with the necessary knowledge, skills and experience for the task.

Reference	153819-NWR-PLN-ESE-000014
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Guidance: The training for those responsible for the safety, compliance and assurance of DR System equipment operation (e.g. Assurance Managers, Health and Safety Managers, or any Technical Auditing Role) should cover the scenarios defined in the BoD [RD3], e.g. Managing Incidents.
In addition, for awareness only, these role holders will need to be familiar with all scenarios defined in the BoD.
The tasks of those in safety, compliance and assurance roles include:

- Safety assurance and auditing, which can include Interoperability, Safety and system assurance planning.

The documents concerned include:

- Basis of Design [RD3]

Infrastructure Managers, Railway Undertakings, and the Supply Chain shall provide the necessary training for those responsible for Digital Railway System incident management. **CRS-O&M-58**

Source: Scenarios-based workshop

Status: Normative

Rationale: To equip those responsible for DR System incident management with the necessary knowledge, skills and experience for the task.

Guidance: The training for those responsible for incident management (Operations Managers, Health and Safety Managers, Investigation Managers) should cover the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Provide Information to Signaller
- Optimise Train Movements
- Manage Incidents
- Safe Working Site Warning

Incident management includes collating evidence, recording real-time information, facilitating, and providing subject matter expertise during investigations.
The training should also cover the following DR requirements:

- For ETCS [RI2]: EOPSS-186
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The documents concerned include:

- Basis of Design [RD3]

3.2.12 Whole-Life Costs

None

3.2.13 Other

The Deployment Project Team shall develop a stakeholder engagement plan applicable from the initial development of the Business Case to DR System decommissioning. **CRS-O&M-3**

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable understanding of the full range of stakeholder engagement.

Guidance: Defining the Business Case benefits will require the various parties, including IMs, RUs and the Supply Chain, to work together from the initial development of the Business Case and continue co-operating throughout the Life Cycle of

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the DR System. This will include (non-exclusive list):

- Joint development of the Business Case and its supporting assumptions.
- Joint working throughout the development, delivery and commissioning of the DR System.
- Revision and updating of the Business Case and its supporting assumptions during the Deployment Project in advance of transition to railway operation.
- Joint working throughout the operational DR System Life Cycle to enable a culture of collaborative working and continuous improvement.
- Ongoing monitoring, validation and revision of the Business Case assumptions during the operational Life Cycle of the DR System.

3.3 Process Requirements

This section sets out other intangible features of a system that a customer expects/requires. The process requirements place constraints on the manner in which Deployment Projects Teams and their suppliers will need to operate.

3.3.1 Target Setting

None

3.3.2 Standards

Infrastructure Managers and Railway Undertakings shall review and then update or create asset policies for each asset type impacted by the Digital Railway System.

CRS-O&M-26

Source: Scenarios-based workshop

Status: Normative

Rationale: To put in place appropriate asset policies for the DR System.

Guidance: Asset policies specify the approach, rules and boundaries for each asset type, providing the direction and framework for control of asset processes and activities. IMs and RUs should consider the following areas:

- Asset Management Policy [CRS-O&M-23], Asset Management Strategy [CRS-O&M-24], and Maintenance Strategy [CRS-O&M-25]
- Sustainability requirements, energy consumption, and carbon emissions
- Aligning asset policies with a physical system-based approach

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings in reviewing and updating the Rule Book to take into account the Digital Railway System.

CRS-O&M-61

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain the Rule Book's fitness for purpose with the implementation of the DR System.

Guidance: Various parties may initiate change to the Rule Book, in accordance with the Railway Group Standards Code, if the Rule Book needs to be updated. In the first instance, the relevant duty holders should be consulted to see whether there is support for the change. Specifically, the Deployment Project Team should check that the Rule Book has been reviewed to take into account the

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following DR requirements:

- For ETCS [RI2]: EOPSS-1005, EOPSS-1009, EOPSS-110, EOPSS-112, EOPSS-113, EOPSS-114, EOPSS-115, EOPSS-122, EOPSS-123, EOPSS-126, EOPSS-128, EOPSS-135, EOPSS-136, EOPSS-138, EOPSS-141, EOPSS-142, EOPSS-144, EOPSS-146, EOPSS-148, EOPSS-149, EOPSS-154, EOPSS-901, EOPSS-902, EOPSS-903, EOPSS-905, EOPSS-916, EOPSS-920, EOPSS-927, EOPSS-928, EOPSS-943, EOPSS-948, EOPSS-956, EOPSS-963, EOPSS-970, EOPSS-971, EOPSS-973, EOPSS-976, EOPSS-982, EOPSS-984, and EOPSS-990
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

Infrastructure Managers shall review and update the National Operating Procedures to take account of the Digital Railway System.

CRS-O&M-64

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain the fitness for purpose of the National Operating Procedures with the implementation of the DR System.

Guidance: The National Operating Procedures should be reviewed and updated to include:

- enabling the user to transfer the required control functions for a defined section of the railway to an authorised remote operator;

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-974
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers to review and update the Sectional Appendix to take account of the Digital Railway System.

CRS-O&M-65

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain the fitness for purpose of the Sectional Appendix with the implementation of the DR System.

Guidance: The Sectional Appendix should be reviewed and updated to take account of the following DR requirements:

- For ETCS [RI2]: EOPSS-773, EOPSS-781, EOPSS-785, and EOPSS-1297
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

Infrastructure Managers and Railway Undertakings shall review and update all publications to take account of the Operating Model.

CRS-O&M-66

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain the fitness for purpose of all publications for the implementation of the Digital Railway System.

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Guidance: All other operational documents that have not been listed specifically within the O&M requirement suites should be reviewed and updated to take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-994, EOPSS-873, and EOPSS-898.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

Such documents include, for example, the Working Manual for Rail Staff and Hazard Directory.

The Deployment Project Team shall define an order of precedence for communications media for all applicable roles as defined in the Operating Model.

CRS-O&M-89

Source: Scenarios-based workshop

Status: Normative

Rationale: Having structured processes in place for communication reduces the potential for confusion, safety risks, and miscommunication.

Guidance: The aim is for there to be an agreed process for the safest and most appropriate form and means of communication. The order of precedence should be addressed for the following (in no particular order), but not be limited to:

- Automated messages between people interacting with the DR System
- Digital messages initiated by people interacting with the DR System
- Voice communication

For example, for communications between driver and signaller, the preferred method is GSM-R Voice, then Signal Post Telephones.

This requirement should be aligned to (non-exhaustive list): the Operating Model [CRS-O&M-6], the Rule Book [CRS-O&M-61], and HAZID [CRS-O&M-101].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to review, and, where necessary, seek amendment to, processes for communication between all users of the Digital Railway System in the event of a loss of the primary communication system.

CRS-O&M-90

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable communication to be maintained in a systematic way in a failure situation.

Guidance: Development of the new processes should cover the following scenarios defined in the BoD [RD3] but which are not exhaustive:

- Safely Operate the Train
- Provide Information to Driver
- Operate Network to Current Plan
- Provide Information to Signaller
- Manage Incidents
- CCS Failure
- Infrastructure Fault
- Train-Based Fault

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-58, EOPSS-121, EOPSS-147, EOPSS-148, and EOPSS-948

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- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.
- This requirement should be aligned to (non-exhaustive list): the Operating Model [CRS-O&M-6], the Rule Book [CRS-O&M-61], Order of precedence for communications [CRS-O&M-89], and HAZID [CRS-O&M-101].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to review, and, where necessary, seek amendment to, processes for communication between all users of the Digital Railway System for the passing of safety-critical information.

CRS-O&M-91

Source: Scenarios-based workshop

Status: Normative

Rationale: It is essential that clear processes should be in place detailing the method of communication and required content of all safety-critical messages.

Guidance: Development of the new processes should take into account the BoD [RD3]. The following DR requirements should also be taken into account: EOPSS-130, EOPSS-947, and EOPSS-982

- For ETCS, this CRS will be updated when relevant DR requirements are available.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The kinds of communication relevance can include messages sent via voice, text message, or between systems, for example:

- Communications between control centres and depots / sidings / yards where local operational instructions apply
- Communications between Signallers and Drivers in the event of operational incidents
- Communications between Signallers in different locations

This requirement should be aligned to (non-exhaustive list): the Operating Model [CRS-O&M-6], the Rule Book [CRS-O&M-61], and HAZID [CRS-O&M-101].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to review and, where necessary, seek amendment to, processes for communication between all users of the Digital Railway System for the passing of non-safety-related information.

CRS-O&M-92

Source: Scenarios-based workshop

Status: Normative

Rationale: It is essential that clear processes should be in place detailing the method and required content of messages which do not have a safety-critical component.

Guidance: Development of the new processes should take into account the BoD [RD3]. The following DR requirements should also be taken into account:

- For ETCS [R12]: EOPSS-130
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The kinds of communication relevance should include messages sent via voice, text message, or between systems. Examples of non-safety-critical information include:

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- Alterations to Driver's diagram
- Alterations to Stock diagrams
- C-DAS information

This requirement should be aligned to (non-exhaustive list): the Operating Model [CRS-O&M-6], the Rule Book [CRS-O&M-61], and HAZID [CRS-O&M-101].

3.3.3 Engineering Management

The Deployment Project Team shall implement any necessary mechanisms for collaborative working between all organisations and their systems throughout the Life Cycle of the Digital Railway System.

CRS-O&M-2

Source: Scenarios-based workshop

Status: Normative

Rationale: To realise the Business Case benefits and capitalise fully on an integrated DR System, the organisations engaging with it and the processes supporting it will need to be at least as integrated as the DR System itself (and their interaction as seamless as that of the DR system).

Guidance: The interfaces [CRS-O&M-13] could be between/within IMs, RUs, physical environment, technological systems, people, and Railway Authorities. The Deployment Project Team will need to put in place the following working mechanisms (non-exhaustive list):

- Internally within the IM, e.g. between DR System users and Network Rail Telecoms (NRT) for GSM-R [CRS-O&M-21]
- Between IMs and RUs for the transfer of maintenance data, for example, provision of wheel diameter data for ETCS odometry purposes. The sharing of maintenance data between IMs and RUs may require a formal commercial agreement or inclusion in the Franchise agreement.
- Between RUs, for the sharing of knowledge regarding operations and maintenance of on-board equipment
- Between IMs and RUs, for contributing adequately and openly to participation in activities such as, the DRACAS process and any other knowledge sharing activities
- Approval of maintenance activities across the industry

The Deployment Project Team shall co-ordinate Infrastructure Managers, Railway Undertakings and the Supply Chain to create and implement a joint alarm and alert management plan for the Digital Railway System.

CRS-O&M-11

Source: Scenarios-based workshop / GSM-R and Cambrian Lessons Learnt Supplementary Review Report [RD27]

Status: Normative

Rationale: To enable the relevant personnel to receive correct and timely information in a manageable form to allow them to take appropriate action.

Guidance: An alarm and alert management plan should be developed. The DR System will generate a large number of self-reporting alarms and alerts of fault warnings. Lessons learnt demonstrate that careful management of these is required, taking into account commercial boundaries. Alarms and alerts are used to notify the relevant personnel of significant events within the DR system. A good alarm and alert management toolset designed

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into the DR System, coupled with a strong plan and processes, is crucial to safe and productive operations; it reduces unplanned downtime, increases safety, improves operator effectiveness, and results in better system performance. Examples of good practice would include:

- The processes of Network Rail Telecoms (NRT) - GSM-R team.
- Alarm Management Standard published by The International Society of Automation.

The documents concerned include:

ISA-18.2 Alarm Management Standard [RD13]

The Deployment Project Team shall work with Infrastructure Managers, Railway Undertakings and the Supply Chain to develop and implement a Knowledge Management Strategy for the Life Cycle of the Digital Railway System.

CRS-O&M-12

Source: Scenarios-based workshop

Status: Normative

Rationale: A Knowledge Management Strategy will enable the transfer and sharing of knowledge between/amongst the organisations involved in the Life Cycle of the DR System.

Guidance: It is important to enable the transfer of asset knowledge from the Supply Chain to the Deployment Project Team and, ultimately, into IMs and RUs, throughout the Life Cycle of the DR System, in line with the Operating Model [CRS-O&M-6]. The Knowledge Management Strategy should include, but not be limited to:

- Design, development, operation, maintenance and disposal of the DR System
- Timely handover and transfer of information throughout the various stages in the Life Cycle
- Facilitation of the collation and sharing of knowledge with other DR system deployments through lessons learnt, as well as learning from those other deployments, e.g. through implementing the National DRACAS process
- Explanation of how this shared knowledge will be captured into areas such as standards, processes, competences, etc. throughout the Life Cycle.

Infrastructure Managers and Railway Undertakings shall develop and implement an Interface Strategy for carrying out operations and maintenance across all interfaces.

CRS-O&M-13

Source: Scenarios-based workshop, Cambrian Lessons Learnt Supplementary Review Report [RD27] and SoS Requirements Maintenance Brainstorm

Status: Normative

Rationale: To provide assurance that operations and maintenance of the DR System will continue across all interfaces without impacting operations.

Guidance: The Interface Strategy should identify and address all possible interfaces, e.g. interfaces between/within RUs and IMs, interfaces within the physical environment, interfaces between technological systems, interfaces between people, and interfaces between organisations such as Office of Rail & Road or Rail Safety & Standards Board.

The Interface Strategy will cover, but not to be limited to:

- how consistency of operation is achieved for cross-boundary trains.
- how consistency of driver experience is achieved for cross-boundary trains.
- roles, responsibilities and accountabilities for the maintenance of the DR System across interfaces, e.g. fault finding and rectification, provision of competent staff.

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• Where testing (or other maintenance activity) requires confirmation of functionality across the GSM-R airgap, then arrangements will need to be made to engage with all necessary parties (IMs, RUs and/or supply chain) to ensure that a robust process is in place for planning and executing those activities.

The Interface Strategy will also need to refer to the requirements identified in the process for jointly managing data [CRS-O&M-17], DRACAS [CRS-O&M-18], and Maintenance Strategy [CRS-O&M-25].

Infrastructure Managers and Railway Undertakings shall have a process for jointly managing data throughout the Life Cycle of the Digital Railway System.

CRS-O&M-17

Source: Scenarios-based workshop

Status: Normative

Rationale: To maintain a consistent approach for managing DR System data.

Guidance: A Data Management Plan should be used to develop the process for jointly managing data.
A Data Management Plan will define how IMs and RUs intend to manage the data generated by the DR System and how they will integrate that data into the existing data infrastructure.

A Data Management Plan should include, but not be limited to:

- the organisation's approach to data management, detailing aspirations for business ownership of data, roles and responsibilities, its approach to data quality management, expectations around modelling requirements, and mandatory requirements for security.
- the approach to the development, agreement and publishing of specific data requirements and tolerances on that data.
- the technology and software to be used to execute the data strategy. This is likely to include a review of current software applications and their suitability, the approach regarding field devices for remote staff, and interfaces and links to other organisational systems.
- transformation of data into trusted and accessible information, e.g. through its management information delivery processes (i.e. the processes required for working to common metric definitions or sources for data).
- the vision for the organisation's data architecture and integration with both internal and external sources, and where international standards are to be adopted.
- unstructured content management (e.g. photographs, records, documents).
- business intelligence intent, e.g. to exploit the full potential of the advanced data analytics technique to support the O&M decision-making process.
- requirements for the organisation's data governance, i.e. where the data steering and decisions are made, arbitration in situations where agreement cannot easily be gained, and responding to issues and emerging requirements.
- transmission/sharing of data across commercial boundaries, e.g. RU maintenance data on wheel diameter measurements, which is essential for successful ETCS odometry performance. Specifically, this might require changes to franchise agreements to ensure that data of sufficient quality is provided.
- managing data downloads and the length of time a data download should be retained, in line with any data retention policy.

The documents concerned include:

- GB Generic System of Systems Customer Requirements Specification [RD6]
- GB Generic Customer Requirements Specification for ETCS Onboard [RD7]
- GB Generic Customer Requirements Specification for ETCS Trackside [RD8]

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- GB Generic Customer Requirements Specification for Traffic Management Systems [RD9]
- GB Generic Customer Requirements Specification for Connected-Driver Advisory System [RD10]
- Generic Interface Requirements Specification [RD11]
- DR Data Specification V1.0 [RD20]
- DR LINX & Data Management [RD21]

Infrastructure Managers and Railway Undertakings shall apply a common Defect Recording, Analysis and Corrective Action System (DRACAS) process for Digital Railway System operations and maintenance.

CRS-O&M-18

Source: Scenario-based workshops / GSM-R and Cambrian Lessons Learnt Supplementary Review Report [RD27]

Status: Normative

Rationale: To provide capabilities which significantly reduce the impact of a defect and enable pro-active maintenance, which is more cost-effective and safer.

Guidance: A common DRACAS System will provide the following:
A common DRACAS Process: This will be designed and agreed by key stakeholders across the Industry. It will detail the way in which the National DRACAS will work to meet the high-level requirements which have been signed off by the National DRACAS Steering Group. The ways in which the National DRACAS process will be implemented by RUs include, but are not limited to: joint stakeholder defect investigations to arrive at a root cause consensus; the sharing of relevant defect corrective and preventative action data to promote improved reliability across the whole network; and ensuring that the data on the National DRACAS Defect and Event Management System is accurate and up to date.
A common DRACAS Defect and Event Management System: This is a shared system which will be used to facilitate data collation and joint investigations for defects related to the ETCS and Global System for Mobile Communications - Railway (GSM-R). It will be used to access the national data set for these defects and to produce bespoke reports. Additionally, it will inform a periodic reporting dashboard to be distributed to all users. User guides will be produced to accompany this system.
An example of good practice would be the National DRACAS Rail Industry Standard (RIS): This document will be published by the Rail Safety and Standards Board (RSSB) and will provide detailed guidance on the National DRACAS Process. Rail Industry Standards are specific standards: the DRACAS RIS will contain requirements applicable to Control, Command and Signalling (CCS) and may set out rules about how sub-systems should be operated or defects and events managed. This will remove the need for companies to develop and maintain their own (company) standards regarding DRACAS. The DRACAS RIS will be produced under governance arrangements approved by the Industry Standards Co-ordination Committee on behalf of the Industry.

The Deployment Project Team shall develop and implement a Human Factors Strategy for the Life Cycle of the Digital Railway System.

CRS-O&M-19

Source: Scenarios-based workshop

Status: Normative

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Rationale: To promote safe, sustainable, maintainable, and operable human interaction with the DR System.

Guidance: The Human Factors Strategy should be developed in conjunction with IMs and RUs and should include: identification and management of ergonomic problems generated by interaction with the DR System; risk evaluation; implementation of solutions and analysis of their effectiveness. It should, simultaneously, help to control deviations in the process, thus preventing defects occurring or reducing the number of defective items.

The Human Factors Strategy should also consider and align to other ongoing Human Factor activities within the deployment scheme.

The documents concerned include:

- GB Generic System of Systems Customer Requirements Specification [RD6]
- GB Generic Customer Requirements Specification for ETCS Onboard [RD7]
- GB Generic Customer Requirements Specification for ETCS Trackside [RD8]
- GB Generic Customer Requirements Specification for Traffic Management Systems [RD9]
- GB Generic Customer Requirements Specification for Connected-Driver Advisory System [RD10]
- Generic Interface Requirements Specification [RD11]

Infrastructure Managers and Railway Undertakings shall develop their operations and maintenance processes and activities to reflect accountabilities defined in the National Asset Accountability Matrix.

CRS-O&M-20

Source: Scenarios-based workshop

Status: Normative

Rationale: To encourage the various parties involved in operating and maintaining the DR System to address collectively all parts of the system without omissions or overlaps in responsibility and accountability.

Guidance: The Deployment Project Team should co-ordinate the activities between IMs and RUs to align to the National Asset Accountability Matrix by considering (non-exclusive list):

- Asset accountability in terms of assurance, compliance, inspection, maintenance and renewals of DR System components, such as the European Vital Computer
- Standards Owners and Discipline Heads
- Interfaces to various asset groups that would be affected by breakdowns, repairs and renewals
- The electronic data source of the asset

These activities should refer to the Interface Strategy [CRS-O&M-13].

Infrastructure Managers and Railway Undertakings shall review and, if necessary, update their Asset Management Policies for the introduction of the Digital Railway System.

CRS-O&M-23

Source: Scenarios-based workshop

Status: Normative

Rationale: To align to the business objectives.

Guidance: Asset Management Policy comprises the principles and mandated requirements derived from, and consistent with, the overall business objectives. IMs and RUs should review and update their Asset Management

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Policy to reflect the impact of the DR System in areas such as:

- Safety
- Compliance
- Risk Management
- Sustainability
- Asset Management approach
- Continuous improvement

Infrastructure Managers and Railway Undertakings shall review and update their Asset Management Strategies/Strategic Asset Management Plans (SAMPs) or equivalent for the introduction of the Digital Railway System.

CRS-O&M-24

Source: Scenarios-based workshop

Status: Normative

Rationale: To align to the Asset Management Policy.

Guidance: The Asset Management Strategy/SAMP aims to direct the way in which IMs and RUs will manage assets to achieve the business objectives. The Asset Management Strategy/SAMP should be reviewed and updated to reflect the impact of the DR System in areas such as:

- Life Cycle management of assets
- How the business objectives are to be broken down into the asset management objectives
- What approach to take to develop asset management plans
- How each organisation will direct, control, and co-ordinate its asset management activities to support achievement of the asset management objectives
- How it will take into account the requirements of any existing Maintenance Strategies

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to make a set of coherent Maintenance Strategies available for the Life Cycle of the Digital Railway System.

CRS-O&M-25

Source: Scenarios-based workshop

Status: Normative

Rationale: To provide overall direction for maintaining the DR System and achieving the Performance, Reliability, Availability, Maintainability and Safety (PRAMS) targets across organisational boundaries.

Guidance: The Maintenance Strategies will provide overall direction on how to maintain the DR System, taking into account, for example (non-exclusive list):

- PRAMS targets [CRS-O&M-15]
- DR Maintenance Framework
- Asset policies [CRS-O&M-26]

The Maintenance Strategies should consider a mix of maintenance concepts to achieve the PRAMS targets, such as:

- Risk-based maintenance
- Condition-based maintenance
- Time-based maintenance
- Reliability-centred maintenance

The documents concerned here are:

- DR Maintenance Framework [RD18]

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The Deployment Project Team shall carry out a Level of Repair Analysis for maintaining the Digital Railway System.

CRS-O&M-27

Source: Scenarios-based workshop

Status: Normative

Rationale: To optimise the corrective maintenance activities for recovery of the operational railway.

Guidance: IMs and RUs should consider how Life Cycle Cost (LCC) can be optimised by using different locations and levels of repair/services for sustainment activities. To optimise maintenance of the DR System, the following should be considered, as a minimum:

- LCC in the selection of locations and levels of repair for on-board, trackside and control room equipment, including the impact on training, spare parts, test equipment, tooling, facilities, etc.
- Provision of technical support from the supply chain to address issues such as: fault restoration, software support, software maintenance, cyber security support, obsolescence management (to include modification and retrofit services, if required)
- How the deployment will make best use of any centrally-procured support services from the supply chain

The output from the Level of Repair Analysis will impact upon the management plan for material resources [CRS-O&M-31] and the human resource management resources plan [CRS-O&M-43].

Infrastructure Managers and Railway Undertakings shall develop and implement a Configuration Management Plan for the Digital Railway System.

CRS-O&M-28

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable the DR system to remain functional and continue to meet its requirements.

Guidance: Configuration management involves identifying, recording and managing the functional and physical attributes of assets, software and related documentation, including the links between DR System components. The Configuration Management Plan will provide a process for systematic control of changes to the identified attributes of items for the purpose of maintaining integrity and traceability throughout the DR System Life Cycle. The Deployment Project Team should engage with the Digital Railway System Authority to ensure that ongoing DR System configuration remains interoperable with other deployments nationally.

Infrastructure Managers and Railway Undertakings shall develop an asset decommissioning and disposal plan for the Digital Railway System.

CRS-O&M-34

Source: Scenarios-based workshop

Status: Normative

Rationale: To promote a sustainable and robust end-of-life asset strategy.

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Guidance: Although the DR System can have a long life that continues well beyond normal business cycles, there almost invariably comes a point where removal from service, decommissioning and disposal occur. The following areas should be considered:

- Any company and industry policies, standards, and legislation
- The environmental impact of disposal, including disposal of hazardous waste.
- The residual value of assets
- Alternative uses for decommissioned assets
- The rehabilitation of land, including decontamination
- Any data generated by the DR System removed from disposed assets in accordance with any IM and RU data policies

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop an Obsolescence Management Plan(s) for the Digital Railway System.

CRS-O&M-36

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable continued operation of the DR System throughout its planned Life Cycle.

Guidance: A plan is intended to identify and mitigate risk when parts, spares, equipment, skills, and software, etc. become obsolete. Obsolescence is inevitable: it cannot be avoided. Its management, therefore, is essential to achieve optimum cost-effectiveness throughout the DR System Life Cycle. Careful forethought and planning can minimise the impact of obsolescence and its potentially high costs. Pro-active strategic and tactical measures can be taken to mitigate many of the risks associated with obsolescence, thus reducing its impact on Life Cycle costs. Given the business-critical nature of the DR System, it is essential that provision is made in the form of an agreement to take control of the Intellectual Property associated with any of the products, software, documentation, designs and any other form of Intellectual Property Rights (IPR) which may be required to operate, maintain or upgrade elements of the DR System. The terms of such an agreement may require an ESCROW arrangement to be made for an independent body to transfer the IPR, documentation and designs and any media on which it is stored to the IMs or RUs, should the terms of the agreement come into force.

Infrastructure Managers and Railway Undertakings shall carry out an impact assessment of existing maintenance processes, procedures and instructions.

CRS-O&M-67

Source: Scenarios-based workshop

Status: Normative

Rationale: To understand the impact on the safety and integrity of the DR System throughout its Life Cycle.

Guidance: IMs and RUs should work collaboratively to understand the impact by:

- defining the scope of the DR System change including any changes to asset accountability;
- determining key differences in the maintenance activities as a result of deployment of the Digital Railway System of Systems; and
- prioritising any required change.

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

The Deployment Project Team shall document all the maintenance processes required for implementation of the Digital Railway System onto the live railway.

CRS-O&M-68

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable the correct methods of maintaining the railway using the DR System to be followed from commencement of service and throughout the remaining DR System Life Cycle.

Guidance: Subject to the outcomes of the impact assessment of existing processes, IMs and RUs should update any existing processes or new create new ones required for maintaining the DR System. Such documents include, for example, Signalling Maintenance Testing Handbook, Signalling Works Testing Handbook, General Instructions to Staff Working on Signalling and Telecoms Equipment, and the Global System for Mobile Communications – Railway (GSM-R) Handbook.

3.3.4 Governance and Approvals

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to obtain the necessary approvals to operate and maintain the Digital Railway System.

CRS-O&M-4

Source: Scenarios-based workshop

Status: Normative

Rationale: To be compliant with legislation, rules and standards, and approved as being compliant, so that the DR System can be used on the operational railway.

Guidance: The documents concerned include:

- DR System Safety Plan [RD16]
- DR System Assurance Plan [RD15]
- DR Preliminary Hazard Analysis Report [RD17]

The Deployment Project Team shall liaise with Infrastructure Managers, Railway Undertakings and the Supply Chain to subject all new and revised operational and maintenance processes and procedures to Hazard Identification (HazID).

CRS-O&M-101

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable hazards to be identified and risk mitigated as part of overall safety assurance.

Guidance: All new and revised operational and maintenance processes and procedures should be subject to the same HazID process as the DR System itself.

The Deployment Project Team shall liaise with Infrastructure Managers, Railway Undertakings and the Supply Chain to subject all new and revised operational and maintenance processes and procedures to a Human Factors (HF) assessment.

CRS-O&M-93

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable Human Factor risks associated with DR System operations and maintenance to be identified and mitigated.

Guidance: The processes should define how HF will be assessed and the frequency with which they will be assessed. They should include procedures for any manual input and interaction, e.g. train data entry. They should also refer to the outcomes of impact assessments of O&M processes, procedures and instructions.
The assessment should take into account the following DR requirements:

- For ETCS [RI2]: EOPSS-55, EOPSS-04
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

3.3.5 Other

The Deployment Project Team, in conjunction with Infrastructure Managers, Railway Undertakings and the Supply Chain shall implement the support mechanisms required to achieve the Performance, Reliability, Availability, Maintainability and Safety (PRAMS) targets for the specific deployments of the Digital Railway System.

CRS-O&M-15

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable DR System PRAMS targets to be achieved when the designed system is combined with the operations and maintenance organisation, processes and Service Level Agreements (SLAs), etc.

Guidance: The Deployment Project Team should co-ordinate IM and RU activities to allocate PRAMS targets between the relevant parties when introducing the DR System to existing infrastructure.
IMs and RUs should understand the PRAMS targets and monitor progress against them.
It is vital that operations' resourcing levels and response times are aligned with designed-in reliability, availability, maintainability, and safety characteristics (which, in turn, will dictate resourcing levels and SLAs in the maintenance area).
The documents concerned include:

- GB Generic System of Systems Customer Requirements Specification [RD6]
- GB Generic Customer Requirements Specification for ETCS Onboard [RD7]
- GB Generic Customer Requirements Specification for ETCS Trackside [RD8]
- GB Generic Customer Requirements Specification for Traffic Management Systems [RD9]
- GB Generic Customer Requirements Specification for Connected-Driver Advisory System [RD10]
- Generic Interface Requirements Specification [RD11]
- DR System Safety Plan [RD16]
- DR System RAM Management Plan [RD14]

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

The Deployment Project Team shall liaise with Infrastructure Managers (IMs) and Railway Undertakings (RUs) to identify and review service levels against the requirements set by the Performance, Reliability, Availability, Maintainability and Safety (PRAMS) analysis for all associated services essential to the operation of the Digital Railway System.

CRS-O&M-21

Source: Scenarios-based workshop

Status: Normative

Rationale: To ensure that the DR System can achieve its forecast benefits, in line with the Business Case.

Guidance: Availability, levels of performance, and maintenance response times may need to change for services such as Electrification & Plant, Building Services, and Telecoms. For example (non-exhaustive list):

- Where power connections are being made to newly installed assets that require a power supply, the levels of redundancy associated with the power supply must be in line with PRAMS requirements. Priority levels and maintenance response times in Service Level Agreements (SLAs) or standards must be appropriate for meeting PRAMS requirements. Levels of redundancy for power systems will be applicable to all assets, but this is particularly so for control and management centres, where PRAMS analysis could mandate dual, independent power supplies which would be best practice for control centre implementations.
- For RUs, the power budget for any systems on board must be reviewed and checked to ensure that they are still appropriate for the additional on-board DR System equipment.
- One of the objectives of the DR System is to increase frequency of train services; similarly, the ETCS has the potential to change typical acceleration and, therefore, electrical power characteristics required of traction power systems. IMs and RUs should analyse changes in traction power requirements (including regenerative braking effects, where appropriate) to ensure that capacity and service levels for the traction power system are appropriate.
- As part of the review of Electrification and Plant (E&P) power connections, consideration should be given to having the power supplies removed (and the service contracts with Regional Electricity Companies closed) for removed assets or those assets which are no longer in use.
- Communications service changes being made to equipment need to be considered. In the case of GSM-R and the Fixed Telecoms Network (next generation) (FTN-X), it should be confirmed that network capacity is sufficient to accommodate the data transmission requirements of the DR System. Additionally, it may be necessary to check that radio coverage and redundancy are sufficient for running safety-critical data over the network. PRAMS requirements should be checked and applied to any SLAs (including those for Network Rail Telecoms (NRT) assets) and fault priority allocations.
- Information Technology (IT) support from IM and / or RU IT support services for desktop type assets in control rooms may require virus protection or Operating System upgrade. It is highly probable that this level of support will be different to that needed for standard desktop IT equipment.
- Complex digital server systems often require specific environmental conditions. Arrangements for monitoring, maintaining, and repairing the building's environmental control systems must provide assurance that the environmental conditions are not compromised. Were environmental conditions to be compromised, it could not only impact warranty obligations, but also fatally damage assets.

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Issue/Ver:	2.0
Date:	25/03/2019

Infrastructure Managers and Railway Undertakings shall update service levels, as appropriate, for all associated services essential to the operation of the Digital Railway System.

CRS-O&M-22

Source: Scenarios-based workshop

Status: Normative

Rationale: To enable that the DR System to achieve its forecast benefits sustainably, in line with the Business Case.

Guidance: The review required by [CRS-O&M-21] will identify service levels that need to be revised. The revision activity may require changes to (but not be limited to) the following:

- Internal Service Level Agreements (SLAs) within the IM or RU
- Informal SLAs between IMs and RUs and/or other railway agencies
- Franchise agreements
- Contracts with service providers
- Contracts with utility providers

Historically, there have been delays on projects relating to the Office of Rail and Road (ORR) and/or other approvals. Advance notice of peaks of work requiring approval may need to be factored into SLAs / understandings with various approval bodies.

The Deployment Project Team shall liaise with Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Train Preparation'.

CRS-O&M-69

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the scenario/s defined in the BoD [RD3], e.g. Train Preparation.

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-54
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Making Train Movements'.

CRS-O&M-70

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3], but which

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are not exhaustive:

- Safely Operate the Train
- Provide Information to Driver
- Optimise Train Movement

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-781, EOPSS-843
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Movements in Sidings/Depots/Yards'.

CRS-O&M-71

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Train Preparation
- Safely Operate the Train
- Interface with Adjacent non-Digital Railway Control Systems

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-60, EOPSS-1004, EOPSS-873, EOPSS-950, and EOPSS-963
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Control of Train Movements'.

CRS-O&M-72

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Operate Network to Current Plan
- Provide Information to Signaller
- Optimise Current Plan
- Monitor Train Movements against Current Plan
- Manage Incidents

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-138, EOPSS-972, EOPSS-976, and EOPSS-942
- For TMS and C-DAS, this CRS will be updated when relevant DR

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requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Level Crossings'.

CRS-O&M-73

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Provide Information to Signaller
- Operate Network to Current Plan
- Safely Operate the Train

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-135, EOPSS-136, EOPSS-943, and EOPSS-947
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers to carry out an impact assessment on existing operational processes, procedures and instructions for 'Managing Areas of Control'.

CRS-O&M-74

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the scenarios defined in the BoD [RD3], e.g. Transfer Signalling Control.

The following DR requirements should also be taken into account:

- For ETCS [RI2]: No specific requirements have been identified.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Planning'.

CRS-O&M-75

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

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Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Optimise Current Plan
- Provide Information to Planning

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-925, EOPSS-140, EOPSS-141, and EOPSS-777
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Emergency Procedures'.

CRS-O&M-76

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3]:

- Operate Network to Current Plan
- Provide Information to Signaller
- Safely Operate the Train
- Provide Information to Driver

- Manage Incidents
- CCS Failure
- Control Centre Failure
- Emergency

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-971
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Managing Possessions'.

CRS-O&M-77

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Possession Planning
- Safe Working Site Warning
- Manage Possession
- Short Notice Possessions

The following DR requirements should also be taken into account:

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- For ETCS, EOPSS-903, EOPSS-905, and EOPSS-910
 - For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.
- This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Taking Infrastructure Out of Use'.

CRS-O&M-78

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the scenarios defined in the BoD [RD3], e.g. Infrastructure Fault.
The following DR requirements should also be taken into account:

- For ETCS [RI2]: No specific requirements have been identified.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to carry out an impact assessment on existing operational processes, procedures and instructions for 'Speed Restrictions'.

CRS-O&M-79

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

Guidance: The impact assessment and any subsequent updates/amendments should take into account the scenarios defined in the BoD [RD3], e.g. Infrastructure Fault.
The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-957
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

This assessment should be aligned to the Operating Model [CRS-O&M-6].

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to review and update all operational processes, procedures and instructions taking into account all impact assessments.

CRS-O&M-80

Source: Scenarios-based workshop

Status: Normative

Rationale: To confirm that processes, procedures and instructions are still current or highlight the need for updates/amendments.

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Guidance: Subject to the outcomes of the impact assessment of existing processes, IMs and RUs should update any existing processes or create new ones, as required, for DR System operations.
All impact assessments should refer to requirements (non-exhaustive list) [CRS-O&M-69], [CRS-O&M-70], [CRS-O&M-71], [CRS-O&M-72], [CRS-O&M-73], [CRS-O&M-74], [CRS-O&M-75], [CRS-O&M-76], [CRS-O&M-77], [CRS-O&M-78], and [CRS-O&M-79].
Any revisions of operational processes, procedures and instructions should be subjected to a HAZID [CRS-O&M-101].

The Deployment Project Team shall liaise with Railway Undertakings to develop all operational processes, procedures and instructions for 'Train Preparation' for the Digital Railway System.

CRS-O&M-81

Source: Scenarios-based workshop

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: Development of the new processes, procedures and instructions should take into account the scenarios defined in the BoD [RD3], e.g. Train Preparation. The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-54
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop all operational processes, procedures and instructions for 'Making Train Movements' for the Digital Railway System.

CRS-O&M-82

Source: Scenarios-based workshop

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: Development of the new processes, procedures and instructions should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Safely Operate the Train
- Provide Information to Driver
- Optimise Train Movement

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-781, EOPSS-843
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop all operational processes, procedures and instructions for 'Degraded Operations' for the Digital Railway System.

CRS-O&M-83

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Source: Scenarios-based workshop

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: Development of the new processes, procedures and instructions should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Safely Operate the Train
- Provide Information to Driver
- Operate Network to Current Plan
- Provide Information to Signaller
- Manage Incidents
- CCS Failure
- Infrastructure Fault
- Train Based Fault

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-68, EOPSS-1007, EOPSS-110, EOPSS-111, EOPSS-118, EOPSS-122, EOPSS-129, EOPSS-131, EOPSS-137, EOPSS-145, EOPSS-146, EOPSS-150, EOPSS-151, EOPSS-899, EOPSS-970, and EOPSS-974
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop all operational processes, procedures and instructions for 'Managing Equipment Failures' for the Digital Railway System.

CRS-O&M-84

Source: Scenarios-based workshop

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: Development of the new processes, procedures and instructions should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Manage Incidents
- CCS Failure
- Infrastructure Fault
- Train-Based Fault

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-68, EOPSS-112, EOPSS-113, EOPSS-123, EOPSS-127, EOPSS-940, and EOPSS-111
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop all operational processes, procedures and instructions for 'Planning' for the Digital Railway System.

CRS-O&M-85

Source: Scenarios-based workshop



Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: Development of the new processes, procedures and instructions should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Operate Network to Current Plan
- Provide Information to Signaller
- Optimise Train Movement
- Monitor Train Movements against Current Plan
- Optimise Current Plan
- Provide Information to Planning

The following DR requirements should also be taken into account:

- For ETCS [R12]: EOPSS-997
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop all operational processes, procedures and instructions for 'Managing System Settings' for the Digital Railway System.

CRS-O&M-86

Source: Scenarios-based workshop

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: New processes, procedures and instructions should be created, as necessary, and implemented. They should take into account the following:

- Managing user settings for TMS: this should include what, when and how settings can be changed, e.g. configuring the screens.
- How only competent and authorised users will be able to access the settings: roles and responsibility should be defined, along with the training required to be able to access the system features.
- Managing login ID, role profile and access to the systems.
- GSM-R lessons learnt.
- Cambrian Lessons Learnt Supplementary Review Report [RD27].

The following DR requirements should also be taken into account:

- For ETCS [R12]: No specific requirements have been identified.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers and Railway Undertakings to develop all operational processes, procedures and instructions for 'Transitions' for the Digital Railway System.

CRS-O&M-87

Source: Scenarios-based workshop

Status: Normative

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: This requirement covers both transitioning from one ETCS Level to another and transitioning between ETCS modes within a given Level. Development of the new processes, procedures and instructions should take into account the following scenarios defined in the BoD [RD3], but which are not exhaustive:

- Manage Train Service Information
- Safely Operate the Train
- Safely Command a Train

The following DR requirements should also be taken into account:

- For ETCS [RI2]: EOPSS-155, EOPSS-873, EOPSS-115, EOPSS-120, EOPSS-132, EOPSS-134, and EOPSS-956
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

Reference should also be made to the Interface Strategy [CRS-O&M-13].

The Deployment Project Team shall liaise with Infrastructure Managers to develop all operational processes, procedures and instructions for 'Managing Area of Control' for the Digital Railway System.

CRS-O&M-88

Source: Scenarios-based workshop

Status: Normative

Rationale: New processes, procedures and instructions will need to be created due to the new Operating Model and will need to be in place to promote safety, competency and productivity.

Guidance: Development of the new processes should take into account the scenarios defined in the BoD [RD3], e.g. Transfer Signalling Control.

The following DR requirements should also be taken into account:

- For ETCS [RI2]: No specific requirements have been identified.
- For TMS and C-DAS, this CRS will be updated when relevant DR requirements are available.

The Deployment Project Team shall liaise with Infrastructure Managers, Railway Undertakings and the Supply Chain to develop and implement a collaborative fault diagnostic procedure for the Digital Railway System.

CRS-O&M-98

Source: SoS Requirements Maintenance Brainstorm

Status: Normative

Rationale: To manage the diagnostic investigation of failures effectively.

Guidance: Ascertaining all the facts to be able to investigate fully and close out a failure will require interrogation of the on-board DR systems in conjunction with investigation of the infrastructure. Data needed to support failure investigation will be held across boundaries; thus, investigation and rectification of faults will require close co-operation between IMs and RUs. Once a primary cause has been established, a joint decision will need to be made as to whether or not to carry on with the full investigation.

4 Associated Information

4.1 Open Points

The open points for this generic Customer Requirements Specification are tabulated in Table 1 below.

Number	Issue	Description	Identified in Version	Closed in Version
1	Concept of Operations	Best endeavours have been used during the development of this specification to align it to the relevant Concepts of Operations documents, which have been updated in parallel. Final assurance of the complete alignment of this specification with the relevant industry endorsed Concepts of Operations will be achieved in a later version. Transferred to Exclusions section at the beginning of this O&M CRS.	0.1	2.0
2	National Asset Accountability Matrix	A National Asset Accountability Matrix is being developed. This O&M requirement document will be updated when it is published. In version 2.0, this open point was closed, and transferred to the Assumption section at the beginning of this O&M CRS.	0.1	2.0
3	DRACAS	A Rail Industry Standard (RIS) is being developed by the industry via the RSSB and will need to be properly cross-referenced in this CRS when it is published. In version 2.0 the requirement has been amended to refer to a common DRACAS without requiring reference to a Rail Industry Standard. Therefore, this open point has been closed.	0.1	2.0
4	Deployment Guide	The Deployment Guide to include Change Management and Capability Frameworks is being developed in parallel with this suite of CRS. In version 2.0, this open point was closed as the DR Change Manual [RD26] is now referred to in this O&M CRS.	0.2	2.0
5	Lessons Learnt	A number of the requirements in this CRS are based upon draft output from Lessons Learnt. When the Lessons Learnt are formally published,	0.2	2.0

		<p>this document will require updating to cross-reference them correctly.</p> <p>In version 2.0, this open point was closed as the Cambrian - Lessons Learned Supplementary Review Report [RD27] is now referred to in this O&M CRS.</p>		
6	Functional Requirements	<p>Functional requirements have been derived from the BoD [RD3] and known operation of DR Systems. This O&M requirement will be updated to align with the SOS requirement.</p> <p>In version 2.0, this open point was closed as the O&M CRS has been aligned to the BoD [RD3].</p>	0.2	2.0
7	Process for jointly managing data	<p>A Data Specification [RD20] has been produced outside of the SR&I Team; it focuses on railway operations only. This document will need to be updated as the Data Specification [RD20] evolves.</p> <p>In version 2.0, this open point was closed as the Data Specification [RD20] is a Dependent Reference in this O&M CRS.</p>	0.2	2.0
8	Automation of the DR System	<p>Refer to CRS O&M 97, whilst we have set a requirement to automatically provide all self test data to the relevant maintenance management system, a question remains over whether this functionality exist in current off the shelf sub-system.</p> <p>The requirement has been updated to resolve the issue as part of version 2.0 of this O&M CRS.</p>	0.3	2.0
9	TM and C-DAS DR requirements	<p>Where ETCS DR requirements are referred in the guidance, it should be noted that TM, and C-DAS have not been included as they are under development.</p>	0.3	
10	Requirement re-alignment exercise	<p>There will be a requirement re-alignment exercise post Nov 2018 which may result in promoting O&M requirements to the SoS requirements. This includes CRS O&M 7, CRS O&M 37, CRS O&M 96, CRS O&M 97, CRS O&M 99, CRS O&M 100.</p> <p>In version 2.0, this open point was closed as the requirements have been retained in this O&M CRS.</p>	0.3	2.0

11	National consistency	<p>There are a number of requirements in this document which all need to be addressed at the national level to ensure a consistent solution result. This includes CRS-O&M-61, CRS-O&M-64, CRS-O&M-89, CRS-O&M-90, CRS-O&M-91, CRS-O&M-92.</p> <p>In version 2.0, this open point was closed, and addressed through assumption section 4.2.</p>	1.0	2.0
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4.2 Assumptions

The assumptions made in connection with this generic Customer Requirements Specification are tabulated in Table 2 below.

Number	Issue	Assumption	Identified in Version	Closed in Version
1	Concept of Operations	The Concept of Operations as an expression of desire will contain items that go beyond what is achieved by the O&M CRS.	0.1	
2	ROSCOs (Rolling Stock Leasing Companies)	Where the requirement mentions Railway Undertakings, it is assumed that this will include ROSCOs and Entities in Charge of Maintenance (ECMs).	0.2	
3	Competence Management Systems	Its assumed that the IMs and RUs have Competence Management Systems following the ORR's guidance.	0.3	
4	Consistent solution at the National Level	There are a number of requirements in this document which need to be addressed at the national level to ensure a consistent solution result. This includes CRS-O&M-61, CRS-O&M-64, CRS-O&M-89, CRS-O&M-90, CRS-O&M-91, CRS-O&M-92.	2.0	

4.3 Dependencies

The dependencies associated with this generic Customer Requirements Specification are tabulated in Table 3 below.

Number	Issue	Dependency
1	Concept of Operations	The Concept of Operations is the source document defining the need for the Digital Railway System and its operation.
2	Basis of Design	The BoD [RD3] supports the creation of the SoS Customer Requirements Specification (CRS).
3	SoS CRS	The SoS CRS [RD3] supports the creation of this O&M CRS.

4.4 Constraints

The constraints associated with this generic Customer Requirements Specification are tabulated in Table 4 below.

Number	Issue	Constraint
	None	

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Appendix A APPLICABILITY ASSESSMENT TEMPLATE

A.1 Guidance on Populating the Template

A Deployment Project wishing to record the results of their applicability assessment should copy this template into a new deployment project-specific document for population.

Insert project name into the relevant box near the top of the template.

For each Application-Specific requirement, insert the word 'Yes' in the 'Applicable' box if the issue or subject addressed by the requirement is relevant to the deployment project in question.

If the issue or subject addressed by an Application-Specific requirement is not relevant to the deployment project in question, insert the word 'No' in the 'Applicable' box.

It is not permissible to change the Applicability status of Normative requirements as these are mandatory on all deployment projects.

A.2 Feedback

Deployment projects are requested to send copies of their populated Applicability Assessment Templates to the Digital Railway System Requirements and Integration team. This will enable the team to assess the value that the industry is deriving from the Application-Specific requirements and will support future improvements to the generic Customer Requirements Specification.

A.3 Template

Deployment Project Applicability Assessment of GB Generic National Customer Requirements Specification for Operations and Maintenance			
Deployment Project Name			
Requirement ID	Type	Status	Applicable
<Populate this column with requirement IDs for all requirements when generic CRS nearly completed>	<Populate this column with 'Functional', 'Non-Functional' or 'Process' for each requirement as appropriate>	<Populate this column with 'Normative' or 'Application-Specific' for each requirement as appropriate>	<For Normative requirements insert 'Mandatory', for App-Specific requirements leave blank>

Reference	153819-NWR-PLN-ESE-000014
Issue/Ver:	2.0
Date:	25/03/2019

Appendix B NEW CUSTOMER REQUIREMENTS TEMPLATE

B.1 Guidance on Populating the Template

A deployment project wishing to draft new Customer Requirements should copy this template into a new deployment project-specific document for population. New requirements should not be added to Appendix B of the generic Customer Requirements Specification itself.

Text in italics prefixed 'GN' forms guidance for the user of this template.

Further guidance may be found in the Digital Railway – Customer Requirements Specification – Requirements Management Plan [RD5].

B.2 Feedback

Deployment projects are requested to send copies of any additional Customer Requirements generated to the Digital Railway System Requirements and Integration team. This will enable the team to identify future improvements to the generic Customer Requirements Specification.

B.3 Template

<p><i>Safety</i></p> <p>The requirement text goes here.</p> <p><i>GN: It must be a clear, concise and unambiguous statement of what is required. It must include the word 'shall'.</i></p> <p style="text-align: right;">Unique-Identifier</p>

Source: Source statement goes here.
GN: This is a statement which identifies where the requirement originated to provide traceability of the requirement's origin. This could include references to a Concept of Operations, System of Systems Customer Requirements Specification, hazard record, or other document that sets out a high-level expression of what this system needs to achieve.

Status: Normative or Application-Specific.
GN: This will be 'Application-Specific' unless this template is being used to propose a change to the generic Customer Requirements Specification in accordance with the change process set out in section 1.4

Rationale: Rationale statement goes here.
GN: This explains why the requirement is needed and its application, including why the requirement exists, who it is for, what industry benefit could be achieved, what the constraints are, and any other essential detail. Cross-referencing to other documentation to avoid the need for lengthy explanations is acceptable.

Guidance: Guidance statement goes here.
GN: The guidance statement contains any supplementary information that may be of value in assisting with the interpretation of the requirement or in determining how the requirement could be satisfied.

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