



EULYNX Initiative

EULYNX Domain Knowledge

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Contents

1	Introduction	1
1.1	Release information	1
1.2	Impressum	1
1.3	Purpose	2
2	Routes	2
2.1	General definitions	2
2.2	Route Definition	2
2.3	Route Life Cycle	4
2.4	Approach Zone Definition	4
2.5	Route Release	5
3	Line block	6
3.1	Direction	6
3.2	Line block with level crossing	7
4	Areas	7
4.1	General	7
4.2	Local Shunting Area	7
4.2.1	Local Shunting Area Definition	7
4.2.2	Adjacent or Overlapping Local Shunting Area	8
4.2.3	Local Shunting Area Life Cycle	8
4.3	Emergency Stop Area	8
4.3.1	Unconditional Emergency Stop Area	8
4.3.2	Conditional Emergency Stop Area	9
4.4	Working Area	9
4.4.1	Working Area Activation	9
4.4.2	Working Area Life Cycle	9
4.4.3	Extended Working Area	9
5	Adjacent Systems	10
5.1	Radio Block Centre	10
5.1.1	RBC General	10
5.1.2	Definition of functions between the interlocking system and the RBC	11
5.2	Centralised ETCS L1 Controller	12
5.2.1	CEC General	12
5.2.2	Interfaces	12
5.2.3	Switching order	13
5.3	Trackworker Safety System	13

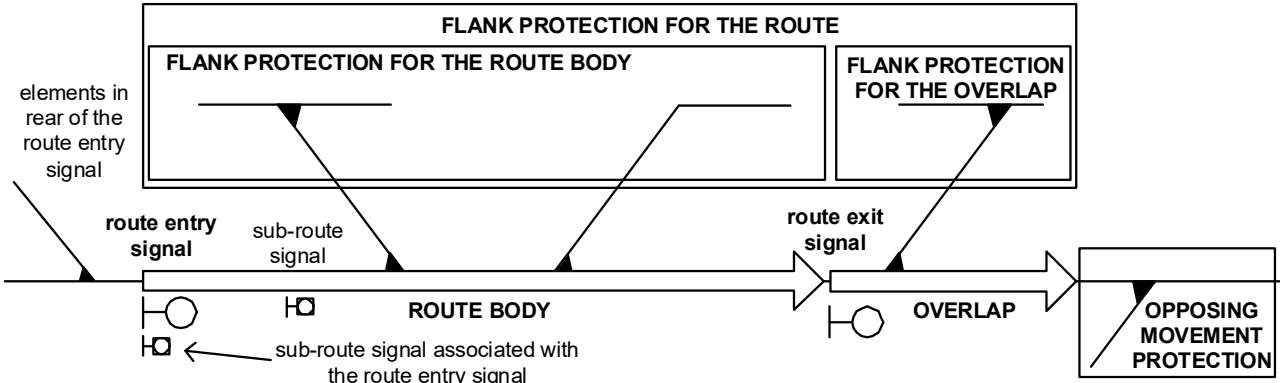
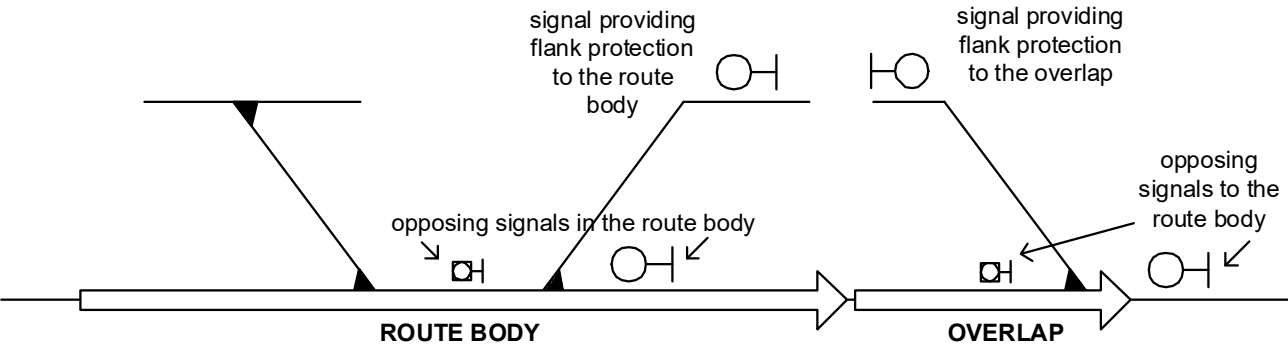
5.3.1	TSS General	13
5.3.2	TSS architecture and interfaces	13
5.3.3	Warning functions	14
5.3.4	Influence functions	14
5.4	External Level Crossing System	14
5.4.1	Interacting functions	15
5.4.1.1	Unconditional activation and deactivation	15
5.4.1.2	Track/route-related activation and deactivation	15
5.4.1.3	Prolonged activation	16
5.4.1.4	Control activation point	16
5.4.2	Autonomous functions	16
5.4.2.1	Autonomous activation and deactivation	16
5.4.3	Combinations	16
5.4.4	Auxiliary functions	16
5.4.4.1	Set protection signals	16
5.4.5	Statuses	16
5.4.6	Command admissibility	17
5.5	Traffic Control System	17
5.5.1	TCS General	17
5.6	EULYNX Interfaces between adjacent systems	18
6	Elements	18
6.1	Light Signals	18
6.1.1	Signal aspect table	18
6.1.2	Signal vector	19
6.1.3	Commanding the signal aspect	19
6.1.4	Degradation	22
6.1.4.1	Lamp dependent degradation	22
6.1.4.2	Additional degradation information	23
6.1.5	Luminosity	23
6.2	Points	24
6.2.1	Point position	25
6.2.1.1	Commanded point position	25
6.2.1.2	Physical point position	25
6.2.1.3	Detected point position	25
6.2.1.4	Overall point position	28
6.2.1.5	Reported point position	29
6.2.2	Degraded point position	29
6.2.3	Point position overview diagram	30
6.2.4	Point machine numbering	30
6.2.5	Crank handle operation	31
6.2.6	Trailing evaluation in the interlocking	31

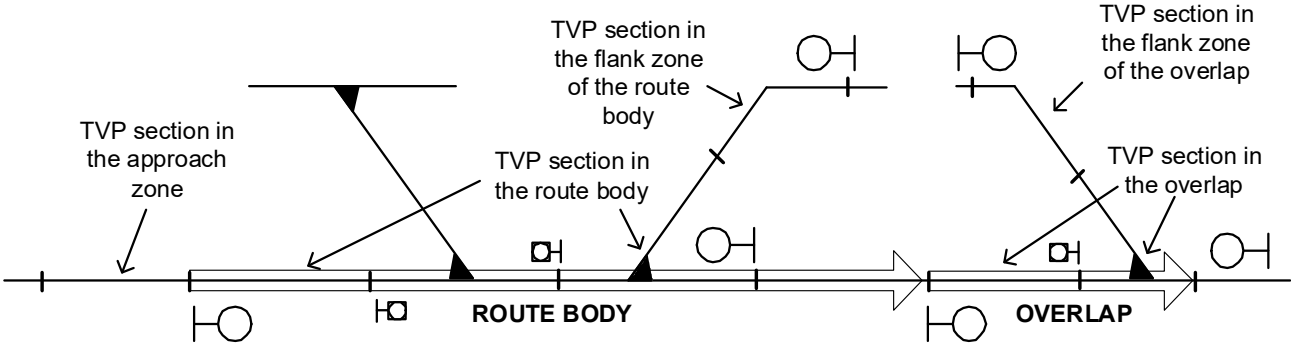
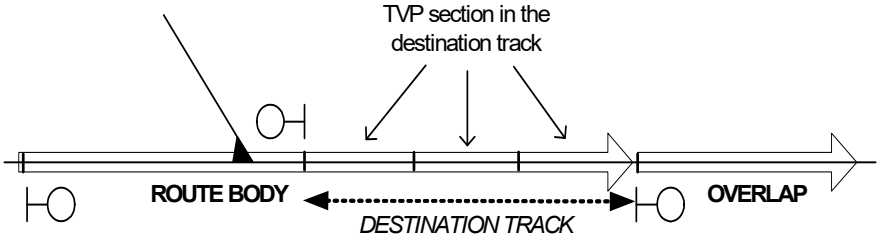
6.2.7	Ability to move the point	31
6.2.8	Point and point machine staggering	31
6.2.8.1	Point staggering	31
6.2.8.2	Point machine staggering	32
6.3	Train detection systems	32
6.3.1	TVP Sections	32
6.3.2	TDP locations	32
6.3.3	Technical and operational identifiers	32
6.3.4	Types of track vacancy proving	32
6.3.4.1	Axle counters	32
6.3.4.2	Track circuits	33
6.3.4.3	Train detection points	33
6.3.5	Power Off Monitoring	34
6.3.5.1	Operational use of POM information	34
6.4	IO elements and systems	35
6.4.1	Functional elements	35
6.4.2	Generic IO definition	36
6.4.2.1	Technical and operational identifiers	36
6.4.3	Application library	39
6.4.4	Constraints with application of subsystem Generic IO	39
6.5	Level Crossing	39
6.5.1	Level Crossing Protection Facility	40
6.5.2	Functions of the subsystem Level Crossing	41
6.5.2.1	Activation and deactivation	41
6.5.2.2	Pre-activation	42
6.5.2.3	Activation and deactivation by local request	42
6.5.2.4	Local operation handover	42
6.5.2.5	Isolation	42
6.5.3	Statuses	42
6.6	Single-element and multi-element controllers	43
6.6.1	Levels and multiplicities	43
6.6.1.1	Communication levels and endpoints	43
6.6.1.2	Multiplicities	44
6.6.2	Essential states	44
6.6.3	Management of SCP connection	44
6.6.4	Scope of model-based specifications	44
6.6.5	Handling of communication inside interlocking	45
6.6.6	Handling of diagnostics, maintenance and security interfaces on multi-element controllers	46
6.6.6.1	Diagnostics interface	46
6.6.6.2	Maintenance interface	46
6.6.6.3	Security interface	46
6.6.7	Handling basic data and basic data identifier	47

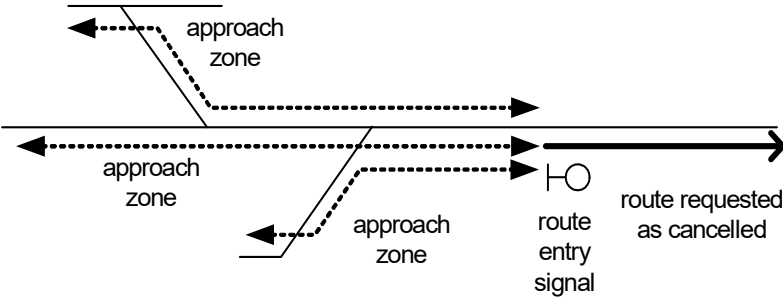
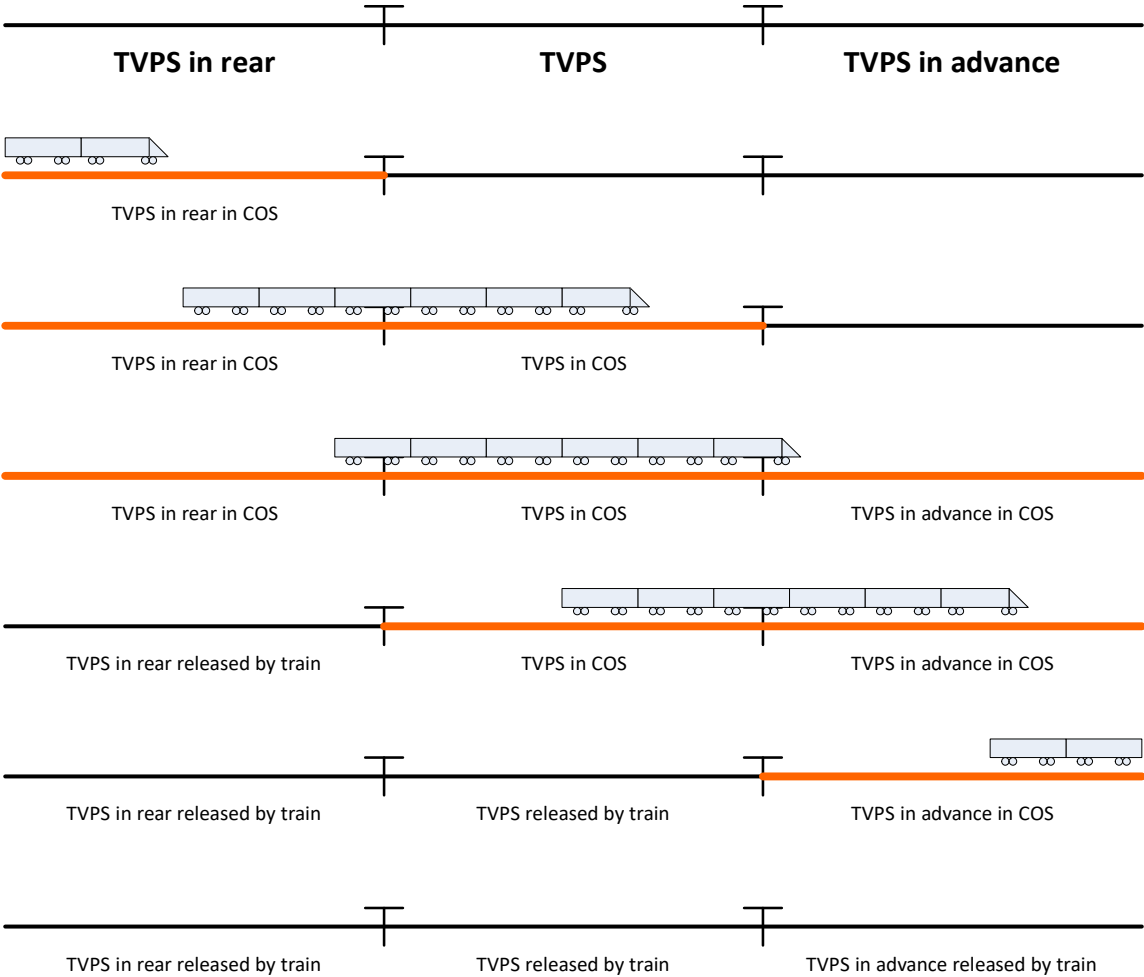
7	Overall timing requirements	47
8	Interlocking system boundaries	47
8.1	Interlocking system boundary definitions	47
8.2	Boundary route across multiple boundaries	49
8.3	Flank protection provision across the boundary	50
8.4	Boundary located in the approach zone of a route	50
8.5	Boundary located in the activation zone of a level crossing	51
8.6	Provision of signalling information for distant signals	52
8.7	Direction	52
8.8	Line status	53
8.9	Application variants	53

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.1	Head	1 Introduction		
Eu.DK.5	Head	1.1 Release information		
Eu.DK.2	Info	[Eu.Doc.10] EULYNX Domain Knowledge CENELEC Phase: 1-5 Version: 1.18 (0.A) Approval date: 29.05.2024		Object Text: [Eu.Doc.10] EULYNX Domain Knowledge CENELEC Phase: 1-5 Version: 1. 16 <u>18</u> (0.A) Approval date: 15 <u>29.06</u> 05.2023 <u>2024</u>
Eu.DK.175	Info	Version history		
Eu.DK.487	Info	version number: 1.14 (0.A) date: 16.05.2022 author: Nico Huurman review: CCB changes: EUGDK-150, EUGDK-154		
Eu.DK.488	Info	version number: 1.15 (0.A) date: 04.04.2023 author: Nico Huurman review: changes: EUGDK-159, EUGDK-160, EUGDK-161, EUGDK-163, EUGDK-165, EUGDK-167, EUGDK-168		
Eu.DK.572	Info	version number: 1.15 (1.A) date: 10.05.2023 author: Nico Huurman review: cluster changes: EUGDK-172, EUGDK-173		
Eu.DK.573	Info	version number: 1.16 (0.A) date: 27.06.2023 author: Nico Huurman review: CCB changes: EUGDK-177, EUGDK-178, EUGDK-180, EUGDK-181		
Eu.DK.574	Info	version number: 1.17 (0.A) date: 21.03.2024 author: Nico Huurman review: cluster changes: EUGDK-186, EUGDK-188, EUGDK-189, EUGDK-190, EUGDK-191, EUGDK-192, EUGDK-193, EUGDK-194, EUGDK-195, EUGDK-198, EUGDK-202		object created after baseline 1.16 (0.A)
Eu.DK.645	Info	version number: 1.18 (0.A) date: 18.06.2024 author: Nico Huurman review: CCB changes: EUGDK-190, EUGDK-203, , EUGDK-207, EUGDK-208, EUGDK-211		object created after baseline 1.16 (0.A)
Eu.DK.3	Head	1.2 Impressum		

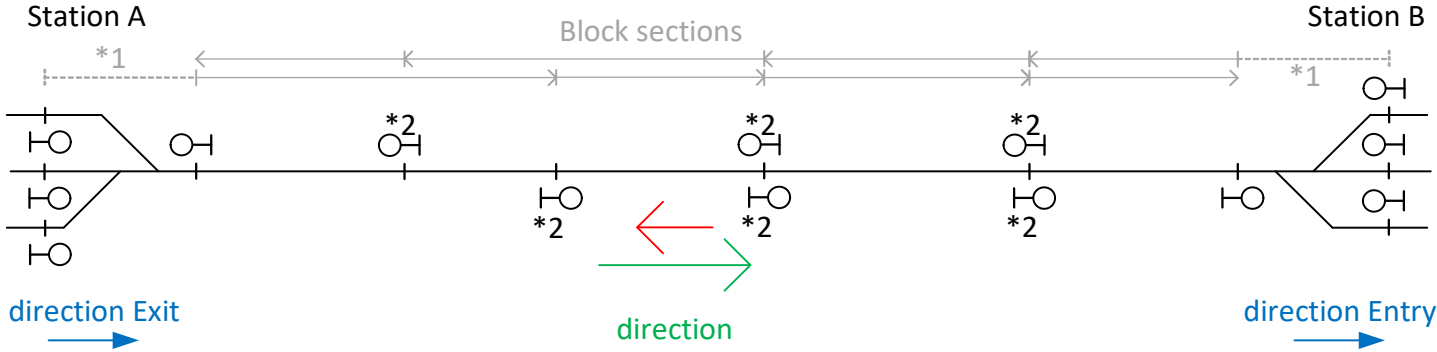
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.4	Info	<p>Publisher: EULYNX Initiative</p> <p>A full list of the EULYNX Partners can be found on https://eulynx.eu/.</p>	EUGDK-211	<p>Object Text: Publisher: EULYNX Initiative</p> <p>A full list of the EULYNX Partners can be found on www.https://eulynx.eu/index.php/members</p> <p>a_JIRA_BL4R3: EUGDK-211</p>
Eu.DK.6	Info	<p>Responsible for this document: EULYNX Project Management Office www.eulynx.eu</p>		
Eu.DK.177	Info	<p>Copyright EULYNX Partners All information included or disclosed in this document is licensed under the European Union Public Licence EUPL, Version 1.2 or later.</p>		
Eu.DK.7	Head	1.3 Purpose		
Eu.DK.8	Info	The purpose of this document is the provision of the domain knowledge relevant for textual and modelled specifications of the EULYNX system.		
Eu.DK.10	Head	2 Routes		
Eu.DK.190	Head	2.1 General definitions		
Eu.DK.191	Info	'Locking' is the supervision in an interlocking system that prevents the movement of elements or their use in another route or area.		
Eu.DK.192	Info	'Monitoring' is an interlocking system process ensuring that the conditions in a route for the display of a movement authority are continuously met.		
Eu.DK.193	Info	'Releasing' is the process of unlocking elements from a route.		
Eu.DK.194	Info	'Cancellation' is the revocation or annulment of a route or part of a route following a request from the signaller.		
Eu.DK.195	Info	'Blocking' is the process of immobilising equipment or provision of protection against train movement into blocked elements or areas.		
Eu.DK.11	Head	2.2 Route Definition		
Eu.DK.12	Info	<p>A route is a predetermined path for a traffic movement. It may consist of the following:</p> <ul style="list-style-type: none"> • <i>the route body</i> • <i>flank protection for the route body</i> • <i>the overlap</i> • <i>flank protection for the overlap</i> • <i>the route elements in rear of the route entry signal</i> 		
Eu.DK.181	Info	Overlap is a defined section of track in advance of the route exit signal, which must be kept clear to avoid the risk of collision should a train inadvertently run past the signal.		
Eu.DK.15	Info	The following diagram displays the terminology for the route and its possible elements.		

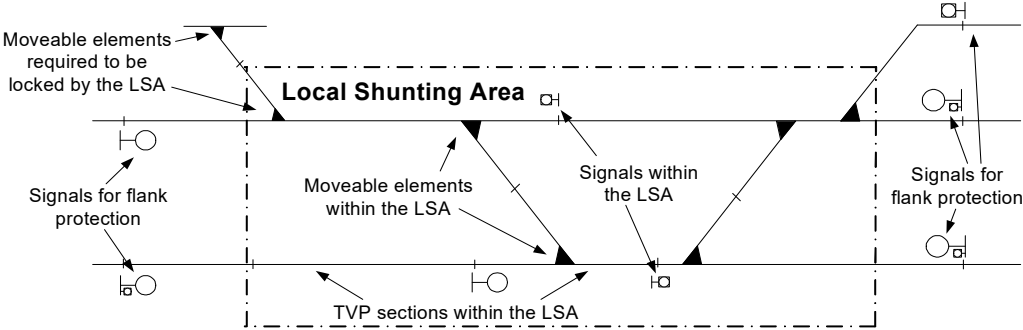
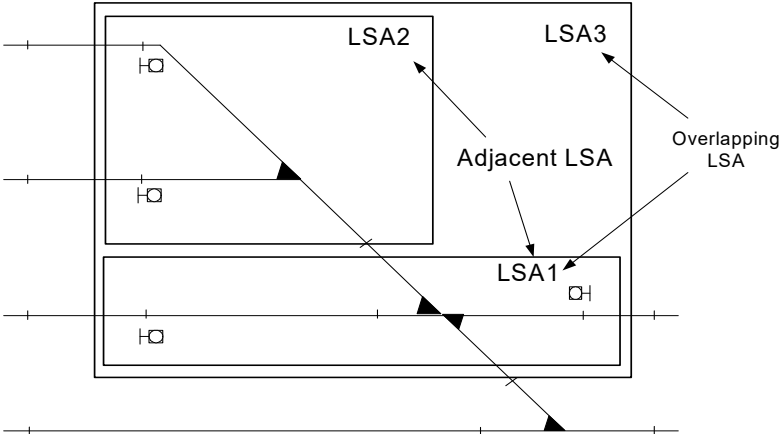
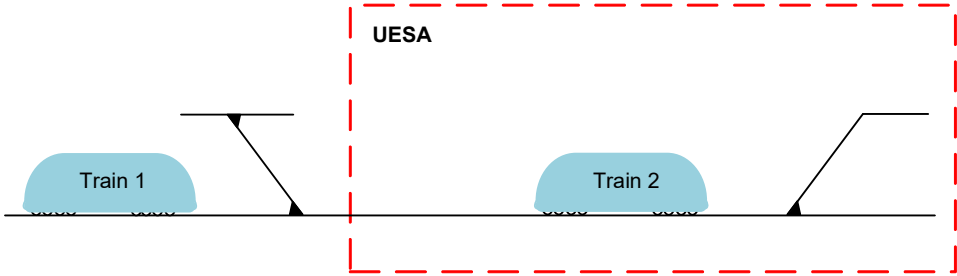
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.16	Info	 <p>The diagram illustrates the components of route protection. A horizontal line represents the track, divided into three main sections: 'ROUTE BODY', 'OVERLAP', and 'OPPOSING MOVEMENT PROTECTION'. The 'ROUTE BODY' section contains a 'sub-route signal' and a 'sub-route signal associated with the route entry signal'. The 'OVERLAP' section contains a 'route exit signal'. Above the track, a large box labeled 'FLANK PROTECTION FOR THE ROUTE' contains two sub-boxes: 'FLANK PROTECTION FOR THE ROUTE BODY' and 'FLANK PROTECTION FOR THE OVERLAP'. Arrows indicate the relationship between these boxes and the signals on the track. A 'route entry signal' is located at the start of the route body, and an 'elements in rear of the route entry signal' are shown to its left. The 'OPPOSING MOVEMENT PROTECTION' section is shown as a separate box to the right of the overlap.</p>		
Eu.DK.17	Info	<p>The elements that are considered as part of the route are:</p> <ul style="list-style-type: none">• <i>route entry signal</i>• <i>route exit signal</i>• <i>sub-route signal (can be a main or a shunting signal)</i>• <i>TVP sections in the route body</i>• <i>TVP sections in the overlap</i>• <i>moveable elements in the route body</i>• <i>moveable elements in the overlap</i>• <i>moveable elements for flank protection</i>• <i>moveable elements in rear of the route entry signal, such as middle points</i>• <i>TVP sections in rear of the route entry signal</i>• <i>lockable devices</i>		
Eu.DK.18	Info	<p>The elements that are not considered as part of the route, but are driven and/or supervised by the route, are:</p> <ul style="list-style-type: none">• <i>signals providing flank protection to the route body</i>• <i>signals providing flank protection to the overlap</i>• <i>opposing signals in the route body</i>• <i>opposing signals to the route body</i>• <i>TVP sections in the flank zone of the route body</i>• <i>TVP sections in the flank zone of the overlap</i>• <i>detection devices</i>• <i>level crossings</i>• <i>line blocks</i>		
Eu.DK.19	Info	<p>Virtual route exit signals may be any of the following:</p> <ul style="list-style-type: none">• <i>dark territory</i>• <i>end of track</i>• <i>open line</i>• <i>stop sign</i>		
Eu.DK.20	Info	<p>The following diagram displays the monitored signals that are not part of the route.</p>		
Eu.DK.21	Info	 <p>The diagram shows a track layout with 'ROUTE BODY' and 'OVERLAP' sections. It highlights signals that are monitored but not part of the route. These include: 'signal providing flank protection to the route body' (a signal above the route body), 'signal providing flank protection to the overlap' (a signal above the overlap), 'opposing signals in the route body' (signals below the route body), and 'opposing signals to the route body' (signals below the overlap). Arrows point from the text labels to the corresponding signal symbols on the track.</p>		

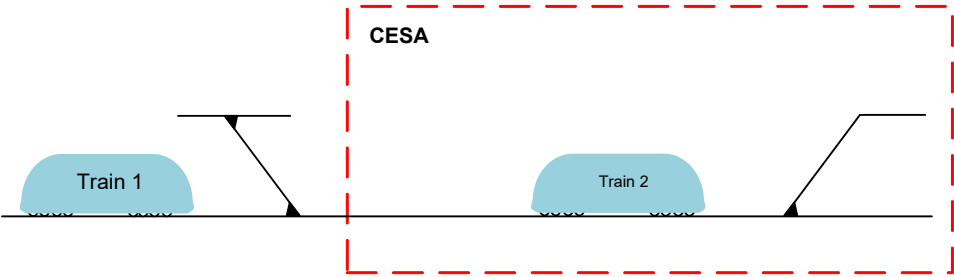
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.22	Info	The following diagram displays the use of TVP sections by a route.		
Eu.DK.23	Info	 <p>The diagram illustrates the use of TVP sections by a route. It shows a horizontal track with several segments. The first segment is labeled 'TVP section in the approach zone'. The second segment is labeled 'TVP section in the route body'. The third segment is labeled 'TVP section in the flank zone of the route body'. The fourth segment is labeled 'TVP section in the flank zone of the overlap'. The fifth segment is labeled 'TVP section in the overlap'. The track is divided into three main sections: 'ROUTE BODY', 'OVERLAP', and 'DESTINATION TRACK'. The 'ROUTE BODY' section contains the first three TVP sections. The 'OVERLAP' section contains the fourth and fifth TVP sections. The 'DESTINATION TRACK' section is shown as a dashed line extending from the end of the 'ROUTE BODY' section.</p>		
Eu.DK.24	Info	The following diagram displays the use of the destination track and its TVP sections.		
Eu.DK.25	Info	 <p>The diagram shows a horizontal track with several segments. The first segment is labeled 'ROUTE BODY'. The second segment is labeled 'TVP section in the destination track'. The third segment is labeled 'OVERLAP'. The track is divided into three main sections: 'ROUTE BODY', 'OVERLAP', and 'DESTINATION TRACK'. The 'ROUTE BODY' section contains the first segment. The 'OVERLAP' section contains the second segment. The 'DESTINATION TRACK' section is shown as a dashed line extending from the end of the 'ROUTE BODY' section.</p>		
Eu.DK.26	Info	The destination track may also contain a middle point. A middle point is a point locked by a route, although located in rear of the route body.		
Eu.DK.27	Info	The destination track may be a dead-end track.		
Eu.DK.28	Head	2.3 Route Life Cycle		
Eu.DK.182	Info	Route setting is the interlocking system process of allocating, positioning and locking moveable track elements into a route.		
Eu.DK.29	Info	A route is considered as: <ul style="list-style-type: none">• <i>'requested' if a request for a route is received by the interlocking system</i>• <i>'rejected' in a situation when the conditions for setting a route are not fulfilled and the route is not set</i>• <i>'prepared' if the route has been requested, but not all objects of the route are available at the time of the request (route preparation ensures operational optimisation by reduction of switching time of route elements)</i>• <i>'initiated' if the route request was accepted, until the moment the route becomes locked</i>• <i>'locked' if all the route elements required to be locked are locked</i>		
Eu.DK.30	Info	An element is considered as: <ul style="list-style-type: none">• <i>'used' if the element is part of a route that is 'initiated' or 'locked'</i>• <i>'locked' if a route requires the element to be locked and the element is locked</i>		
Eu.DK.31	Info	An element is considered as a 'route element' only while it is 'used' by a route. For example, a signal is a route entry signal only if a route exists that uses that signal as a route entry.		
Eu.DK.32	Info	An individual route is intended to be traversed by one train only.		
Eu.DK.33	Info	The use and locking of a route element is particular to an individual route. If the same route is set again, the route element is used and locked in the new route.		
Eu.DK.461	Info	If no contradicting conditions are present, an element can be used and locked in more than one route. For example a point can be in the route body of one route and act as flank protection for another route, if both routes require the point to be locked in the same position.		
Eu.DK.34	Info	A route element that is used and locked in multiple routes shall have the locking applied independently by the different individual routes.		
Eu.DK.183	Info	A 'residual route' remains if part of a route is not released after the passage of a train (e.g. incorrect train operated route release, stopped train, turnback movement).		
Eu.DK.35	Head	2.4 Approach Zone Definition		

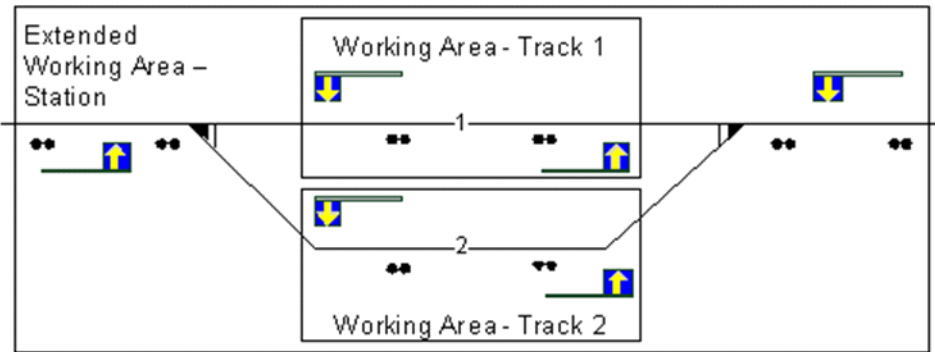
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.36	Info	The approach zone is used to detect a vehicle on a valid approach towards the route entry signal. It provides the conditions governing a delayed or immediate route release after a cancellation request.		
Eu.DK.37	Info	The following diagram displays the use of multiple approach zones for a route.		
Eu.DK.38	Info			
Eu.DK.39	Head	2.5 Route Release		
Eu.DK.40	Info	The following diagrams display the elements used to determine the correct 'occupancy sequence' for train operated route release.		
Eu.DK.372	Info	<p>Correct occupancy sequence (COS) - variant 1</p> 		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.373	Info	<p>Correct occupancy sequence (COS) - variant 2</p> <p>TVPS in rear</p> <p>TVPS</p> <p>TVPS in advance</p> <p>TVPS in rear in COS</p> <p>TVPS in rear in COS</p> <p>TVPS in COS</p> <p>TVPS in COS</p> <p>TVPS in rear released by train</p> <p>TVPS in COS</p> <p>TVPS in rear released by train</p> <p>TVPS in COS</p> <p>TVPS in advance in COS</p> <p>TVPS in rear released by train</p> <p>TVPS released by train</p> <p>TVPS in advance in COS</p> <p>TVPS in rear released by train</p> <p>TVPS released by train</p> <p>TVPS in advance released by train</p>		
Eu.DK.432	Info	For specific train types (e.g. a special transport which does not duly occupy the track sections), the train operated route release may be inhibited. This function can be used as a mitigating measure against a premature release of a train route which can cause a too early locking of a new conflicting train route.		
Eu.DK.196	Head	3 Line block		
Eu.DK.197	Info	A line block is a section of the railway between two stations controlled by a line block system.		
Eu.DK.198	Info	In an automatic line block system, certain fixed signals for block sections are operated automatically by the passage of trains, depending on the state of the line block track.		
Eu.DK.207	Info	In a route based line block system, the fixed signals for the block sections are operated by an interlocking, based on route setting. Route setting can be performed automatically, manually or by an automatic route setting system (ARS).		
Eu.DK.199	Info	A block section is a section of track between two successive block signals, which ensure the protection of trains in the section.		
Eu.DK.208	Info	If the railway section controlled by a line block system consists of more than one track, the line block of each track functions independently.		
Eu.DK.209	Head	3.1 Direction		
Eu.DK.200	Info	A line block track has a determined direction of movement of trains on the track, which is synchronised between the interlocking systems of the two adjacent stations, so that rail vehicle movements can be safely performed in that direction.		
Eu.DK.210	Info	The direction of each track of a railway section controlled by a line block system is set independently.		
Eu.DK.211	Info	A determined direction corresponds to one of the two adjacent stations having the direction set to 'Exit' and the other having the direction set to 'Entry' for the respective track.		

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Eu.DK.212	Info	A station adjacent to a line block can have the direction set to 'no direction'. This state is used upon start-up of the line block system when the last known direction information is not available.		
Eu.DK.378	Info	A station adjacent to a line block can have the direction set to 'idle'. This state is used for a specific line block configuration in which the direction is controlled by route setting and train movement.		
Eu.DK.217	Info	<div>The diagram below shows the main definitions regarding a line block system and direction. <div><div>*1: Depending on national rules regarding stations and open line, the dotted line can be considered as being/ not being part of the first block section</div><div>*2: In an automatic line block system, these block signals can function as signals operated automatically by the passage of trains (see also [Eu.DK.198])</div></div></div>		
Eu.DK.215	Head	3.2 Line block with level crossing		
Eu.DK.216	Info	If a track section with an automatic line block system contains a level crossing, additional functionality may be necessary to combine the automatic functioning of line block (direction and/or line block signals) with the functioning of the level crossing.		
Eu.DK.46	Head	4 Areas		
Eu.DK.95	Head	4.1 General		
Eu.DK.96	Info	Objects in a defined area may be grouped together into areas in order to perform tasks together.		
Eu.DK.97	Info	All areas are implemented during the engineering process, and require an operational identifier assigned to each of them. These identifiers are used by the interlocking system, Radio Block Centre and Traffic Control System for communication about activation and deactivation of the different areas.		
Eu.DK.47	Head	4.2 Local Shunting Area		
Eu.DK.48	Head	4.2.1 Local Shunting Area Definition		
Eu.DK.49	Info	<div>A local shunting area consists of the following elements:</div> <ul style="list-style-type: none">• the TVP sections within the local shunting area• the signals within the local shunting area• the moveable elements within the local shunting area• the lockable devices within the local shunting area• the signals required to display a 'stop' aspect for flank protection• the moveable elements required to be 'locked' before enabling the local shunting area• the lockable devices required to be 'locked' before enabling the local shunting area		
Eu.DK.51	Info	The following diagram displays the terminology for the local shunting area:		
Eu.DK.52	Info			

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Eu.DK.53	Info	The LECP (Local Element Control Panel) is an external panel located trackside which allows the shunter to manipulate with an enabled local shunting area.		
Eu.DK.54	Head	4.2.2 Adjacent or Overlapping Local Shunting Area		
Eu.DK.55	Info	Adjacent or overlapping local shunting areas may be enabled, simultaneously or one after the other.		
Eu.DK.56	Info	All released elements in the resulting local shunting area shall have flank protection when the resulting local shunting area is enabled.		
Eu.DK.57	Info			
Eu.DK.58	Head	4.2.3 Local Shunting Area Life Cycle		
Eu.DK.59	Info	A local shunting area is considered as: <ul style="list-style-type: none">• <i>'initiated' if the request is not rejected, until the local shunting area becomes enabled in the activation process or disabled in the deactivation process</i>• <i>'enabled' if the initiation of the local shunting area is completed</i>• <i>'disabled' if the withdrawal of an initiated or enabled local shunting area is completed</i>		
Eu.DK.98	Head	4.3 Emergency Stop Area		
Eu.DK.99	Info	Emergency stop areas are used when unwanted situations occur. These areas are divided into two categories, unconditional emergency stop areas (UESA) and conditional emergency stop areas (CESA).		
Eu.DK.100	Head	4.3.1 Unconditional Emergency Stop Area		
Eu.DK.102	Info	UESA is also referred to as Emergency stop area. When the area is activated, trains approaching the area (Train 1) will receive a conditional emergency stop. Trains inside the area (Train 2) will receive an unconditional emergency stop. The following diagram displays the UESA scenario:		
Eu.DK.154	Info	UESA scenario 		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.101	Head	4.3.2 Conditional Emergency Stop Area		
Eu.DK.104	Info	CESA is also referred to as Escape area. When this area is activated, trains outside the area (Train 1) will receive a conditional emergency stop. Trains inside the area will not receive any stop messages. The following diagram displays the CESA scenario:		
Eu.DK.155	Info	CESA scenario 		
Eu.DK.106	Head	4.4 Working Area		
Eu.DK.107	Info	Maintenance staff shall be protected technically against train traffic. A working area (WA) is a predefined area where maintenance work can be done safely. Maintenance staff will be able to operate objects (such as points, derailleurs, level crossings and tunnel gates) within an activated WA.		
Eu.DK.108	Head	4.4.1 Working Area Activation		
Eu.DK.109	Info	<p>For activating the working area several steps are required:</p> <ol style="list-style-type: none"><i>The signaller activates the area according to a work order</i><i>The interlocking system receives the activation command, and performs necessary actions to activate the area.</i><i>The interlocking confirms that the area is activated.</i><i>Maintainer confirms presence in the relevant area. This can for example be done with a hand held terminal. The confirmation results in sending the securing command to the interlocking system.</i><i>The interlocking system receives the securing command, and performs necessary actions to secure the area.</i><i>The interlocking confirms that the area is activated and secured.</i> <p>When the working area becomes secured, the signaller will have the possibility to enable transitions to shunting mode.</p>		
Eu.DK.110	Head	4.4.2 Working Area Life Cycle		
Eu.DK.111	Info	<p>A working area is considered as:</p> <ul style="list-style-type: none"><i>‘activated’ if the activation request is not rejected, until the working area becomes secured in the activation process</i><i>‘secured’ if the activation of the working area is completed by confirmation from the maintainer</i><i>‘not activated’ if the withdrawal of an activated or secured working area is completed</i>		
Eu.DK.112	Head	4.4.3 Extended Working Area		
Eu.DK.113	Info	An extended WA will typically consist of two or more adjacent working areas. If a second WA is activated nearby an activated WA it is considered as extended also when the WAs are not overlapping.		

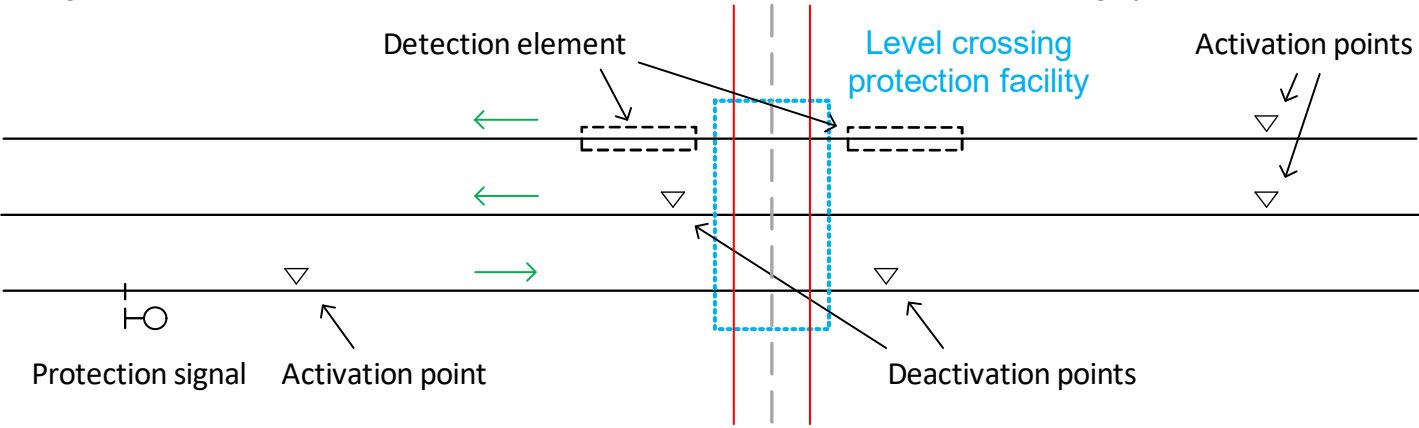
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.156	Info	<div>Example of Extended Working Areas</div> 		
Eu.DK.60	Head	5 Adjacent Systems		
Eu.DK.70	Head	5.1 Radio Block Centre		
Eu.DK.71	Info	This section contains domain knowledge related to the functionality between the interlocking system (EIL) and the Radio Block Centre (RBC).		
Eu.DK.116	Head	5.1.1 RBC General		
Eu.DK.117	Info	<p>The RBC is a computer-based system that elaborates messages to be sent to the train on basis of information received from external trackside systems and on basis of information exchanged with the on-board subsystems. The main objective of these messages is to provide movement authorities to allow the safe movement of trains on the Railway infrastructure area under the responsibility of the RBC. The RBC is used in ETCS level 2. In this level there is a permanent communication between the train and the RBC. The RBC generates the movement authority (MA) considering dynamic and static data from train and track. The static data are part of planning procedure and include for example the position of points and Eurobalises as well as the speed restrictions or gradients on the track. The dynamic data are received by the RBC from the interlocking system and the train.</p>	EUGDK-202 EUGDK-207	<p>Object Text:</p> <p>The RBC is a computer-based system that elaborates messages to be sent to the train on basis of information received from external trackside systems and on basis of information exchanged with the on-board subsystems. The main objective of these messages is to provide movement authorities to allow the safe movement of trains on the Railway infrastructure area under the responsibility of the RBC. The RBC is used in ETCS level 2-and-level-3. In thesethis levelslevel there is a permanent communication between the train and the RBC. The RBC generates the movement authority (MA) considering dynamic and static data from train and track. The static data are part of planning procedure and include for example the position of points and Eurobalises as well as the speed restrictions or gradients on the track. The dynamic data are received by the RBC from the interlocking system and the train.</p> <p>a_JIRA_BL4R3:</p> <p>EUGDK-202 EUGDK-207</p>

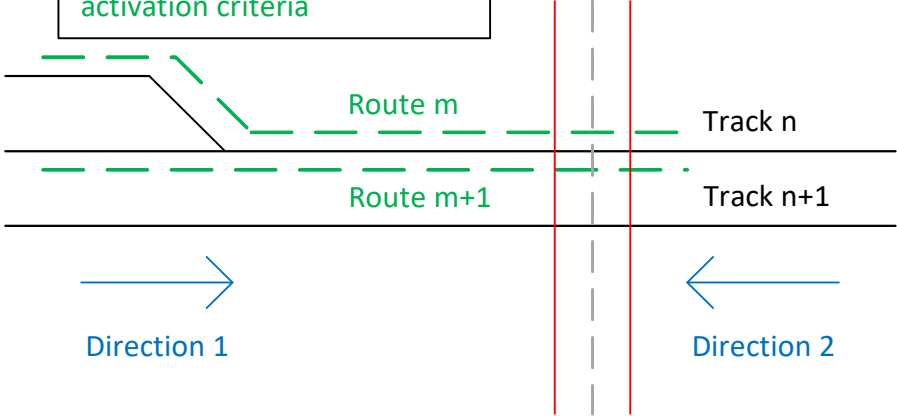
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.157	Info	<p>The relation between the RBC and the interlocking system</p> <pre>graph TD RBC[RBC] -- "requests, triggers, etc..." --> EIL[EIL] EIL -- "status information, etc..." --> RBC RBC --- GSM_R1[GSM-R] GSM_R1 -- "trackside data" --> GSM_R2[GSM-R] GSM_R2 -- "train data" --> GSM_R1 GSM_R2 -- "command and monitor field elements" --> ETCS[ETCS on-board unit] subgraph Track direction LR T1(()) --- T2(()) --- T3(()) --- T4(()) T2 --- Train[Train] end</pre>		
Eu.DK.119	Head	5.1.2 Definition of functions between the interlocking system and the RBC		
Eu.DK.120	Info	Overlap release: The release of overlap section on the track. Normally the EIL will release the overlap timer-driven. With ETCS L2 (or higher) the EIL may release the overlap after a signal which is reserved for overlap release by the ETCS if the RBC has sent permission for the release of the overlap and all of the internal conditions of the EIL are fulfilled.		
Eu.DK.121	Info	Route/sub-route request: The request from the RBC to the interlocking system to lock a particular route or sub-route for a train. A sub-route may be set during start of mission up to the next signal.		
Eu.DK.122	Info	Route release: The release of a route triggered by the RBC.		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.123	Info	Setting signals to dark: Used in German LZB train protection system and ETCS Level 2 (or higher). A line is divided into blocks. If there is no train in the entire line, the entry signal into the first block would be green. If the first block is occupied, the signal would be red. But if the first block is free and an LZB-or-ETCS-led train is approaching, the signal would set to dark and the train would continue just under the LZB/ETCS supervision. The purpose of using dark signals is to not let the driver get used to pass a red light signal.	EUGDK-207	Object Text: Setting signals to dark: Used in German LZB train control protection system and ETCS Level 2 (or higher). A line is divided into blocks. If there is no train in the entire line, the entry signal into the first block would be green. If the first block is occupied, the signal would be red. But if the first block is free and an LZB-or-ETCS-led train is approaching, the signal would set to dark and the train would continue just under the LZB/ETCS supervision. The purpose of using dark signals is to not let the driver get used to pass a red light signal. a_JIRA_BL4R3: EUGDK-207
Eu.DK.124	Info	Route setting trigger: The train runs over designated location and triggers the request for a route.		
Eu.DK.125	Info	Blocking of mixed traffic in defined sections: Functionality used to prevent meeting of passenger trains and freight trains in defined sections, such as tunnels. Operational requirement dictates that passenger trains and freight trains must not encounter in a single-tube (double-tracked) tunnel. The German term for this functionality is 'Tunnelbegegnungsverbot', abbreviated as TBV.		
Eu.DK.126	Info	Group failure: Field elements connected to an EIL may be partitioned into groups of elements due to the HW-architecture of an EIL. If the elements of a group are failed, the EIL sends a group failure message to the RBC in order to avoid a mass of single failure messages, individually for every single element. If elements of more than one group are out of order, the EIL sends to the RBC a separate failure message for each group.		
Eu.DK.383	Head	5.2 Centralised ETCS L1 Controller		
Eu.DK.384	Info	This section contains domain knowledge related to the functionality between the interlocking system (EIL) and the Centralised ETCS L1 Controller (CEC).		
Eu.DK.385	Head	5.2.1 CEC General		
Eu.DK.386	Info	The CEC receives status information from the interlocking system, in a similar way as the RBC receives such information. The CEC then determines, according to engineering data and internal logic, which balise groups should transmit which messages and sends the relevant telegrams into the corresponding Eurobalises via a balise driver.		
Eu.DK.387	Info	The CEC can control the Eurobalises for a whole signalling area (one or several stations). It switches them according to its internal logic and status information from the interlocking system.		
Eu.DK.388	Info	The CEC also incorporates information about temporary speed restrictions (TSRs). This information can be received from the Command Control system or from a dedicated system for TSR management.		
Eu.DK.389	Head	5.2.2 Interfaces		
Eu.DK.390	Info	The CEC receives status information from the interlocking system via the EULYNX interface SCI-RBC.		
Eu.DK.465	Info	The status information received from the interlocking may contain only light signal status, or also include information about the status of other track elements (e.g. points, TVP sections, level crossings). The required status information depends on national specifications for the CEC.		
Eu.DK.391	Info	The CEC receives TSR information from the CC system or the TSR management system via the interface SCI-CC.		
Eu.DK.392	Info	The CEC controls balise drivers via an interface that is not standardised in EULYNX.		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.393	Info	<p>The diagram below shows the architectural location of the CEC and its interfaces</p> <pre>graph TD subgraph Train_Control_System [Train Control System] CCS[Command Control System] TSM[TSR-Management] end CCS --- SCI_CC_routes[SCI-CC (routes)] TSM --- SCI_CC_TSRS[SCI-CC (TSRs)] subgraph Outside_TCS [] SEI[Subsystem – Electronic Interlocking] CETCS[Centralised ETCS L1 Controller] BD[balise driver] end SCI_CC_routes --- SEI SCI_CC_TSRS --- CETCS SEI --- SCI_RBC[SCI-RBC] --- CETCS CETCS --- Telegram[Telegram level (not standardised in current phase)] --- BD</pre>		
Eu.DK.394	Head	5.2.3 Switching order		
Eu.DK.466	Info	In most CEC systems, the balise groups will switch telegrams when the aspect of the associated light signal switches, or directly after the light signal aspect has been switched.		
Eu.DK.395	Info	National specifications (and the followed signalling philosophy) may require that some balise groups may need to be switched before the associated light signals. If this principle is used, a distinction is made between pre-signal and post-signal balise groups.		
Eu.DK.396	Info	Pre-Signal Balise Group are switched before the light signal, to which it is functionally associated, displays a more permissive aspect. The functionality of pre-signal balise groups ensures that a signal is not permitted to display a more permissive aspect in case of balise group failure. In this context, signal balise groups are generally treated as pre-signal balise groups. Signal balise groups are placed in the tracks close to a light signal to which they have a functional link.		
Eu.DK.397	Info	Post-Signal Balise Group are switched after or at the same moment the light signal displays the more permissive aspect already. If there is a failure in setting the post-signal balise groups, national rules decide whether the associated light signal can remain at the permissive aspect or not. In this context, infill balise groups are generally treated as post-signal balise groups. Infill balise group transmit information that is valid for a location in advance.		
Eu.DK.400	Head	5.3 Trackworker Safety System		
Eu.DK.401	Info	This section contains domain knowledge related to the functionality between the interlocking system (EIL) and the Trackworker Safety System (TSS).		
Eu.DK.402	Head	5.3.1 TSS General		
Eu.DK.403	Info	Trackside Safety Systems provide warnings and can apply additional protection for trackside workers. The TSS collects information about the position of trains and rail vehicles from various sources, such as the electronic interlocking. The Control Unit of the TSS processes the train position information and generates a warning message when any train or rail vehicle reaches a trigger point on approach to a warning area.		
Eu.DK.404	Head	5.3.2 TSS architecture and interfaces		

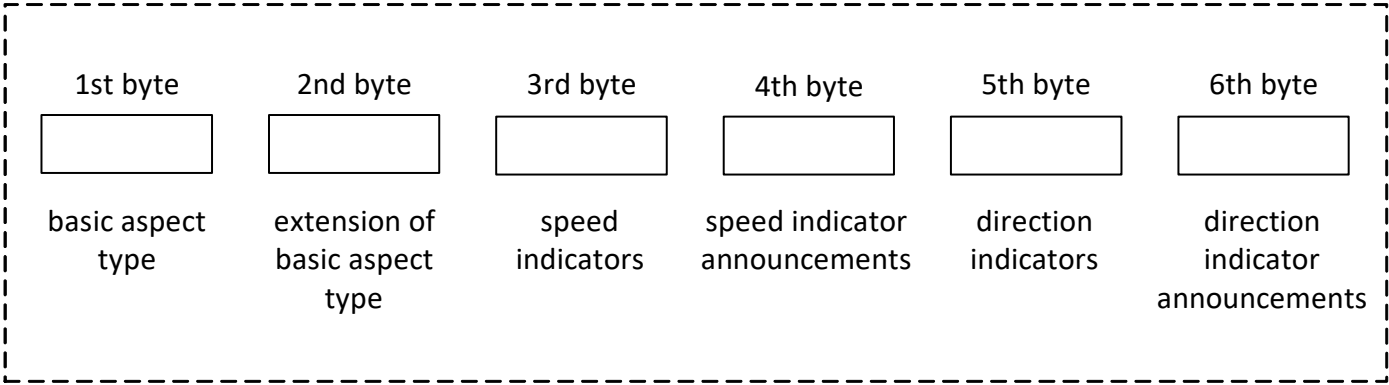
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.405	Info	The TSS in the context of EULYNX is an implementation of a signal controlled warning system (SCWS), as defined in [EN 16704-2-1], consisting of a Control Unit Indoor and a Control Unit Outdoor.		
Eu.DK.406	Info	The Control Unit Outdoor can interface to trackside workers and warning units along the track. The interfaces and implementation of the Control Unit Outdoor are outside the scope of EULYNX. The EULYNX System interfaces only to the Control Unit Indoor, as part of the TSS.		
Eu.DK.407	Info	<p>The diagram below shows the architecture of a TSS and its interfaces</p>		
Eu.DK.408	Head	5.3.3 Warning functions		
Eu.DK.409	Info	To perform the functions of a signal controlled warning system, the TSS receives status information about warning conditions from the interlocking system via a dedicated interface SCI-CC.		
Eu.DK.410	Info	<p>Warning conditions include:</p> <ul style="list-style-type: none"> • Routes set • Signal aspects • Positions of points • Track section occupancy 		
Eu.DK.411	Info	The TSS may have an additional interface to the Radio Block Centre (RBC), also using the interface SCI-CC.		
Eu.DK.412	Info	Additional warning conditions can be received either from the interlocking system or from the RBC, depending on the functional apportionment between these two systems.		
Eu.DK.413	Info	<p>Additional warning conditions include:</p> <ul style="list-style-type: none"> • Train location and speed • Train status 		
Eu.DK.414	Head	5.3.4 Influence functions		
Eu.DK.415	Info	In addition to providing warnings to trackside workers, the TSS can use influence functions to apply additional protection.		
Eu.DK.416	Info	<p><i>Manage Working Areas</i></p> <p>The TSS can command the interlocking system to secure / unsecure working areas, to make sure workers are protected against trains in an identified area.</p>		
Eu.DK.417	Info	<p><i>Set Signal to Stop</i></p> <p>In emergency situations, the TSS can command the interlocking system to set specific light signals to a Stop Aspect to stop trains from approaching a dangerous location.</p>		
Eu.DK.418	Info	<p><i>Delay route setting</i></p> <p>The TSS can command the interlocking system to apply a delay when setting a route and clearing the associated route entry signal. This allows trackside workers additional time to vacate the track in those cases where the route entry signal is located close to the working location.</p>		
Eu.DK.434	Head	5.4 External Level Crossing System		

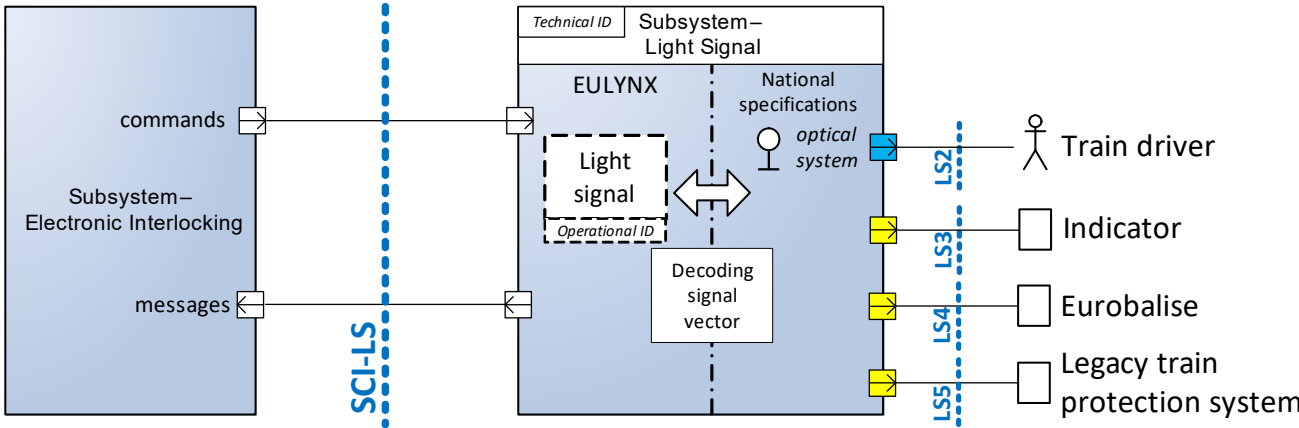
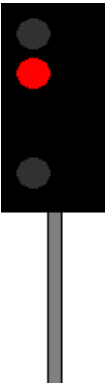
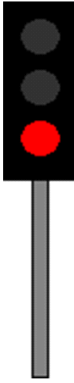

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.438	Info	Systems to prevent collisions between trains and road users at level crossings are integrated to the interlocking system through the subsystem Level Crossing or through the adjacent system External Level Crossing System.		
Eu.DK.439	Info	The adjacent system External Level Crossing System is used to integrate level crossing systems for which the activation and deactivation logic is handled primarily inside the level crossing system, based on commands from the interlocking and on the status of connected (de)activation points and detection elements.		
Eu.DK.440	Info	The adjacent system External Level Crossing System controls one level crossing as a single operational element. The External Level Crossing System contains a level crossing protection facility, as defined in section 6.5 (see Eu.DK.293).		
Eu.DK.441	Info	<p>The figure below shows the main definitions of elements related to the External Level Crossing System.</p> 		
Eu.DK.442	Head	5.4.1 Interacting functions		
Eu.DK.300	Info	<p>Interacting functions are performed in cooperation with the interlocking and related to activation or deactivation of the level crossing protection facility. The interlocking sends activation and deactivation commands to the External Level Crossing System. Multiple principles are used to activate or deactivate the protection facility of a level crossing:</p> <ul style="list-style-type: none"> • Unconditional activation and deactivation • Track/route-related activation and deactivation • Prolonged activation • Control activation point 		
Eu.DK.445	Head	5.4.1.1 Unconditional activation and deactivation		
Eu.DK.443	Info	The start of the activation or deactivation sequence is directly triggered by a command from the interlocking. The unconditional activation (or deactivation) refers to all tracks of the level crossing. That means that the complete level crossing protection facility shall be activated (or deactivated) without conditions on track, direction or route.		
Eu.DK.444	Info	<p>Activation or deactivation may be commanded based on one or more conditions in the interlocking. Examples of conditions leading to an unconditional activation are:</p> <ul style="list-style-type: none"> • a request resulting from a command by the signaller • a request resulting from a command by the Radio Block Centre 		
Eu.DK.308	Head	5.4.1.2 Track/route-related activation and deactivation		
Eu.DK.309	Info	The interlocking commands the External Level Crossing System to expect train movement on a certain track or route. The External Level Crossing System evaluates if the conditions for activation are fulfilled and triggers the activation sequence of the level crossing protection facility as soon as it detects a train on an activated activation point corresponding to the commanded track or route. If no activation point exists for a certain track or route, the activation sequence of the protection facility is triggered immediately.		
Eu.DK.310	Info	The External Level Crossing System triggers the deactivation sequence of the level crossing protection facility when it detects a train on a deactivation point or on a deactivation element corresponding to the commanded track or route (and no trigger for activation is present).		




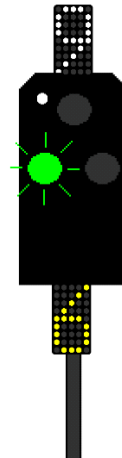
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.350	Info	<p>The figure below shows the main definitions related to track/route-related activation and deactivation.</p> <div><div>Note: Each route can have a different speed and different activation criteria</div></div>		
Eu.DK.311	Head	5.4.1.3 Prolonged activation		
Eu.DK.312	Info	The interlocking commands the External Level Crossing System to remain activated, i.e. to maintain the protection of the level crossing protection area.		
Eu.DK.313	Head	5.4.1.4 Control activation point		
Eu.DK.314	Info	The interlocking commands the External Level Crossing System to activate or deactivate a certain activation point. The External Level Crossing System triggers the activation sequence of the level crossing protection facility as soon as it detects a train on the selected activation point.		
Eu.DK.315	Head	5.4.2 Autonomous functions		
Eu.DK.316	Info	Autonomous functions are performed inside the External Level Crossing System without interaction with the interlocking.		
Eu.DK.317	Head	5.4.2.1 Autonomous activation and deactivation		
Eu.DK.318	Info	The External Level Crossing System triggers the activation sequence of the level crossing protection facility as soon as it detects a train on an activation point configured for autonomous activation.		
Eu.DK.319	Info	The External Level Crossing System triggers the deactivation sequence of the level crossing protection facility as soon as it detects a train on a deactivation point or on a detection element configured for autonomous activation (and no trigger for activation is present).		
Eu.DK.320	Head	5.4.3 Combinations		
Eu.DK.321	Info	It is possible for one External Level Crossing System to use several different principles of activation and deactivation. Depending on different tracks, routes and directions, the level crossing protection facility can be activated by unconditional activation commanded by the interlocking, by a track/route-related activation commanded by the interlocking, by an activation point commanded by the interlocking and/or by an autonomous activation point not commanded by the interlocking.		
Eu.DK.322	Info	At a level crossing covering more than one track, it is possible for several activations to occur (partly) simultaneously. It is the responsibility of the External Level Crossing System to supervise the ' <i>most protective activation envelope</i> ', meaning the level crossing protection facility shall be activated as soon as required by one activation and remain activated until all activations have been concluded by a corresponding deactivation (either commanded or autonomous).		
Eu.DK.323	Head	5.4.4 Auxiliary functions		
Eu.DK.324	Info	Auxiliary functions are performed in cooperation with the interlocking, but not directly related to the activation or deactivation of the level crossing protection facility. The interlocking sends auxiliary commands to the External Level Crossing System.		
Eu.DK.330	Head	5.4.4.1 Set protection signals		
Eu.DK.331	Info	The interlocking can command the External Level Crossing System to set its protection signals to a stop aspect. This may be used when a signaller observes via cameras or by other means notices a dangerous situation on the level crossing protection area.		
Eu.DK.448	Head	5.4.5 Statuses		
Eu.DK.449	Info	The External Level Crossing System informs the interlocking of its status, based on different principles:		




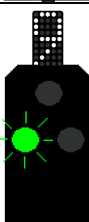



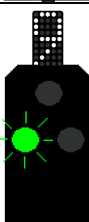



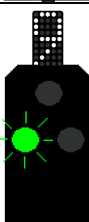

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.450	Info	<i>Functional status</i> This message is used for the statuses of the External Level Crossing System which are required within the interlocking logic.		
Eu.DK.451	Info	<i>Monitoring status</i> This message is used for the statuses of the External Level Crossing System which are required for display to the signaller.		
Eu.DK.452	Info	<i>Failure status</i> This message is used when a failure occurred or is revoked.		
Eu.DK.453	Info	<i>Obstacle detection status</i> This message is used to report an obstacle detected inside the level crossing protection area.		
Eu.DK.454	Info	<i>Detection element status</i> This message is used to report the occupancy status of detection elements.		
Eu.DK.455	Info	<i>Status of activation point</i> This message is used to report the status of activations points.		
Eu.DK.456	Head	5.4.6 Command admissibility		
Eu.DK.457	Info	The monitoring of activation and deactivation is in the logic of the External Level Crossing System. National requirements can request that the subsystem Electronic Interlocking must check the admissibility of commands received from the Traffic Control System which cause a change in the state of the External Level Crossing System. This is a feasibility check of the commands coming from the signaller.		
Eu.DK.458	Info	If a command of the signaller is permitted in the current state of the External Level Crossing System, the signaller receives a confirmation with a positive processing message. If a command of the signaller is not permitted in the current state of the External Level Crossing System, the signaller receives a negative processing message and the command is rejected thereby.		
Eu.DK.459	Info	To reduce the processing time of a command of the signaller and to avoid the forwarding of the admissibility check to the External Level Crossing System, the External Level Crossing System sends the scope of the currently permitted and not permitted signaller commands with each relevant change of state.		
Eu.DK.460	Info	This command admissibility has to be evaluated by the subsystem Electronic Interlocking when a signaller command is received from the Traffic Control System in order to accept or to reject this command.		
Eu.DK.554	Head	5.5 Traffic Control System		
Eu.DK.555	Info	This section contains domain knowledge related to the functionality between the interlocking system (EIL) and the Traffic Control System (TCS).		
Eu.DK.556	Head	5.5.1 TCS General		
Eu.DK.557	Info	In the EULYNX System reference architecture, three systems are considered to be part of the Traffic Control System: <ul style="list-style-type: none"> Command Control System Automatic Route Setting System Train Descriptor 		
Eu.DK.558	Info	Although train operations as well as graphic symbols of infrastructure elements are different on European level, information like the states of infrastructure elements (for example locked, occupied, vacant) may be exchanged between the EULYNX System and the Command Control System as a generic standard.		
Eu.DK.559	Info	There may be multiple scenarios for interfacing the EULYNX System and/or the Radio Block Centre to the Traffic Control System, including: <ul style="list-style-type: none"> single interface to the EULYNX System separate interfaces to the EULYNX System and to the Radio Block Centre single interface to the EULYNX System, which may integrate the functions of both the interlocking system and the Radio Block Centre single interface to the EULYNX System, while the Radio Block Centre interfaces separately to the EULYNX System (without an interface to the TCS) 		
Eu.DK.560	Info	The SCI-CC interface specification will be specified in a common format and structure, regardless whether it is used for interfacing with the EULYNX System, the Radio Block Centre or the Centralised ETCS L1 Controller.		
Eu.DK.561	Info	The SCI-CC interface is not intended for communication between two Traffic Control Systems.		
Eu.DK.562	Info	It is foreseen that individual implementations of the SCI-CC interface protocol will use a full set or a partial subset of the application data, depending on the applied scenario, as defined by national specifications.		

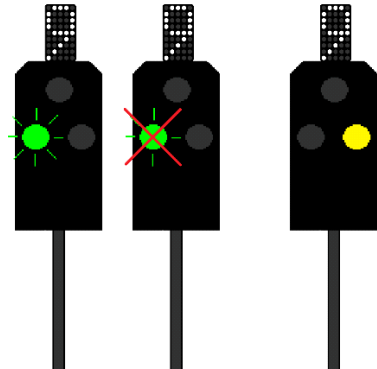
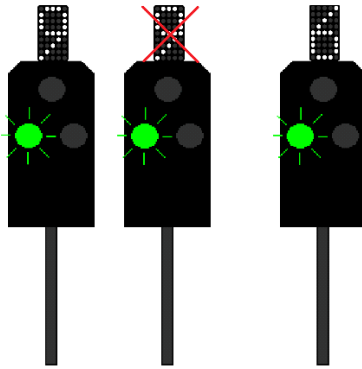
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.424	Head	5.6 EULYNX Interfaces between adjacent systems		
Eu.DK.425	Info	Certain EULYNX interface specifications can also be used to directly connect two adjacent systems to each other.		
Eu.DK.426	Info	The SCI-CC interface specification can also be applied for connecting the Traffic Control System directly to the following adjacent systems: <ul style="list-style-type: none">• the Radio Block Centre• the Centralised ETCS L1 Controller		
Eu.DK.427	Info	The SCI-CC interface specification can also be applied for connecting the Trackworker Safety System directly to the following adjacent systems: <ul style="list-style-type: none">• the Radio Block Centre		
Eu.DK.428	Info	In such cases the functional apportionment must be completed from the perspective of the adjacent system by the system integrator.		
Eu.DK.429	Info	<p>The diagram below displays the use of EULYNX interfaces between adjacent systems</p> <p>----- EULYNX interface applied between adjacent systems</p> <p>Diagram illustrating EULYNX interfaces between adjacent systems:</p> <ul style="list-style-type: none">Trackworker Safety SystemCentralised ETCS L1 ControllerRadio Block CentreTraffic Control SystemSubsystem – Electronic Interlocking <p>Interfaces shown:</p> <ul style="list-style-type: none">SCI-CC (Trackworker Safety System to Centralised ETCS L1 Controller)SCI-RBC (Centralised ETCS L1 Controller to Radio Block Centre)SCI-RBC (Radio Block Centre to Traffic Control System)SCI-CC (Traffic Control System to Subsystem – Electronic Interlocking)		
Eu.DK.72	Head	6 Elements		
Eu.DK.73	Info	This section contains domain knowledge related to individual elements.		
Eu.DK.174	Head	6.1 Light Signals		
Eu.DK.249	Info	Wayside light signal and indicator lamps are integrated to the interlocking system through the subsystem Light Signal.		
Eu.DK.248	Info	The subsystem Light Signal controls one light signal as a single operational element.		
Eu.DK.237	Head	6.1.1 Signal aspect table		
Eu.DK.250	Info	Since signal aspects are different on European level, the aspects are managed on an abstract level and defined through the signal aspect table [Eu.Doc.37].		
Eu.DK.251	Info	In the signal aspect table, all national signal elements or aspects are assigned to generic signal element or aspect names.	EUGDK-193	Object Text: In the signal aspect table, all national signal elements or aspects are assigned to generic signal element or aspect names. a_JIRA_BL4R3: EUGDK-193

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.252	Info	For each generic signal element or aspect name, the signal aspect table defines a value of the corresponding signal vector byte.	EUGDK-193	Object Text: For each generic signal element or aspect name, the signal aspect table defines a value of the corresponding signal vector byte . a_JIRA_BL4R3: EUGDK-193
Eu.DK.253	Info	The signal vector value is the expression of signal aspects used in the communication between the subsystem Light Signal and the subsystem Electronic Interlocking.		
Eu.DK.239	Head	6.1.2 Signal vector		
Eu.DK.254	Info	The signal vector consists of 6 bytes of information. The following diagram displays the structure of the signal vector.		
Eu.DK.255	Info	<div><h3>Signal vector</h3></div>		
Eu.DK.256	Info	The coding of the bytes of the signal vector corresponds to the coding used in the signal aspect table [Eu.Doc.37] and to the telegrams Command “Indicate Signal Aspect” and Message “Indicated Signal Aspect” in the Interface specification SCI-LS [Eu.Doc.33].		
Eu.DK.257	Info	The 6 bytes of the signal vector represent the following information: <ul style="list-style-type: none">• First byte: code for basic aspect types• Second byte: code for extension of basic aspect types• Third byte: speed indicators• Fourth byte: speed indicator announcements• Fifth byte: direction indicators• Sixth byte: direction indicator announcements		
Eu.DK.258	Info	The meaning of each byte value and the relation to corresponding national signal elements or aspects can be found in the signal aspect table [Eu.Doc.37] and related national specification documents.	EUGDK-193	Object Text: The meaning of each byte value and the relation to corresponding national signal elements or aspects can be found in the signal aspect table [Eu.Doc.37] and related national specification documents . a_JIRA_BL4R3: EUGDK-193
Eu.DK.259	Info	The bytes of the signal vector are independent. As an example, the speed indicator byte can take any value described in the signal aspect table, independent of the value of the bytes for the basic aspect, extension, speed indicator announcements and direction indicators. Configuration and engineering data define which combinations of the signal vector byte values constitute a valid signal aspect at an individual signal.		
Eu.DK.260	Head	6.1.3 Commanding the signal aspect		
Eu.DK.261	Info	The subsystem Electronic Interlocking sends the signal vector corresponding to the desired signal aspect to the subsystem Light Signal. It can send additional information that specifies additional rules to be taken into account when transforming the signal vector into a signal aspect.		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)																		
Eu.DK.262	Info	<p>The subsystem Light Signal decodes the received signal vector and transforms it into a signal aspect.</p> <p>National specifications govern the interpretation of the signal vector byte values and any additional rules to drive:</p> <ul style="list-style-type: none">• Signal optics• Indicators• Eurobalises• Legacy train protection systems																				
Eu.DK.263	Info	<p>The national specifications that are needed to drive the above mentioned components shall be covered by the configuration of the national part on the subsystem Light Signal.</p>																				
Eu.DK.264	Info	<p>The diagram below shows the main definitions regarding the subsystem Light Signal.</p> 																				
Eu.DK.268	Info	Examples of simple signal vector values																				
Eu.DK.280	Info	<p>Example 1: Stop / Danger (1)</p> <table><tr><th>1st byte</th><th>2nd byte</th><th>3rd byte</th><th>4th byte</th><th>5th byte</th><th>6th byte</th></tr><tr><td>Basic aspect type</td><td>Extension of basic aspect types</td><td>Speed indicators</td><td>Speed indicator announcements</td><td>Direction indicators</td><td>Direction indicator announcements</td></tr><tr><td>0x01</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte	Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements	0x01	0xFF	0xFF	0xFF	0xFF	0xFF		
1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte																	
Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements																	
0x01	0xFF	0xFF	0xFF	0xFF	0xFF																	
Eu.DK.282	Info	<div><p>DB: Hp 0</p></div> <div><p>NR: Red/Stop/On</p></div> <div><p>SŽ: SZ1</p></div>																				
Eu.DK.283	Info	<p>Example 2: Approach / Caution</p> <table><tr><th>1st byte</th><th>2nd byte</th><th>3rd byte</th><th>4th byte</th><th>5th byte</th><th>6th byte</th></tr><tr><td>Basic aspect type</td><td>Extension of basic aspect types</td><td>Speed indicators</td><td>Speed indicator announcements</td><td>Direction indicators</td><td>Direction indicator announcements</td></tr><tr><td>0x07</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte	Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements	0x07	0xFF	0xFF	0xFF	0xFF	0xFF		
1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte																	
Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements																	
0x07	0xFF	0xFF	0xFF	0xFF	0xFF																	

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)																		
Eu.DK.284	Info	<div><div></div><div></div><div></div></div> <div>DB: Ks 2NR: YellowSŽ: SZ3</div>																				
Eu.DK.269	Info	Examples of compound signal vector values																				
Eu.DK.285	Info	<div>Example 3: Flashing clear (2) with speed indicator and speed indicator announcement 90 km/h in advance of signal, 60km/h at next signal</div> <table><tr><td>1st byte</td><td>2nd byte</td><td>3rd byte</td><td>4th byte</td><td>5th byte</td><td>6th byte</td></tr><tr><td>Basic aspect type</td><td>Extension of basic aspect types</td><td>Speed indicators</td><td>Speed indicator announcements</td><td>Direction indicators</td><td>Direction indicator announcements</td></tr><tr><td>0x06</td><td>0xFF</td><td>0x09</td><td>0x06</td><td>0xFF</td><td>0xFF</td></tr></table>	1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte	Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements	0x06	0xFF	0x09	0x06	0xFF	0xFF		
1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte																	
Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements																	
0x06	0xFF	0x09	0x06	0xFF	0xFF																	
Eu.DK.286	Info	<div></div> <div>DB: Ks 1 with Zs 3, Zs 3v and Zusatzlicht (indicating shortened braking distance)</div>																				
Eu.DK.287	Info	<div>Example 4: Approach / Caution with indicator 'no overlap'</div> <table><tr><td>1st byte</td><td>2nd byte</td><td>3rd byte</td><td>4th byte</td><td>5th byte</td><td>6th byte</td></tr><tr><td>Basic aspect type</td><td>Extension of basic aspect types</td><td>Speed indicators</td><td>Speed indicator announcements</td><td>Direction indicators</td><td>Direction indicator announcements</td></tr><tr><td>0x07</td><td>0x13</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte	Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements	0x07	0x13	0xFF	0xFF	0xFF	0xFF		
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Basic aspect type	Extension of basic aspect types	Speed indicators	Speed indicator announcements	Direction indicators	Direction indicator announcements																	
0x07	0x13	0xFF	0xFF	0xFF	0xFF																	
Eu.DK.288	Info																					

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)																																																			
		<div></div> <p>SŽ: SZ3 with SZ23</p>																																																					
Eu.DK.265	Head	6.1.4 Degradation																																																					
Eu.DK.266	Info	If, for example because of a lamp failure, a light signal cannot show the commanded signal aspect, it must show another valid signal aspect. The alternative aspect shown shall always give a more restrictive instruction to the train driver. The choice of alternative signal aspects to be used in case of degradation is governed by national specifications and must be included in the configuration of the national part on the subsystem Light Signal.																																																					
Eu.DK.267	Info	The process of degradation takes place within the subsystem Light Signal, based on information that has been configured. After applying degradation, the subsystem Light Signal reports to the subsystem Electronic Interlocking the signal aspect that is indicated to the train driver. There is no further interaction with the interlocking.																																																					
Eu.DK.270	Info	Example of degradation																																																					
Eu.DK.281	Info	<table><tr><th rowspan="2">Aspect index</th><th colspan="6">Signal vector value</th><th rowspan="2">Example aspect</th><th rowspan="2">When not available, degrade to aspect index</th></tr><tr><th>1st byte</th><th>2nd byte</th><th>3rd byte</th><th>4th byte</th><th>5th byte</th><th>6th byte</th></tr><tr><td>#1</td><td>0x01</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td></td><td>N/A</td></tr><tr><td>#2</td><td>0x07</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td></td><td>#1</td></tr><tr><td>#3</td><td>0x05</td><td>0xFF</td><td>0x09</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td></td><td>#2</td></tr><tr><td>#4</td><td>0x04</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td></td><td>#2 (not #3)</td></tr></table>	Aspect index	Signal vector value						Example aspect	When not available, degrade to aspect index	1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte	#1	0x01	0xFF	0xFF	0xFF	0xFF	0xFF		N/A	#2	0x07	0xFF	0xFF	0xFF	0xFF	0xFF		#1	#3	0x05	0xFF	0x09	0xFF	0xFF	0xFF		#2	#4	0x04	0xFF	0xFF	0xFF	0xFF	0xFF		#2 (not #3)		
Aspect index	Signal vector value						Example aspect	When not available, degrade to aspect index																																															
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#1	0x01	0xFF	0xFF	0xFF	0xFF	0xFF		N/A																																															
#2	0x07	0xFF	0xFF	0xFF	0xFF	0xFF		#1																																															
#3	0x05	0xFF	0x09	0xFF	0xFF	0xFF		#2																																															
#4	0x04	0xFF	0xFF	0xFF	0xFF	0xFF		#2 (not #3)																																															
Eu.DK.271	Head	6.1.4.1 Lamp dependent degradation																																																					

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)																																																									
Eu.DK.272	Info	If a signal aspect consists of more than one lamp, the degradation can depend on individual lamp failures.																																																											
Eu.DK.273	Info	Example of lamp dependent degradation																																																											
Eu.DK.289	Info	<table><tr><td>Aspect nr.</td><td>Signal vector value</td><td>When not available, degrade to aspect nr.</td></tr><tr><td></td><td><table><tr><td>1st byte</td><td>2nd byte</td><td>3rd byte</td><td>4th byte</td><td>5th byte</td><td>6th byte</td></tr></table></td><td></td></tr><tr><td>#1</td><td><table><tr><td>0x01</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table></td><td>N/A</td></tr><tr><td>#2</td><td><table><tr><td>0x07</td><td>0xFF</td><td>0x06</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table></td><td>#1</td></tr><tr><td>#3</td><td><table><tr><td>0x07</td><td>0xFF</td><td>0x09</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table></td><td>#1 or #2, depending on which lamp fails</td></tr><tr><td>#4</td><td><table><tr><td>0x05</td><td>0xFF</td><td>0x06</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table></td><td>#2 or #1, depending on which lamp fails</td></tr><tr><td>#5</td><td><table><tr><td>0x05</td><td>0xFF</td><td>0x09</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table></td><td>#3 or #4, depending on which lamp fails</td></tr></table>	Aspect nr.	Signal vector value	When not available, degrade to aspect nr.		<table><tr><td>1st byte</td><td>2nd byte</td><td>3rd byte</td><td>4th byte</td><td>5th byte</td><td>6th byte</td></tr></table>	1 st byte	2 nd byte	3 rd byte	4 th byte	5 th byte	6 th byte		#1	<table><tr><td>0x01</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x01	0xFF	0xFF	0xFF	0xFF	0xFF	N/A	#2	<table><tr><td>0x07</td><td>0xFF</td><td>0x06</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x07	0xFF	0x06	0xFF	0xFF	0xFF	#1	#3	<table><tr><td>0x07</td><td>0xFF</td><td>0x09</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x07	0xFF	0x09	0xFF	0xFF	0xFF	#1 or #2, depending on which lamp fails	#4	<table><tr><td>0x05</td><td>0xFF</td><td>0x06</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x05	0xFF	0x06	0xFF	0xFF	0xFF	#2 or #1, depending on which lamp fails	#5	<table><tr><td>0x05</td><td>0xFF</td><td>0x09</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x05	0xFF	0x09	0xFF	0xFF	0xFF	#3 or #4, depending on which lamp fails		
Aspect nr.	Signal vector value	When not available, degrade to aspect nr.																																																											
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#2	<table><tr><td>0x07</td><td>0xFF</td><td>0x06</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x07	0xFF	0x06	0xFF	0xFF	0xFF	#1																																																					
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#3	<table><tr><td>0x07</td><td>0xFF</td><td>0x09</td><td>0xFF</td><td>0xFF</td><td>0xFF</td></tr></table>	0x07	0xFF	0x09	0xFF	0xFF	0xFF	#1 or #2, depending on which lamp fails																																																					
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0x05	0xFF	0x09	0xFF	0xFF	0xFF																																																								
Eu.DK.290	Info	<div><div><p>Case 1: Flashing green lamp fails > yellow lamp lighted instead Ks 1 + Sv 3 (9) > Ks 2 + Sv 3 (9)</p></div><div><p>Case 2: Speed indicator 9 fails > speed indicator 6 lighted instead Ks 1 + Sv 3 (9) > Ks 1 + Sv 3 (6)</p></div></div>																																																											
Eu.DK.274	Head	6.1.4.2 Additional degradation information																																																											
Eu.DK.275	Info	In specific cases, the subsystem Electronic Interlocking can send additional degradation information to the subsystem Light Signal. This can be used when there is more than one option how to apply degradation and the preferred choice depends on which route has been set.																																																											
Eu.DK.276	Info	The subsystem Electronic Interlocking will send this additional information with the commanded signal aspect, independent of the fact whether degradation needs to be applied. If degradation needs to be applied, the subsystem Light Signal will take this additional information into account without further interaction with the interlocking.																																																											
Eu.DK.277	Head	6.1.5 Luminosity																																																											
Eu.DK.278	Info	The brightness of the background of a light signal differs greatly between daylight and night conditions. To ensure optimum visibility of the signal lamps, the luminosity of the light signal is managed. During the daylight period, the signal lamps will be illuminated more brightly, to ensure they stand out against the background. During the night, the lamps are dimmed, to avoid blinding of the train driver.																																																											
Eu.DK.279	Info	Depending on national specifications and local conditions, one of the two luminosities can be defined as the default luminosity of a light signal or signal group.																																																											

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.173	Head	6.2 Points		
Eu.DK.187	Info	Moveable elements, whose position may be changed by a point machine, are integrated to the interlocking system through the subsystem Point.		
Eu.DK.219	Info	The subsystem Point controls one point as a single operational element.		
Eu.DK.188	Info	The subsystem Point is used to control and monitor the point machines of the following elements: <ul style="list-style-type: none">• simple points• double slip points (as two operational elements)• single slip points (as two operational elements)• moveable switch diamond crossings• moveable crossing noses on any of the above (as part of the operational element)• derailleurs		
Eu.DK.468	Info	A point machine has 2 functionalities: a. Moving the point b. Detecting the point position		
Eu.DK.469	Info	There are two possible configurations: - 'Point detector': A point machine with only functionality b. - 'Full functionality': A point machine with functionality a and b.		
Eu.DK.220	Info	A point can be equipped with one or more point machines. In case of more than one point machine, it is possible that some point machines only function as a point detector, without moving the point blades.		
Eu.DK.221	Info	EULYNX specifies the functional interface to the point machine. The physical interface to the point machine is covered by national specifications.		
Eu.DK.222	Info	<p>The diagram below shows the main definitions regarding the subsystem Point.</p> <p>The diagram illustrates the functional and physical interfaces between the Subsystem - Electronic Interlocking and the Subsystem - Point. The Subsystem - Electronic Interlocking (left) sends 'commands' and receives 'messages' from the Subsystem - Point (center). The Subsystem - Point is divided into 'EULYNX' (Technical ID) and 'National specifications' (Operational ID). The 'EULYNX' part contains a 'functional point interface' and a 'Point' block. The 'National specifications' part contains a 'physical point interface'. A dashed double-headed arrow connects the 'functional point interface' and the 'physical point interface'. The 'physical point interface' connects to multiple 'Point machine' blocks (Point machine₁, Point machine₂ (optional), ..., Point machine_n (optional)). A vertical dashed line labeled 'P3' separates the Subsystem - Point from the Point machines. A note box states: 'Note: Point machines 2 to n can also be implemented as point detectors only'.</p>		
Eu.DK.470	Info	There are 2 implementation variants of the functional interface to the point machine: - non-4-wire - 4-wire		
Eu.DK.471	Info	For the non-4-wire implementation, EULYNX only defines functional input and output information.		
Eu.DK.472	Info	For the 4-wire implementation, the input information is represented as 4-wire patterns.		
Eu.DK.473	Info	The 4-wire pattern consists of four digits, each being in a state of „1" or „0". The state of „1" represents a closed contact in the 4-wire circuit while „0" represents an open contact in the 4-wire circuit.		
Eu.DK.474	Info	There are four contact pairs, where each pair is represented by a specific digit in the 4-wire pattern (ABCD): Contact 1+3 -> Digit A Contact 1+4 -> Digit B Contact 2+4 -> Digit C Contact 2+3 -> Digit D		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.476	Info	<p>The figure shows a schematic representation of the 4-wire circuit</p>		
Eu.DK.585	Head	6.2.1 Point position	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.587	Head	6.2.1.1 Commanded point position	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.586	Info	The position of the point as commanded from the Subsystem - Electronic Interlocking to Subsystem - Point. It can be one of the following positions: 'End position (commanded)' with value either left or right.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.588	Info	End position (commanded) Command to move the Moveable element to the left or right 'End position (physical)'.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.589	Head	6.2.1.2 Physical point position	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.590	Info	The position of the point as physically present and detectable at the moveable component. It can be one of the following positions: 'End position (physical)' with value either left or right or 'Intermediate position (physical)'.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.591	Info	End position (physical) Detectable position of the moveable component that safely guides a rail vehicle to either the left or right branch.	EUGDK-190 EUGDK-202	object created after baseline 1.16 (0.A)
Eu.DK.592	Info	Intermediate position (physical) Position of the moveable component that cannot guarantee safe guidance of a rail vehicle. This position may be caused by trailing, obstruction of the moveable element or other unforeseen events.	EUGDK-190 EUGDK-202	object created after baseline 1.16 (0.A)
Eu.DK.499	Head	6.2.1.3 Detected point position	EUGDK-190	Object Heading: Point Detected machinepoint position a_JIRA_BL4R3: EUGDK-190
Eu.DK.500	Info	The subsystem Point interprets the signal at the point machine or point detector interface, corresponding to the physical position of the moveable component. As a simplification, this is expressed as the point machine or point detector 'detecting' the position of the moveable component.		
Eu.DK.593	Info	The position of the point as interpreted by the Subsystem – Point for a single Point machine can be one of the following positions: 'End position (detected)' with value either left or right, 'No end position (detected)' or 'Unintended position (detected)'.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.501	Info	End position (detected) The point machine reliably detects that the moveable component of the point is in a 'End position (physical)' (left or right) at the location of a point machine.	EUGDK-190	Object Text: End position (left or right detected)

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
		In case the subsystem Point is implemented with the 4-wire variant of the interface to the point machine, the 'End position (detected)' corresponds to the 'End position (physical)' only if it also corresponds to the last received 'End position (commanded)'.		<p>The point machine reliably detects that the moveable component <u>of the point</u> is either in <u>thea 'End position (physical)'</u> (left or right) <u>at the location of a point machine.</u></p> <p><u>In case the subsystem Point is implemented with the 4-wire variant of the interface to the point machine, the 'End position (detected)'</u> corresponds to the <u>'End position (physical)'</u> only if it also corresponds to the last received 'End position_ (commanded)'.</p> <p>a_JIRA_BL4R3: EUGDK-190</p>

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.503	Info	<p><i>Unintended position (detected)</i></p> <p>The point machine is able to reliably detect that the moveable component of the point is in an 'Intermediate position (physical)'.</p> <p>In case the subsystem Point is implemented with the 4-wire variant of the interface to the point machine, this detected point position also occurs when the moveable component of the point is in an 'End position (physical)' that does not correspond to the last received 'End position (commanded)' at the location of a point machine.</p> <p>This detection of an 'unintended position' may be caused by a trailing movement or occur for other reasons.</p> <p>This detected point position is always used if the subsystem Point is implemented with the 4-wire variant of the interface to the point machine. If the subsystem Point is implemented with the non-4-wire variant of the interface to the point machine, this detected point position is only used in implementations that can reliably detect the 'Intermediate position (physical)'.</p>	EUGDK-190	<p>Object Text:</p> <p>Unintended position <u>(detected)</u> If<u>The point machine is able to reliably detect that the moveable component of the point is in an 'Intermediate position (physical)'.</u></p> <p><u>In case the subsystem Point is implemented aswith athe 4-wire variant of the interface, to the point machine, is this able detected to point reliably position detect also that occurs when the moveable component of the point is in an 'End position (physical)' that does not correspond to the commanded last end received 'End position (commanded)' at the location of a point machine.</u></p> <p>This detection of an 'unintended position' may be caused by a trailing movement or occur for other reasons. If <u>This detected point position is always used if the subsystem Point is implemented aswith athe non-4-wire variant of the interface, to the point machines machine.</u> <u>If may the not subsystem be Point equipped is implemented with the functionality non-4-wire variant of the interface to the point machine, this detected point position is only used in implementations that can reliable detect an the 'unintended' Intermediate position (physical)'.</u> a_JIRA_BL4R3: <u>EUGDK-190</u></p>
Eu.DK.502	Info	<p><i>No end position (detected)</i></p> <p>In case the subsystem Point is implemented such that it uses the Unintended position (detected), the No end position (detected) means that the point machine is not able to reliably detect that the moveable component of the point is either in an 'End position (detected)' or in a 'Unintended position (detected)' at the location of a point machine.</p> <p>In case the subsystem Point is implemented such that it does not use the Unintended position (detected), the No end position (detected) means that the point machine is not able to detect that the moveable component of the point is in an 'End position (detected)' at the location of a point machine.</p>	EUGDK-190	<p>Object Text:</p> <p>No end position <u>(detected)</u> If<u>In case the subsystem Point is implemented as such that a 4-wire it interface uses the Unintended position (detected), the No end position (detected) means that the point machine is not able to reliably detect neither that end the position moveable nor component of the point is either in an unintended 'End position of (detected)' or in a 'Unintended position (detected)' at the moveable location component of a</u></p>

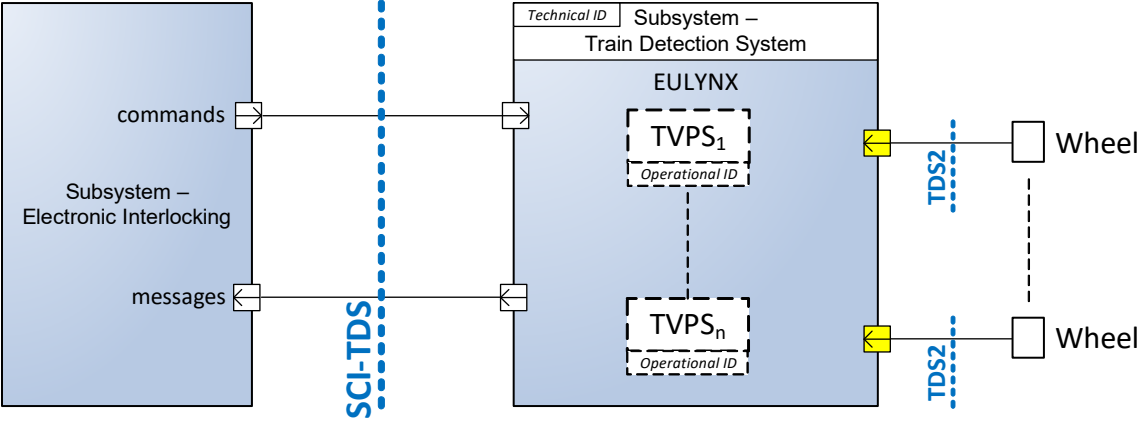
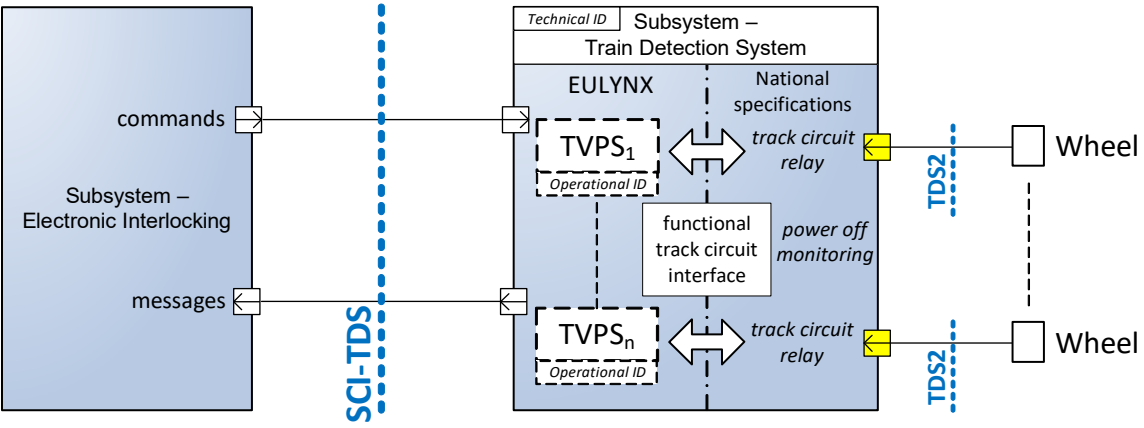
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
				point machine. If In case the subsystem Point is implemented as such that non-4-wire it interfaces does not use the Unintended position (detected), the No end position (detected) means that the point machine is not able to detect that the moveable component is of not the point is in either an end 'End position (detected)' at the location of a point machine. a_JIRA_BL4R3: EUGDK-190
Eu.DK.504	Head	6.2.1.4 Overall point position		
Eu.DK.505	Info	<p>When a moveable element is equipped with more than one point machine interface to the subsystem Point (some of them may be only point detectors), their inputs must be combined and consolidated into an overall point position that is reported to the interlocking.</p> <p>When a moveable element is equipped with only one point machine interface, the overall point position directly corresponds to the detected point position.</p>	EUGDK-208	Object Text: When a moveable element is equipped with more than one point machine interface to the subsystem Point (some of them may be only point detectors), their inputs must be combined and consolidated into an overall point position that is reported to the interlocking. When a moveable element is equipped with only one point machine interface, the overall point position directly corresponds to the detected point position. a_JIRA_BL4R3: EUGDK-208
Eu.DK.594	Info	The point position as consolidated by the subsystem Point based on the detected point position of each point machine can be one of the following positions: 'End position (overall)' with value either left or right, 'No end position (overall)', or 'Unintended position (overall)'.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.507	Info	<p><i>End position (overall)</i></p> <p>This overall position is reported to the interlocking only when all configured point machines of the subsystem Point detect the corresponding 'End position (detected)', either left or right.</p>	EUGDK-190	Object Text: End position (left or right overall) This overall position is reported to the interlocking only when all configured point machine machines of the subsystem Point detect the corresponding end End position (detected)', either left or right. a_JIRA_BL4R3: EUGDK-190

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.508	Info	<i>Unintended position (overall)</i> This overall position is reported to the interlocking as soon as at least one point machine of the subsystem Point detects an 'Unintended position (detected)'.	EUGDK-190	Object Text: Unintended position (overall) This overall position is reported to the interlocking as soon as at least one point machine of the subsystem Point detects an unintended 'Unintended position (detected) '. a_JIRA_BL4R3: EUGDK-190
Eu.DK.509	Info	<i>No end position (overall)</i> This overall position is reported to the interlocking whenever the detected inputs from the configured point machines of the subsystem Point don't correspond to an 'End position (overall)' or to an 'Unintended position (overall)'.	EUGDK-190	Object Text: No end position (overall) This overall position is reported to the interlocking whenever the detected inputs from the configured point machines of the subsystem Point don't correspond to an end 'End position (overall) ' or to an unintended 'Unintended position (overall) '. a_JIRA_BL4R3: EUGDK-190
Eu.DK.595	Head	6.2.1.5 Reported point position	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.596	Info	Point position report sent from the subsystem Point to the electronic interlocking, directly corresponding to the overall point position. It can be one of the following positions: 'End position (reported)' with value either left or right, 'No end position (reported)' or 'Unintended position (reported)'.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.506	Info	The functionality of the subsystem Point does not contain any 'memory' of the reported state. As soon as the conditions are fulfilled to report a different state, the new state is reported to the EIL.		
Eu.DK.477	Head	6.2.2 Degraded point position		
Eu.DK.475	Info	When a moveable element is equipped with more than one point machine interfaces to the subsystem Point (some of them may be only point detectors), more elaborate information about the overall position of the element is available in the subsystem. Some of this information can be useful for the interlocking system to increase availability of the infrastructure.		
Eu.DK.597	Info	The 'degraded point position' is determined independently from the 'overall point position', based on the 'detected point position' of each configured point machine. The 'degraded point position' is reported to the electronic interlocking independently from the 'reported point position'.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.478	Info	In certain 'degraded' states, the point position may be deemed reliable enough to provide flank protection to other routes. It is not reliable enough to drive over the point with normal speed. The use of the 'degraded' position depends on national implementation in the interlocking logic.		
Eu.DK.479	Info	For this purpose, two levels of reliability are defined for detected point positions.		
Eu.DK.480	Info	<i>End position (left or right)</i> The moveable element can be used to satisfy any operational need. E.g., points in route body and overlap or flank protection.		
Eu.DK.481	Info	<i>Degraded position (left or right)</i> The moveable element can only be used for specific operational needs. E.g., only limited flank protection can be accepted.		
Eu.DK.482	Info	To determine the level of reliability of the detected overall position, each point machine must be configured as 'crucial' or as 'non-crucial', depending on how crucial the position detected by that point machine is to determine the overall position. At least one point machine (the only point machine when the moveable element is equipped with only one point machine interface) must be configured as 'crucial'.	EUGDK-208	Object Text: To determine the level of reliability of the detected overall position, each point machine must be configured as 'crucial' or as 'non-crucial', depending on how crucial the position detected by that point machine is to determine the overall position. At

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
				least one point machine (the only point machine when the moveable element is equipped with only one point machine interface) must be configured as 'crucial'. a_JIRA_BL4R3: EUGDK-208
Eu.DK.483	Info	To be able to report an end position to the interlocking system, all point machines, whether they are configured as 'crucial' or 'non-crucial', must be detecting the same end position.		
Eu.DK.484	Info	To be able to report a degraded position to the interlocking system, all point machines, which are configured as 'crucial' must be detecting the same end position. The point machines configured as 'non-crucial' don't need to detect the same end position, as long as they don't detect the opposite end position.	EUGDK-207	Object Text: To be able to report a degraded position to the interlocking system, all point machines, which are configured as "crucial" must be detecting the same end position. The point machines configured as "non-crucial" don't need to detect the same end position, as long as they don't detect the opposite end position. a_JIRA_BL4R3: EUGDK-207
Eu.DK.485	Info	If there is no need to report degraded positions to the interlocking system, e.g. because the interlocking logic doesn't use this information, all point machines can be configured as 'crucial'.	EUGDK-207	Object Text: If there is no need to report degraded positions to the interlocking system, e.g. because the interlocking logic doesn't use this information, all point machines can be configured as "crucial". a_JIRA_BL4R3: EUGDK-207
Eu.DK.643	Head	6.2.3 Point position overview diagram	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.644	Info	The figure below gives an overview of the terminology related to point position See Figure 1 on page 55.	EUGDK-190	object created after baseline 1.16 (0.A)
Eu.DK.575	Head	6.2.4 Point machine numbering	EUGDK-186	object created after baseline 1.16 (0.A)
Eu.DK.576	Info	If a point is equipped with more than one point machine, all point machines are numbered from 1 until n. The ordered numbering does not imply a specific position along the moveable point blades.	EUGDK-186	object created after baseline 1.16 (0.A)
Eu.DK.577	Info	For the purpose of detecting the degraded position, there is a distinction between 'crucial' and 'non-crucial' point machines. There must always be at least one 'crucial' point machine.	EUGDK-186 EUGDK-207	object created after baseline 1.16 (0.A)
Eu.DK.578	Info	If a point is equipped with more than one 'crucial' point machine, the 'crucial' point machines are numbered from 1 until i. The ordered numbering of 'crucial' point machines is independent from the ordered numbering of all point machines.	EUGDK-186 EUGDK-207	object created after baseline 1.16 (0.A)
Eu.DK.579	Info	If a point machine is equipped with 'non-crucial' point machines, the 'non-crucial' point machines are numbered 1 until k. The ordered numbering of 'non-crucial' point machines is independent from the ordered numbering of all point machines.	EUGDK-186 EUGDK-207	object created after baseline 1.16 (0.A)
Eu.DK.580	Info	The total number of point machines (n = any number starting from 1) equals the total number of 'crucial' point machines (i = any number starting from 1) plus the total number of 'non-crucial' point machines (k = any number starting from 0), n = i + k.	EUGDK-186 EUGDK-207	object created after baseline 1.16 (0.A)

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.486	Head	6.2.5 Crank handle operation		
Eu.DK.189	Info	Crank handle operation is used to operate a point machine by hand. For staff safety reasons, point machines are isolated from the power at the point machine when a crank handle is in use.		
Eu.DK.510	Head	6.2.6 Trailing evaluation in the interlocking		
Eu.DK.511	Info	The required functionality related to detecting trailing on the functional level of the interlocking depends heavily on national signalling regulations and practices, which in their place depend on national operational rules.		
Eu.DK.512	Info	On this functional level, position information from the individual point may be combined with other information available in the EIL, e.g. occupancy of TVP sections or route statuses, to conclude that a point is in a state that must be considered 'trailed'.		
Eu.DK.513	Info	The conclusion that a certain point must be considered 'trailed' may also be based only on position information from the point object controller. For this, it is needed that the subsystem point reports 4 states, so it is possible to distinguish a detected 'unintended position' from a loss of position detection.		
Eu.DK.514	Info	The conditions to no longer consider a certain point as 'trailed' again depend on national operational and signalling rules.		
Eu.DK.603	Head	6.2.7 Ability to move the point	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.604	Info	The subsystem Point may be equipped with functionality to supervise its ability to move the point and report this to the electronic interlocking.	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.605	Info	This functionality can be used to supervise failures which cause unavailability of power to drive the point machines. Having this information available in the interlocking avoids sending futile commands to move a point, which would certainly lead to a timeout, and can thereby increase the availability of the infrastructure.	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.606	Info	This functionality can also be used to prevent unwanted movement of a point during construction or operational restrictions, as the maintainer can set a switch that disables the movement. It is preferable to not disconnect or turn off the subsystem point, as the supervision of the point position could still be needed to provide flank protection to neighbouring routes.	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.607	Info	The ability to move is monitored for each configured point machine and in the subsystem Point itself.	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.608	Info	Inability to move at the level of one point machine may be caused, for example, by: <ul style="list-style-type: none"> • A malfunction of the point machine motor • A switch or other type of input that disables the point machine 	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.609	Info	Inability to move at the level of the subsystem Point may be caused, for example, by: <ul style="list-style-type: none"> • Insufficient voltage to provide drive power to the point machines • A malfunction in the control of drive power to the point machines • A switch or other type of input that disables point movement 	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.610	Info	When the subsystem Point detects inability to move at any point machine or at the level of the subsystem itself, it reports the inability to the electronic interlocking. It also stops any ongoing point movement and does not start any new movement.	EUGDK-192	object created after baseline 1.16 (0.A)
Eu.DK.611	Head	6.2.8 Point and point machine staggering	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.612	Info	The moving of point machines has significant power consumption, with a characteristic peak at the start of the movement.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.613	Info	When multiple point machines simultaneously start a movement, the power consumption may exceed the capacity of the power supply system.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.614	Info	To optimise the use of the available power supply and improve availability, it may be needed to slightly delay the start of movement of points or individual point machines, called 'staggering'.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.615	Head	6.2.8.1 Point staggering	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.616	Info	The setting of a certain route may require a change of position of several points. If the interlocking commands each subsystem Point simultaneously, the start of movement of their respective point machines will very likely overlap.	EUGDK-194	object created after baseline 1.16 (0.A)

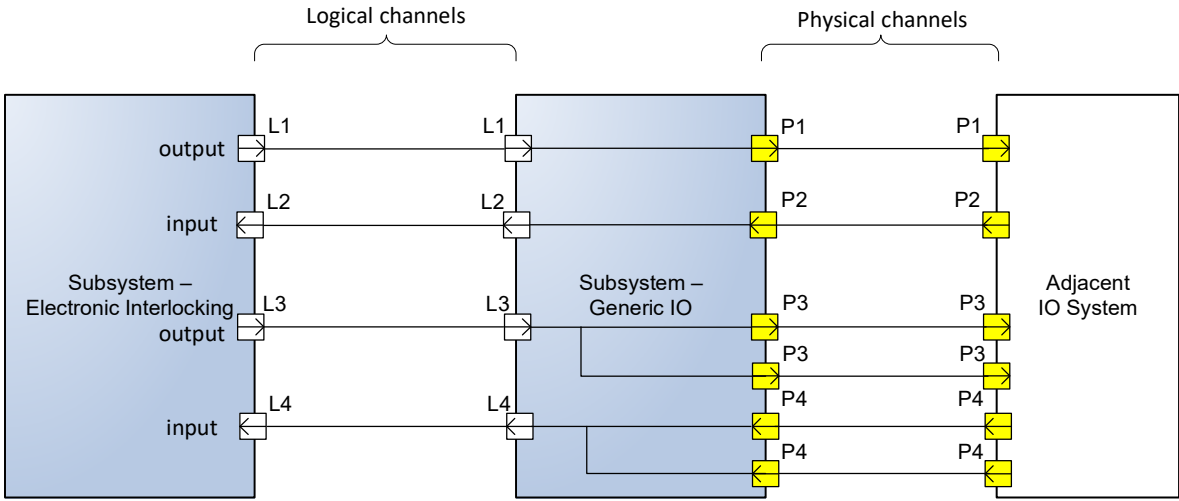
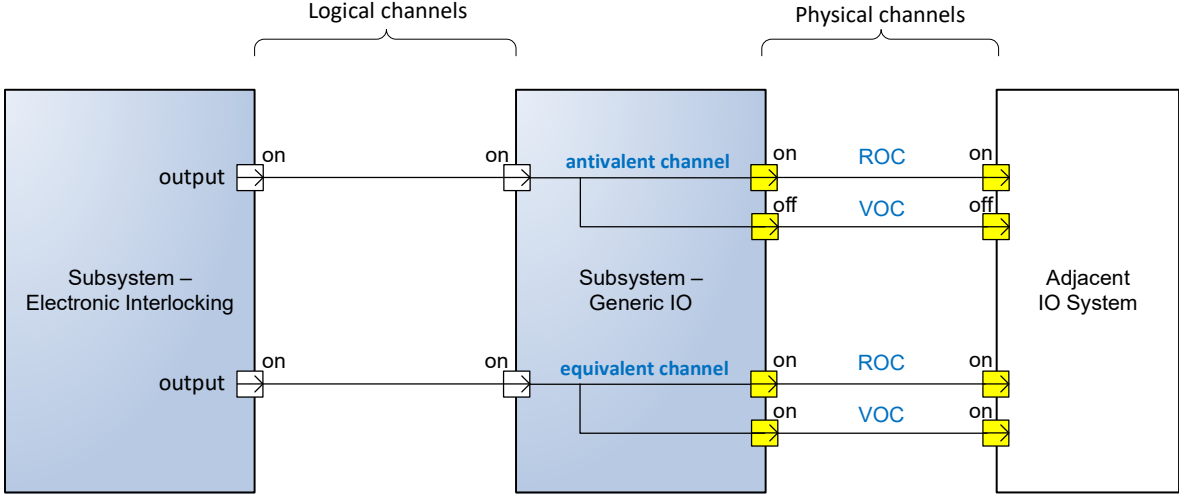
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.617	Info	To avoid this, the interlocking can intentionally add a small delay before sending a command to move to subsequent subsystems Point. This functionality is part of the interlocking logic, which is covered by national specifications.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.618	Head	6.2.8.2 Point machine staggering	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.619	Info	A subsystem Point may control one point with multiple point machines. If the subsystem Point starts each of its point machines simultaneously, the start of movement will overlap. This may cause the power consumption for that point to exceed the power supply limits.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.620	Info	To avoid this, the subsystem Point can intentionally add a small delay before starting subsequent point machines. This functionality is not in scope of the harmonised requirements, it is covered by national specifications.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.621	Info	Apart from the control of power consumption, there may also be reasons related to the physical design of the moveable elements that require specific timing of the movement of individual point machines.	EUGDK-194	object created after baseline 1.16 (0.A)
Eu.DK.206	Head	6.3 Train detection systems		
Eu.DK.223	Info	Track vacancy proving (TVP) and Train detection point (TDP) functions are integrated to the interlocking system through the subsystem Train Detection System (TDS). Track vacancy proving may be implemented with track circuits or axle counting systems. Train detection points may be implemented with the same wheel sensors used for track vacancy proving using an axle counter system or with separate wheel sensors. One subsystem Train Detection System may control one or many TVP sections and TDP locations.		
Eu.DK.224	Head	6.3.1 TVP Sections		
Eu.DK.225	Info	Track vacancy proving is the function that proves that a defined section of track is vacant. For this purpose, the track is divided into distinct portions, or TVP sections (TVPS). One subsystem Train Detection System may control more than one TVP section.		
Eu.DK.489	Head	6.3.2 TDP locations		
Eu.DK.490	Info	The Train detection point function proves that a train passes a defined track location. For this purpose, a wheel detection sensor is located at a position on the track to identify the passing of train wheels in a certain direction.		
Eu.DK.226	Head	6.3.3 Technical and operational identifiers		
Eu.DK.227	Info	The subsystem TDS has a technical identifier. In telegrams that are exchanged between the subsystem TDS and the subsystem Electronic Interlocking and relate to the generic behaviour of the subsystem TDS, the technical identifier of the subsystem TDS is used as identifier of the sender or receiver respectively.		
Eu.DK.228	Info	Every TVPS that is controlled by a subsystem TDS has an operational identifier. In telegrams that are exchanged between the subsystem TDS and the subsystem Electronic Interlocking and regard the specific behaviour of individual TVP sections, the operational identifier of the TVPS is used as identifier of the sender or receiver respectively.		
Eu.DK.491	Info	Every TDP that is controlled by a subsystem TDS has an operational identifier. In telegrams that are exchanged between the subsystem TDS and the subsystem Electronic Interlocking and concern the specific behaviour of individual TDP locations, the operational identifier of the TDP is used as identifier of the sender or receiver respectively.		
Eu.DK.229	Head	6.3.4 Types of track vacancy proving		
Eu.DK.230	Head	6.3.4.1 Axle counters		
Eu.DK.231	Info	In an axle counter system, TVP sections are logical entities consisting of a section of track that is usually closed off by at least two detection points. One detection point can function as entry/exit point of more than one TVP section. On dead end tracks, one detection point can function as the sole entry/exit point of one TVP section.		
Eu.DK.232	Info	In an axle counter system, one instance of the subsystem TDS usually covers several TVP sections.		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.238	Info	<p>The diagram below shows the main definitions regarding the subsystem TDS when implemented with axle counters.</p> <div><div>TDS with axle counters</div></div>		
Eu.DK.233	Head	6.3.4.2 Track circuits		
Eu.DK.234	Info	In a track circuit system, a TVP sections is a logical entity that usually coincides with the physical entity of one track circuit section. One logical TVP section can be composed of several track circuit sections.		
Eu.DK.235	Info	In a track circuit system, one instance of the subsystem TDS covers one or several TVP sections.		
Eu.DK.236	Info	EULYNX specifies the functional interface to the track circuits. The physical interface to the track circuit relays and possibly power off monitoring is covered by national specifications.		
Eu.DK.240	Info	<p>The diagram below shows the main definitions regarding the subsystem TDS when implemented with track circuits.</p> <div><div>TDS with track circuits</div></div>		
Eu.DK.492	Head	6.3.4.3 Train detection points		
Eu.DK.493	Info	In a train detection system, a TDP location is a logical entity that coincides with the physical entity of one detection point.		
Eu.DK.494	Info	In a train detection system, one instance of the subsystem TDS usually covers several TDP locations.		
Eu.DK.495	Info	EULYNX specifies the functional interface to the detection point. The physical interface to the implementation of the detection point is covered by national specifications.		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.497	Info	<p>The diagram below shows the main definitions regarding the subsystem TDS when implemented with train detection points.</p> <p>The diagram illustrates the architecture of the TDS with train detection points. It shows two main subsystems: 'Subsystem - Electronic Interlocking' and 'Subsystem - Train Detection System (EULYNX)'. The EULYNX subsystem contains multiple 'Train Detection Points' (TDP₁ to TDP_n). The Electronic Interlocking sends 'messages' to the TDS via an 'SCI-TDS' interface. The TDS then communicates with 'Wheel' sensors via 'TDS2' interfaces.</p>		
Eu.DK.627	Head	6.3.5 Power Off Monitoring	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.628	Info	In case track vacancy proving is implemented with track circuits, power off monitoring must be configurable.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.629	Info	The Power Off Monitoring supervises the availability of power supply to the track circuit device(s) for one or more TVP sections.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.630	Info	As crucial safety functionality, it must be assumed that non-availability of power supply to a track circuit device will always lead to detection of an occupancy.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.631	Info	The purpose of Power Off Monitoring is to distinguish between a real occupancy and an occupancy caused by a failure of the power supply to a TVP section.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.632	Info	In case the track circuit device detects an occupancy and the Power Off Monitoring does NOT detect a failure of the power supply, the occupancy is 'real' and very likely caused by presence of a railway vehicle in the TVP section.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.633	Info	In case the track circuit device detects an occupancy and the Power Off Monitoring does detect a failure of the power supply, it is not known what causes the occupancy. It may be caused by the power supply failure OR by presence of a railway vehicle in the TVP section.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.634	Info	The Power Off Monitoring may also fail itself. In case the availability of power supply to a track circuit device can't be determined with certainty, it must be assumed that the POM will report a power supply failure.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.635	Info	It is possible that the track circuit device detects, with certainty, a vacancy of a TVP section, while the POM reports a power supply failure. This can happen when the POM can't determine the power supply availability with certainty.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.636	Head	6.3.5.1 Operational use of POM information	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.637	Info	<p><i>Case 1</i></p> <p>Section state: Vacant POM state: OK The TVP section is certainly vacant. The power supply is certainly available.</p>	EUGDK-198	object created after baseline 1.16 (0.A)

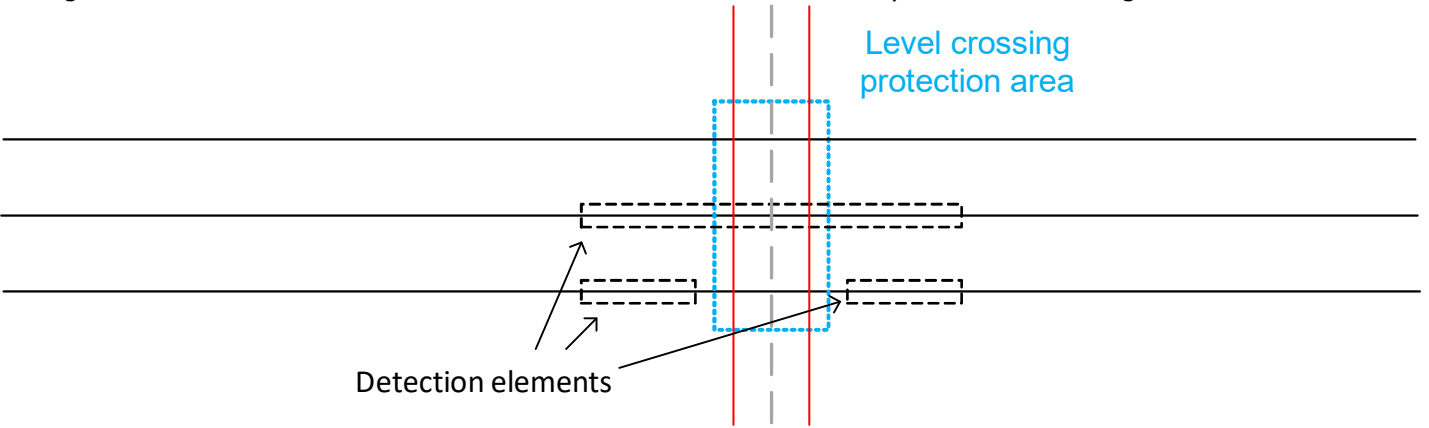
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.638	Info	<i>Case 2</i> Section state: Occupied POM state: OK The TVP section may be occupied. The power supply is certainly available. The occupation is most likely caused by a railway vehicle.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.639	Info	<i>Case 3</i> Section state: Vacant POM state: NOK The TVP section is certainly vacant. The power supply may not be available. The power supply must be sufficient for the track circuit to certainly detect a vacant section. It can therefore be concluded that the POM is not working properly.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.640	Info	<i>Case 4</i> Section state: Occupied POM state: NOK The TVP section may be occupied. The power supply may not be available. The occupation is most likely caused by a power supply failure, but presence of a railway vehicle can't be excluded.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.641	Info	In case 3, no limitations are needed in train operation, as the reliable detection of vacancy by the track circuit is a crucial safety functionality.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.642	Info	The distinction between case 2 and case 4 can be helpful to increase availability of railway capacity. As there is no certainty in case 4 that an occupation is NOT caused by a railway vehicle, this information can't be use for safety functions (locking a route, clearing a signal, granting movement authority). It can be used for availability functions (automatic route setting, train describer), in accordance with national specifications, for example to allow or suppress them in specific cases.	EUGDK-198	object created after baseline 1.16 (0.A)
Eu.DK.115	Head	6.4 IO elements and systems		
Eu.DK.127	Info	Individual signalling components are integrated to the interlocking system through the subsystem Generic IO. The subsystem Generic IO should not be used for interfacing with components or subsystems defined through dedicated SCI interfaces as SCI-P or SCI-LS. The controlling and monitoring of these components is performed with generic inputs and outputs, configurable for each specific application.		
Eu.DK.128	Head	6.4.1 Functional elements		
Eu.DK.129	Info	The IO elements or systems are referred to as "Adjacent IO Systems" and may be grouped according to their functionality: <ul style="list-style-type: none"> elements requiring releasing and locking functionality elements used as indicators, but not controlled as a light signal elements used for detection elements serving as local control panels 		
Eu.DK.130	Info	Functional elements used as lockable devices, requiring releasing and locking functionality, may be any of the following: <ul style="list-style-type: none"> Moveable bridges Tunnel gates / track closing gates Key lock Key lock on the line Catenary elevating system 		
Eu.DK.131	Info	Functional elements used as indicators may be any of the following: <ul style="list-style-type: none"> Warning lamp Fouling point control lamp Derailment and tracking indicator 		
Eu.DK.132	Info	Functional elements used as detectors may be any of the following: <ul style="list-style-type: none"> Avalanche detection Hot wheel box detector 		

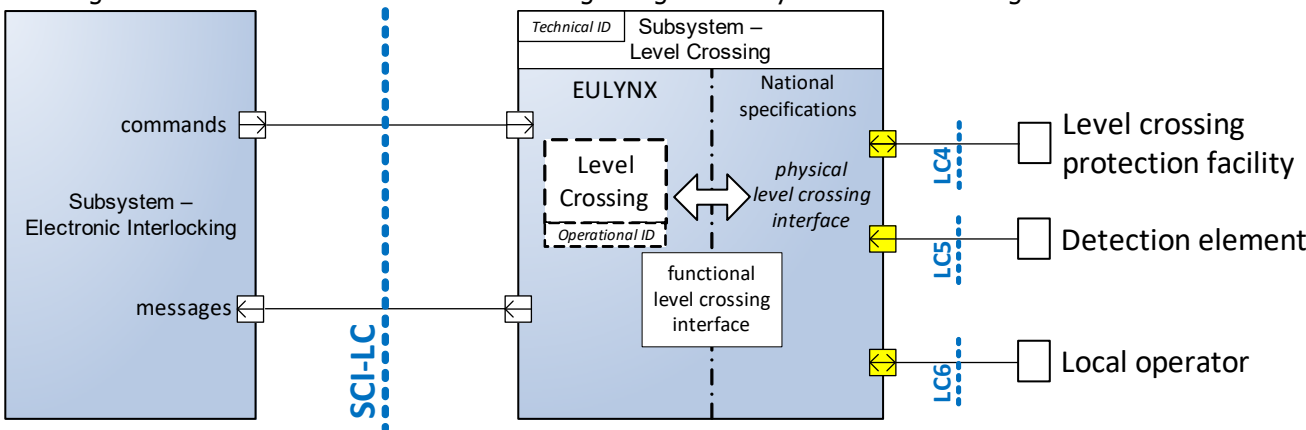
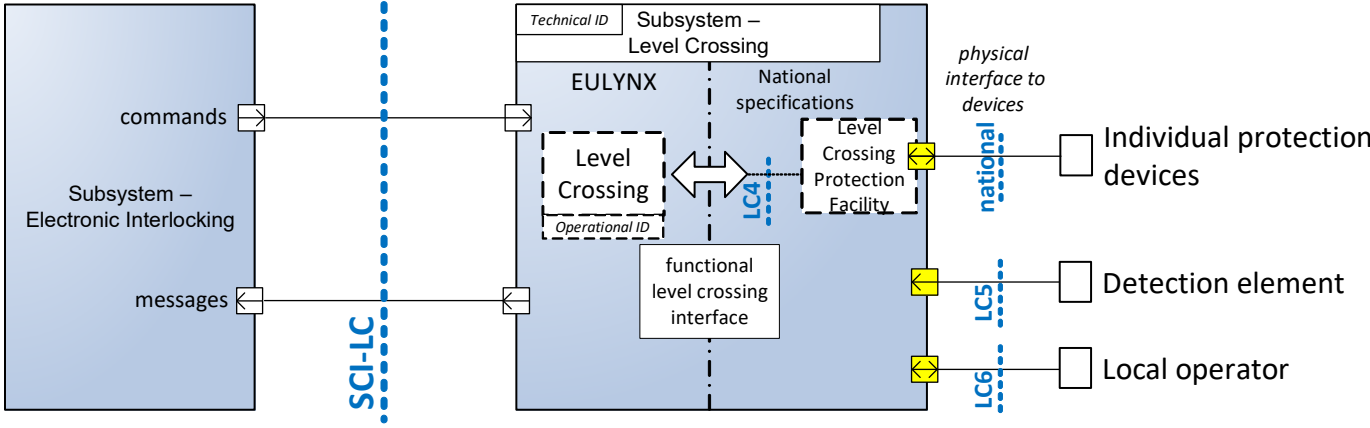
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
		<ul style="list-style-type: none">Flat wheel detectorGas detectorFire detectorsDoor sensorsIntrusion detectorOverload detectorLight intensity detectionTrip wire detectionOverheating / freezing detectionPower supply status detection		
Eu.DK.133	Info	Functional elements serving as local control panels may be any of the following: <ul style="list-style-type: none">Local control panel for single element - moveable bridgeLocal control panel for single element - key locksLocal control panel for single element - derailerLocal control panel for single element - pointLocal control panel for single element - catenary elevating systemLocal control panel for single element - gatesLocal control panel for - handling of transfer to verbal line blockLocal control panel for areas (multiple elements)		
Eu.DK.135	Info	The above lists are non-exclusive.		
Eu.DK.136	Head	6.4.2 Generic IO definition		
Eu.DK.241	Info	One subsystem Generic IO may control more than one Adjacent IO system. The Adjacent IO systems can be homogeneous or heterogeneous.		
Eu.DK.242	Info	One Adjacent IO System may need to be controlled by more than one subsystem Generic IO, for example in case of a many-button local control panel (where the number of buttons exceeds the amount of channels available on one subsystem).		
Eu.DK.243	Head	6.4.2.1 Technical and operational identifiers		
Eu.DK.244	Info	The subsystem Generic IO has a technical identifier. In telegrams that are exchanged between the subsystem Generic IO and the subsystem Electronic Interlocking and relate to the generic behaviour of the subsystem Generic IO, the technical identifier of the subsystem Generic IO is used as identifier of the sender or receiver respectively.		
Eu.DK.245	Info	Every Adjacent IO System that is controlled by a subsystem Generic IO has an operational identifier. In telegrams that are exchanged between the subsystem Generic IO and the subsystem Electronic Interlocking and regard the specific behaviour of individual Adjacent IO Systems, the operational identifier of the Adjacent IO System is used as identifier of the sender or receiver respectively.		
Eu.DK.246	Info	<p>The diagram below shows the main definitions regarding the subsystem Generic IO.</p> <p>The diagram illustrates the main definitions regarding the subsystem Generic IO. It shows the interaction between the Subsystem - Electronic Interlocking and the Subsystem - Generic IO. The Subsystem - Electronic Interlocking sends commands and receives messages from the Subsystem - Generic IO. The Subsystem - Generic IO is composed of EULYNX and multiple Adjacent IO Systems (IO System1 to IO Systemn). Each Adjacent IO System has its own Operational ID. The diagram also shows the connection between the Subsystem - Generic IO and the Adjacent IO Systems via SCI-IO channels, with specific channel identifiers (IO2, IO3) shown.</p>		

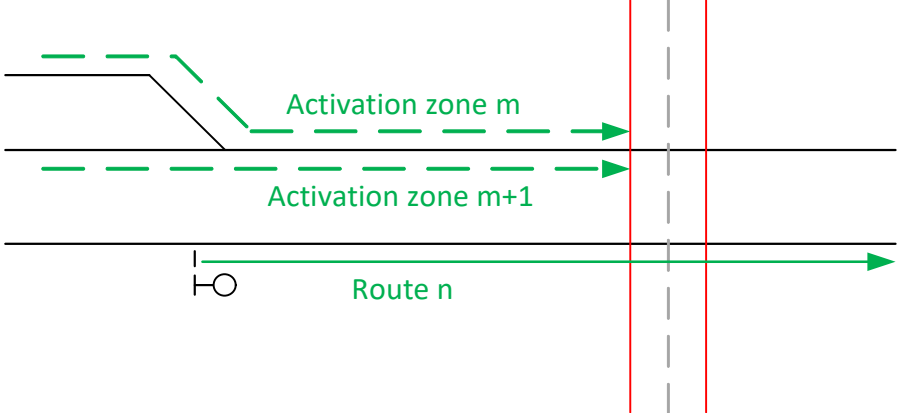
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.139	Info	<p>A logical channel represents a channel between the subsystem Electronic Interlocking and the subsystem Generic IO.</p> <p>A logical channel may be configured as:</p> <ul style="list-style-type: none">input, representing the information, which is available to subsystem Electronic Interlockingoutput, representing a command, which is sent from subsystem Electronic Interlocking <p>A logical channel may be implemented as:</p> <ul style="list-style-type: none">single channel, when assigned to one physical channelantivalent channel, when assigned to two physical channels evaluated as antivalentequivalent channel, when assigned to two physical channels evaluated as equivalent		
Eu.DK.247	Info	Several logical channels can be addressed to the same Adjacent IO System. The logical channels can be of the same type or of differing types.		
Eu.DK.137	Info	The following diagram displays the terminology of logical and physical channels for connection of an Adjacent IO Systems to the interlocking system through the subsystem Generic IO:		
Eu.DK.158	Info	<p>Channel definition</p>  <p>The diagram illustrates the channel definition process. On the left, the 'Subsystem - Electronic Interlocking' has four logical channels: 'output' (L1), 'input' (L2), 'output' (L3), and 'input' (L4). In the center, the 'Subsystem - Generic IO' acts as a bridge. On the right, the 'Adjacent IO System' has four physical channels: P1, P2, P3, and P4. The connections are as follows: L1 connects to P1; L2 connects to P2; L3 connects to P3; and L4 connects to P4. The physical channels P3 and P4 are shown with multiple yellow squares, indicating they are shared or have multiple instances.</p>		
Eu.DK.140	Info	Antivalent and equivalent configurations are displayed on the following diagram:		
Eu.DK.159	Info	<p>Example of antivalent and equivalent configurations</p>  <p>The diagram shows two types of channel configurations. The 'Subsystem - Electronic Interlocking' has two 'output' channels. The 'Subsystem - Generic IO' has two channels: 'antivalent channel' and 'equivalent channel'. The 'Adjacent IO System' has four physical channels: two 'ROC' (on/off) and two 'VOC' (on/off). The 'antivalent channel' connects to the first ROC and the first VOC. The 'equivalent channel' connects to the second ROC and the second VOC. The physical channels are labeled 'on' and 'off' to indicate their state.</p>		
Eu.DK.142	Info	<p>A logical output channel may be configured as:</p> <ul style="list-style-type: none">monitored, if the subsystem Generic IO proves internally that the outputs are set to the intended value (This monitoring only serves to report the technical failure of the output channel in the subsystem Generic IO. If for a specific application a fail-safe supervision of the reaction in the Adjacent IO System is required, an input channel shall be used for confirming the activation of the output in the Adjacent IO System)	EUGDK-195	<p>Object Text:</p> <p>A logical output channel may be configured as: monitored, if the subsystem Generic IO proves internally that</p>

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
		<ul style="list-style-type: none"> not monitored (this can be used for outputs that are not safety-critical, or for outputs that are supervised indirectly via a related input channel) 		<p>the outputs are set to the intended value (This monitoring only serves to report the technical failure of the output channel in the subsystem Generic IO. If for a specific application a fail-safe supervision of the reaction in the Adjacent IO System is required, an input channel shall be used for confirming the activation of the output in the Adjacent IO System)</p> <p>not monitored (this can be used for outputs that are not safety-critical, or for outputs that are supervised indirectly via a related input channel)</p> <p>a_JIRA_BL4R3: EUGDK-195</p>
Eu.DK.143	Info	<p>A logical channel may be in one of the following states:</p> <ul style="list-style-type: none"> switched on switched off flashing (only output) disturbed (operationally, when the anti/equivalence condition is not fulfilled, or technically) 		
Eu.DK.144	Info	<p>A physical channel represents a channel between the subsystem Generic IO and the Adjacent IO System.</p> <p>A physical channel may be configured as:</p> <ul style="list-style-type: none"> input, representing the information available to the subsystem Generic IO; output, representing the information available from the subsystem Generic IO; 		
Eu.DK.145	Info	<p>A physical channel is referred to as the following:</p> <ul style="list-style-type: none"> Reference Output Channel (ROC): The reference output channel is a physical output channel. It is configured to be antivalent, equivalent or single channel. The reference output channel is used to represent the information of the logical output channel. The logical output channel is commanded by the subsystem Electronic Interlocking via SCI-IO. Validation Output Channel (VOC): The validation output channel is a physical output channel. It is always implemented in pair with a reference output channel, and is configured identically as the reference output channel. The validation output channel is not used for single channels. The state of the validation output channel is switched by the subsystem Generic IO internally, in an antivalent or equivalent way to the reference output channel. Reference Input Channel (RIC): The reference input channel is a physical input channel. It is configured to be antivalent, equivalent or single channel. The reference input channel is used for providing the information for the logical input channel. If no disturbance is detected, the logical input channel is reported to the subsystem Electronic Interlocking via SCI-IO. Validation Input Channel (VIC): The validation input channel is a physical input channel. It is always implemented in pair with a reference input channel, and is configured identically as the reference input channel. The validation input channel is not used for single channels. The state of validation input channel is used by the subsystem Generic IO internally for proving the condition to the reference input channel. 		
Eu.DK.204	Info	The relation between physical and logical channels		

ID	Type	Domain knowledge					JIRA	V 1.18 (0.A) > V 1.16 (0.A)																																												
		<table><tr><td>Physical channels are configured as:</td><td>Value of RIC/ROC</td><td>Value of VIC/VOC</td><td>Value of related logical channel</td><td>Evaluation of physical channels</td></tr><tr><td rowspan="4">antivalent</td><td>0</td><td>0</td><td>Disturbed</td><td>Invalid</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Valid</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Valid</td></tr><tr><td>1</td><td>1</td><td>Disturbed</td><td>Invalid</td></tr><tr><td rowspan="4">equivalent</td><td>0</td><td>0</td><td>0</td><td>Valid</td></tr><tr><td>0</td><td>1</td><td>Disturbed</td><td>Invalid</td></tr><tr><td>1</td><td>0</td><td>Disturbed</td><td>Invalid</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Valid</td></tr><tr><td rowspan="2">single</td><td>0</td><td>Not existent</td><td>0</td><td>Valid</td></tr><tr><td>1</td><td>Not existent</td><td>1</td><td>Valid</td></tr></table>	Physical channels are configured as:	Value of RIC/ROC	Value of VIC/VOC	Value of related logical channel	Evaluation of physical channels	antivalent	0	0	Disturbed	Invalid	0	1	0	Valid	1	0	1	Valid	1	1	Disturbed	Invalid	equivalent	0	0	0	Valid	0	1	Disturbed	Invalid	1	0	Disturbed	Invalid	1	1	1	Valid	single	0	Not existent	0	Valid	1	Not existent	1	Valid		
Physical channels are configured as:	Value of RIC/ROC	Value of VIC/VOC	Value of related logical channel	Evaluation of physical channels																																																
antivalent	0	0	Disturbed	Invalid																																																
	0	1	0	Valid																																																
	1	0	1	Valid																																																
	1	1	Disturbed	Invalid																																																
equivalent	0	0	0	Valid																																																
	0	1	Disturbed	Invalid																																																
	1	0	Disturbed	Invalid																																																
	1	1	1	Valid																																																
single	0	Not existent	0	Valid																																																
	1	Not existent	1	Valid																																																
Eu.DK.351	Info	The subsystem Electronic Interlocking has no knowledge whether a logical channel is implemented with a single, antivalent or equivalent physical channels.																																																		
Eu.DK.146	Head	6.4.3 Application library																																																		
Eu.DK.147	Info	The subsystem Generic IO has no functional knowledge about the attached Adjacent IO Systems, except grouping the channels connected to each Adjacent IO System. The functional knowledge about the Adjacent IO Systems is in the subsystem Electronic Interlocking. An application library may be used by IMs to describe the individual logical and physical implementation of each Adjacent IO System (such as key lock, moveable bridge...).																																																		
Eu.DK.148	Head	6.4.4 Constraints with application of subsystem Generic IO																																																		
Eu.DK.149	Info	The use of the subsystem Generic IO is limited to a realistic sampling rate of 1Hz.																																																		
Eu.DK.150	Info	The mitigation of bouncing effects on the input channels is not a function of the application layer, this must be handled by the physical implementation.																																																		
Eu.DK.151	Info	The following issues must be considered by the physical implementation: <ul style="list-style-type: none">• debouncing of the inputs• detection of fleeting inputs shorter than the available sampling rate.																																																		
Eu.DK.61	Head	6.5 Level Crossing																																																		
Eu.DK.291	Info	Systems to prevent collisions between trains and road users at level crossings are integrated to the interlocking system through the subsystem Level Crossing or through the adjacent system External Level Crossing System.																																																		
Eu.DK.433	Info	The subsystem Level Crossing is used to integrate level crossing systems for which the activation and deactivation logic is handled externally of the subsystem (for example in the interlocking system or in the Radio Block Centre)																																																		
Eu.DK.292	Info	The subsystem Level Crossing controls one level crossing as a single operational element. It controls one Level Crossing Protection Facility to protect the corresponding Level Crossing protection area.					EUGDK-188	Object Text: The subsystem Level Crossing controls one level crossing as a single operational element. It controls one Level Crossing Protection Facility to protect the corresponding Level Crossing protection area. a_JIRA_BL4R3: EUGDK-188																																												

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.348	Info	<p>The figure below shows the main definitions of elements related to the subsystem Level Crossing.</p> 	EUGDK-208	a_JIRA_BL4R3: EUGDK-208
Eu.DK.498	Info	The Subsystem - Level Crossing does not control (de)activation points. Different track element may act as (de)activation point, depending on the activation logic, which may be handled in the interlocking or RBC. This includes detection elements of the Subsystem - Level Crossing, TVP sections, Train detection points or train position reports.		
Eu.DK.584	Info	Detection elements of the Subsystem - Level Crossing are not intended to be used for the monitoring of track occupation and/or route release. Elements for those functions can be integrated to the interlocking system via the subsystem Train Detection System.	EUGDK-189	object created after baseline 1.16 (0.A)
Eu.DK.581	Head	6.5.1 Level Crossing Protection Facility	EUGDK-188	object created after baseline 1.16 (0.A)
Eu.DK.293	Info	<p>The level crossing protection facility controls all protection devices that are used to warn and obstruct road traffic. It may contain:</p> <ul style="list-style-type: none"> • Road signals (with warning lamps and/or warning bells) • Barriers • Obstacle detector • Warning signs • Other devices 	EUGDK-188	a_JIRA_BL4R3: EUGDK-188
Eu.DK.294	Info	The level crossing protection facility protects the area where road traffic (including motor vehicles, bicycles, pedestrians, etc.) is at risk of being hit by a passing train, called the level crossing protection area.	EUGDK-188	a_JIRA_BL4R3: EUGDK-188
Eu.DK.646	Info	<p>The level crossing protection facility has three states, defined as follows:</p> <ul style="list-style-type: none"> • Protected: The activation sequence has been completed, all protection conditions are fulfilled. • Unprotected: An activation or deactivation sequence is ongoing, or a protection condition is not or no longer fulfilled (e.g. broken barrier, failed warning lamp). • Idle: The deactivation sequence has been completed, all protection has been removed. 	EUGDK-208	object created after baseline 1.16 (0.A)
Eu.DK.297	Info	When the level crossing protection facility is activated, it will start a sequence of warning devices and barrier movement to protect the level crossing protection area. Once this sequence has been completed, the level crossing is considered to be in the state 'protected'.	EUGDK-188	a_JIRA_BL4R3: EUGDK-188
Eu.DK.298	Info	When the level crossing protection facility is deactivated, a deactivation sequence will start to remove the protection of the level crossing protection area. As soon as the level crossing protection facility starts deactivating, the level crossing is considered to be in the state 'unprotected'. Once this sequence has been completed, the level crossing is considered to be in the state 'idle'.	EUGDK-188 EUGDK-208	<p>Object Text:</p> <p>When the level crossing protection facility is deactivated, a deactivation sequence will start to remove the protection of the level crossing protection area. As soon as thisthe sequencelevel crossing protection facility starts deactivating, the level crossing is considered to be in the state 'unprotected'. Once this sequence has been completed, the level crossing is considered to be in the state 'idle'.</p> <p>a_JIRA_BL4R3: EUGDK-188 EUGDK-208</p>

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.295	Info	EULYNX specifies the functional interface to the level crossing. The physical interface to the level crossing protection facility is covered by national specifications.	EUGDK-188	a_JIRA_BL4R3: EUGDK-188
Eu.DK.347	Info	<p>The diagram below shows the main definitions regarding the subsystem Level Crossing.</p>  <p>The diagram illustrates the functional and physical interfaces of the subsystem Level Crossing. On the left, a box labeled 'Subsystem – Electronic Interlocking' contains 'commands' and 'messages'. A vertical dashed blue line labeled 'SCI-LC' separates it from the 'Subsystem – Level Crossing' box. Inside this box, 'EULYNX' and 'National specifications' are shown. A dashed box labeled 'Level Crossing' (with 'Operational ID' below it) contains a 'functional level crossing interface'. To the right, a 'physical level crossing interface' connects to three external components: 'Level crossing protection facility' (via LC4), 'Detection element' (via LC5), and 'Local operator' (via LC6). A double-headed arrow indicates interaction between the 'Level Crossing' and the 'functional level crossing interface'.</p>	EUGDK-188	a_JIRA_BL4R3: EUGDK-188
Eu.DK.582	Info	The physical interface to the level crossing protection facility may be implemented as several physical interfaces to individual protection devices (lamps, warning bells, barriers). In this case, the logic to control the activation and deactivation sequences, which is part of the functionality of the level crossing protection facility will be handled in the same physical device as the subsystem Level Crossing. The interface LC4 will in this case be a purely internal logical interface. The physical interfaces to the individual protection devices of the LCPF are in this case not part of LC4.s	EUGDK-188	object created after baseline 1.16 (0.A)
Eu.DK.583	Info	<p>The diagram below shows the main definitions regarding the subsystem Level Crossing in case the logic to control the activation and deactivation sequences of the level crossing protection facility is handled in the same physical device as the subsystem Level Crossing.</p>  <p>This diagram shows an alternative configuration where the logic for the level crossing protection facility is handled within the same physical device as the subsystem Level Crossing. The 'Subsystem – Level Crossing' box contains 'EULYNX' and 'National specifications'. The 'Level Crossing' (with 'Operational ID') now includes a 'Level Crossing Protection Facility'. The 'functional level crossing interface' is still present. The 'physical interface to devices' (labeled 'national') connects to 'Individual protection devices'. The 'Detection element' (via LC5) and 'Local operator' (via LC6) remain. The 'SCI-LC' interface with the 'Subsystem – Electronic Interlocking' is also shown.</p>	EUGDK-188	object created after baseline 1.16 (0.A)
Eu.DK.299	Head	6.5.2 Functions of the subsystem Level Crossing		
Eu.DK.301	Head	6.5.2.1 Activation and deactivation		
Eu.DK.302	Info	The activation (or deactivation) of the level crossing is directly triggered by a command from the interlocking. That means that the complete level crossing protection facility shall be activated (or deactivated) without an evaluation of conditions on track, direction or route by the level crossing.		
Eu.DK.420	Info	<p>Activation or deactivation may be commanded based on one or more conditions in the interlocking. Examples of conditions leading to an activation are:</p> <ul style="list-style-type: none"> • route (or overlap) setting resulting in a request to activate or deactivate a level crossing • presence of a train in an activation zone • a request resulting from a command by the signaller • a request resulting from a command by the Radio Block Centre 		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.422	Info	<p>The figure below shows the main definitions related to conditions in the interlocking for (de)activation.</p> 		
Eu.DK.305	Head	6.5.2.2 Pre-activation		
Eu.DK.306	Info	The interlocking commands the pre-activation of a level crossing. Pre-activation is used for pre-warning traffic lights, interrupts to control units of traffic lights etc.. Interlocking conditions for pre-activation are used as for regular activation, with the difference that a pre-activation usually start some distance in rear of the start of the corresponding activation zone.		
Eu.DK.307	Info	The interlocking can revoke a pre-activation by commanding a deactivation in case a previously expected train is no longer expected to activate the level crossing (e.g. it stopped in the pre-activation zone and will not continue).		
Eu.DK.462	Head	6.5.2.3 Activation and deactivation by local request		
Eu.DK.328	Info	A local operator can request activation or deactivation of the level crossing via a local operator interface. Requests can be applied for the complete or partial (e.g. one out of two tracks) level crossing protection area, based on an index. Requests are sent to the interlocking, which will evaluate relevant conditions. After evaluation, the interlocking can send activation or deactivation commands to the subsystem Level Crossing.		
Eu.DK.435	Info	The level crossing protection facility may be operated independent of the interlocking system or subsystem Level Crossing (e.g. no connection to the interlocking, subsystem Level Crossing not operational). This direct operation of the level crossing protection facility and the related operational procedures are outside of the scope of EULYNX and are subject to national specifications.		
Eu.DK.327	Head	6.5.2.4 Local operation handover		
Eu.DK.329	Info	The interlocking logic may handle a handover of responsibility of the level crossing protection area to a local operator, according to national operational procedures. For this handover, commands and messages are exchanged between the interlocking and the local operation interface connected to the subsystem Level Crossing. The handover can be applied for the complete or partial (e.g. one out of two tracks) level crossing protection area, based on an index.		
Eu.DK.423	Head	6.5.2.5 Isolation		
Eu.DK.421	Info	<p>The interlocking can command the subsystem Level Crossing to become isolated, and not react on failure of the communication. This may be used in case of engineering works on an interlocking, in order to prevent all level crossings connected to that particular interlocking to go into a fail-safe state due to failure of communication, resulting in a protected level crossing protections facility.</p> <p>The interlocking system guarantees and monitors the safe application of this function. Applying the isolated mode may only be permitted if for example there are no routes locked and the route setting is blocked.</p>		
Eu.DK.342	Head	6.5.3 Statuses		
Eu.DK.343	Info	The subsystem Level Crossing informs the interlocking of its status, based on different principles:		
Eu.DK.344	Info	<p>Functional status</p> <p>This message is used for the statuses of the subsystem Level Crossing which are required within the interlocking logic.</p>		
Eu.DK.345	Info	<p>Monitoring status</p> <p>This message is used for the statuses of the subsystem Level Crossing which are required for display to the signaller.</p>		
Eu.DK.346	Info	<p>Failure status</p> <p>This message is used when a failure occurred or is revoked.</p>		

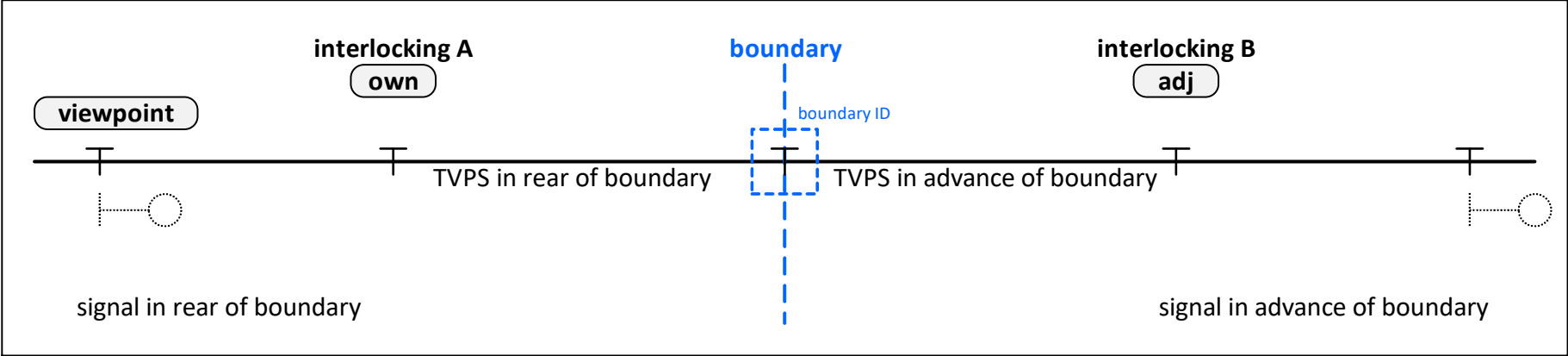
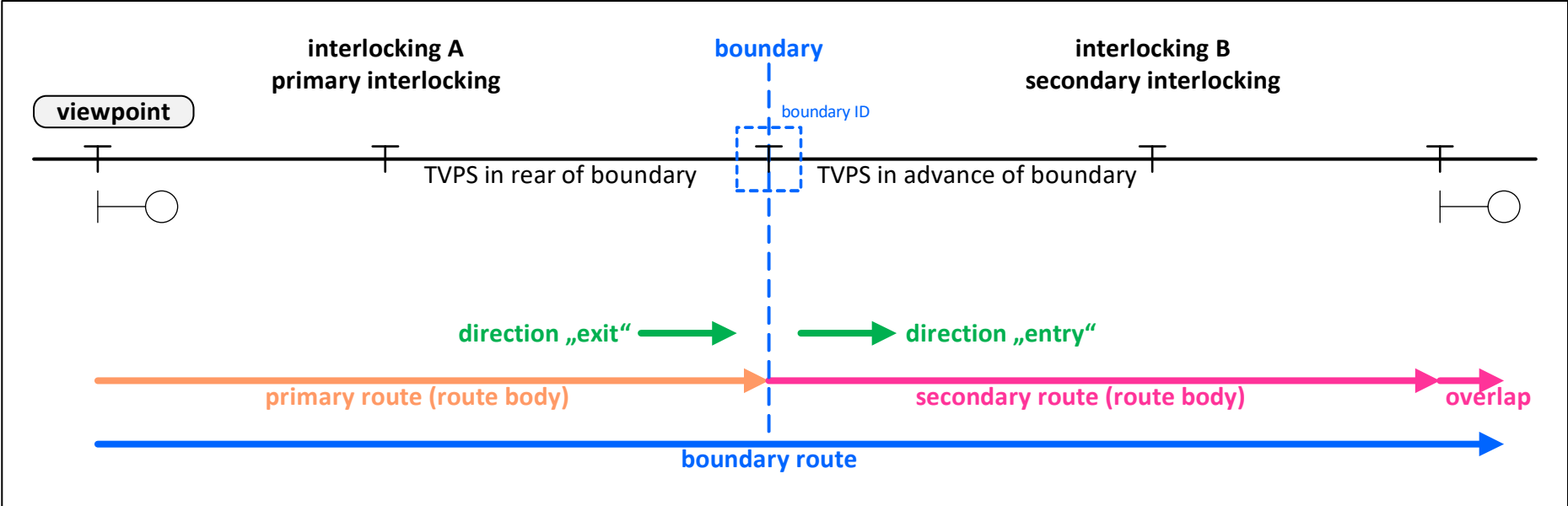
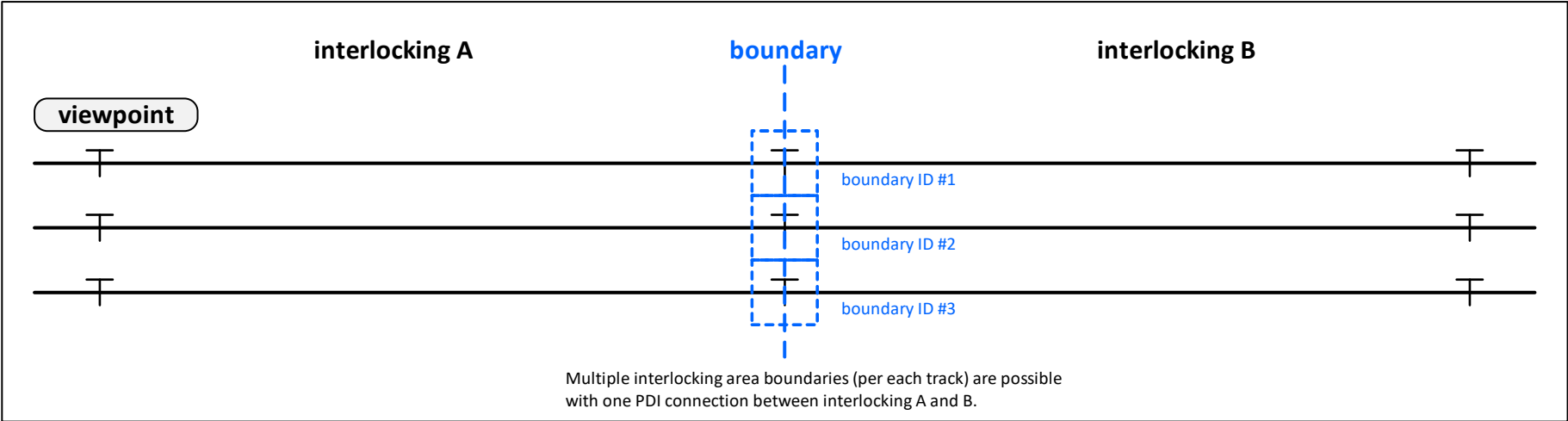
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.436	Info	Obstacle detection status This message is used to report an obstacle detected inside the level crossing protection area.		
Eu.DK.437	Info	Detection element status This message is used to report the occupancy status of detection elements.		
Eu.DK.515	Head	6.6 Single-element and multi-element controllers		
Eu.DK.516	Info	The EULYNX field element subsystems (EfeS) can be implemented with different types of controllers.		
Eu.DK.517	Info	A single-element controller implements one EfeS in a single physical device.		
Eu.DK.518	Info	A single type multi-element controller implements more than one EfeS in a single physical device. All EfeS are of the same type (Light Signal, Point, Train Detection System, Generic IO or Level Crossing).		
Eu.DK.519	Info	A multi type multi-element controller implements more than one EfeS in a single physical device. The implemented EfeS are of different types.		
Eu.DK.520	Head	6.6.1 Levels and multiplicities		
Eu.DK.521	Info	The multiplicity between one physical device and multiple controlled track elements is handled on different logical levels.		
Eu.DK.551	Info	<p>The logical levels and their multiplicities are visualised in the diagram below and described in the sections that follow.</p> <p>Communicaton endpoints, levels and cardinalities</p> <p>Legend:</p> <ul style="list-style-type: none"> RaSTA Telegrams (Blue line) PDI Mgmt Cmds (Green line) Element specific DX (Brown line) <p>Endpoints:</p> <ul style="list-style-type: none"> SCP connection: RaSTA ID EULYNX field element subsystem: SubS_ID (Technical ID) Operational element: Operational ID <p>Cardinalities:</p> <ul style="list-style-type: none"> 1:n (RaSTA ID to SubS_ID) 1:1 (SubS_ID to Operational ID) 1:n (RaSTA ID to Operational ID) <p>Multiplicity</p>		
Eu.DK.522	Head	6.6.1.1 Communication levels and endpoints		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.523	Info	<u>Operational elements</u> The lowest logical level of the communication between the electronic interlocking and the EfeS addresses a single operational element. This is a specific light signal, point, track vacancy proving section, train detection point, adjacent IO system or level crossing. The telegrams of the Process Data Interface protocol include the operational identifier as Sender or Receiver Identifier when addressing a concrete operational element.		
Eu.DK.524	Info	<u>EULYNX field element subsystem</u> A part of the communication between the electronic interlocking and the EfeS addresses the EfeS itself. This is the case for all generic PDI telegrams that are exchanged during the establishing and closing of the PDI connection. These generic telegrams of the Process Data Interface protocol contain the technical identifier of the EfeS as Sender or Receiver Identifier.		
Eu.DK.525	Info	<u>Safe Communication Protocol RaSTA</u> The communication layer below the PDI protocol is the Safe Communication Protocol. The endpoints of this communication are formed by the RaSTA endpoints. For multi-element controllers, the RaSTA endpoint of the SCP connection may be located on a common system part for all the instances of EULYNX field element subsystems implemented on the device.		
Eu.DK.526	Head	6.6.1.2 Multiplicities		
Eu.DK.527	Info	<u>Number of operational elements per EULYNX field element subsystem</u> The EfeS for Light Signal, Point and Level Crossing control only one single operational element. The EfeS for Train Detection System and Generic IO control multiple operational elements (TVP sections, train detection points, logical input and output channels). A physical device implementing <i>one</i> subsystem TDS or Generic IO is considered a <i>single-element controller</i> , even if it controls multiple operational elements!		
Eu.DK.528	Info	<u>Number of PDI connections per EULYNX field element subsystem</u> There is always exactly one PDI connection that connects the EULYNX field element subsystem with the interlocking system.		
Eu.DK.529	Info	<u>Number of PDI connections per SCP connection</u> A single-element controller implements one EULYNX field element subsystem and therefore has only one PDI connection, which will be stacked on one SCP connection. The multiple PDI connections of a multi-element controller (single type or multi type) can be stacked together on one SCP connection.		
Eu.DK.530	Info	Because MEC platforms can share one SCP (RaSTA) channel for multiple PDI connections, the heartbeat communication related to one EfeS instance is reduced. The bandwidth requirement per EfeS instance decreases accordingly.		
Eu.DK.531	Info	<u>No. of SCP connections per physical device</u> A single-element controller will have only one SCP connection. A multi-element controller (single type or multi type) may have one or more SCP connections. Although possible, it may not be optimal to have a high number of PDI connections all stacked on a single SCP connection.		
Eu.DK.532	Head	6.6.2 Essential states		
Eu.DK.533	Info	For a concrete EfeS instance on a multi-element controller, the essential states must be regarded as abstract states, even if their naming implies a relation to hardware behaviour. By its nature, the status of the platform that implement a multi-element controller may impact the status of all the EfeS instances that it implements. This means that there are some dependencies between the EfeS states and the state of the multi-element controller.		
Eu.DK.534	Info	The state can be BOOTING either because the underlying platform controller is booting or because the interface to a specific (set of) operational element(s) is booting. The state NO_POWER can be interpreted as meaning that the core functionality of an EfeS instance is turned off. The state INITIALISING of an EfeS has a fully identical meaning for multi-element and single-element controllers. The specific EfeS is ready to establish connection to the interlocking or ready to perform maintenance interaction with the MDM.		
Eu.DK.535	Head	6.6.3 Management of SCP connection		
Eu.DK.536	Info	The management of the SCP connection is fully decoupled from the essential state of the EfeS. This is necessary, because on a multi-element controller it is possible that the SCP connection is provided by a different part of the controller (either physically or logically separated).		
Eu.DK.537	Info	On a multi-element controller, depending on the architecture, it may be possible to have an established SCP connection while one or more of the EfeS is (re-)booting. Given by its architecture, a single-element controller may have constraints to this flexibility. For a single-element controller, it will most likely not be possible to establish the SCP connection before the EfeS has finished booting and is in state INITIALISING.		
Eu.DK.538	Head	6.6.4 Scope of model-based specifications		
Eu.DK.539	Info	The model-based specifications of EULYNX don't cover the dependencies between the state of the multi-element controller and the essential states of the implemented EfeS. The management of the SCP connection is also not in the scope of the model-based specifications.		

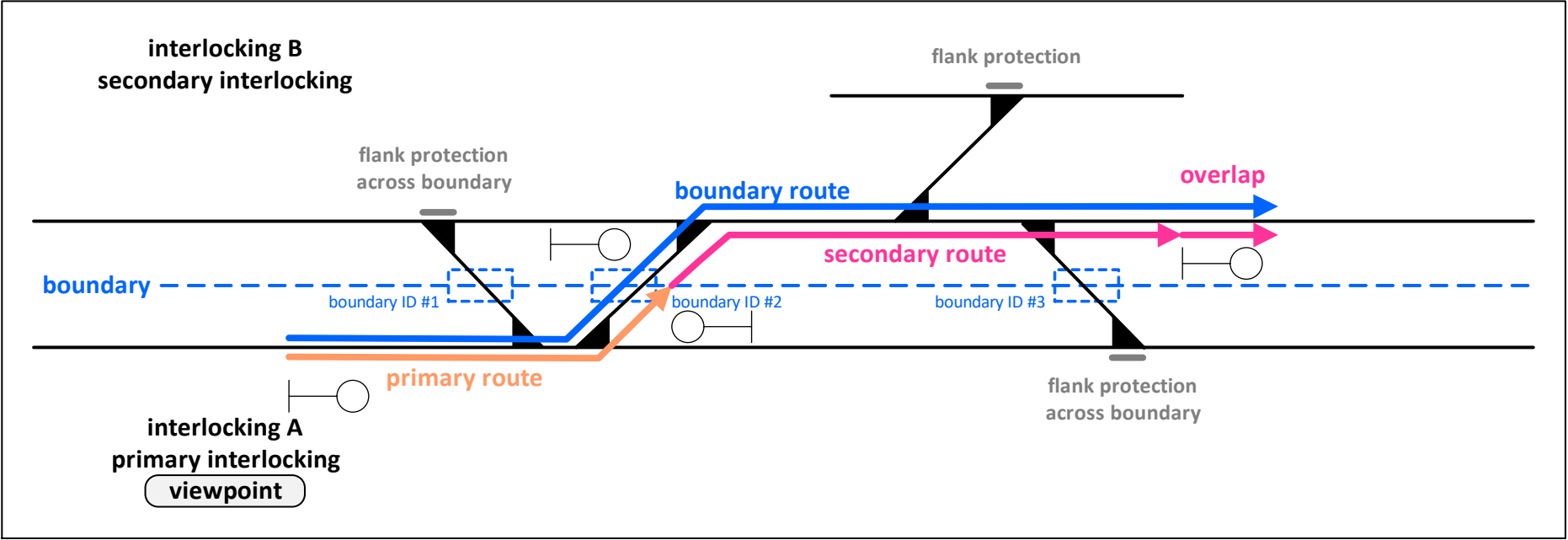
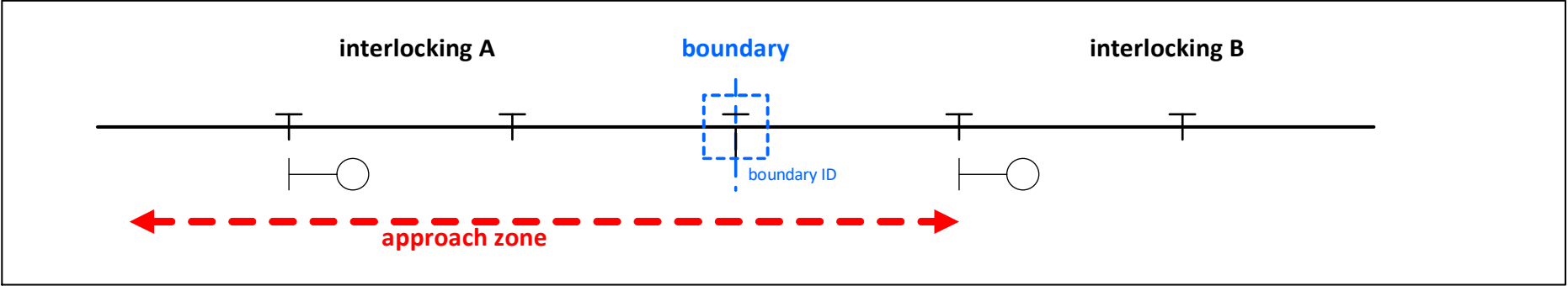
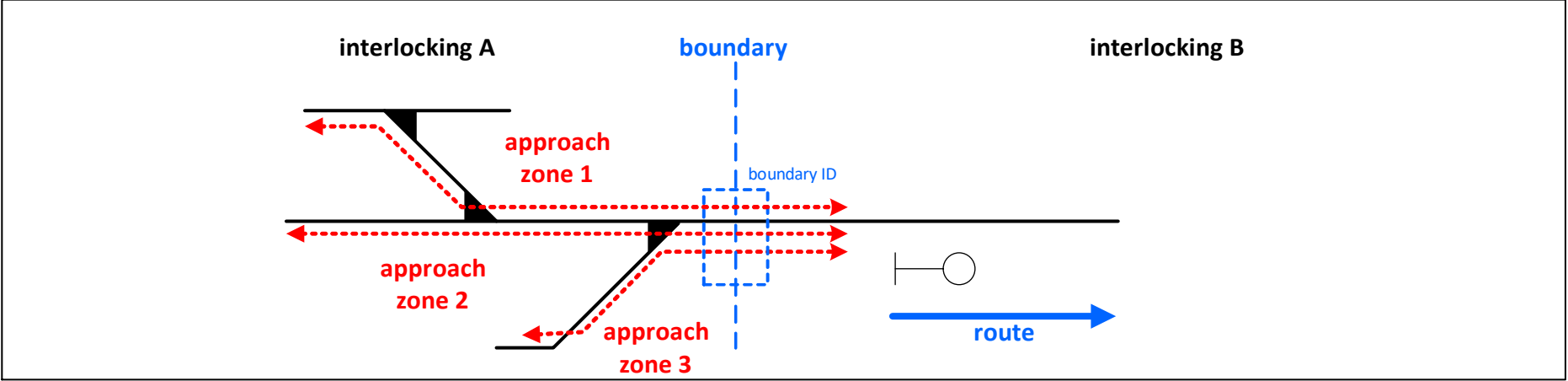
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.552	Info	<p>Modelling scope related to single- and multi-element controllers</p> <p>Electronic Interlocking</p> <p>Single Element Controller</p> <p>Multi Element Controller</p> <p>Various independent EfeS instances share the same SCP</p> <p>Platform internal dependencies</p> <p>Legend:</p> <ul style="list-style-type: none"> EULYNX Field Element Subsystem Essential State EST EfeS M Modelled X Not modelled 		
Eu.DK.540	Head	6.6.5 Handling of communication inside interlocking		
Eu.DK.541	Info	The multi-element controller is transparent for communication with the interlocking. It does not form an explicit endpoint from the point of view of the interlocking. All endpoints required by the interlocking refer to the operational element to be controlled (during operation) or to the EfeS (during initialisation).		
Eu.DK.542	Info	The multiplicity among communication levels may vary. This is implicitly manifested by the addressing configuration. Each operational element that occurs in the configuration and engineering data of the interlocking must be able to be controlled via the following assignment (addressing configuration): Object X -> Operational Identifier -> Technical Identifier (EfeS) -> RaSTA ID -> IP address and/or TLS Endpoint ID.		
Eu.DK.543	Info	Functionally, there is no difference in commanding an EfeS hosted on a single-element controller or a multi-element controller. The different endpoints are assigned in the configuration and engineering data of the interlocking and thus the communication paths are always resolved in the same manner.		

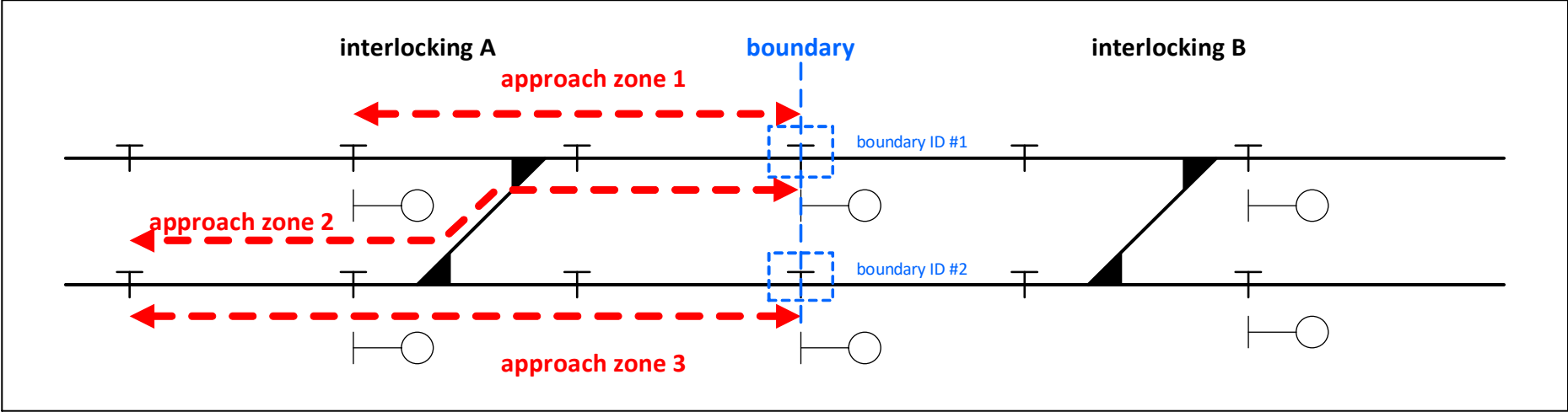
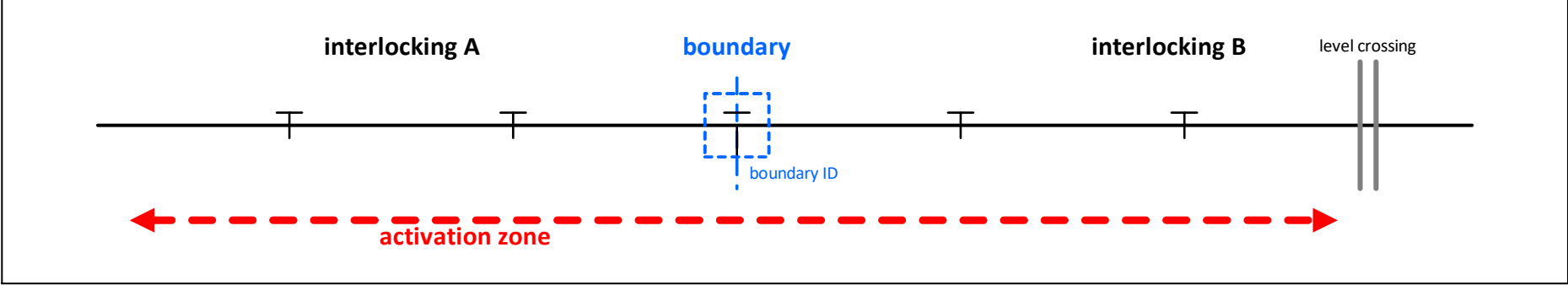
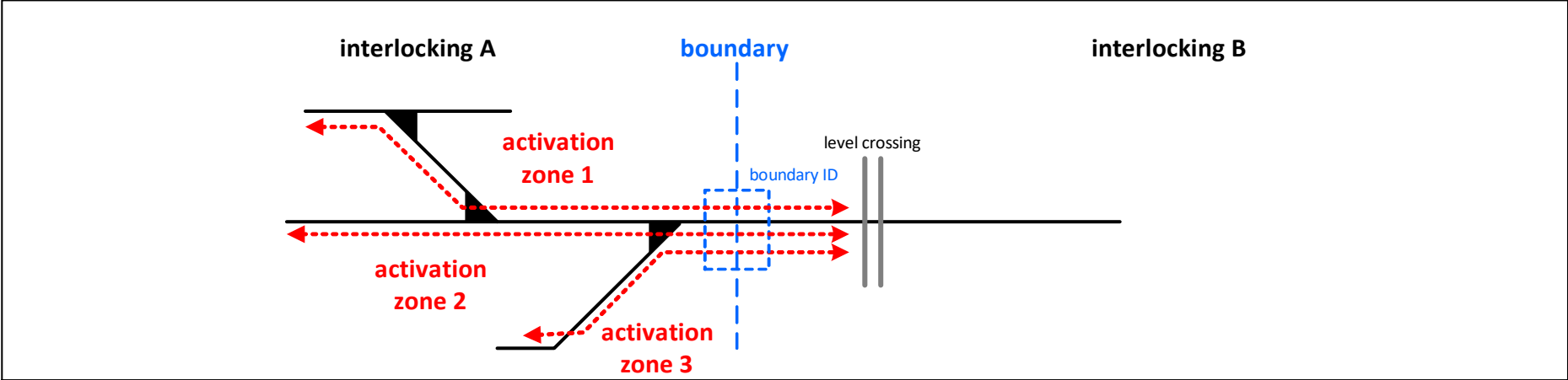
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.553	Info	<p>Endpoint handling</p>		
Eu.DK.544	Head	6.6.6 Handling of diagnostics, maintenance and security interfaces on multi-element controllers		
Eu.DK.545	Head	6.6.6.1 Diagnostics interface		
Eu.DK.546	Info	EULYNX does not define how the cardinality between EfeS instances and OPC UA endpoints for SDI should be implemented. It is possible that one OPC UA endpoint can serve as a diagnostics gateway for multiple EfeS instances. Therefore, the generic SDI data model supports the addressing of both physical equipment instances and logical subsystem instances.	EUGDK-203	<p>Object Text: <u>DiagnosticEULYNX data does is not sent define per how EfeS the instance cardinality in between the EfeS same instances way and as OPC UA endpoints for a SDI single element should controllers be implemented.</u> <u>There It is no possible grouping that of one diagnostic OPC data UA endpoint can serve as a diagnostics gateway for different multiple EfeS instances. Therefore, the generic SDI data model supports the addressing of both physical equipment instances and logical subsystem instances.</u> a_JIRA_BL4R3: EUGDK-203</p>
Eu.DK.547	Head	6.6.6.2 Maintenance interface		
Eu.DK.548	Info	EULYNX does not define how the cardinality between EfeS instances and OPC UA endpoints for SMI should be implemented. It is possible that one OPC UA endpoint can serve as a maintenance gateway for multiple EfeS instances. Therefore, the generic SMI data model supports the addressing of a specific subsystem within a MEC by a top-level node with the SubS_ID as identifier.		
Eu.DK.549	Head	6.6.6.3 Security interface		
Eu.DK.550	Info	The manufacturer can design the placement of the SSI endpoints and the use of the Security Services in such a way that the MEC concept is supported optimally and in accordance with the security specifications.		

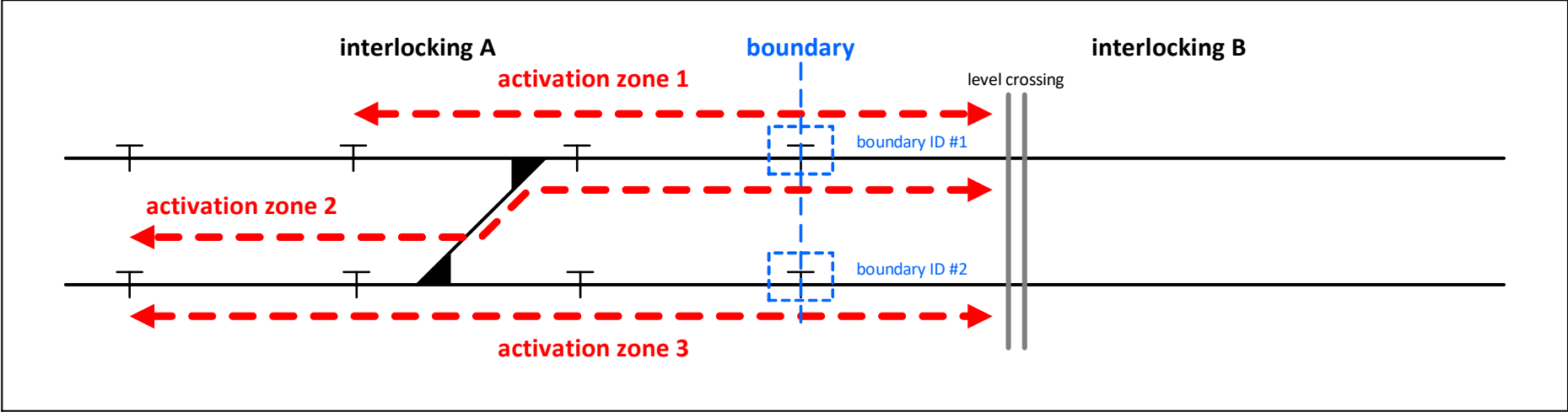
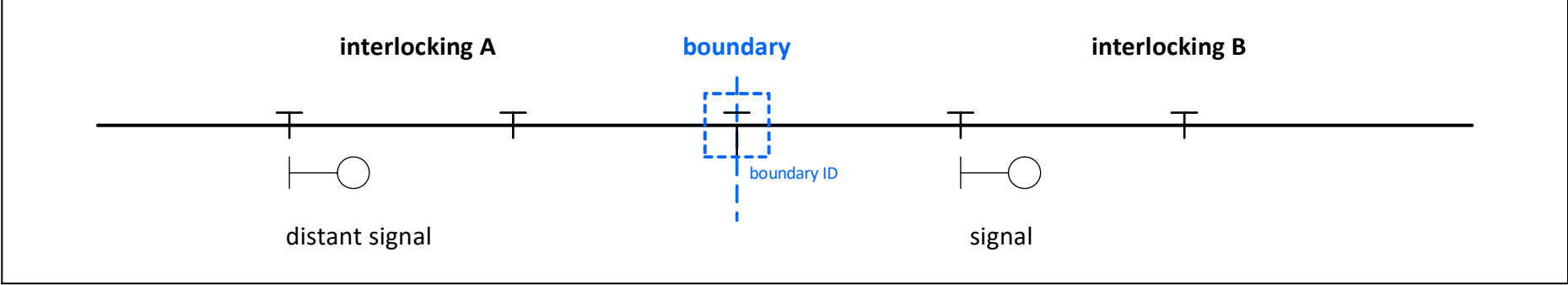
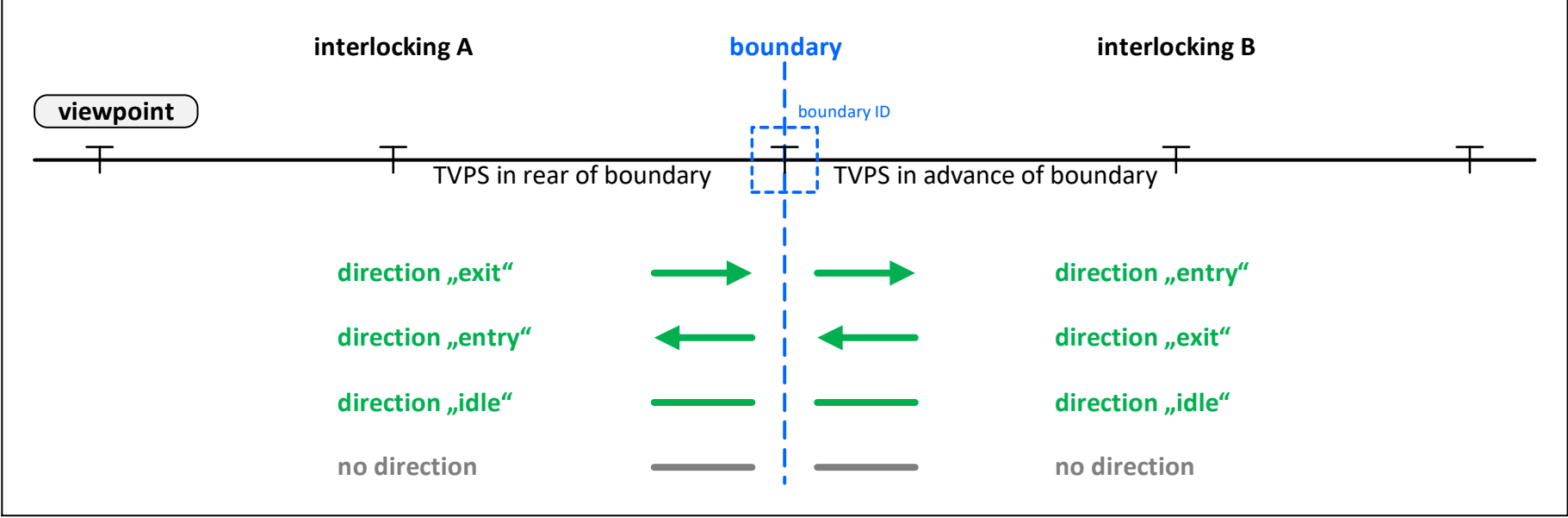
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.598	Head	6.6.7 Handling basic data and basic data identifier	EUGDK-191	object created after baseline 1.16 (0.A)
Eu.DK.599	Info	Each EfeS instance requires its own set of basic data.	EUGDK-191	object created after baseline 1.16 (0.A)
Eu.DK.600	Info	A part of the basic data content may be identical for several EfeS instances that are implemented on a multi-element controller. This includes the own network addresses and the network addresses of the communication partners (including the MDM).	EUGDK-191	object created after baseline 1.16 (0.A)
Eu.DK.601	Info	EULYNX does not define the data structure of the basic data provided to either the multi-element controller as a whole or to each EfeS instance individually.	EUGDK-191	object created after baseline 1.16 (0.A)
Eu.DK.602	Info	The physical implementation of the Basic Data identifier is left to the suppliers. The implementation must be such that there is a physical relation between the data set for a specific EfeS instance and the in/outputs related to the controlled subsystem.	EUGDK-191	object created after baseline 1.16 (0.A)
Eu.DK.563	Head	7 Overall timing requirements		
Eu.DK.564	Info	Overall timing behaviour is governed by one safety requirement. This safety requirement defines the safety response time needed between the occurrence of an infrastructure related anomaly violating route monitoring conditions until setting the safety relevant outputs (for example signal aspect) to a safe state.		
Eu.DK.565	Info	The assumed overall safety response time for an undisturbed EULYNX system is 1,6 seconds. This overall assumed time is derived by summing up the values below as follows: Eu.DK.566 + Eu.DK.569 + Eu.DK.568 + Eu.DK.569 + Eu.DK.567.		
Eu.DK.566	Info	For a EULYNX field element subsystem, the time span between detection of a status change at the control interface (e.g. status of lamps, point position, wheel sensor) and the sending of an SCI-XX message at the PoS-Signalling reporting this is assumed to not exceed 500 ms. Note: The concrete timing requirements are defined in the requirements specification of the EULYNX field element subsystems and may differ from this value.		
Eu.DK.567	Info	For a EULYNX field element subsystem, the time span between reception of an SCI-XX command at the PoS-Signalling and the respective reaction at the control interface (e.g. turning lamps on or off, start of point movement) is assumed to not exceed 500 ms. Note: The concrete timing requirements are defined in the requirements specification of the EULYNX field element subsystems and may differ from this value.		
Eu.DK.568	Info	For a Subsystem - Electronic Interlocking, the time span between reception of an SCI-XX message at the PoS-Signalling reporting a status change and the sending of an SCI-XX command at the PoS-Signalling to a EULYNX field element subsystem reflecting the changed status is assumed to not exceed 500 ms. Note: The concrete timing requirements for the Subsystem - Electronic Interlocking are defined by national requirements.		
Eu.DK.569	Info	The delay between the sender and the receiver at a PoS-Signalling assumed to not exceed 50 ms. Note: This concrete timing requirement is defined in [Eu.Doc.100].		
Eu.DK.571	Info	In case a disturbance is present inside the EULYNX system, the safety response time can be higher. The most likely disturbance is related to the delay on the Subsystem – Communication System.		
Eu.DK.74	Head	8 Interlocking system boundaries		
Eu.DK.75	Info	This section describes the concept and terminology across interlocking system boundaries.		
Eu.DK.179	Info	Boundaries may be located in a station area or on the open line.		
Eu.DK.76	Info	The route across an interlocking system boundary is considered as a 'boundary route'.		
Eu.DK.77	Info	A 'boundary route' consists of the following: <ul style="list-style-type: none"> <i>primary route as part of the boundary route located in the primary interlocking</i> <i>secondary route as part of the boundary route located in the secondary interlocking</i> 		
Eu.DK.78	Info	The primary route contains the route entry signal. The secondary route contains the route exit signal. This is the default scenario.		
Eu.DK.79	Info	The direction must be accounted for applications on the line.		
Eu.DK.80	Head	8.1 Interlocking system boundary definitions		
Eu.DK.81	Info	The concepts and terminology defining the use of interlocking boundaries are displayed in the following figures.		

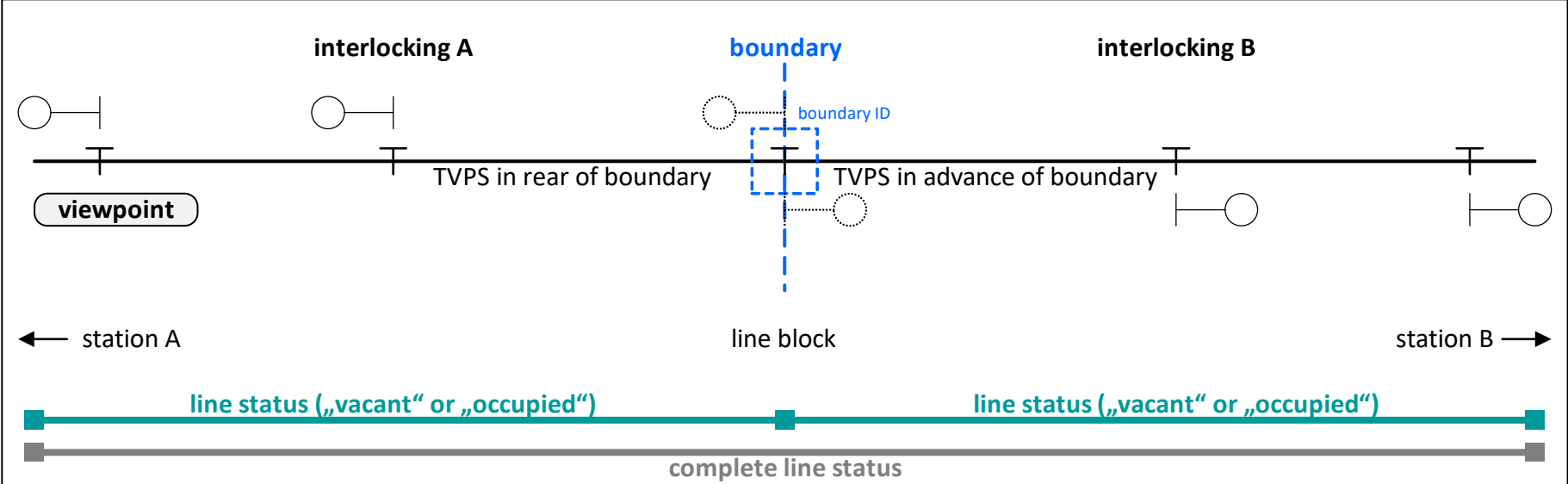
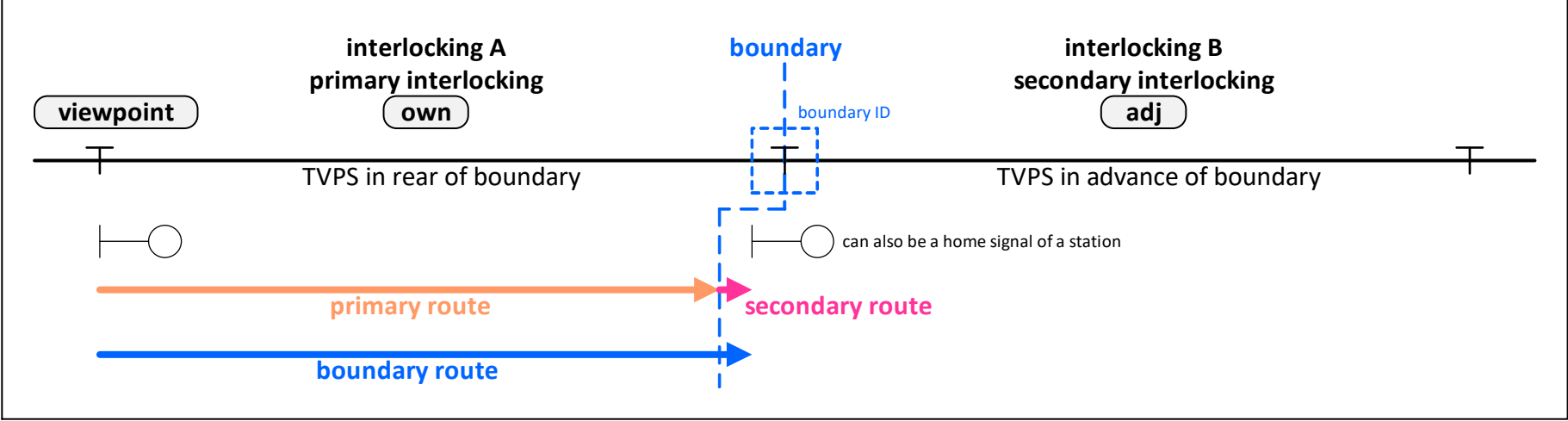
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.161	Info	<div>Basic terms</div>  <p>Diagram illustrating basic terms for a boundary between interlocking areas. The diagram shows a horizontal track with a vertical dashed line representing the boundary. To the left is 'interlocking A' with a 'viewpoint' and 'own' label. To the right is 'interlocking B' with an 'adj' label. The boundary is marked with a dashed box and 'boundary ID'. TVPS are shown on either side of the boundary. Signals are shown in the rear and advance of the boundary.</p>		
Eu.DK.162	Info	<div>Routes crossing the boundary between interlocking areas</div>  <p>Diagram illustrating routes crossing the boundary between interlocking areas. The diagram shows a horizontal track with a vertical dashed line representing the boundary. Below the track, three routes are shown: a green 'direction „exit“' arrow pointing right, a pink 'direction „entry“' arrow pointing right, and a blue 'boundary route' arrow pointing right. The primary route (orange) and secondary route (pink) overlap at the boundary.</p>		
Eu.DK.358	Info	<div>Example for multiple boundaries</div>  <p>Diagram illustrating an example for multiple boundaries. The diagram shows a horizontal track with a vertical dashed line representing the boundary. To the left is 'interlocking A' with a 'viewpoint'. To the right is 'interlocking B'. The boundary is marked with a dashed box and 'boundary ID'. Multiple boundary IDs are shown: 'boundary ID #1', 'boundary ID #2', and 'boundary ID #3'. A note at the bottom states: "Multiple interlocking area boundaries (per each track) are possible with one PDI connection between interlocking A and B."</p>		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.359	Info	<div>Example for line block boundary 1</div>		
Eu.DK.360	Info	<div>Example for line block boundary 2</div>		
Eu.DK.86	Head	8.2 Boundary route across multiple boundaries		
Eu.DK.87	Info	A route may be a primary route and a secondary route at the same time if multiple interlocking boundaries are passed.		
Eu.DK.164	Info	<div>Boundary route across multiple boundaries</div>		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.165	Head	8.3 Flank protection provision across the boundary		
Eu.DK.166	Info	Flank protection may be provided across a boundary by the adjacent interlocking system.		
Eu.DK.167	Info	Flank protection provision across the boundary 		
Eu.DK.89	Head	8.4 Boundary located in the approach zone of a route		
Eu.DK.168	Info	Boundary located in the approach zone of a route 		
Eu.DK.379	Info	Example of multiple approach zones 1 		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.357	Info	<p>Example of multiple approach zones 2</p> 		
Eu.DK.92	Head	<p>8.5 Boundary located in the activation zone of a level crossing</p>		
Eu.DK.169	Info	<p>Boundary located in the activation zone of a level crossing</p> 		
Eu.DK.380	Info	<p>Example of multiple activation zones 1</p> 		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.381	Info	<div>Example of multiple activation zones 2</div> 		
Eu.DK.170	Head	8.6 Provision of signalling information for distant signals		
Eu.DK.171	Info	<div>Signalling information for distant signals across a boundary</div> 		
Eu.DK.361	Head	8.7 Direction		
Eu.DK.365	Info	<div>Definition of direction</div> 		
Eu.DK.362	Info	Description of 'no direction': An interlocking is in the state 'no direction' regarding the line direction when the last known own direction information is not available in the interlocking during the initialisation of the PDI connection. The state 'no direction' is then sent to the adjacent interlocking during status report.		
Eu.DK.363	Info	If both interlockings are in state 'no direction' then the direction agreement is achieved by using the pre-configured direction information which is stored in configuration data).		

ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.364	Info	Note: The direction 'idle' is used only for a specific line block variant in which the direction is controlled by route setting and train movement. This is valid status of the direction in a operational interface regarding this line block variant. It shall not be confused with 'no direction'.		
Eu.DK.366	Head	8.8 Line status		
Eu.DK.367	Info	<div>Line status </div>		
Eu.DK.368	Info	The line status provides information about the status of the line between the station and the interlocking system boundary regarding one interlocking area.		
Eu.DK.370	Info	Vacant: No train vehicle is on the line. Detailed conditions can be defined by national specifications. Occupied: A train vehicle is on the line. Detailed conditions can be defined by national specifications.		
Eu.DK.369	Info	Line status information is exchanged between two interlockings so that each interlocking can determine the status of the whole line for further purposes in the interlocking logic.		
Eu.DK.374	Head	8.9 Application variants		
Eu.DK.375	Info	<div>Possible application variant 1 </div>		

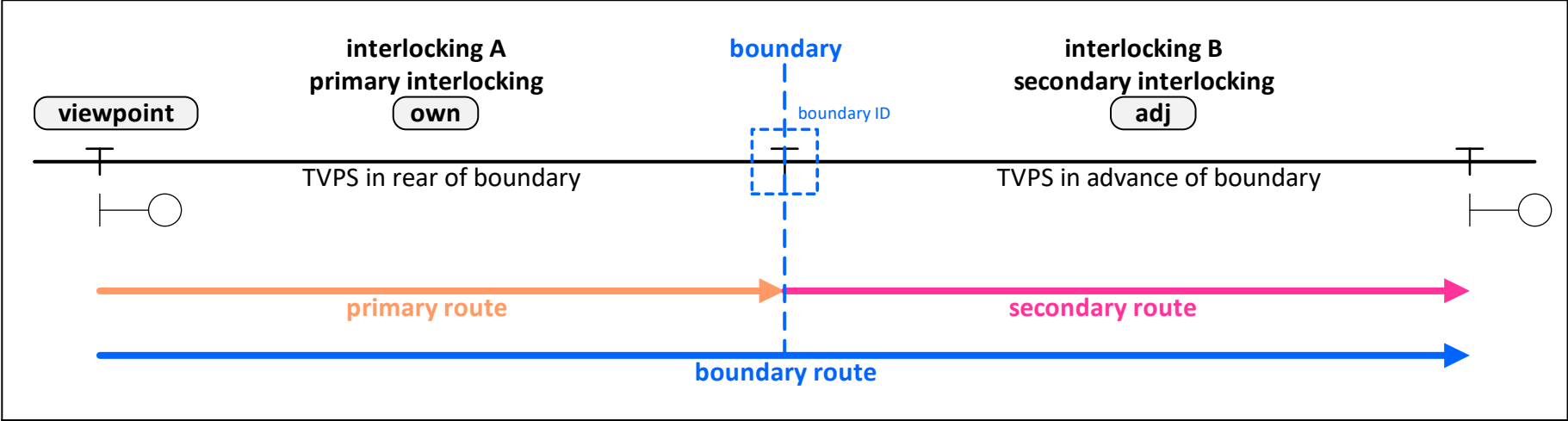
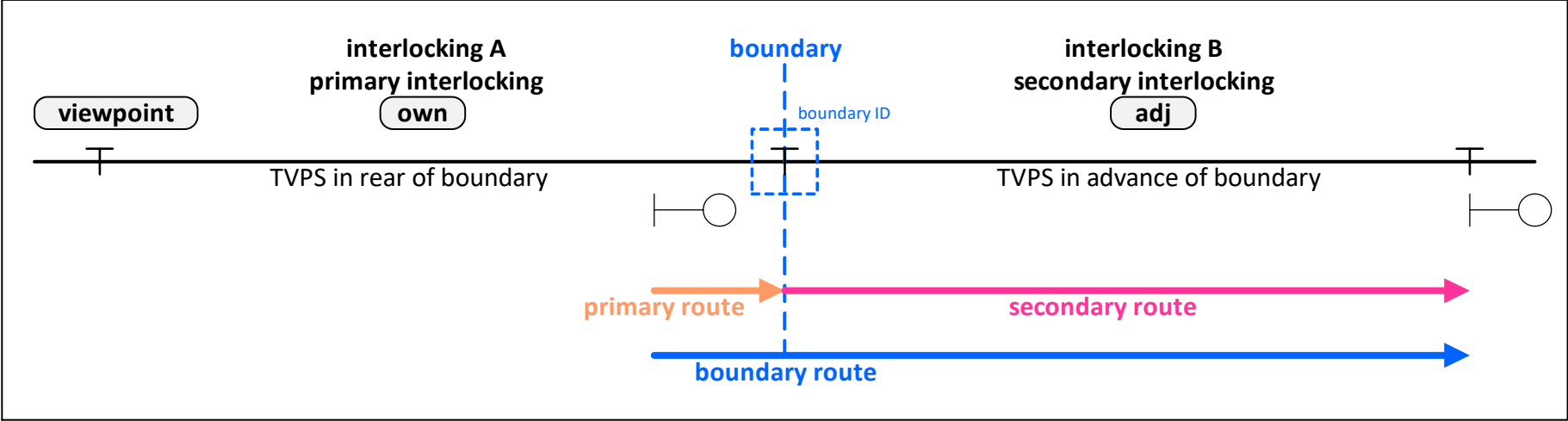
ID	Type	Domain knowledge	JIRA	V 1.18 (0.A) > V 1.16 (0.A)
Eu.DK.377	Info	<div><p>Possible application variant 2</p><p>The diagram illustrates a railway track layout with two interlocking systems separated by a boundary. On the left, 'interlocking A primary interlocking' is shown with a 'viewpoint' and 'own' status. A 'TVPS in rear of boundary' is located here. On the right, 'interlocking B secondary interlocking' is shown with an 'adj' status. A 'TVPS in advance of boundary' is located here. A vertical dashed line represents the 'boundary', with a 'boundary ID' label. Below the track, three horizontal arrows represent routes: an orange 'primary route' starting from the left, a pink 'secondary route' starting from the boundary, and a blue 'boundary route' starting from the left and passing through the boundary. The primary and secondary routes are shown as continuous lines across the boundary.</p></div>		
Eu.DK.376	Info	<div><p>Possible application variant 3</p><p>The diagram illustrates a railway track layout similar to variant 2, but with a different route configuration. It shows 'interlocking A primary interlocking' on the left and 'interlocking B secondary interlocking' on the right, separated by a 'boundary'. A 'viewpoint' and 'own' status are on the left, and an 'adj' status is on the right. 'TVPS in rear of boundary' and 'TVPS in advance of boundary' are marked. A vertical dashed line represents the 'boundary' with a 'boundary ID'. Below the track, three horizontal arrows represent routes: an orange 'primary route' starting from the left and ending at the boundary, a pink 'secondary route' starting from the boundary and continuing to the right, and a blue 'boundary route' starting from the left and passing through the boundary. The primary route is shown as a separate segment that terminates at the boundary.</p></div>		

Figure 1: From object 644 on page 30.

