XSD2017d

VDV-Implementation rules 454 – Swiss Public transport

CUS version

Based on VDV Guideline 454 version 2.2.1

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Change history from V 1.1 to 1.2

Section	Change	Changed by	Changed on
Sect. 1.4		KIDS WG	20.12.16
Sect. 3.2.6	Subscription behaviour for REF-AUS in Swiss public transport CR0024 from WG meeting on 15.09.2016	KIDS WG	04.10.16
Sect. 5.1.1	Implementation of operator filter for data platforms and ITCS with two or more operators is mandatory. The use of the operator filter by clients is recommended. CR0036 from WG meeting dated 15.09.2016	KIDS WG	04.10.16
Sect. 5.1.1, 5.2.1	Use of placeholders in the Swiss public transport system CR0039 from WG meeting dated 08.06.2016	KIDS WG	17.08.16
Sect. 5.2.2	In the Swiss public transport system, the first message in the AUS service must always be a complete journey, in order to ensure an initial status in each case for the journey, which is independent of the service. CR0030 from WG meeting dated 08.06.2016	KIDS WG	17.08.16
Sect. 5.1.3.1, 5.2.2.1	Order of stops as per inspection. CR0032 from WG meeting dated 08.06.2016	KIDS WG	17.08.16

Change history from V 1.2 to 1.3

Section	Change	Changed by	Changed on
1.4	Reference [6] added	C. Heimlicher	18.12.17

3.3	Sections ProduktID (product ID) VerkehrsmittelText (transport mode text) revised in accordance with harmonisation of transport. In particular, the transport category sources were replaced by transport categories and the table was added.	C. Heimlicher	18.12.17
5.1.3.1	The section now matches the VDV standard in version 2.5. Processing has not changed.	KIDS WG	17.07.17
5.2.2.1	The section now matches the VDV standard in version 2.5. Processing has not changed.	KIDS WG	17.07.17
5.2.2.8	New section included from VDV Guideline 454.	KIDS WG	17.07.17
6.1.10	Withdrawal of PrognoseMoeglich (forecast possible) from true to false was given new processing in VDV Guideline 454. This is not compatible with previous versions.	KIDS WG	17.07.17
6.1.15	New section included from VDV Guideline 454.	KIDS WG	17.07.17
6.1.6	The description of partial cancellations (route changes) was moved from section 6.1.12 to section 6.1.6. Implementation remains the same.	KIDS WG	04.10.17
6.1.12	For total cancellations, it was clarified that only the last valid stops (from the last complete journey) need to be transmitted again for a cancellation message. The fact that the FahrtStartEnde (journey start end) element is not permitted to be changed is already set out in the VDV Guideline.	KIDS WG	04.10.17
5.1.3 5.1.3.1	VerkehrsmittelText (transport mode text) and ProduktID (product ID) must be provided either in the line timetable or in the scheduled journey.	KIDS WG	06.12.17
5.2.2.1	VerkehrsmittelText (transport mode text) and ProduktID (product ID) must be provided in the actual journey.	KIDS WG	06.12.17

3.3	Text added for BetreiberID (operator ID): "An operator can deliver either rail or local transport data with a BetreiberID (operator ID). If an operator needs to deliver both rail and local transport data, this must be delivered with a different BetreiberID (operator ID) even if both use the same line.	KIDS WG	20.09.18
3.3	Text added for LinienID (line ID): "If an operator has multiple same lines (same line numbers), each of these lines must be delivered with a separate BetreiberID (operator ID)."	KIDS WG	20.09.18
5.2.1	In the Swiss public transport system, delivery of real-time information to the FOT and therefore in the CUS is mandatory for all transport companies.	KIDS WG	20.09.18
10.9	New values added for the VerkehrsmittelText (transport mode text) and the conversion procedure.	KIDS WG	20.09.18
10.10	New values added for the ProduktID (product ID) and the conversion procedure.	KIDS WG	20.09.18
10.11	New values added for the ServiceAttribut (service attribute) and the conversion procedure.	KIDS WG	20.09.18

Change history from V 1.3 to 1.4.2

Section	**Change**	**Changed by**	**Changed on**
Various	Offer category and transport category link to document created.	KIDS WG	26.11.2019
1.1	Reference to VDV Guideline 454, V2.2. Instruction repeated: version XSD2017.c must always be used across the Swiss public transport system.	KIDS WG	31.08.2020
1.4	An additional document created to clarify the use of the forecast status. This document has been linked in this section.	KIDS WG	13.07.2020
1.4	Links to the original documents added.	KIDS WG	26.11.2019
3.2.6 5.5.1	From XSD2017c, all subscriptions in the Swiss public transport system should be set with the element MitBereitsAktivenFahrten=true (with already active journeys = true) (default is "false"). The journeys must also be sent accordingly.	KIDS WG	13.07.2020

3.3	• Product ID (ProduktID) and transport mode text (VerkehrsmittelText) are mandatory in AUS and REF-AUS. Lists have been moved to an external document. • Specifics on VerkehrsmittelNummer (transport number) • Note on LinienText (line text) • Track and sector information is now delivered in or obtained from two separate fields in the CUS data platform. • Format of tracks and sectors for rail transport added. • A maximum of two values per line can be supplied with one character. The values "H" and "R" are recommended. These values must match the target data. The special case of rail is not applicable.	KIDS WG	06.07.2020
3.6	The time format is described in enough detail in the VDV Guideline and has therefore been deleted.	KIDS WG	26.11.2019
5.1.1	MitBereitsAktivenFahrten=true (with already active journeys = true) is now mandatory for subscriptions.	KIDS WG	31.08.2020
5.1.3	Transport mode text (VerkehrsmittelText) and product ID (ProduktID) are now mandatory	KIDS WG	31.08.2020
5.1.3.1	• Transport mode text (VerkehrsmittelText) and product ID (ProduktID) are now mandatory • Specifics on transport number (Verkehrsmittel-Nummer)	KIDS WG	31.08.2020
5.1.4	Section from VDV Guideline 454 added.	KIDS WG	31.08.2020
5.2.1	All suppliers must be able to work with the MitRealZeiten=true (with real time = true) flag in the subscription (see Section 1.4.3).	KIDS WG	27.11.2019
5.2.2	The text has been clarified and when changing PrognoseMoeglich (forecast possible) from "false" to "true" a complete journey must be sent with all stops.	KIDS WG	14.09.2020
5.2.2.1	• Transport mode text (VerkehrsmittelText) and product ID (ProduktID) are now mandatory • Specifics on VerkehrsmittelNummer (transport number)	KIDS WG	31.08.2020
5.2.2.3	More detail provided on handling forecast status in an external document.	KIDS WG	31.08.2020
5.2.2.8	Implementation note on Fahrtbeziehung (journey relationship) added:	KIDS WG	14.09.2020
5.3	Implementation note on AnschlussPlan (connection plan) added:	KIDS WG	14.09.2020
6.1.6	Comments added on transmitting route interruptions in rail transport.	KIDS WG	13.07.2020
6.1.9	Implementation note on new value PrognoseUngenau=unbekannt (forecast inaccurate = unknown) added.	KIDS WG	14.09.2020

6.1.12	For an initial message (as a complete journey), all stops must always be included in the Swiss public transport system, even in the case of a cancellation.	KIDS WG	27.11.2019
10.5	New values FehlendeRollstuhlplaetze (no wheelchair facilities) and FehlendeNiederflurwagen (no low floor coach)	KIDS WG	27.11.2019
10.9	Information on product ID (ProduktID) deleted and reference to Section 3.3 added.	KIDS WG	27.11.2019
10.10	Information on transport mode text (VerkehrsmittelText) deleted and reference to Section 3.3 added	KIDS WG	27.11.2019

Change history from V 1.4.2 to 1.4.3

Section	Change	Changed by	Changed on
Page 1 Section 1.1 Section 1.4	XSD2017c replaced by XSD2017d.	KIDS WG	07.04.2021
Section 1.4	VDV453 version 2.6 replaced by version 2.6.1.	KIDS WG	07.04.2021
Page 1 Section 1.1 Section 1.4	VDV454 version 2.2 replaced by version 2.2.1.	KIDS WG	07.04.2021

Change history from V 1.4.3 to 1.5

Section	Change	Changed by	Changed on
1.2	Versioning of CUS subversions	KIDS WG	29.06.2021
1.4	Redundant Section "1.4 Supported Versions" was removed. The supported versions are listed in Section 1.6.	KIDS WG	29.06.2021
1.6	References modified to new versions	KIDS WG	29.06.2021
2.2.2	Information on matching of AUS/REF-AUS/working timetable	KIDS WG	23.06.2021
2.2.3	Text added on the provision of working data	KIDS WG	29.06.2021
3.3.1	Text added: The optional Haltepositions-Code (stop position code) portion is not used to rail traffic.	KIDS WG	29.06.2021
3.3.3	Text added: The direction ID (RichtungsID) is a static value that remains unchanged across all the messages (AUSRef/AUS) relating to a journey.	KIDS WG	29.06.2021
3.3.5	Text added: The `<BetreiberID> (operator ID)` contains the concessionaire (GO number according to DiDok list [5]) of the lines and journeys supplied. The value supplied must match the one in INFO+.	KIDS WG	29.06.2021

3.3.8	The arrival bay text (AnkunftssteigText) and departure bay text (AbfahrtssteigText) of rail traffic must be transmitted whenever possible.	KIDS WG	23.06.2021
4.2.1	Text adopted from VDV453	KIDS WG	23.06.2021
5.1.1	Other table elements added with description.	KIDS WG	23.06.2021
5.1.2	Table with element description added	KIDS WG	23.06.2021
5.1.3	Other table elements added with description.	KIDS WG	23.06.2021
5.1.3.1	Other table elements added with description.	KIDS WG	23.06.2021
5.1.3.1 5.2.2.1	Vehicle number (VerkehrsmittelNummer) and journey designation text (FahrtBezeichnerText) are mandatory elements for rail traffic. In the Swiss public transport rail system, the train number must be included in both elements.	KIDS WG	23.06.2021
5.1.3.3	Table with element description added	KIDS WG	23.06.2021
5.1.3.4	Table with element description added	KIDS WG	23.06.2021
5.2.1	Other table elements added with description.	KIDS WG	23.06.2021
5.2.2.1	Other table elements added with description.	KIDS WG	23.06.2021
5.2.2.3	Other table elements added with description.	KIDS WG	23.06.2021
5.2.2.8	Table with element description added	KIDS WG	23.06.2021
6.1.11	Note: Specifying Ankunftstatus and Abfahrtstatus =Real (arrival and departure status = real) does not provide any information as to whether a vehicle has effectively stopped at a stop or just travelled through. **The times are transmitted immediately and independently of the `<Durchfahrt>` (non-stopping pass) element.** The `<Durchfahrt>` (non-stopping pass) element is only for planning purposes and not used to retroactively report that a train has travelled through a stop.	KIDS WG	23.06.2021
6.1.12	Text added: In REF-AUS, all stops must always be supplied, even if there is no change of route (and especially in the event of trip cancellations).	KIDS WG	23.06.2021
6.1.13	Description expanded.	KIDS WG	23.06.2021
6.1.15	Description expanded.	KIDS WG	23.06.2021
6.1.16	New section added	KIDS WG	23.06.2021
6.1.17	New section added	KIDS WG	23.06.2021
7	Glossary added	KIDS WG	23.06.2021
1.1 1.4.4 1.4.5 1.4.6 1.3 2.2.3.1 2.3 3.2.6.4	New sections added, which are only relevant to CUS.	KIDS WG	23.06.2021

5.2.2.4 (and sub-chapter) 5.2.2.5 (and sub-chapter) 5.3.1			

Change history from V 1.4.3 to 1.5, CUS V1.0

Section	Change	Changed by	Changed on
General	Everything in blue added to the Implementation Rules (RV) from SBB-Spec. V2.9.1.	J. Wichtermann	12.05.21

Change history from V 1.5 to 1.6

Section	Change	Changed by	Changed on
1.6	The use of the XSD "XML schema VDV453_incl_454_V2017d.xsd" is now mandatory. All elements from this XSD must be received without errors and forwarded in data hubs (CR_0200). The links have been adapted to the new repository.	KIDS WG	28.04.2023
3.3.1	Chapter simplified. The specifications for the format inserted as a reference to RV VDV 453. This means that SLOID does not have to be incorporated separately.	KIDS WG	15.12.2021
3.3.5	Reminder of change in V1.5: The <BetreiberID> (operatorID) contains the concessionaire (GO number according to DiDok list [5]) of the delivered lines and trips. The supplied value must match the one in INFO+.	KIDS WG	28.04.2023
5.2.2.2	Reference to SJYID inserted. For details see RV VDV 453	KIDS WG	15.12.2021
2.4	With the introduction of the new Swiss IDs (SID4PT) and the necessary changes in the XSD2017, IDs may no longer be interpreted.	KIDS WG	25.02.2022
5.1.3.1 5.2.2.1	`<FahrtBezeichnerText>`: Description clarified.	KIDS WG	10.05.2022

5.2.2.1 5.2.2.3 6.1.9 6.1.18 6.1.19 6.1.20	PrognoseUngenau and PrognoseQualitaet: For further implementation specifications for Public Transport Switzerland, see the chapters In 6.1.18, 6.1.19 and 6.1.20.	KIDS WG	20.06.2022
3.3.4 3.3.6	Specifying the examples: In the case of the means of transport category, the name is entered directly in the <ProduktID> filled, with the “Angebotskategorie” (offer category) the abbreviation in the <VerkehrsmittelText>. ProduktID and VerkehrsmittelText always in upper/lower case in German and consistent with V580 Product 6.	KIDS WG	23.08.2022
3.3.2	Chapter simplified. The specifications for the format inserted as a reference to RV VDV 453. This means that the SLNID does not have to be incorporated separately.	KIDS WG	12.05.2023
10.11	Chapter reduced and moved to RV 453.	KIDS WG	12.05.2023
5.2.1	Element “MitRealZeiten” is not a mandatory element for all elements: In order to provide other partners and the BAV with real times, the subscriptions must always be set to "MitRealZeiten=true" for public transport Switzerland, except for systems that no longer forward real-time data, e.g. information systems.	KIDS WG	27.06.2023

Release status

Version	Changed on	Status
1.0	07.11.2014	Approved by IT committee (VöV)
1.1	21.10.2015	Approved by IT committee (VöV)
1.2	28.04.2017	Reviewed by IT committee and recommended for release
1.2	02.11.2017	Approved by SKI management board
1.3	01.10.2018	Reviewed by IT committee and recommended for release
1.3	24.10.2018	approved and declared binding by SKI management board
1.4.2	11.11.2020	approved and declared binding by SKI management board
1.4.3	05.05.2021	approved and declared binding by SKI management board
1.5	27.10.2021	approved and declared binding by SKI management board
1.6	30.08.2023	approved and declared binding by KKI

1. Preliminary remarks

Based on the official VDV Guideline 454 (published by the German Association of Transport Companies (VDV), this document describes the implementation rules for public transport in Switzerland, hereinafter abbreviated to "VDV-RV 454".[3]
It explains the specifics and deviations from the official guideline, with the aim of ensuring its uniform application across the entire Swiss public transport system.

Implementation rules (VDV-RV 454) as shared basis across the Swiss public transport system

The implementation rules in this document have been agreed upon by the working group „Kundeninformationsdaten-Schnittstellen im öV-Schweiz“ (KIDS) (customer information data interface in the Swiss public transport system) and are the result of a standardisation process that concerns the uniform application of VDV Guidelines across the Swiss public transport system.

The implementation rules are officially approved by the SKI management board.

The implementation rules consist largely of:

- Concretisation of points that are purposely defined in an abstract and open-ended manner in the VDV Guideline.
- Concretisation of points that were previously handled in an inconsistent manner by Swiss public transport.
- Deliberate deviations from the official VDV Guideline within Swiss public transport.

1.1. Guidelines for Swiss public transport and CUS additions (additions to VDV RV 454)

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

This document contains both the generally applicable agreement on the Swiss public transport system and CUS (the central data platform for public transport in Switzerland). The following colours are used to improve legibility:

Text colour	Meaning
Black	Rules apply to all Swiss public transport systems
Blue	Additional rules for all connections to CUS

The rules in black letters are binding for all partners operating within the Swiss public transport system; all other colours are only for a direct connection to CUS.

1.2. Versioning of CUS subversions / change log (additions to VDV-RV 454)

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)
An additional CUS subversion is maintained for CUS texts in “CUS version”. It uses a separate ascending number without any decimal places. The number is only increased if changes are needed in additional CUS-specific texts between two versions of the implementation rules that do not have to be accepted by the management board.

The separate CUS subversion will be inserted into the document names in the following position:

- VDV454_Realisierungsvorgabe_ÖV_CH_V1.5_**CUS**_**V1**_Basis_XSD2017_DE

This will not affect the allocation of new version numbers of the implementation rules.

The list of changes is divided into RV (as before) and CUS with blue text, marked with the option "hidden").

1.3. On behalf of FOT to the SBB (addition in VDV-RV 454)

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

The SBB infrastructure fulfils two mandates from the Federal Office of Transport (FOT) which ensure access to journey data without discrimination:

- Timetable collection (LV 2021 – 2024 [9]) => ensured with INFO+
- Real-time information (LV 2021 – 2024 [9]) => ensured by CUS Central

Services related to the **seasonal** or **annual timetables** based on the service agreement LV 2021 - 2024 [9]are shown in the INFO+ product.

The specification in the present document relates to VDV recommendation 454 [3], which (as with VDV 453) ensures the exchange of real-time data [3] (LV[9] 2021-2020) by means of the AUS data service and of the daily scheduled timetable by means of the REF-AUS data service.

While real-time data (AUS) and daily scheduled timetables (REF-AUS) are always exchanged via the VDV data services, seasonal timetable data must be obtained directly from the relevant timetable systems (e.g. from the timetable collection of Swiss public transport – INFO+).

1.4. Document structure and scope (additions in VDV-RV 454)

1.4.1. Scope

These implementation rules for the Swiss public transport system (VDV-RV 454) supplement the official VDV Guideline 454 [3] and describe only deviations, changes and concretisations of this guideline. This document does **not** therefore replace the official VDV Guideline 454 [3] and does not contain the complete information needed to implement or understand the VDV454 interface.

In addition to these implementation rules, the respective partners require an agreement that is even more specific than described here and is tailored to the individual circumstances and needs of the individual partners. This VDV interface specification specifies points not described here and may also contain explicit deviations and additions to VDV-RV 454. These bilateral or multilateral specifications (hereinafter referred to as Partner2Partner specifications) should always refer to this VDV-RV 454 and be based as closely as possible on this.

This document should not be interpreted as a contract. The contractual situation between two partners or their suppliers is not part of this document.

1.4.2. Uniform chapter structure

In order to simplify a direct comparison between the implementation rules and the official VDV Guideline, the section structure of VDV Guideline 454 [3] was adopted throughout this document **from Section 2**.

More specifically, this means that:

- The official VDV Guideline 454 [3] generally applies. The statements and definitions set out there are not repeated in this document[1].
- A **blank section** in this document means that the original VDV Guideline apples without exceptions or additional definitions.
- If specifics or deviation from the standard is necessary due to special circumstances within Swiss public transport, these will be described in detail in the section in question.
- The official VDV Guideline 454 [3] purposefully does not make any definitions on metadata for data exchange between VDV partners. Definitions on individual metadata and their structure, which apply to the whole Swiss public transport system [2], are described in the relevant sections.

[1] An exception to this rule will be made if a brief description of the normal case defined in VDV Guideline 454 is required or practical in order to understand a subsequent text or the general context.

[2] The rules are defined by the KIDS Working Group and apply as the standard for the Swiss public transport system.

The consistency of the section structure is guaranteed, with the following caveat:
If an explanation or addition is necessary and does not match the specified section structure, a separate section will be added at the end of the section level in question, which always has the extra text "(**addition in VDV-RV 454**)" in the title. This section (including any subsections) does not correspond to the official VDV Guideline 454 [3] and placing it at the end of the section level does not therefore affect other section numbers that follow it.

1.4.3. Mandatory, optional and non-supported fields

In the tables describing the XML structure of a data element, the last column specifies whether the element in question is mandatory or optional. If use deviates from the original VDV Guideline 454[3], the value in this document is shown in red.

Mandatory	Element must be specified in the XML structure **and** contain a semantically meaningful value. Specifying a mandatory field without a value is not allowed.
Optional	Element can be specified or can be omitted. If the element is specified, it must contain a semantically meaningful value. A previously delivered value can be reset by explicitly not specifying the value when the element is transferred **again** (if this is permitted by the XSD definition). If the optional element is omitted in the case of a change notification, the value from the last transfer applies. If the optional element is omitted in the case of a complete journey, the value is reset to the default (if defined) or otherwise left blank (null).
n/a	Element is not supported. If it is specified, the content will be ignored. All data elements that are not supported or are not known to the system-specific XSD are to be ignored by the system. This must not result in a processing or validation error.

Table 1: Mandatory and optional fields

1.4.4. Differentiation of the roles of CUS (addition in VDV-RV 454)

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

It is important to distinguish in some places whether CUS functions in relation to a particular service as a data recipient (client) or as a data supplier (server) or as a data platform (DDS) or as a railway data producer (DPB). The passages in question are marked as follows:

CUS as a data server:
- "CUS as data platform – DDS (server)" (*standard, not marked*)
- "CUS as railway data producer – DPB (server)" (*marked*)

CUS as data client:
- "CUS as data platform – DDS (client)" (*standard, not marked*)
- "CUS as rail data producer – DPB (client)" (*marked*)

1.4.5. CUS as data platform (addition in VDV-RV 454*)*

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

This document describes the interface functionalities of CUS as a data platform as they relate to the sharing of data between partners via VDV 454.

Where special treatments and exceptions exist, they are explicitly marked in the document. (cf.1.4.4 Distinction of server and client (*addition in DV-RV 454*)).

The following are the requirements for CUS as a data platform for public transport in Switzerland:

- As a data platform, CUS distributes data supplied via one of the VDV454 data services (REF-AUS, AUS). Provided that it complies with the standard, the incoming data is stored in CUS and forwarded unchanged to recipients.
- As a data platform, CUS ensures that the individual VDV data services can be used as standalone services individually and independently:
    - Technically speaking, CUS as a data platform strictly separates VDV453 data from VDV454 data.
    - The CUS data platform meticulously separates VDV454 data from REF-AUS data services from the AUS data services at a technical level.
- As a data platform, CUS regularly deletes the data from the previous operating days. However, the recipients can always access the data from the current and previous day.
- As a data platform, CUS makes schema changes with inbound delivery via the XSD2015 interface and outbound delivery via XSD2017 and v.v. This affects
    - Cleaning up of items that are identified as inbound but do not exist as outbound.
    - Populating items that missing as inbound but are mandatory for outbound.

The requirements for CUS as a data platform, with regard to referencing actual data and supplying planning data, are listed in sections 2.2.2 and 2.2.3

1.4.6. CUS as rail data producer – DPB (*addition in VDV-RV 454)*

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

In addition to its role as a data platform for Swiss Public transport, CUS also adopts the role of a data producer/supplier for rail services (this applies to all rail transport except for trams).

In this regard, the following assumptions are made:

- As a rail traffic data producer, CUS consolidates incoming raw data from railway operating systems for the data producers and supplies this as produced data to interested customers via the Swiss public transport data platform.
- In this case, the production of the timetable data and the use of the algorithms, rounding rules, threshold values and semantic formatting required to do so is the responsibility of CUS as the data producer.
- CUS as a data producer makes actual timetable data and daily scheduled timetable data available from the AUS and REF-AUS data services in accordance with the VDV standards. The seasonal timetable (annual working timetable) must still be obtained from INFO+.

The requirements for CUS as a data producer, with regard to referencing of actual data and supplying working data, are listed in Sections 2.2.2 and 2.2.3.

Specific procedures relating to the production of timetable data can be found in the relevant sections, e.g. under "CUS as a data producer".

1.5. **Binding nature** (addition in VDV-RV 454)

This document describes how VDV Guideline 454 [3] is applied and interpreted specifically within Switzerland. It forms the basis of agreements for VDV connection between the individual public transport partners for exchanging current data.

In addition to the definitions in this document, the respective partners will need to agree upon metadata not defined here or in the official VDV specification.

Text in blue is only mandatory for a direct connection to CUS.

1.6. Referenced documents (addition in VDV-RV 454)

[1] German Association of Transport Companies VDV
VDV Guideline 453 - Live data interface timetable information, version 2.6.1, Cologne (Germany), 2021
https://www.xn--v-info-vxa.ch/de/branchenstandard/branchenstandard-kundeninformation-bs-ki/technische-standards

[2] German Association of Transport Companies VDV
XML schema VDV453_incl_454_V2017d.xsd (version: "2017d"), Cologne (Germany), 2021
https://www.vdv.de/i-d-s-downloads.aspx

[3] German Association of Transport Companies VDV
VDV Guideline 454 - Live data interface timetable information, version 2.2.1, Cologne (Germany), 2021
https://www.xn--v-info-vxa.ch/de/branchenstandard/branchenstandard-kundeninformation-bs-ki/technische-standards

[4] **VDV453 Implementation rules for Swiss public transport Version 1.6**, Bern (CH), 2023
https://www.xn--v-info-vxa.ch/de/branchenstandard/branchenstandard-kundeninformation-bs-ki/technische-standards

[5] Federal Office for Transport (BAV)
Stops (DiDok list), Bern (Switzerland)
https://opentransportdata.swiss/de/dataset/didok

[6] Alliance Swiss Pass
V580 – FIScommun / Product no. 06
https://www.allianceswisspass.ch/de/tarife-vorschriften/uebersicht/V580/Produkte-der-V580-FIScommun-1

[7] Using the Forecast Status in VDV454
https://www.xn--v-info-vxa.ch/de/branchenstandard/branchenstandard-kundeninformation-bs-ki/technische-standards

[8] SKI business unit
SKI roadmap.
https://www.xn--v-info-vxa.ch/de/organisation/systemaufgaben-kundeninformation-ski/ski-roadmap

[9] Federal Office of Transport.
Service-level agreement SBB 2021 to 2024
https://www.bav.admin.ch/dam/bav/de/dokumente/das-bav/finanzierung/abgeschlossene-lv-2021-2024/lv-sbb-2021-2024.pdf.download.pdf/SBB%20LV%202021-2024.pdf

[10] SID4PT
https://www.xn--v-info-vxa.ch/de/branchenstandard/branchenstandard-kundeninformation-bs-ki/technische-standards

2. Introduction

2.1. General objective

The VDV454 interface aims to transfer timetable data to one or more VDV partners. The data transferred via this interface is also required in order to provide real-time data in information systems.
This document, together with the official VDV Guideline 454 [3], defines the Swiss-wide standard for implementing the VDV interface, as well as individual data structures, based on the mutual exchange of real-time transport information between public transport companies using the ITCS (Intermodal Transport Control System) or "data platforms".

Both documents, when taken together, describe in detail:

- what data may be exchanged between public transport partners?
- what elements of the VDV Guideline are supported within the Swiss public transport system?
- explicit deviations from the corresponding VDV Guideline
- the format of an individual data element
- the content and time-related data flows
- what agreements on metadata and master are necessary?
- what data can be exchanged between SBB and the public transport partners
- what elements of the VDV Guideline 454 [3] are supported by SBB
- what needs to be considered when operating the interface?
- how data is to be interpreted when it is not clear from VDV Guideline 454 or when its use deviates from VDV Guideline 454 [3]

(see also the corresponding section in the VDV Guideline [3])

2.2. Requirements for data exchange

(see VDV Guideline 454 [3])

2.2.1. Transfer of updated planning and operating data

(see VDV Guideline 454 [3])

2.2.2. Referencing of actual data

(see VDV Guideline 454 [3])

A distinction can be made between the following possible references:

- AUS service to REF-AUS (actual/forecast/working) → schedule times in seasonal timetable):
  - Referencing is undertaken via the FahrtID (journey ID) (see Section 5.2.2.2) in VDV454

- AUS service to seasonal timetable (actual/forecast/ working) → schedule times in seasonal timetable):
  - Background. Today, matching takes place in the information system, e.g. according to the matching defined by the system manufacturer.

  - Desired outcome. Referencing and matching of the data from the VDV service AUS with the seasonal timetable is carried out according to criteria that have been jointly defined by the submitting data producer and the information systems.
  - Via an end-to-end journey reference based on the Swiss journey ID SJYID. The implementation time is shown by the coloured arrows (see [8])

- REF-AUS service to seasonal timetable (working → schedule times in seasonal timetable):
  - Background. Today, matching takes place in the information system according to the matching algorithm defined by the system manufacturer.
  - Desired outcome. Referencing and matching of the data from the VDV service REF-AUS with the seasonal timetable is carried out according to the VDV Guideline as per the definition of the line timetables and subject to the criteria established jointly by the data producers and the information systems.

According to the DVD specifications, it must be possible to use the AUS services independently of the REF AUS. The AUS data is therefore referenced either with the daily timetable (REF-AUS) or the seasonal timetable (INFO+). Note: Due to outstanding commitments, not all partners can use the REF-AUS.

The matching criteria required for all referencing to the seasonal timetable (e.g. INFO+ for Swiss public transport) must be specified to the data recipient by the data-producing transport companies. With the introduction of the continuous journey ID, matching can be regulated uniformly via the journey ID.

CUS as a Swiss public transport data platform – DDS:
CUS, as the central Swiss public transport data platform, does not perform any referencing between the data of the various VDV data services or the seasonal timetable. This referencing must be facilitated by the data-producing transport company itself and carried out by the data retriever (display system, timetable information system, etc.):

- In this regard, the data-producing transport companies are responsible for the quality of the data provided and must ensure that the journeys of the various VDV data services can be referenced to each other via the FahrtID (see section 5.2.2.2).

CUS as rail data producer – DPB:

- is responsible for the quality of the railway data supplied and ensures that the journeys of the various VDV data services can be referenced to one another using FahrtID (see section 5.2.2.2.
- publishes the alignment criteria for Swiss public railway transport needed for any referencing or alignment of the data from the VDV services to the seasonal timetable (e.g. INFO+ for Swiss public transport), and ensures that the information for journey referencing from the VDV services corresponds to the information on unique journey identification in the seasonal timetable in terms of content.

2.2.3. Provision of target data

(see VDV Guideline 454 [3])

The data relating to seasonal or annual timetables within the Swiss public transport network are collected centrally in the INFO+ timetable database and are available to interested recipients in proprietary HAFAS raw data format[3].

The provision of planning data in AUS service begins for the first time when the preview time is reached within the context of the initial message.

If data recipients also require timetable data which goes beyond the preview time or validity window of the REF-AUS service, this can be obtained via the up-to-date seasonal timetable from INFO+.

It is assumed that the partner has access to the relevant data from the seasonal timetable and that it is therefore possible to map the operational data received to the seasonal timetable.

The relevant data recipient is responsible for ensuring that he/she has the valid data platform as a reference.

Regarding referencing between the VDV services AUS and REF-AUS to the seasonal timetable, see also Section 2.2.2.

2.2.3.1. Special case: values deviating from the seasonal timetable (*addition in VDV-RV 454*)

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

CUS as rail data producer – DPB:
Trains used for **cross-border rail transport** may be represented differently (e.g. division into foreign and domestic, incl. separate train numbers) in the INFO+ and CUS systems. In some cases, the TC code, vehicle type and even the train number can differ for trains that are actually the same:

- In the case of international transport, the sections within Switzerland are retrieved from the NeTS planning system and those outside of Switzerland are obtained from EVAplus or NeTEx. These sections are then connected in CUS as a long, continuous train. The train bears the attributes of the Swiss train (normally TC code "11")
- In traffic with France (e.g. the Geneva-Bellegarde crossing), only the section from Switzerland to the first change of train number is transmitted.
- When trains are entered manually in INFO+, they are given a fictitious TU code which is corrected when it is imported into CUS.

2.2.4. Definition of values to be used uniformly

(see VDV Guideline 454 [3])

2.3. Authentication and encryption (addition in VDV-RV 454*)*

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

[3] Due to its widespread use, the HAFAS raw data format is unofficially regarded as a "quasi-standard" for the exchange of planning data in public transport Switzerland.

See also the section with the same heading the VDV 453 implementation rules [1].

2.4. IDs are not allowed to be interpreted (addition in VDV-RV 454*)*

With the introduction of the new Swiss IDs (SID4PT [10]) and the necessary changes in the XSD2017 in this context, IDs may no longer be interpreted.

3. Introduction and basic terms

3.1. Structure of the interface

(see VDV Guideline 454 [3])

3.2. Timetable information data service AUS

(see VDV Guideline 454 [3])

3.2.1. Overview

(see VDV Guideline 454 [3])

3.2.2. Specialist services REF-AUS and AUS

(see VDV Guideline 454 [3])

3.2.3. Functional scope of REF-AUS

(see VDV Guideline 454 [3])

3.2.4. Functional scope of AUS

(see VDV Guideline 454 [3])

3.2.5. Scope of specialist service DFI

(see VDV Guideline 454 [3])

3.2.6. Data exchange with REF-AUS (addition in VDV-RV 454)

Before the operating day for the individual transport company starts, the recipient should obtain a complete day timetable via the REF-AUS service in accordance with VDV Guideline 454 (Section 3.2.2 and 3.2.3).[3] This creates a common basis for the subsequent subscription of AUS messages.

In processing the REF-AUS data in the recipient system, a time replacement from line timetables is used – same operator ID (BetreiberID), same line ID (LinienID), same direction ID (RichtungsID). This means that all journeys already received for these line timetables are replaced in the transmitted validity period (GueltigVon (valid from), GueltigBis (valid to)) by the newly transmitted journeys from the day timetable (also for the seasonal timetable).
This principle also applies to REF-AUS processing in an information system – even if the data from the seasonal timetable is used there as a basis. In this case, all journeys from REF-AUS are individually matched to the appropriate journeys in the seasonal timetable:

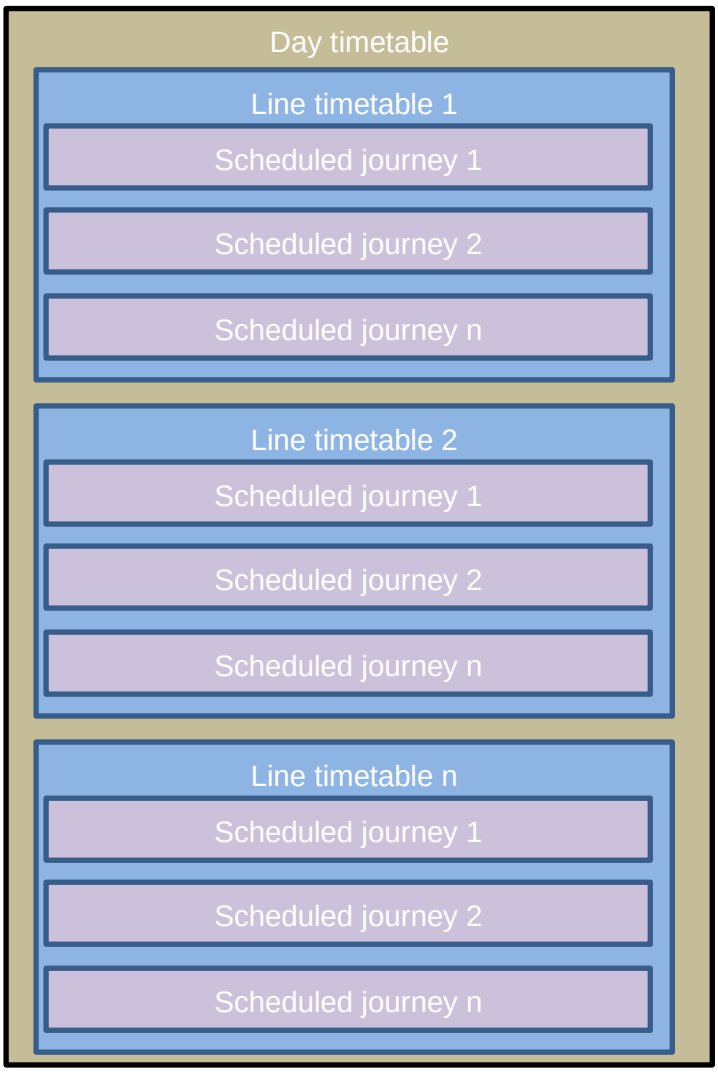
- matching journeys are displayed
- additional journeys from REF-AUS are displayed without the "additional journey" attribute, without using the "additional journey" note.
- Unsubmitted journeys from REF-AUS are removed from seasonal timetable without using the "Failed" indication

This ensures that the number of operated journeys is always determined by the ITCS. The information system can, however, still display additional attributes contained in the period timetable (e.g. subject to surcharge).

The maximum available validity periods and when the target day timetables are available from the respective data producer shall be agreed upon across the entire supply chain (producer, data platform, recipient) (see Section 3.2.6.3).

3.2.6.1. Day timetable

A day timetable consists of a number of line timetables and a line timetable of a number of scheduled journeys.



Complete line timetables across the defined validity period (GueltigVon (valid from), GueltigBis (valid to)) are transferred via VDV454 REF-AUS. Each line timetable contains all scheduled journeys that start before or within the validity period and have at least one stop within the validity period (VDV Guideline 454, section 5.1.1: MitBereitsAktivenFahrten=true).

The following rules must be observed in the process

- A line timetable must always be transferred completely in one message. Dividing it up across multiple packets (e.g. DatenAbrufenAntworten via WeitereDaten=true) is not permitted. A line timetable always contains all journeys that are operated for the defined validity period. Scheduled journeys that are not transferred in the line timetable

are not operated; new scheduled journeys are interpreted as additional journeys and the "additional journey" flag is applied by the recipient as per the transferred scheduled journey.
- A blank line timetable is also a complete line timetable. A blank line timetable therefore deletes all journeys for the defined validity period
- If the recipient cannot interpret scheduled journeys, it is a good idea to discard the complete line timetable, or it at least needs to be considered whether it is better to discard the scheduled journeys that cannot be interpreted (which are then no longer operated) or discard the entire line timetable.
- If a line timetable cannot be delivered in full for the agreed validity period as per the subscription, then it should not be transferred; otherwise, all journeys that are not transferred will be deleted.
- If a line timetable is not transferred, the recipient's line timetable continues from its most recent transfer status (REF-AUS or period timetable).
- Scheduled journeys in the line timetable can be marked as cancelled with the flag FaelltAus=true (cancelled = true). If scheduled journeys are simply omitted, it is recommended for the recipient to delete the journey and not set the FaelltAus flag.

3.2.6.2. Transmission sequence for REF-AUS and AUS

According to VDV Guideline 454 [3](section 3.2.2 and 3.2.3), the day timetables should first be synchronised (the recipient has the same target data as the sender) and then changes to the day timetable are subscribed via the AUS service.

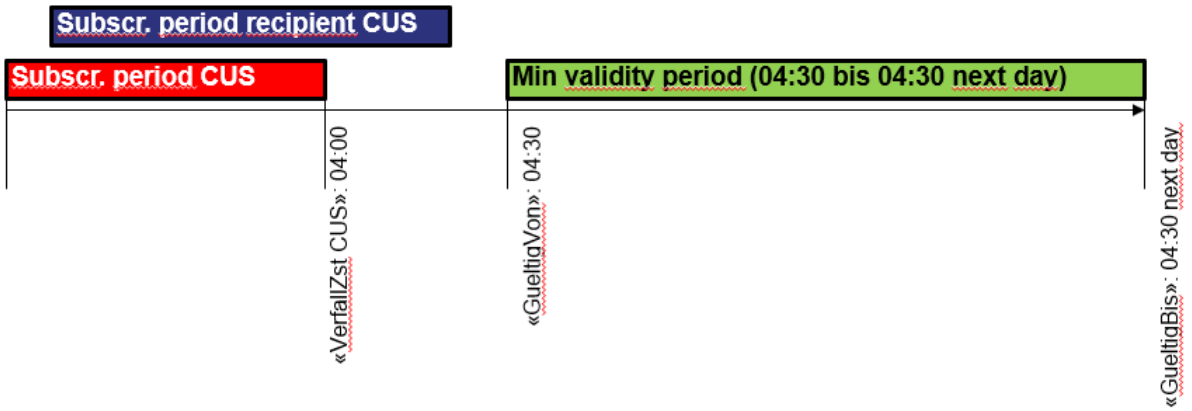
Reason:
- AUS messages will otherwise be transferred without the recipient's and supplier's data pools being synchronised
- Obsolete or incorrect data pools may be displayed.
    - Additional journeys from REF-AUS are not displayed in the AUS service or are only displayed when the first journey is transferred.
    - Cancelled journeys continue to be displayed.
    - Route changes from REF-AUS are not displayed in the AUS service or are only displayed when the first journey is transferred.
    - Compositions are not displayed in the AUS service or are only displayed when the first journey is transferred.
    - Actual journeys from the AUS service must be compared against the period timetable. If a journey cannot be compared, journeys may not be deleted or may be duplicated.
    - Etc.

3.2.6.3. Organisational agreement in CUS for the transfer of REF-AUS data

In order to issue subscriptions over the correct subscription period and with the right validity period, an organisational agreement is needed across the entire supply chain.
- Which subscription periods and validity periods for this day timetable can be defined is agreed upon organisationally across the entire supply chain (producer, data platforms, recipient).
- All CUS suppliers agree to deliver their line timetables in CUS by 04:00 at the latest on the day of operation, with a validity period running from 04:30 to 04:30 of the following day at a minimum.

- CUS as the data platform can only check whether the received line timetables comply with the recipient's validity period once the line timetables are received from the suppliers, which is why CUS confirms the recipient's subscription without checking whether it can deliver this data in each case. It is ensured, however, that only data that matches the subscription is delivered. If this is not the case, no line timetables are delivered.
- The recipient always orders at least the minimum validity period from 04:30 to 04:30 of the following day.

The graphic shows how REF-AUS data can be transferred via a data platform (CUS in this case).



Sample table for organisational agreement:

Operator	Operator > CUS (inbound)				CUS > recipient (outbound)			
	Time range for subscription query		Day timetable		Time range for subscription query		Day timetable	
	Subscription query	Subscription expiry	Valid from	For duration of	Subscription query	Subscription expiry	Valid from	For duration of
Partner 1	03:30	04:00	04:30	24:45 h	04:00	04:30	04:30	24:45h
Partner 2	03:30	04:00	04:30	30 h	04:00	04:30	04:30	30h
Partner 3	23:00 (previous day)	01:00	04:30	48 h	01:30	02:30	04:30	30h

This table is maintained by Fachbus CUS in accordance with the agreements.

CUS as a railway data producer makes its REF-AUS data for the day of operation available on CUS from 22:00 hours the day before. The REF-AUS data for local traffic no later than 04:30 on the day of operation.

It is recommended that the individual operators' data should be obtained within the time window 04:00–04:30. The expiry time (`VerfallZst`) for the REF-AUS subscription should be

set to no later than 06:00 in order to ensure that no active subscriptions remain set up during the day. (also see Section 3.2.6.4 for information about CUS blocking times).

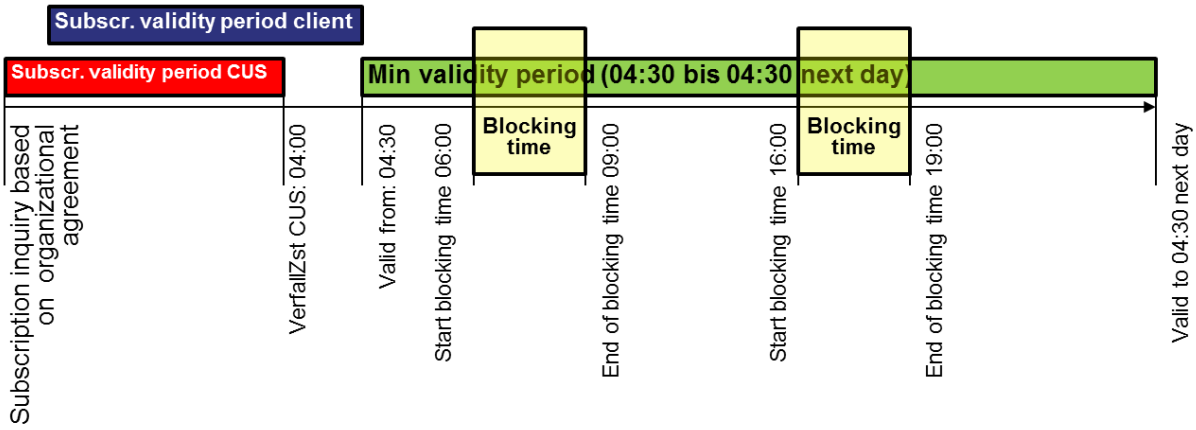
3.2.6.4. CUS blocking times (*addition in VDV-RV 454*

(Because the following text is only relevant for a direct connection to CUS, it may potentially be hidden. The documentation in its entirety is available only in the CUS version)

CUS reserves the right to introduce a blocking period in the event of system overloads.

The CUS blocking periods in this case would be:

- Due to potential overloading of the system, a blocking time may be set during times of peak traffic (the following values are currently configured: 06:00 to 09:00 and 16:00 to 19:00).
- No subscriptions are accepted and no messages delivered during the blocking time.
- For logical reasons, the recipient sets no new subscription during the blocking time and concludes the subscriptions no later than the start of the blocking time.
- During the blocking time, the back-up level for the REF-AUS is the AUS service and the seasonal timetable (from INFO+).



3.3. Metadata, mapping of stops and lines

(see VDV Guideline 454 [3])

3.3.1. Stop information (HaltID) (addition in VDV-RV 454)

(see VDV Guideline 454 [3])
The `<HaltID>` (stop ID) element describes the stop, and optionally the stopping point to which a vehicle travels.

Format:
The "HaltID" should be specified at the finest granularity available, if possible, and should also be treated the same in the application of the VDV453 [1] and VDV454 [3]. The conversion to SLOID [10] is also taken into account there.

3.3.2. Line id (LinienID)

(see VDV Guideline 454 [3])

The LineID together with the OperatorID must always be unique.

Note on REF-AUS:
If a line is operated by multiple transport companies and delivered to recipient systems via separated ITCS, these ITCS and the data cancel each other out. These types of line must be divided into two separate lines (with separate line ID or separate operator ID) similar to the ITCS.

The format of the "LinienID" is defined in the realization specification VDV-RV 453 [4], chapter 6.1.6 Line and direction references [4]. The conversion to the SLNID [10] is also taken into account there.

3.3.3. Direction ID (RichtungsID) – (addition in VDV-RV 454)

(see VDV Guideline 454 [3])

Recommendation: When journeys are transmitted, the direction ID (RichtungsID) value, which is transmitted via VDV454 services, should match the value from the "ID for direction" field for the corresponding journey from the seasonal timetable (e.g. INFO+). A maximum of two values per line may be supplied with one character. The values "H" and "R" are recommended.

The direction ID is a static value that must remain unchanged across all the messages (REF-AUS/AUS) relating to a journey.

3.3.4. Product ID (ProduktID) – (addition in VDV-RV 454)

(see VDV Guideline 454 [3])

The vehicle category is communicated as the `<ProduktID>` (product ID) in the Swiss public transport system (e.g. boat, bus, train, etc.). The data-producing transport company must ensure in the process that the vehicle categories [6] transmitted match the vehicle categories used in the timetable collection in the Swiss public transport system (INFO+).

Note

- Specifying the product ID (ProduktID) is partly used for the assignment of pictograms in the information systems.
- The current transport categories can be found on the home page of Alliance Swiss Pass [6]. The use of German-language values, incl. upper and lower case, are mandatory and must be adhered to across the Swiss public transport system whenever possible.
- Nonetheless, the values for the transport category may change at short notice and sometimes even without any notice. Recipient systems should therefore be able to respond rapidly to such changes and must not discard data with unknown transport categories.

3.3.5. Operator ID (BetreiberID) – (addition in VDV-RV 454)

(see VDV Guideline 454 [3])

The <BetreiberID> (operator ID) contains the concessionaire (GO number according to DiDok list) [5]) of the lines and journeys supplied. The value supplied must match the one in INFO+.

The operator ID is a mandatory field in the Swiss public transport system and must be specified in the following format:

[**UIC country code**]:[**UIC code**] **(UIC country code: business organisation no.)**

Definitions:

Identifier	Meaning	Example
UIC country code)	The country code of the transport undertaking (as per UIC) operating the journey. Numeric value with max. 2 digits	85
UIC code (business organisation number)	Number of the business organisation of a transport company operating the journey, as per the FOT DiDok list or reference for the country in question.[5] (Synonym: TU-Code, or transport company code.) The number should not start with a leading zero. These must be adhered to across the Swiss public transport system whenever possible. Max. six-digit alphanumerical value (permissible characters are { A-Z, a-z, 0-9, _ }). The business organisation number (UIC code) must be identical in the journey identifier (FahrtBezeichner) and line ID (LinienID) elements. If the numbers are different, it may not be possible to process the journey (inconsistencies).	37

An operator can deliver either rail or local transport services data with an operator ID (BetreiberID). If an operator needs to deliver both rail and local transport data, these must be delivered with different operator IDs even if both use the same line (e.g. use of buses in place or trains at off-peak times).

Note
It must be possible to subscribe to the product "Bahn" (rail) even without local transport data (including filtering). Until all systems can deliver the product ID (ProduktID) and have consistently implemented a product filter (ProduktFilter), this interim solution involving a separate operator ID (BetreiberID) for rail and local transport must remain in place.

3.3.6. Vehicle text (VerkehrsmittelText) – (addition in VDV-RV 454)

The abbreviation of the service category (e.g. ICE, RE, R, S, B, T, FUN, LB, etc.) is transmitted as <TransportText> in Public Transport Switzerland. The data-producing TU must

ensure that the transmitted "VerkehrsmittelText" corresponds to the German-language service categories [6] used in the timetable collection of ÖV-Schweiz (INFO+), including upper/lower case.

Note

- Specifying the product ID (ProduktID) is partly used for the assignment of pictograms in the information systems.
- The current offer categories can be found on the home page of Alliance SwissPass [6]. These must be adhered to across the Swiss public transport system whenever possible.
- Nonetheless, the values for the transport category may change at short notice and sometimes even without any notice. Recipient systems should therefore be able to respond rapidly to such changes and must not discard data with unknown offer categories.
- Deviating offer categories from foreign transport companies are accepted as delivered by the transport companies and transmitted in an unchanged format to relevant data recipients.

3.3.7. Line text (LinienText) – (addition in VDV-RV 454)

The `<LinienText>` (line text) element is publication-relevant and must therefore be forwarded to the information system and displayed there in the format of consistent customer information as prepared by the data supplier.

The line text is a matching criterion for certain information systems and should therefore match the line number in INFO+. The line text in the HDRF in Switzerland corresponds to the short name (code: N T).

Line text in rail traffic:
In VDV454 services, the publication-relevant line designation (PLB) is transmitted in the `<LinienText>` (line text) element. The line text must always be transmitted for additional journeys, since in this case the value cannot be obtained from INFO+.

In CUS this is composed of the following elements:

Offer category	Line number	Line text (LinienText)
S		S
S	1	S1
IC		IC
Inter-City Express		ICE
R		R
S	L1	SL1

In rail traffic, the PLB is delivered to CUS, but subdivided into vehicle text (VerkehrsmittelText) (offer category) and line text (LinienText) (line number):

- PLB = S1
  - CUS (VDV454 delivery)
    - VerkehrsmittelText (vehicle text) = S
    - LinienText (line text) = 1 or LinienText = S1
  - INFO+ (delivery)
    - Category = S

        - Line = 1
    - Note: Delivery from CUS in the line text: S1 (as per table above).

- PLB = R
    - CUS (VDV454 delivery)
        - VerkehrsmittelText = R
        - LinienText = "blank" or R
    - INFO+ (delivery)
        - Category = R
        - Line = blank
    - Delivery from CUS in the line text: R (as per table above).

3.3.8. Arrival/departure bays (AnkunftssteigText, AbfahrtssteigText) - (Addition in VDV-RV 454)

For rail travel, the "Steig" (bay) corresponds to the track identifier, without the sector. This is normally a number. In NAV it is normally a letter.

In rail traffic, the track must be transmitted in the element “AbfahrtssteigText” whenever possible.

3.3.9. Arrival/departure sectors (AnkunftsSektorenText, AbfahrtsSektorenText) - (addition in VDV-RV 454)

The following format must be observed in rail travel:
Sectors are specified in the following format to save space:

- Letters A to Z, max. three-characters without spaces (e.g. "ABC")
- For more than three letters, describe as a range with a hyphen (e.g. "A-D, corresponds to "ABCD")

This is to be ensured by the source systems (INFO+, CUS, VDV supplier partners, etc.).

Sectors only have to be transmitted if the stopping point deviates from the usual location (e.g. two trains at the same platform).

3.4. Estimation of data quantities

(see VDV Guideline 454 [3])

3.5. Estimation of data currency

(see VDV Guideline 454 [3])

See also Section 6.1.8 for more detailed information about delays.

3.6. Time formatting

(see VDV Guideline 454 [3])

3.7. Operating day (addition in VDV-RV 454)

(see also VDV453 RV [4] Section 6.1.1)

4. "Basic infrastructure" interface description

4.1. Preliminary remarks

(see VDV Guideline 454 [3])

4.2. Subscription procedure

(see VDV Guideline 454 [3])

4.2.1. Dividing large data packets (*addition in VDV-RV 454)*

Subscription data can be divided across multiple packets using the “WeitereDaten” (more data) mechanism. The data supplier can decide whether it wants to use the more data (Weitere-Daten) mechanism or not.

Data packets that are associated with each other must be transmitted without delay.

CUS is set up for 300 actual or scheduled journeys in one packet. If this value is exceeded, the data packet should be split using the more data mechanism or the packets should be transmitted at more frequent intervals. If neither of these options is possible, contact the Fachbus CUS VDV. An exception to this are the complete line timetables in REF-AUS, which must be transmitted in one packet.

A threshold can be set in the CUS master data for the maximum number of actual/scheduled journeys that can be transmitted in one data packet. This threshold is set to 100 and can be adjusted for each partner.

The threshold may be exceeded in the following circumstances:
A line timetable must always be transmitted in one data packet. It is therefore not possible to submit scheduled journeys in a line timetable (via "WeitereDaten = `true`") retrospectively. This can result in the threshold value being exceeded.

All the data or connection pairs in the <`GesAnschluss`> (protected connection) element are always delivered, regardless of the threshold value.

4.3. Logs

(see VDV Guideline 454 [3])

4.4. Service ID/Query URL (Dienstekennung / Anfrage-URL)

(see VDV Guideline 454 [3])

Since changes within a partner’s system environment, which also acts as a server, can also affect application addressing, it is a good idea to design the addressing of VDV queries to be configurable on the client side.
Changes to the URL of a service on the server side must be approved by the recipients.

4.4.1. Control point ID (Leitstellenkennung) – (addition in VDV-RV 454)

The control point ID is included in both the access URL and in the message itself in the form of the `sender` XML attribute.

In addition to the **sender of a message** (system ID), the control point ID also identifies the **platform** from which a message has been sent (platform ID). Both components are connected with a "_" (under-score sign) between them.

<Systemkennung>_<Plattformkennung>

It is recommended to specify the control point identifier in lowercase letters.

The system ID (Systemkennung) can be freely selected. The underscore sign "_", however, must not be used as part of the system ID. It is a good idea to specify in the system ID the respective abbreviations for the partner and, if necessary, the abbreviation for the system designation (e.g. sbb, aags, riv, zvv, zvb, sip_hub, etc.).

The platform from which data is exchanged is specified in the platform ID.

The following IDs are defined as standard:

Platform	Platform ID
Development	entw
Test	test
Integration	int
Production	prod

Table 2: Platform IDs

If the platform IDs defined here are not sufficient, more IDs can be added with the agreement of both sides. Partners that operate fewer than the platforms listed here are limited to the ones they have available.

Examples of valid control point IDs are: zvv_test, zvv_prod, riv_prod, sbb_int, sbb_prod, sip_hub_test, sip_hub_prod.

4.5. Reused data types

(see VDV Guideline 454 [3])

In relation to the VDV454 services, please explicitly follow the specifics from VDV-RV 453 [4] regarding the following reused data types:

Element	Remarks	Specifics in VDV-RV 453 [4]
DatenAbrufenAnt-wort (data supply an-swer)	The separation of data for a subscription. Include as much detail as possible	Section 5.1.4.2
FahrtID (journey ID)	Specifics concerning mandatory field and formatting of <FahrtID> (journey ID) and use and consistency of <FahrtBezeichner> (journey iden-tifier) (VDV453/454)	Section 6.1.5
LinienID (line ID)	Specifics concerning formatting, use and consistency of <LinienID> (VDV453/454)	Section 6.1.6

4.5.1. Status query (StatusAnfrage) and status reply (StatusAntwort) – (addition in VDV-RV 454)

Client side

If a client receives a "notok" back in the <StatusAntwort> (status reply) to a sent <Sta-tusAnfrage> (status query), it must be assumed that the entire service is not available. From this point, the client is not allowed to send any more queries to the partner system except for <StatusAnfragen > (status queries) that take place on a cyclical basis. As soon as the first "ok" is received in a <StatusAntwort>, the service in question is considered "available again" and regular data exchange can be resumed. The behaviour is no different from when absolutely no reply is received to a <StatusAnfrage> (status query) (see also VDV Guide-line 453 [1], section 5.1.8][1].

4.6. Use of optional fields

VDV-RV 454 follows the definitions of VDV Guideline 454 [3]in this case in principle. For data recipients, this means that they always have to compare newly received data against data that was received prior, in order to have all information for a journey. Data in optional elements that were specified in a previous message retain their validity even if they are no longer explicitly specified in a subsequent change message (except when transmitting complete journeys).

5. Specialist services

5.1. Target data service REF-AUS

(see VDV Guideline 454 [3])

5.1.1. Timetable data query (*AboAUSRef*)

(see VDV Guideline 454 [3])

The following table contains only changes to VDV- 454:

Element	Comments	Field
LinienFilter (line filter)	(see VDV Guideline 454 [3]) Subscribing to individual vehicle numbers in rail transport is not permitted	optional
BetreiberFilter (operator filter)	(subelement, mandatory/optional, multiple) Filter for the transport company for which day timetables are to be sent. The element contains the operator ID (<BetreiberID>) for which the subscriber is requesting data (see VDV Guideline 454 [3], Section 5.1.1.3. Operator filter not set: All of the **target** data known to the ITCS must be transmitted (subject to other filters or limitations). For all data platforms delivered in CUS and ITCS with two operators or more, the operator filter (outbound) must be implemented; for all others implementation is optional. Data suppliers that have not yet implemented the operator filter (<BetreiberFilter>) must respond to a subscription query (<AboAnfrage>) with an operator filter (<BetreiberFilter>) with "notok" and an error number 3xx. Using the operator filter is recommended for all data recipients, as otherwise all new operators will automatically be taken from the server. The <BetreiberFilter> (operator filter) is mandatory for all CUS partners (inbound and outbound). Exceptions are possible by agreement.	Optional / mandatory (see notes)

Element	Comments	Field
MitBereitsAktivenFahrten (with already active journeys)	(see VDV Guideline 454 [3]) This element should always be transmitted with the value "true" in the Swiss public transport system. From version 3.0 the element is omitted and the value "true" is instead always accepted. All journeys that start before the validity period and have at least one stop within the validity period are also transmitted with this parameter.	mandatory
ProduktFilter (product filter)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
VerkehrsmittelTextFilter (vehicle text filter)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
HaltFilter (stop filter)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
UmlaufFilter (block filter)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
MitGesAnschluss (with protected connection)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
MitBereitsAktivenFahrten (with already active journeys)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
MitFormation (with composition)	(see VDV Guideline 454 [3]) CUS as data platform – DDS (client): Train compositions are only supported by CUS for outbound services. CUS does not provide subscriptions with compositions and does not obtain any information about compositions through VDV 454.	optional

Use of placeholders in the Swiss public transport system:
Two partners can agree to use placeholders in the filter criteria. The following characters are allowed:

- the asterisk * represents any number of characters (letters or numbers), or for no character at all.
- the question marks? represents exactly one character (letter or number)
- The hash # represents exactly one digit of a number.

Please note: the use of placeholders in the Swiss Public transport system is voluntary and must be explicitly agreed upon between two partners. CUS does not support placeholders.

5.1.2. Transmitting data (AUSNachricht)

(see VDV Guideline 454 [3])

The following table contains only changes to VDV Guideline 454:

Element	Comments	Field
SollUmlauf (scheduled block)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
IstUmlauf (actual block)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
FahrtVerband (combined journeys)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
GesAnschluss (protected connection)	(please refer to VDV Guideline 454 [3]) and Section 5.3 Is only supported by CUS outbound.	optional

5.1.3. Line-oriented timetable data transmission (Linienfahrplan) (line timetable)

Changes to VDV Guideline 454 [3]:

Element	Comments	Field
ProduktID (Product ID)	(see VDV Guideline 454 [3]) The product ID must be specified in the line timetable, in all scheduled journeys or in both structures. Warning: The field is mandatory from XSD2017 (and retrospectively for XSD2015). CUS as rail data producer – DPB (client): If the <ProduktID> is set neither in the <Linienfahrplan> (line timetable) nor in each <SollFahrt> (scheduled journey), CUS discards the <Linienfahrplan>. CUS as data platform – DDS: • If in XSD2015 the <ProduktID> is set neither in the <Linienfahrplan> nor in at least one <SollFahrt> (scheduled journey), the default value 'Bus' is set in the <Linienfahrplan> for the conversion to XSD2017. • If the <ProduktID> is not set in the <Linienfahrplan>in XSD2015, but there is at least one <SollFahrt> (scheduled journey), the <ProduktID> of this scheduled journey is transferred to the line timetable for conversion to XSD2017.	manda-tory/op-tional (see notes
BetreiberID (operator ID)	(See Section 3.3, BetreiberID) The <BetreiberID> (operator ID) contains the concessionaire (GO number according to DiDok list) [5]) of the lines and journeys supplied. The value supplied is used for sharing a time-limited section of the line timetable and must always correspond to the one in INFO+.	manda-tory
LinienText (line text)	(See VDV Guideline 454[3] and Section 3.3) Local traffic: The <LinienText> line text is often used by information systems to match the journeys to the seasonal timetable.	optional/ manda-tory
RichtungsText (direction text)	(See VDV Guideline 454[3] and Section 6.1.17)	optional
VonRichtungsTex (from direction text)	(See VDV Guideline 454[3] and Section 6.1.17)	optional

Element	Comments	Field
VerkehrsmittelText (vehicle text)	(see VDV Guideline 454 [3]) Identifier for the offer category of the scheduled journeys in a line timetable. (See also Section 3.3 VerkehrsmittelText) The offer category (<VerkehrsmittelText>) element can be overridden for each scheduled journey. (see VDV Guideline 454 [3], Section 5.1.3.1) The offer category (<VerkehrsmittelText>) must be specified in the <Linienfahrplan> (line timetable), in all scheduled journeys or in both structures. **Warning:** The field is mandatory from XSD2017 (and retrospectively for XSD2015). CUS as rail data producer – DPB (client): If the <VerkehrsmittelText> (offer category) is set neither in the <Linienfahrplan> line timetable nor in each scheduled journey, CUS discards the <Linienfahrplan> line timetable. CUS as data platform – DDS: • If in XSD2015 the <VerkehrsmittelText> (offer category) is set neither in the <Linienfahrplan> (line timetable) nor in at least one <SollFahrt> (scheduled journey), the default value 'B' is set in the <Linienfahrplan> (line timetable) for the conversion to XSD2017. • If the <VerkehrsmittelText> (offer category) is not set in the line timetable in XSD2015, but there is at least one <SollFahrt> (scheduled journey), the <VerkehrsmittelText> (offer category) of this <SollFahrt> (scheduled journey) is transferred to the <Linienfahrplan> (line timetable) for the conversion to XSD2017XSD2017.	Mandatory/optional (see notes)
PrognoseMoeglich (forecast possible)	(See also Section 6.1.10.) This element is no longer present in the XSD2017, REFAUS. **Warning:** The field is optional in XSD2015 optional and has been removed in XSD2017. CUS as data platform – DDS: When converting from XSD2015 to XSD2017, default value true is set.	Was removed from XSD2017.

Element	Comments	Field
FahrradMitnahme (accompanied bicycles)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): CUS as rail data producer does not supply any <FahrradMitnahme> Instead, the <FahrradMitnahme> must be determined by the customer by evaluating the <FoFahrzeugAusstattungsCode>. Changes can be recognised by comparing the current transmission with the seasonal timetable.	optional

5.1.3.1. Single journey data (scheduled journey)
(see VDV Guideline 454 [3])

Changes to VDV Guideline 454 (cf. [3] Section 5.1.3.1):

Element	Comments	Field
SollHalt (scheduled stop)	(See VDV Guideline 454[3] and Section 5.1.3.3) All stops must always be transmitted. In the event of a change to a scheduled arrival or scheduled departure time in "REF-AUS", CUS expects the partner to provide a complete journey. Otherwise, it will not be possible to find the associated actual stop <HaltID> for an update. The update is performed using stop ID (<HaltID>) and scheduled departure and arrival times.	mandatory
UmlaufID (block ID)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
KursNr (run number)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): The run number (<KursNr>) field is not populated. CUS as data platform – DDS: When converting from XSD2015a to XSD2017, the <KursNr> field is not populated.	optional

Element	Comments	Field
FahrtBezeichnerText (journey description text)	(see VDV Guideline 454 [3]) The train number must always be transmitted in this element for rail traffic in Switzerland. CUS as data platform – DDS: When converting from XSD2015 to XSD2017, the train number is transmitted in the <FahrtBezeichnerText> element.	optional / mandatory
VerkehrsmittelNummer (vehicle number)	(see VDV Guideline 454 [3]) The train number must always be transmitted in this element for rail traffic in Switzerland. When converting from XSD2015 to XSD2017, the train number is transmitted in the <VerkehrsmittelNummer> element.	optional / mandatory
Line text (LinienText)	(See VDV Guideline 454[3] and Section 3.3) Line identifier relevant to the public Local traffic: The <LinienText> (line text) is often used by information systems to match the journeys to the seasonal timetable.	optional/mandatory

Element	Comments	Field
ProduktID (Product ID)	(see VDV Guideline 454 [3]) The <ProduktD> must either be specified in the line timetable or in all scheduled journeys. **Warning:** The field is mandatory from XSD2017 (and retrospectively for XSD2015). CUS as rail data producer – DPB (client): If the <ProduktD> is set neither in the <Linienfahrplan> (line timetable) nor in each scheduled journey, CUS discards the <Linienfahrplan> (line timetable). CUS as data platform – DDS: • If in XSD2015 the <ProduktD> is set neither in the <Linienfahrplan> (line timetable) nor in at least one <Sollfahrt> (scheduled journey), the default value 'BUS' is set in the <Linienfahrplan> (line timetable) for the conversion to XSD2017. • If the <ProduktD> is not set in the <Linienfahrplan> (line timetable) in XSD2015, but there is at least one <Sollfahrt> (scheduled journey), the <ProduktD> of this <Sollfahrt> (scheduled journey)is transferred to the <Linienfahrplan> (line timetable) for conversion to XSD2017.	mandatory/optional (see notes)
RichtungsText (direction text)	(see VDV Guideline 454 [3]) CUS as DPB (rail production): Final stop of the journey as text, e.g. "Zurich HB" (see also Section 6.1.17)	optional
VonRichtungsText (from direction text)	(see VDV Guideline 454 [3]) CUS as DPB (rail production) Departure stop of the journey as text, e.b. "Zurich HB" (see also Section 6.1.17)	optional
HinweisText (explanatory information)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): CUS as rail data producer does not supply any explanatory information text (<HinweisText>). Exception: new usage scenario in Section 6.1.6.	optional

Element	Comments	Field
Zugname (Name of train)	(see VDV Guideline 454 [3]) The marketing name is included in the train name (*Zugname*) element (see [6])	optional
VerkehrsmittelText (vehicle text)	(see VDV Guideline 454 [3]) The <VerkehrsmittelText> (offer category) must be stated either in the line timetable (<Linienfahrplan>) or in all scheduled journeys. **Warning:** The field is mandatory from XSD2017 (and retrospectively for XSD2015). CUS as rail data producer – DPB (client): If the `<VerkehrsmittelText>` (offer category) is set neither in the `<Linienfahrplan>` (line timetable) nor in each `<SollFahrt>` (scheduled journey), CUS discards the line timetable. CUS as data platform – DDS: • If in XSD2015 the `<VerkehrsmittelText>` is set neither in the `<Linienfahrplan>` (line timetable) nor in at least one `<SollFahrt>` (scheduled journey), the default value 'B' is set in the `<Linienfahrplan>` (line timetable) for the conversion to XSD2017. • If the `<VerkehrsmittelText>` is not set in the `<Linienfahrplan>` (line timetable) in XSD2015, but there is at least one `<SollFahrt>` (scheduled journey), the `<VerkehrsmittelText>` of this `<SollFahrt>` (scheduled journey) is transferred to the `<Linienfahrplan>` (line timetable) for the conversion to XSD2017	manda-tory/op-tional (see notes)
Zusatzfahrt (extra journey)	(see Section 6.1.4 6.1.13)	optional
PrognoseMoeglich (forecast possible)	(See also Section 6.1.10.) This element is no longer present in the XSD2017, REF-AUS. **Warning:** The field is optional in XSD2015 optional and has been removed in XSD2017c. CUS as data platform – DDS: When converting from XSD2015 to XSD2017, the default value is set to "true".	Was re-moved from XSD2017.

Element	Comments	Field
FahrradMitnahme (Accompanied bicycles)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): CUS as rail data producer does not supply any <FahrradMitnahme> Instead, the <FahrradMitnahme> must be determined by the customer by evaluating the <FoFahrzeugAusstattungsCode>. Changes can be recognised by comparing the current transmission with the seasonal timetable.	optional
FahrzeugTypID (vehicle type ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): CUS as rail data producer does not supply any <FoFahrzeugTypID> (vehicle type ID). The exact compositions of the trains with the individual vehicle types (sequence of <FoFahrzeugTyp>) and certain deviations of the scheduled and actual compositions of the trains <FoAenderungsCode >) must be taken from the compositions of the trains.	optional
ServiceAttribut (service attribute)	(see VDV Guideline 454 [3]) The service attributes are predefined in the Swiss public transport system, see also Section 10.11.	optional
SollFormation (scheduled composition)	(see VDV Guideline 454 [3] and Section 5.1.3.4 and 5.2.2.4) CUS as data platform – DDS (client) CUS does not provide subscriptions with compositions. Provision of compositions in CUS via VDV454 is not supported.	optional
FahrtBeziehungen (journey relationships)	(See Section 5.4)	optional

5.1.3.2. Information on the journey service (ServiceAttribute)

(See VDV Guideline 454 [3] and Section (10.11)

5.1.3.3. Information on the stop (scheduled stop)

(see VDV Guideline 454 [3])

It is always mandatory to state all the commercial stops of a vehicle's journey. They are specified as a list of <SollHalt> elements which are sorted in ascending order in the effective order of operating points travelled.

The following table contains only changes to VDV Guideline 454:[3]

Element	Comments	Field
AbfahrtssteigText (departure bay/platform text)	(See VDV Guideline 454[3] and Section 3.3.8) Details of boarding area (e.g. platform) without sector. Does not apply to the end stop. **N.B:** In all VDV 453 and 454 services from XSD2017 on, track and sector information are supplied in two separate fields. A blank xxxSteigText (xxx bay/platform text) deletes all the information previously transmitted. CUS as rail data producer – DPB (server): Examples of how the bays and sectors are populated: • `<AbfahrtssteigText>6</AbfahrtssteigText>` • `<AbfahrtsSektorenText>AB</AbfahrtsSektorenText>`	optional
AnkunftssteigText (arrival bay/platform text)	(See VDV Guideline 454[3] and Section 3.3.8) As for the departure bay text (AbfahrtssteigText) Does not apply to the departure stop.	optional
AbfahrtsSektoren (departure sectors text)	(see VDV Guideline 454 [3]) Does not apply to the end stop. See departure bay/platform text (AbfahrtssteigText) above for an example of how CUS populates bays and sectors. CUS as rail data producer – DPB (client): Is evaluated in the CUS core. CUS as rail data producer – DPB (server): Is populated in the CUS core. CUS as data platform – DDS: Conversion between XSD2015 and XSD2017 does not take place for local traffic.	optional
AnkunftsSektoren-Text (arrival sector text)	(see VDV Guideline 454 [3]) As for the departure sectors text (AbfahrtsSektorenText). Does not apply to the departure stop.	optional

Element	Comments	Field
Einsteigeverbot (no boarding):	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): Service stops at which the elements <Einsteigverbot> (no boarding) and <Aussteigverbot> (no alighting) are assigned the value "true" are not transmitted in REF_AUS. Scheduled service stops (no boarding and no alighting = true) can also be reported when the composition of the train is changed during service stops.	optional
Aussteigeverbot (no alighting):	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): As for the <Einsteigeverbot> above.	optional
Durchfahrt (non-stopping pass)	(see VDV Guideline 454 [3], Section 6.1.11 and entry in Section 7 Glossary on extraordinary non-stopping passes). Scheduled non-stopping passes are normally not transmitted. Exception: In the case of changes in composition at hypothetical service stops, non-stopping passes may also be reported for these service stops.	optional
HinweisText (explanatory information)	(see VDV Guideline 454 [3]) **NB:** A new usage scenario is communicated in CUS via XSD2017 with the aid of the <HinweisText> CUS as rail data producer – DPB (server): See the new usage scenario in Section 6.1.6	optional
SollAnschluss (scheduled connection)	(see VDV Guideline 454 [3])	optional CUS: [n/a]

If the elements <Einsteigeverbot> (no boarding), <Aussteigverbot> (no alighting) and <Durchfahrt> (non-stopping pass) are not specified, CUS assumes a normal stop.

CUS as rail data producer – DPB:
Service stops at which the elements <Einsteigeverbot> (boarding not allowed) and <Aussteigverbot> (alighting not allowed) are assigned the value "true" are not transmitted in REF_AUS.

The formats are defined in Section 3.3.

5.1.3.4. Information on the composition of the scheduled journey (SollFormation)
(see VDV Guideline 454 [3])

The compositions of the trains (for which composition data is available), which are planned specific to the day, are transmitted to the partners by the structure <SollFormation> (scheduled composition) at the start of the operating day.

The following table <SollFormation> / <IstFormation> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoFremdFahrzeuge (third-party rolling stock)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugAusstattungFahrtAbschnitte (journey segments for rolling stock equipment)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugZustandFahrtAbschnitte (rolling stock status journey segments)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugBelegungFahrtAbschnitte (rolling stock occupation journey segments)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.1.3.5. Scheduled connections (SollAnschluss)

(see VDV Guideline 454 [3])

5.1.4. Block-related journey data transmission (SollUmlauf)

(see VDV Guideline 454 [3])

5.2. Actual data service AUS

5.2.1. Actual data query (AboAUS)

(see VDV Guideline 454 [3], incl. subsections)

The following table contains only changes to VDV Guideline 454:

Element	Comments	Field
LinienFilter (line filter)	(see VDV Guideline 454 [3]) Subscribing to individual vehicle numbers in rail transport is not permitted	optional

Element	Comments	Field
BetreiberFilter (operator filter)	(see VDV Guideline 454 [3]) Using the operator filter is recommended for all data recipients, as otherwise all new operators will automatically be taken from the server. The operator filter is mandatory for all CUS partners (inbound and outbound). Exceptions are possible by agreement. Exception: For all data platforms delivered in CUS and ITCS with two operators or more, the operator filter (outbound) must always be implemented; for all others, implementation is optional. Data suppliers who have not yet implemented the operator filter (<BetreiberFilter>) must respond to a subscription query (<AboAnfrage>) with a <BetreiberFilter> (operator filter) with "notok" and an error number 3xx.	Optional / mandatory (see notes)
HaltFilter (stop filter)	(see VDV Guideline 454 [3])	optional CUS: [n/a]
UmlaufFilter	(see VDV Guideline 454 [3])	optional CUS: [n/a]
Delay	(see VDV Guideline 454 [3])	mandatory
MitGesAnschluss (with protected connection)	according to VDV Guideline 454 [3]	optional
MitRealZeiten (with real times)	(see VDV Guideline 454) In order to provide real times to other partners and the BAV, the subscriptions must always be set with "MitRealZeiten=true" in the Swiss public transport, except for systems that no longer forward real-time data, e.g. information systems. In the Swiss public transport system, delivery of real-time information to the FOT and therefore in the CUS is mandatory for all transport companies. CUS therefore sets all subscriptions exclusively with the <MitRealZeiten=true> (with real time = true) parameter. Every supplier must be able to work with this (see Section 1.4.3).	mandatory

Element	Comments	Field
MitFormation (with composition)	(see VDV Guideline 454 [3]) CUS as data platform – DDS (client): Train compositions are only supported by CUS for outbound services. CUS does not provide subscriptions with compositions and does not obtain any information about compositions through VDV 454.	optional
NurAktualisierung (update only)	(see VDV Guideline 454 [3]) Is in CUS implemented inbound and outbound. If an inbound partner has not implemented 'update only', then they simply deliver all the data again. The subscription requests (<AboAnfragen>) are sent out with the changed operating day: • If the subscription definition has not changed from the previous day, the flag `<NurAktualisierung=true>` is sent in the subscription request. If, on the other hand, there is a technical change to the subscription definition, the subscription is deleted and a new subscription request sent.	optional

Use of placeholders in the Swiss public transport system:
Two partners can agree to use placeholders in the filter criteria. The following characters are allowed:

- the asterisk * represents any number of characters (letters or numbers), or for no character at all.
- the question marks? stands for exactly one character (letter or number)
- The hash # represents exactly one digit of a number.

Please note: the use of placeholders in the Swiss Public transport system is voluntary and must be explicitly agreed upon between two partners. CUS does not support placeholders.

5.2.2. Transmitting actual data

(see VDV Guideline 454 [3])

For all suppliers that deliver in CUS, the first message in the AUS service must always be a complete journey, to ensure an initial status in each case for the journey, which is independent of the service. The also applies to any change from "false" to "true" in PrognoseMoeglich (forecast possible).

If the `<DatensatzAlle>` (dataset all) element `<DatenAbrufenAnfrage>` (data query) is set to `true`, all the journeys that are active and relevant at the time are transmitted as complete journeys. The partners concerned must decide among themselves whether existing journeys are relevant.

5.2.2.1. Actual data for a journey (IstFahrt)

(see VDV Guideline 454 [3])

In contrast to VDV Guideline 454 (cf.[3], Section 5.1.3), there are additional mandatory elements and specifications for:

Element	Comments	Field
LinienID (line ID)	(see Section 3.3.2 and VDV Guideline 454 [3]) "Technical line reference": Technical number for identifying the line. Can deviate from the publication-relevant line reference in the <LinienText> (element line text) element. CUS as rail data producer – DPB (client): CUS does not need the <LinienID> in the railway format for the delivery of railway data, the train number is taken from the <FahrtBezeichner> journey identifier.	mandatory
RichtungsID (direction ID)	(See VDV Guideline 454[3] and Section 3.3) CUS as rail data producer – DPB (client): CUS does not need the <RichtungsID> (direction ID) to supply railway data.	mandatory
Komplettfahrt (complete journey)	(see VDV Guideline 454 [3]) In the case of a complete journey, it is expected that the scheduled and actual stops are already provided to the data suppliers in the correct order in which they run. CUS as rail data producer – DPB (server): Initial messages (regular and additional journeys), changes to the route (partial cancellations, extensions, diversions) and complete cancellations are always reported by SBB as a complete journey. In the case of a complete cancellation, the complete journey, including all cancelled actual stops, is transmitted. (see Section 6.1.6).	mandatory
UmlaufID	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

Element	Comments	Field
KursNr (run number)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): The <KursNr> (run number) field is not populated. CUS as data platform – DDS: When converting from XSD2015 to XSD2017, the element <KursNr> is not populated.	optional
BetreiberID (operator ID)	(See VDV Guideline 454[3] and Section 3.3, operator ID (BetreiberID) The Transportunternehmung (business organisation number as per the DiDok list [5] that is commissioned (by FOT, the canton, etc.) to run this journey and holds the concession for it is always specified in the operator ID (BetreiberID). It does not matter whether they run this journey themselves or commission another (third-party) transport company to do it.	mandatory
IstHalt (scheduled stop)	(See VDV Guideline 454[3] and Section 5.1.3.3) In the event of a change to a scheduled arrival or scheduled departure time in "AUS", CUS expects the partner to provide a complete journey. Otherwise, it will not be possible to find the associated actual stop for an update. The update is performed using stop ID (<HaltID>) and scheduled departure and arrival times.	optional
FahrtBezeichnerText (journey description text)	(see VDV Guideline 454 [3]) The train number must always be transmitted in this element for rail traffic in Switzerland. CUS as data platform – DDS: When converting from XSD2015 to XSD2017, the train number is transmitted in the <FahrtBezeichnerText> element.	optional / mandatory
VerkehrsmittelNummer (vehicle number)	(see VDV Guideline 454 [3]) The train number must always be transmitted in this element for rail traffic in Switzerland. When converting from XSD2015 to XSD2017, the train number is transmitted in the element <Verkehrsmittel-Nummer>.	optional / mandatory

Element	Comments	Field
Line text (Linien-Text)	(See VDV Guideline 454 and [3] Section 3.3) Line identifier relevant to the public Local traffic: The line text is often used by information systems to match the journeys to the seasonal timetable. CUS as rail data producer – DPB (client): If a company delivers railway data in CUS via VDV454, inclusion of the <LinienText> is mandatory. CUS determines the <LinienText> from INFO +, but this is only possible if the train has already been made available in INFO +, but not for additional journeys.	op-tional/man-datory
ProduktID (Product ID)	(See VDV Guideline 454[3] and Section 3.3, ProduktID) **Warning:** The field is mandatory from XSD2017 (and ret-rospectively for XSD2015). CUS as rail data producer – DPB (client): If the <ProduktID> (product ID) for an actual journey is missing during processing, the actual journey is rejected by CUS. CUS as data platform – DDS: If in XSD2015 there is no <ProduktID> (product ID) set in the <IstFahrt>, the default value 'BUS' is set for the conversion to XSD2017.	mandatory
RichtungsText (di-rection text)	(See VDV Guideline 454[3] and Section 6.1.17) CUS as DPB (rail production): Customer-relevant end stop of the journey as text, e.g. "Zurich HB"	optional
VonRichtungsText (from direction text)	(See VDV Guideline 454[3] and Section 6.1.17) CUS as DPB (rail production): Customer-relevant departure stop of the journey as text, e.g. "Zurich HB"	optional

Element	Comments	Field
Zugname (name of train)	(see VDV Guideline 454 [3]) The marketing name is included in the train name (*Zugname*) element (see [6]) CUS as rail data producer – DPB (server): Is populated with the designation relevant for tourism if it does not fit into a normal class. Examples of this would be Glacier Express, Nostalgia Train, etc.	optional
VerkehrsmittelText (vehicle text)	(See VDV Guideline 454[3] and Section 3.3) **Warning:** The field is mandatory from XSD2017 (and retrospectively for XSD2015). CUS as rail data producer – DPB (client): If the vehicle ID for an `<IstFahrt>` (actual journey) is missing during processing, the `<IstFahrt>` (actual journey) is rejected by CUS. CUS as data platform – DDS: If in XSD2015 there is no vehicle text set in the `<IstFahrt>` (actual journey), the default value 'B' is used for the conversion to XSD2017.	mandatory
PrognoseMoeglich (forecast possible)	(see VDV Guideline 454 [3], Section 6.1.10 and 5.2.2 **N.B.:** Behaviour has changed with XSD2017. See also the `<FahrtZuruecksetzen>` field below. For further implementation specifications for "PrognoseMoeglich" and "PrognoseUngenau" = "missing update", see chapter 6.1.20.	optional
PrognoseUngenau (forecast inaccurate)	(see VDV Guideline 454 [3]) (see also the fields `<Ist*PrognoseStatus>`) For further implementation specifications, see chapters 6.1.18, 6.1.19 and 6.1.20. CUS as rail data producer – DPB (server): New value of 'unbekannt' (unknown) added in XSD2017. However, it is not needed by the CUS core or XSD2015. Instead, this information is communicated (separately for arrival and departure) via the `<Ist*PrognoseQualitaet>` (actual forecast quality) element with PrognoseVerlaesslichkeit 5 (forecast reliability 5).	optional

Element	Comments	Field
Zusatzfahrt (extra journey)	(See VDV Guideline 454[3] and Section 6.1.13) true, if an additional journey (e.g. special train) is involved. No specification: no change to the planned schedule or the last message.	optional
FaelltAus (cancelled)	(see VDV Guideline 454 [3]) **N.B.:** The completely cancelled scheduled journey or total cancellation of an IstFahrt) scenario has changed in XSD2017 All actual stops for the last complete journey must now be delivered prior to the cancellation message. The following should be taken into account when communicating with CUS. CUS as rail data producer – DPB (client): If a complete journey (Komplettfahrt) is delivered with actual stops (IstHalten) and shortly afterwards a total cancellation with different actual stops without sending the actual journey (IstFahrt) to the outbound partner, the total cancellation will be sent with the actual behaviour of the first complete journey. CUS as rail data producer – DPB (client): • Total cancellations with `<IstFahrt>` elements but without `<IstHalt>` elements are accepted inbound, provided they are not first journeys. • The latter applies also after a subscription inquiry or a DatensatzAlle=true (dataset all = true). • The `<IstHalt>` elements submitted in the cancellation message with XSD2017 are not taken into account in the event of a total cancellation. CUS as data platform – DDS: In the event of a total cancellation, the `<IstHalt>` elements submitted with XSD2017 have no relevance in XSD2015 either. In this case, the original actual stops specified in XSD2015 outbound are sent.	optional/ mandatory

Element	Comments	Field
FahrtZuruecksetzen (reset journey)	(See VDV Guideline 454 [3], Section 6.1.10 and 5.2.2) CUS as rail data producer – DPB (client): • <FahrtZuruecksetzen=true> for XSD2017 rail traffic in the core: - Special trains delivered via VDV are flagged as deleted.[4] - For all other trains, all IstGleise (actual tracks), forecasts, (partial) cancellations, diversions and extensions are reset to the original state. • <FahrtZuruecksetzen=false> and <PrognoseMoeglich=false> (forecast possible = false) for rail traffic XSD2017 in the core: If VDV could set a forecast, then the forecast and/or control technology time is removed. • <FahrtZuruecksetzen=true> for local traffic XSD2017 in the core: All AUS messages are deleted and the journey flagged accordingly. • <FahrtZuruecksetzen=false> and <PrognoseMoeglich=false> for local traffic XSD2017 in the core: All forecast and control system times are reset to the scheduled times. **N.B.:** • Partial cancellations are not reset. • Vehicles are not corrected at the departure and end journey point (e.g. arrival/departure time). • Deleted stops are not communicated via the VDV 453 services DFI and ANS • Journey relationships (<FahrtBeziehungen>) are not recalculated. CUS as data platform – DDS: • <FahrtZuruecksetzen=true> for local traffic XSD2017 of the DDS: The journey is not adjusted and the flag is forwarded to the outbound partners. • <FahrtZuruecksetzen=false> and <PrognoseMoeglich=false> for local traffic XSD2017 of the DDS: The journey is not adjusted and the flags are forwarded to the outbound partners. **N.B.:** The constellation <FahrtZuruecksetzen=true> with <PrognoseMoeglich=false> is the same as the old behaviour of <PrognoseMoeglich=false> in XSD2015 and v.v.	optional

Element	Comments	Field
Accompanied bicycles (FahrradMitnahme)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): CUS as rail data producer does not supply any <FahrradMitnahme>. Instead, the <FahrradMitnahme> must be determined by the customer by evaluating the <FoFahrzeugAusstattungs-Code>. Changes by comparing the current transmission with the period schedule.	optional
Vehicle type ID (FahrzeugTypID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): CUS as rail data producer does not supply any <FahrzeugTypID>. The exact compositions of the trains with the individual vehicle types (sequence of <FoFahrzeugTyp>) and certain deviations of the scheduled and actual compositions of the trains <FoAenderungsCode >) must be taken from the compositions of the trains.	optional
ServiceAttribut (service attribute)	(see VDV Guideline 454 [3]) The service attributes are predefined in the Swiss public transport system, see also Section 10.11.	optional
IstFormation (actual composition)	(See VDV Guideline 454 and [3] Section 5.2.2.4)) CUS as data platform – DDS (client) CUS does not provide subscriptions with compositions. Provision of compositions in CUS via VDV454 is not supported.	optional
FahrtBeziehungen (journey relationships)	(see Section 5.4)	optional

5.2.2.2. Referencing the journey data

(see VDV Guideline 454 [3])

In contrast to VDV Guideline 454 (cf.[3], Section 5.2.2.2), the FahrtID (journey ID) is a mandatory field:

[4] The term "deleted" is used here because CUS has no scheduled data for local traffic (as opposed to rail traffic) at its core. So it cannot be "reset" to scheduled data.

Element	Comments	Field
FahrtID (journey ID)	(see Section 2.2.2 and VDV Guideline 454 [3]) The journey ID (<FahrtID>) must always be specified, as it is needed in the Swiss public transport system to reference the actual journeys (<IstFahrt> elements) (AUS) and for mapping to scheduled journeys (REF-AUS). Concerning the format of <FahrtBezeichner> (journey identifier), see VDV-RV 453 [4], Section 6.1.5. The conversion to the SJYID [10] is also taken into account there.	mandatory

5.2.2.2.1. Alternative referencing information (FahrtStartEnde)

(see VDV Guideline 454 [3])

5.2.2.3. Information on the Stop (IstHalt)

(see VDV Guideline 454 [3])

The formats are defined in Section 3.3.

In addition, more detail is provided on the process for transmitting a forecast status in the document "Using the Forecast Status in VDV454" [7]. This document applies to all versions of the VDV454 implementation rules in the Swiss public transport system.

Element	Comments	Field
IstAbfahrtPrognoseStatus (Actual departure forecast status)	(See VDV Guideline 454 [3] and Section 6.1.1) **N.B:** The event <Ist*PrognoseStatus=Unbekannt> (actual * forecast status=unknown) is handled differently by CUS than described in the VDV454 Guideline and implementation rules. It is possible that implausible time forecast sequences could be reported in some cases. See also Section 6.1.1. CUS as rail data producer – DPB (client): Information is mandatory when submitting data for railway production. CUS requires the information directly on departure to correctly determine and publish the connections.	General: optional Real times@ **- Local traffic**: optional - **Rail: mandatory**, exceptions are possible by mutual agreement

Element	Comments	Field
IstAnkunftPrognoseStatus (actual arrival forecast status)	(See VDV Guideline 454 [3] and Section 6.1.1) See 'IstAbfahrtPrognoseStatus' above.	General: optional Real times@ **- Local traffic**: optional - **Rail: mandatory**, exceptions are possible by mutual agreement
IstAbfahrtPrognoseQualitaet (actual departure forecast quality)	(see VDV Guideline 454 [3]) The changeover to the SJYID [10] is also considered there. For further implementation specifications in ÖV Schweiz, see chapters 6.1.18, 6.1.19 and 6.1.20.	optional
IstAnkunftPrognoseQualitaet (actual arrival forecast quality)	(see VDV Guideline 454 [3]) The changeover to the SJYID [10] is also considered there. For further implementation specifications in ÖV Schweiz, see chapters 6.1.18, 6.1.19 and 6.1.20.	optional
IstAbfahrtDisposition (expected departure time)	(see VDV Guideline 454 [3]) Is not supported for rail travel.	optional
IstAnkunftDisposition (expected arrival time)	(see VDV Guideline 454 [3]) Is not supported for rail travel.	optional
PrognoseUngenau (forecast inaccurate)	(See VDV Guideline 454[3] and Section 6.1.9) The changeover to the SJYID [10] is also taken into account there. For further implementation specifications in ÖV Schweiz, see chapters 6.1.18, 6.1.19 and 6.1.20.	optional

Element	Comments	Field
AbfahrtssteigText (departure bay/platform text)	(See VDV Guideline 454[3] and Section 3.3.8) Details of boarding area (e.g. platform) without sector. Does not apply to the end stop. **N.B:** In all VDV 453 and 454 services from XSD2017 on, track and sector information is supplied in two separate fields. A blank xxxSteigText (xxx bay/platform text) deletes all the information previously transmitted. CUS as rail data producer – DPB (server): Examples of how the bays and sectors are populated: • `<AbfahrtssteigText>6</AbfahrtssteigText>` • `<AbfahrtsSektorenText>AB</AbfahrtsSektorenText>`	optional
AnkunftssteigText (Arrival bay/platform text)	(See VDV Guideline 454[3] and Section 3.3.8)f As for the departure bay text/platform text (`<AbfahrtssteigText>`) Does not apply to the departure stop.	optional
AbfahrtsSektoren (departure sectors text)	(see VDV Guideline 454 [3]) Does not apply to the end stop. See departure bay/platform text (`<AbfahrtssteigText>`) above for an example of how CUS populates bays and sectors. CUS as rail data producer – DPB (client): Is evaluated in the CUS core. CUS as rail data producer – DPB (server): Is populated in the CUS core. CUS as data platform – DDS: Conversion between XSD2015 and XSD2017 does not take place for local traffic.	optional

Element	Comments	Field
AnkunftsSektorenText (arrival sectors text)	(see VDV Guideline 454 [3]) As for the departure sectors text (<Abfahrtssteig-Text>). Does not apply to the departure stop.	optional
Einsteigeverbot (no boarding):	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): In the event of unscheduled service stops, the <Einsteigverbot> "no boarding" and <Aussteigverbot> "no alighting" elements are set to the value "true" (if an actual stop has already been transmitted by CUS). Otherwise, unscheduled service stops are not transmitted. Scheduled service stops (no boarding and no alighting = true) or hypothetical service stops can also be reported when the composition of the train is changed during service stops.	optional
Aussteigeverbot (no alighting):	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (server): As for the <Einsteigverbot> above.	optional
Durchfahrt (non-stop-ping pass)	(see VDV Guideline 454 [3], Section6.1.11 and entry in Section 7 Glossary on extraordinary non-stopping passes). CUS as rail data producer – DPB (server): true with unusual non-stopping pass Otherwise, non-stopping passes are not transmitted. In the case of changes in composition at hypothetical service stops, non-stopping passes may also be reported for these service stops.	optional
RichtungsText (direction text)	(See VDV Guideline 454[3] and Section 6.1.17)	optional
VonRichtungsText (from direction text)	(See VDV Guideline 454[3] and Section 6.1.17)	optional

Element	Comments	Field
HinweisText (explanatory information)	(see VDV Guideline 454 [3]) **NB:** New usage scenarios are communicated in CUS via XSD2017 with the aid of the explanatory information text (<HinweisText>). CUS as rail data producer – DPB (server): • See the new usage scenario in Section 6.1.6. • The platform side of the train is entered in the <HinweisText>in the following format: <HinweisText>Platform side: left|right</HinweisText>	optional

5.2.2.4. Composition of the actual journey (IstFormation)

(see VDV Guideline 454 [3])

CUS as data platform – DDS (client):
Submitting compositions in CUS via VDV454 (CUS as a client) is not supported.

CUS as rail data producer – DPB (server):
The element <MitFormation> (with composition) must be set to “true " when setting up the subscription for the transmission of composition information in the actual journeys (see 5.2.1).

An initial message will always be sent as a complete journey for all journeys for which composition information is transmitted. Train composition modifications over the initial message are also sent as a complete journey. Transmitted compositions retain their validity until the next transmission of a complete journey with compositions.

The following table <IstFormation> / <SollFormation> contain only changes to VDV Guideline 454:

Element	Comments	Field
FoFahrzeuge (rolling stock)	(see VDV Guideline 454 [3]) All rolling stock running in the actual journey. (see 5.2.2.4.1)	mandatory
FoFremdFahrzeuge (third-party rolling stock)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugGruppen (rolling stock groups)	(see VDV Guideline 454 [3]) All FoFahrzeugGruppen (rolling stock in ordered sequence) within the journey. CUS always transmits this information (if available). (see 5.2.2.4.3)	optional

Element	Comments	Field
FoFahrzeugGruppenFahrtAbschnitte (journey segments for rolling stock groups)	(see VDV Guideline 454 [3]) Sections of the journey during which the rolling stock groups operate unchanged. CUS always transmits this information (if available). (see 5.2.2.4.4).	optional
FoFahrzeugAusstattungFahrtAbschnitte (journey segments for rolling stock equipment)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugZustandFahrtAbschnitte (rolling stock status journey segments)	(see VDV Guideline 454 [3]) Segments of the journey created for the actual journey because of the statuses of the individual rolling stock. (see 5.2.2.4.6) CUS as rail data producer – DPB: Not supported by CUS.	optional CUS DPB: [n/a]
FoFahrzeugBelegungFahrtAbschnitte (rolling stock placement journey segments)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoHalte (train composition at stop)	(see VDV Guideline 454 [3]) Stop information relevant to the train composition for arrival at/departure from a stop (stop positions for the individual rolling stock). CUS always transmits this information (if available). (see 5.2.2.4.8)	optional

5.2.2.4.1. FoFahrzeuge (Rolling stock in the composition)

(see VDV Guideline 454 [3])

The `<FoFahrzeuge>` (rolling stock) element contains a number of `<FoFahrzeug>` sub-elements. A `<FoFahrzeug>` element contains the description of one of the units of rolling stock involved in the journey. The number as a whole describes all the rolling stock relevant to the journey (other rolling stock **cannot** be in the composition). Until further notice, potential `<FoFremdfahrzeuge` > (third-party rolling stock in composition) affecting the journey are specified in the set of `<FoFahrzeuge>` elements.

The following table `<FoFahrzeug>`contains only changes to VDV-RV 454:

Element	Comments	Field
FoFahrzeugTyp (rolling stock type)	(see VDV Guideline 454 [3]) Rolling stock must have a rolling stock type which identifies its characteristics. The permissible rolling stock types are defined by the values list in section 10.1.	mandatory
Rolling stock number (FoFahrzeugNummer)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugAusstattungen (rolling stock equipment)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Transmitted by CUS as long as the necessary information is made available by the source systems providing the data. (see 5.2.2.4.1.1)	optional
FoTechnischeAttribute (technical attributes of rolling stock)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.1.1. Rolling stock equipment (FoFahrzeugAusstattungen)
(see VDV Guideline 454 [3])

The element `<FoFahrzeugAusstattungen>` (rolling stock equipment) contains a number of `<FoFahrzeugAusstattung>` elements. A `<FoFahrzeugAusstattung>` element contains the definition of a specific item of equipment of the referenced rolling stock.

The following table `<FoFahrzeugAusstattung>` contains only changes to VDV Guideline 454:

Element	Comments	Field
FoFahrzeugAusstattungCode (rolling stock equipment code)	(see VDV Guideline 454 [3]) An enum for defining the equipment. (see 10.2)	optional
FoBezeichnung (rolling stock designation)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoSprachcode (rolling stock language code)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

Element	Comments	Field
FoAnzahl (number of rolling stock)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.1.2. 5.2.2.4.1.2. Technical attributes of rolling stock (FoTechnischeAttribute)
(see VDV Guideline 454 [3])

n/a

5.2.2.4.2. Third-party vehicles (FoFremdFahrzeuge) in the composition
(see VDV Guideline 454 [3])

n/a.

5.2.2.4.3. Rolling stock groups in the composition (FoFahrzeugGruppen)
(see VDV Guideline 454 [3])

The element <FoFahrzeugAusstattungen> (rolling stock equipment) contains a number of <FoFahrzeugGruppe> elements. A <FoFahrzeug> element contains the description of one of the units of rolling stock involved in the journey (see VDV454 Guideline [1]). The total quantity specifies all the vehicle groups involved in the complete journey.

The following table <FoFahrzeugGruppe> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoFahrzeugPositionen (rolling stock positions)	(see VDV Guideline 454 [3]) Position of the individual rolling stock within the rolling stock group (see 5.2.2.4.3.1).	mandatory
FoVerkehrlicheNummer (rolling stock traffic number)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoFahrzeugGruppenZielText (rolling stock group target text)	(see VDV Guideline 454 [3]) A target text can be specified for a rolling stock group. The target text applies to all sections of the journey on which the rolling stock group runs. CUS as rail data producer – DPB (server): CUS supplies the official destination of the relevant stop for the vehicle destination in accordance with DIDOK.	optional

Element	Comments	Field
FoFahrzeugGruppenStartText (rolling stock group departure text)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.3.1. Rolling stock with position in the rolling stock group (FoFahrzeugPositionen) (see VDV Guideline 454 [3])

The element <FoFahrzeugPositionen> (rolling stock positions) contains a number of <FoFahrzeugPosition> elements. A <FoFahrzeugPosition> element uniquely defines the position of particular rolling stock within the relevant rolling stock group.

The following table < contains only changes to VDV Guideline 454:

Element	Comments	Field
FoPosition (rolling stock position)	(see VDV Guideline 454 [3]) Unique position within the rolling stock group as a positive integer. The numbering is in ascending order starting from 1.	mandatory
FoOrientierung (orientation of rolling stock)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.4. Segments of the journey for rolling stock groups (FoFahrzeugGruppenFahrtAbschnitte) (see VDV Guideline 454 [3])

The element <FoFahrzeugGruppenFahrtAbschnitte> (rolling stock positions) contains a number of <FoFahrzeugGruppenFahrtAbschnitte> elements>. A <FoFahrzeugGruppenFahrtAbschnitt> describes the route on which the particular vehicle groups run unchanged. When there are changes within vehicle groups, the positions must be redefined.

The following table <FoFahrzeugGruppenFahrtAbschnitt> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoAbschnitt (rolling stock sections)	(see VDV Guideline 454 [3]) Sections of the journey during which the rolling stock groups operate unchanged. (see 5.2.2.5.1)	mandatory

Element	Comments	Field
FoFahrtAbschnittFahrzeugGruppen (rolling stock groups in segment)	(see VDV Guideline 454 [3]) The individual rolling stock groups with their position (location) on the segment of the journey. (see 5.2.2.4.4.1)	mandatory
FoFahrtrichtung (direction of travel)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoAenderungen (composition changes)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.4.1. Rolling stock groups with position on the segment of the journey (FoFahrtAbschnitt-FahrzeugGruppen)

(see VDV Guideline 454 [3])

The element `<FoFahrtAbschnittFahrzeugGruppen>` (journey segment rolling stock groups in composition) contains many `<FoFahrtAbschnittFahrzeugGruppe` > (journey segment rolling stock group in composition) elements, which in turn define the position of a rolling stock group on a journey segment (configuration of rolling stock groups). The position of the rolling stock within the group is specified as a positive integer (the front rolling stock group [in the direction of travel] contains the lowest value in the `<FoPosition>` field).

The following table `<FoFahrtAbschnittFahrzeugGruppen>` contains only changes to VDV Guideline 454:

Element	Comments	Field
FoDurchgaenge (passageways)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
Composition changes (FoAenderungen)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.4.1.1. Accessible passageway to adjacent rolling stock group (FoDurchgang)

(see VDV Guideline 454 [3])

n/a

5.2.2.4.4.2. Direction-of-travel change during a journey (FoFahrtrichtung)

(see VDV Guideline 454 [3])

n/a

5.2.2.4.4.2.1. Processing without FoFahrtrichtung being transmitted
(see VDV Guideline 454 [3])

The <FoFahrtrichtung> element (composition direction of travel) is currently not transmitted by CUS. The default value for the direction of travel is thus always "forward".

5.2.2.4.4.3. Processing with FoFahrtrichtung being transmitted
(see VDV Guideline 454 [3])

n/a

5.2.2.4.5. Journey segments for rolling stock equipment (FoFahrzeugAusstattung-FahrtAbschnitte)
(see VDV Guideline 454 [3])

n/a

5.2.2.4.6. Journey segments for rolling stock statuses (FoFahrzeugZustandFahrtAbschnitte)
(see VDV Guideline 454 [3])

n/a

5.2.2.4.7. Rolling stock positions on journey segments (FoFahrzeugBelegungFahrtAbschnitte)
(see VDV Guideline 454)

5.2.2.4.7.1. Position of the rolling stock on the segment of the journey (FoFahrzeugBelegung)
(see VDV Guideline 454 [3])

The element <FoFahrzeugBelegungen> (rolling stock positions) contains a number of <FoFahrzeugBelegung> elements>.

The following table <FoFahrzeugBelegung> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoFahrzeugIDREF (rolling stock ID reference)	(see VDV Guideline 454 [3]) Reference to the rolling stock for which the occupations in this structure are applicable. CUS as rail data producer – DPB (server): FoFahrzeugIDREF is made up as follows: "fz-[UUID]" Example: fz-e28932a2-6a37-4d8b-b0fe-f43a84d825f2	mandatory

Element	Comments	Field
FoBelegungProzentual (rolling stock occupancy in percent)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoReisegruppen (travel groups)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Always provided by CUS to flag the existence of a travel group (=occupancy). (see 5.2.2.4.7.1.1)	optional

5.2.2.4.7.1.1. Specification of travel groups on the rolling stock (FoReisegruppen)

(see VDV Guideline 454 [3])

The element is specified once an occupancy exists (boarding groups) or once the rolling stock is occupied by groups to a certain degree (transit). SBB currently only transmits the occupation by travel groups.

The following table `<FoReisegruppen (travel groups)>` contains only changes to VDV Guideline 454:

Element	Comments	Field
FoReisegruppeVorhanden (travel groups present)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Always "true" in CUS because the element is also only specified if at least one travel group exists.	mandatory
FoReisegruppenNamen (travel group name)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.8. Train composition at the stop (FoHalte)

(see VDV Guideline 454 [3])

CUS as rail data producer – DPB (server):
The element `<FoHalte>` contains a number of `<<FoHalt> elements.` CUS generally provides all stops in a journey for which composition information is available (transmission of the journey as a complete journey).

In order to ensure referencing even in cases of multiple visits of a stop, the elements `<Ankunftszeit>` (arrival time) and `<Abfahrtszeit>` (departure time) are always provided (in the first or last stop of the journey, only the departure or arrival time will be transmitted accordingly).

5.2.2.4.8.1. Technical description of the arrival at/departure from stop
(see VDV Guideline 454) [3]

5.2.2.4.8.2. Train compositions for the arrival at stop (FoAnkunft)
(see VDV Guideline 454) [3]

5.2.2.4.8.2.1. Rolling stock, statuses and stop positions on arrival at stop (FoFahrzeugeAmHalt)
(see VDV Guideline 454 [3])

The element <FoFahrzeugeAmHalt> (rolling stock at stop) contains a number of <FoFahrzeugAmHalt> elements.

The following table <FoFahrzeugAmHalt> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoFahrzeugeIDREF (rolling stock ID reference)	(see VDV Guideline 454 [3]) Reference to the arrival of relevant rolling stock or third-party rolling stock at the stop. (see 5.2.2.4.1)	mandatory
FoZustand (rolling stock status)	(see VDV Guideline 454 [3]) Status of the rolling stock upon arrival at the stop (see 5.2.2.5.3)	optional
FoErweiterung (rolling stock extension)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.4.8.2.1.1. Rolling stock stop position upon arrival at the stop (FoHaltPosition)
(see VDV Guideline 454) [3]

5.2.2.4.8.2.2. Sector designation and positioning upon arrival at stop (FoSektorPositionen)
(see VDV Guideline 454) [3]

5.2.2.4.8.2.2.1. Sector positioning upon arrival at the stop (FoHaltPosition)
(see VDV Guideline 454) [3]

5.2.2.4.8.3.
(see VDV Guideline 454) [3]

5.2.2.4.8.3.1. Rolling stock, statuses and stop positions on arrival at stop at stop <FoFahrzeugAm-Halt>
(see VDV Guideline 454 [3])

The element <FoFahrzeugeAmHalt> (rolling stock at stop) contains a number of <FoFahrzeugAmHalt> elements.

The following table <FoFahrzeugAmHalt> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoFahrzeugeIDREF (rolling stock ID reference)	(see VDV Guideline 454 [3]) Reference to the departure of relevant rolling stock or third-party rolling stock at the stop. (see 5.2.2.4.1)	mandatory
FoZustand (rolling stock status)	(see VDV Guideline 454 [3]) Status of rolling stock upon departure from the stop <FoFahrzeugAmHalt. (see 5.2.2.5.3)	optional
FoErweiterung	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Not supported by CUS.	optional Optional CUS DPB: [n/a]

5.2.2.4.8.3.1.1. Stop position of a vehicle on departure from stop (FoHaltPosition)
(see VDV Guideline 454) [3]

5.2.2.4.8.3.2. Sector positioning on departure from stop (FoSektorPositionen)
(see VDV Guideline 454) [3]

CUS as rail data producer – DPB (server):
The element is transmitted by CUS as soon as a platform at the <IstHalt> (actual stop) has a sector classification.

5.2.2.4.8.3.2.1. Stop position of a vehicle on departure from stop (FoHaltPosition)
(see VDV Guideline 454) [3]

5.2.2.5. Multiple use of element structures within the actual composition (IstFormation)

5.2.2.5.1. Description of segment (FoAbschnitt)
(see VDV Guideline 454) [3]

5.2.2.5.2. Description of changes from specification (FoAenderungen)
(see VDV Guideline 454) [3]

The element <FoAenderungen> (composition changes) contains a number of <FoAenderung> (composition change) elements. In the case of a change to the composition affecting customers, this is transmitted to the relevant subscribers. The <FoAenderungsCodeAmHalt> (composition change code at stop) element is used to describe changes at the stop.

The following table <FoAenderung> contains only changes to VDV Guideline 454:

Element	Comments	Field
FoAenderungsCodeAmHalt (composition change code at stop)	(see VDV Guideline 454 [3]) Change code indicating type of change. The valid values are defined in chapter 10.5.	mandatory
FoAenderungsTexte (composition change text)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.5.2.1. Description of change texts (FoAenderungsTexte)

(see VDV Guideline 454) [3]

n/a

5.2.2.5.3. Description of rolling stock status (FoZustand)

(see VDV Guideline 454) [3]

The status of particular composition elements (e.g. for rolling stock or rolling stock equipment) is transmitted using the element `<FoZustand>` (rolling stock status).

The following table `<FoZustand (rolling stock status)>` contains only changes to VDV Guideline 454:

Element	Comments	Field
FoZustandsCode (rolling stock status code)	(see VDV Guideline 454 [3]) Designation of a status (The applicable values are listed in Section 10.6)	mandatory
FoZustandsKurzform (Short form of the condition)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoZustandsText (composition change text)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]
FoZustandsEmpfehlung (composition status recommendation)	(see VDV Guideline 454 [3])	optional CUS DPB: [n/a]

5.2.2.5.4. Description of structural access points for extensions (FoErweiterung)

(see VDV Guideline 454 [3])

n/a

5.2.2.6. Additional Information (StoerungsInfo) (congestion information)

(see VDV Guideline 454 [3])

n/a

5.2.2.7. Forecast quality (IstAnkunftPrognoseQualitaet or actual arrival forecast quality and IstAbfahrtprognoseQualitaet or actual departure forecast quality: ZeitQualitaet or time quality))

(see VDV Guideline 454 [3])

5.2.2.8. Reference to the originally scheduled journey: (FahrtBeziehung)

(see VDV Guideline 454 [3])

The following table `<FoZustand>` (rolling stock status) contains only changes to VDV Guideline 454:

Element	Comments	Field
FahrtRef > LinienID (journey reference > line ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional
FahrtRef > LeitstellenID (journey ref. > control centre ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional

Implementation note:
All data platforms must receive and forward the new `<FahrtBeziehung>` (journey relationship) element. The following applies to all other systems`<FahrtBeziehung>` does not have to be sent or evaluated in the Swiss public transport system. However, if a `<FahrtBeziehung>` is received, an XSD validation error must not be triggered.

5.2.3. Traffic-related actual data transmission (IstUmlauf)

(see VDV Guideline 454 [3])

5.3. Secured connection relationships

(see VDV Guideline 454 [3])

Implementation note:
All data platforms must receive and forward the modified `<AnschlussPlan>` (connection plan). The following applies to all other systems: the `<AnschlussPlan>` does not have to be sent or evaluated in the Swiss public transport system. However, if an `<AnschlussPlan>` is received, an XSD validation error must not be triggered.

CUS only supports the element`<GesAnschluss>` outbound, and not inbound.

CUS as rail data producer – DPB (server):

Please note the following points:

- With incoming status requests, connections that are not sent result in a <DatenBereit=true> (data ready=true).
- Irrespective of size of the packets for the actual journeys, all connection pairs to be sent are always delivered.

The following table <GesAnschluss> (protected connection) contains only changes to VDV Guideline 454:

Element	Comments	Field
AnschlussPlan (connection plan)	(See VDV Guideline 454[3] and Section 5.3.1) CUS as rail data producer – DPB (server): The following are not reported: • Connections for which no decision is available • Connections for which a decision from RCS has been reported, even though RCS is not responsible (private railway service) • Changes to the connection time due to track changes without a (new) connection decision having being received. CUS as rail data producer – DPB (client): Not supported by CUS.	optional
AnschlussStatus (connection status)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB (client): Not supported by CUS.	optional

5.3.1. 5.3.2 Planning data of a connection relationship (AnschlussPlan)

(see VDV Guideline 454 [3])

Please note the following points:

- It is assumed that actual journeys referenced in connecting and feeder services have already been delivered as complete journeys. Here, there is no check on whether the actual journeys have already been sent to the partner.
- Connection plans remain valid for a certain time beyond the scheduled departure time of the connecting service.

The following table <AnschlussPlan> (connection plan) contains only changes to VDV Guideline 454:

Element	Comments	Field
AnschlussID (connection ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is populated by CUS. with the technical AnschlussenscheidID (connection decision ID).	mandatory

Element	Comments	Field
Zubringer > LinienID (feeder > line ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional
Zubringer > LeitstellenID (feeder > control centre ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional
Abbringer > LinienID (connecting service > line ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional
Abbringer > LeitstellenID (connecting service > control centre ID)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional

Umsteigewegezeit (interchange duration)	(see VDV Guideline 454 [3]) <u>CUS as rail data producer – DPB:</u> The VDV interchange duration time is calculated using the connection time from the core depending on the connection status. The following cases are differentiated: • Connection status = **BEING HELD**: ⇨ Interchange duration = *connection time held* = 0 seconds The connection time is artificially reduced to 0 seconds so that the information system interprets the connection as securely attainable. • Connection status = **HELD:** ⇨ interchange duration = scheduled connection time • Connection status - **HELD PROVISIONALLY:** ⇨ Interchange duration = 0.9 * scheduled connection time The connection time is artificially [5] reduced so that the information system is likely to assume a connection. • Connection status - **IS BROKEN:** ⇨ Interchange duration = *connection time broken* = 999 seconds The connection time is artificially increased to 999 seconds so that the information system will interpret the connection as being broken. • Connection status = **BROKEN:** ⇨ Interchange duration = 1.1 * scheduled connection time The connection time is artificially[13] increased so that the information system is likely to assume a broken connection. • Connection status = **PROVISIONALLY BROKEN:** ⇨ Interchange duration = 1.1 * scheduled connection time The connection time is artificially[13] increased so that the information system is likely to assume a broken connection. • Default: ⇨ interchange duration = scheduled connection time The scheduled connection time is either retrieved from the master data or from the scheduled and/or actual tracks of connecting and feeder services.	

Element	Comments	Field
MaxAutoVerzoegerung (max, auto delay)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional
Prioritaet (priority)	(see VDV Guideline 454 [3]) CUS as rail data producer – DPB: Is not populated by CUS.	optional

5.4. Transmission of train composition information

(see VDV Guideline 454 [3])

5.5. Transmission of combined journeys (connection of vehicle journeys)

(see VDV Guideline 454 [3])

6. Handling of AUS actual data service

6.1. Implementation notes and rules

(see VDV Guideline 454 [3])

6.1.1. Forecasting competence of the ITCS

(see VDV Guideline 454 [3])

CUS as data producer (server)
SBB calculates and reports forecasts for all the vehicle journeys on their network (i.e. trains from SBB, BLS, SOB, TPF, RA, etc., as well as foreign railway undertakings using SBB routes). The same is true for operators who use RCS for scheduling (BLS and SOB).

SBB processes real-time data from a number of different partners for each journey. Some of them don't supply real-time data or times. Since the actual values are not known to SBB, the ascending order of times by journey, or resetting from an "unknown" status based on all the previous times, does not necessarily make sense, because passengers would then no longer receive real-time data on the journey even though it is available. For example, only Italy does not provide real-time data on a journey from Germany via Switzerland to Italy. It is therefore not possible to supply real-time data along the entire route.

As a result, the forecast status can be different during a journey. The forecast status of any actual stop can be reported as unknown without the forecast status of previous stops being set to unknown and the forecast times being lost. It is possible that implausible time forecast sequences could be reported in some cases as a result of the various divisions of responsibility.

6.1.2. Additional rule on delay profile

(see VDV Guideline 454 [3])

6.1.3. Aggregation of messages for a journey

(see VDV Guideline 454 [3])

6.1.4. Example "Travelling through a stop" (attribute change)

(see VDV Guideline 454 [3])

6.1.5. Example "Operating a request stop"

(see VDV Guideline 454 [3])

6.1.6. Example "Route changes"

(see VDV Guideline 454 [3])

In the case of a partial cancellation, an `<IstFahrt>` (actual journey) is sent with the following characteristics:

- the `<FaelltAus>` (cancelled) element is not included or has the value `false`.
- the `<Komplettfahrt>` > (complete journey) element contains the value `true`.
- all currently valid elements of the `<IstHalt>` (actual stop) types are specified.

- the cancelled elements of the `<IstHalt>` (actual stop) type are not given.

In rail transport, the journey cannot always be divided into two separate journeys in the event of a line closure. Instead, as a temporary solution, the last stop before the route closure is transmitted with `<HinweisText=Teilausfall Abfahrt>` (information text = partial cancellation departure) and the first stop after the route closure is transmitted with `<HinweisText=Teilausfall Ankunft>` (information text = partial cancellation arrival). All stops between these two stops are cancelled.

6.1.7. First message and preview time

(see VDV Guideline 454 [3])

CUS as data producer (server)
CUS accepts a minimum of 10 minutes and a maximum of 180 minutes as the `<Vorschauzeit>` (preview time) for the subscriptions provided. Times of less than 10 minutes and greater than 180 minutes are rounded to the nearest margin value [10, 180].

6.1.8. Time-related message behaviour – delays

(see VDV Guideline 454 [3])

For application in the Swiss public transport system, a standard value of 30 seconds has been defined for the delay for all systems. If a subscription contains a different value, the server is nevertheless entitled to process the subscription with a delay of 30 seconds. Usefully, the same approach is taken in VDV454 and VDV453

CUS as data platform – DDS:

Messages providing new data are not sent immediately, but at configurable intervals. The reasons for this include preventing overloading of SBB's internal systems and partner systems. The transmission intervals are in the two-digit second range (currently 20 seconds)

6.1.9. Element Forecast inaccurate (PrognoseUngenau)

(see VDV Guideline 454 [3])

Implementation note:
The new value of unknown (unbekannt)) in forecast inaccurate (PrognoseUngenau) must be received, evaluated and forwarded.

For further implementation specifications in ÖV Schweiz, see chapters 6.1.18, 6.1.19 and 6.1.20.

CUS as rail data producer – DPB (server)
If the SBB scheduling system detects that one of its trains is not at the expected location[6] or if a forecast is not possible for some other reason, a message is generated in which the element

[6] SBB commonly refers to the train as being "missing" in this case. The display boards in SBB stations will then show `"indefinite delay"` for the train.

<PrognoseUngenau> (forecast inaccurate) contains the value "fehlende Aktualisierung" (missing update). The forecast fields nonetheless contain the last known forecast time in accordance with the VDV454 Guideline [3].

The other possible values from the set of values defined by the VDV recommendation 454 [3] are not used by CUS.

6.1.10. Withdrawal of forecasts/resetting the journey

(see VDV Guideline 454 [3])

Note:
The behaviour regarding withdrawing predictions by setting forecast possible = false (<PrognoseMoeglich=false>) was changed in VDV Guideline 454 [3], version 2.1. Now only prediction times are reset to the target times; other changes such as route changes, track changes, formation changes, etc. remain. If the entire journey needs to be reset to target, the new reset journey (<FahrtZuruecksetzen>) flag must be set to the value <true>. Forecast possible = false (PrognoseMoeglich=false) in combination with reset journey = true (<FahrtZuruecksetzen=true>) corresponds to the previous behaviour.

Note:
Forecast possible (<PrognoseMoeglich>) has been removed from REF-AUS.

(see also Section 5.2.2)

6.1.11. Actual arrival and departure times

(see VDV Guideline 454 [3])

Note: Specifying arrival and departure status = real does not provide any information as to whether a vehicle has effectively stopped at a stop or just travelled through. The times are transmitted immediately and independently of the element <Durchfahrt> (Non-stopping pass). The non-stopping pass (<Durchfahrt>) element is only for planning purposes and not used to retroactively report that a train has travelled through a stop.

6.1.12. Journey cancellations

(see VDV Guideline 454 [3])

In REF-AUS, all stops must always be supplied, even if there is no change of route (and especially in the event of trip cancellations).

In AUS, **when scheduled journeys are cancelled completely**, at least one <IstFahrt> (actual journey) must be sent with the following properties:

- the <FaelltAus> (cancelled) element has the value true.
- the <Komplettfahrt> > (complete journey) element contains the value true.

All stops from the last complete journey prior to the cancellation message" must be delivered.

In the event of a cancellation, all stops from the "Cancellation message" column must be included.

Erstmeldung (first message)	Komplettfahrt (complete journey	Komplettfahrt (complete journey	Cancellation message (as complete journey)
Stop A	Stop A	Stop A	Stop A
Stop B	Stop B	Stop B	Stop B
Stop C	Stop C	Stop C	Stop C
Stop D	Stop D	Stop D	Stop D
Stop E	Stop E		
Stop F			

The aim is to provide the data recipients with as much information as possible about the cancelled journey. This is especially practical for matching (if no REF-AUS data is available) and for data recipients that do not have a seasonal timetable or other scheduled data available.

<FahrtStartEnde> (journey end) must not be altered when a route is changed.

Note:
- The cancellation of a journey that has already started never results in a journey cancellation; instead, it only results in a partial cancellation or a route change.
- For an initial message (as a complete journey), all stops must always be included in the Swiss public transport system, even in the case of a cancellation.

Partial cancellations are route changes and are therefore described in Section 6.1.6.

6.1.13. Additional journeys

In the case of additional actual journeys (AUS service) (e.g. special event trains), the <Zusatzfahrt> (additional journey) element from ITCS is set to true. Additional journeys are always communicated in the initial message as a complete run (<Komplettfahrt> = true) (complete journey = true).

N.B.:
A special train must not be operated with the same train number as a regular train running on the same day. The combination (operating day, operator/TSP, journey/vehicle or train number) must be unique, i.e. must not occur more than once on operating day X.

Implementation notes for information systems:
All journeys received from an information system via the REF-AUS or AUS data service that cannot be matched to the seasonal timetable are to be considered as additional journeys and must be added as a complete journey regardless of the flag <Zusatzfahrt=true> (additional journey = true). Setting the flag provides clarity. It should be set by the data producer whenever possible.

Note:

CUS sees the 'additional journey' flag as a professional courtesy and not as technical information. A journey supplied with the `<Zusatzfahrt=true>` flag may well occur in the planned timetable and must be matched in any case.

6.1.14. Implementation for rail applications

(see VDV Guideline 454 [3])

6.1.15. Obtaining sensible forecasts

(see VDV Guideline 454 [3])

No matter what the type of vehicle, only the customer-relevant part of a vehicle's journey is transmitted via the VDV interface. Sections relating to service journeys are removed from the journey before sending. In the event of an indefinite delay or composition changes, it may not always be possible to uphold this rule with rail traffic.

6.1.16. Special features of associated trains *(addition in VDV-RV 454)*

(see VDV Guideline 454 [3])

In the case of cross-border travel, SBB combines partial journeys having the same train number and connects the individual partial runs to form a single vehicle journey. This procedure means that the MoT journeys in the seasonal timetable differ from the vehicle journeys in the actual messages.

6.1.17. Special features of feeder trains (*addition in VDV-RV 454*)

(see VDV Guideline 454 [3])

Both splitting (where one train is split into two trains) and combining (where two trains are coupled into one) are feeder trains. As of XSD2017, feeder journeys are linked by journey relationships (`<FahrtBeziehung>`) and are therefore clearly recognisable as such.

Implementation notes for information systems:
Elements such as `<RichtungsText>` (direction text), `<VonRichtungsText>` (from direction text) and `<FahrtStartEnde>` (journey start end) are based on specific vehicle journeys, which is why their values for feeder journeys, without specification and interpretation by the information system of the associated `<FahrtBeziehungen>` (journey relationship), are not suitable for publication to customers.

6.1.18. Undetermined delay (addition in VDV RV 454)

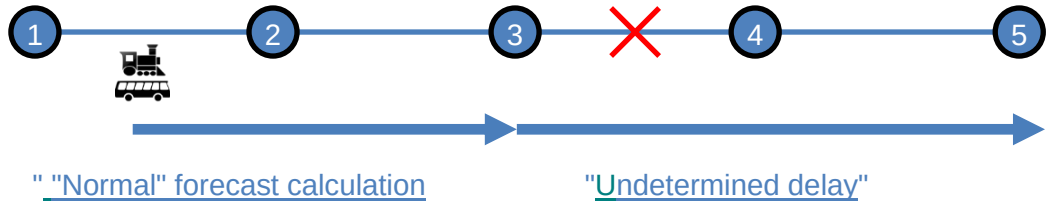
Transmission of an " undetermined delay" in VDV454
According to VDV Guideline 454 [3] an "indefinite delay" must be transmitted as follows:

Value in PrognoseUngenau	Value in Prognose-Qualität	Recommendations for presentation to customers
This attribute should not be transmitted	5	• The attribute is not valid for the whole trip, but only for the corresponding arrivals and departures. • Instead of the transmitted delay, the customer should be shown a note such as "undetermined delay". • Important: The display should convey to the customer that the displayed connection is uncertain and that he should look for alternatives.

Business definition of "undetermined delay"

In **Swiss** rail traffic, "**undetermined delay**" refers to the condition in which it is not possible to predict when the vehicle will continue or arrive at or depart from a future stop. As a rule, this is a disposition decision.

In the following example, the route between stops 3 and 4 is interrupted, for example by a landslide. At present, it is not yet clear when the obstacle can be removed.



The train is located between stops 1 and 2 and can still continue to stop 3.
The interface should now be used to transport the train to stops 1 and 2 as predicted, and stop 3 can still be reached as predicted. From the departure time at stop 3, the "undetermined delay" exists.

Possible causes for an "Undetermined delay":

- A train has a technical problem at a station that cannot be scheduled.
- A train has a technical problem on the line that cannot be scheduled.
- A non-terminable infrastructure problem (e.g. rail breakage, overhead line malfunction, etc.) with complete track disruption.
- Natural phenomena (e.g. landslide) with complete interruption of the line.
- An ambulant person in the vehicle must be picked up by an ambulance.
- etc.

The only thing that is certain about an "undetermined delay" is that the ITCS (or the dispatcher) does not know when the vehicle will continue or arrive at or depart from a future stop. Therefore, until further notice, no forecast time can be determined, at most it can be roughly esti-

mated. In this case, instead of the arrival and departure forecasts (or a time delay), the passenger is shown an "undetermined delay". This term is known to the passengers. Based on this information, they decide for themselves whether there is a safer connection to their destination for their needs.

The following should be noted:

1. an "indefinite delay" tells the passenger that this part of the trip is uncertain and that he or she may be directed to another trip later.
2. connections for arrivals or departures with an "undetermined delay" cannot be calculated based on real-time data due to the lack of forecast times. If these are to be displayed to the passenger, a rough estimate is used as a basis and the connection must be marked accordingly. In many cases, an alternative is displayed.
3. if the vehicle is at a stop, it can happen that the vehicle arrives on time at this stop and the connection can still be reached, while the departure is uncertain due to an event and an "undetermined delay" is displayed for this.
4. an "indefinite delay" can also start a few stops later than the vehicle is now. In this case, the journey must continue to be supplied with real-time data as usual up to the point where the "undetermined delay" begins.
5. the information in the journey planners must be consistent with that at the station.
6. many journeys with an "undetermined delay" end in a breakdown. However, unlike an outage, a trip with an undetermined delay can be reactivated via a new dispatching and then flows back into the routing and connection assurance.
7. the operator wants to transport passengers away from the trips with "undetermined delay", not to them.

6.1.19. Vehicle in traffic (addition in VDV RV 454)

Transmission of "Vehicle in traffic jam" in VDV 454
According to VDV Guideline 454 [3], "Vehicle in traffic jam" can be transmitted as follows:

Value in PrognoseUngenau	Value in PrognoseQualität	Recommendations for presentation to customers
"Vehicle in traffic jam"	This attribute is not transmitted	• Traffic jam will be published on DFI-Display. • Notice such as "Vehicle is in traffic jam - expect further delays" in the output channels. • Important: The presentation should convey to the customer that the vehicle will probably arrive later than forecast but will not fail.

Business notes for "Vehicle in traffic jam"
Basically, "vehicle in congestion" is a locating condition of the vehicles monitored by the control system. The idea behind this is that no reliable forecasts can be made during this time, as the normal flow of travel is disrupted. The state is set as soon as the vehicle.

(a) Is located between two stops.
(b) For a certain time (e.g. 20 seconds)
(c) Slower than a certain speed (e.g. 5 km/h)

is on the road. The locating state "Vehicle in traffic jam" is therefore not set as long as the vehicle is in the area of a stop.

The traffic jam message is also often transmitted in case of unclean data supply or driving style, i.e. in case of location problems: The driver is already with his vehicle on the stop (usually final stop) and waits. According to the vehicle location, however, the vehicle has not yet arrived. Then the vehicle also gets into a traffic jam. At least the congestion message is not updated to the next trip.
Or the driver waits at the start stop for departure. Now something happens and he pulls ahead with the bus. If the stopping area is too small, the departure is determined by the on-board computer. However, since the driver is not yet driving off "properly", but is waiting, the traffic jam message is transmitted.

Representation on the DFI displays.
In many control systems, the location status "vehicle in traffic jam" is either not configured or it is not output to the customer. In the ZVV, on the other hand, this function is used throughout and is indicated on the DFI displays by a ">" sign.

Whether all customers understand this sign is not entirely clear.

6.1.20. Missing update (Erweiterung RV)

According to VDV Guideline 454 [3], "Missing update" can be transmitted as follows, "Missing update" can be transmitted as follows.

Value in PrognoseUngenau	Value in Progno-seQualität	Recommendations for presentation to customers
"Missing update"	This attribute is not transmitted	No representation to the customers

With PrognoseUngenau = "missing update" forecast times are displayed, but no longer updated. If no update is possible for a longer time, PrognoseMoeglich=false shall be transmitted.

6.2. Connection information

(see VDV Guideline 454 [3])

7. Glossary

(see VDV Guideline 454 [3])

Specialist terms used in this document:

Term	Meaning
Extraordinary non-stopping pass (Ausserordentliche Durchfahrt)	An extraordinary non-stopping pass is when, as a result of a planning change, a stop is not used even though it has been transmitted as part of the planning data or in a previous message (AUS, REF-AUS).
(CUS) VDV v2017c	The internal CUS designation for the VDV interfaces based on the VDV specification and schema version XSD2017. **N.B.:** This is normally referred to as XSD2017 in the Swiss public transport system. The designation used by CUS and also in this document takes into account that an implementation must also consider special characteristics, ID specifications and use cases of the Swiss public transport implementation rules, which are not part of the VDV XSD schema.
Real-time data	In the ITCS Central, short-term timetable forecasts are calculated or assignment measures are defined that are effective in the short term. This term describes actual data from the processes that are transmitted via the VDV454 AUS data service.
Seasonal timetable	Timetable valid for a defined period of time and containing the (working) timetable data, normally for that particular season. It can be adjusted to suit changing circumstances. Example: INFO+. The complete seasonal timetable is not available via VDV interfaces.
Daily working timetable	The daily working timetable contains the (working) timetable data for a short amount of time (approx. 24 to 48 hrs.) This data is exchanged via the VDV454 REF-AUS data service.
Working timetable data	Working timetable data refers to all scheduled timetable data (e.g. daily and seasonal scheduled timetable data)
Data subscribers	This document refers the following data subscribers: - Display system - Timetable information system - Data platform In some cases, data subscribers are restricted.
Data producers	The following systems are designated as data producers: - All systems that process data and send it to a data platform. Data platforms to not produce any data!
GO-Nr.	Business organisation number: DIDOK2.0 [5] maintains a directory of business organisations. These can be the business organisations of transport companies (e.g. sub-organisations such as SBB-P, SBB-I) as well as other business organisations (such as Hotelplan Schweiz). The GO-Nr (GO no.) is the unique identifier of these business organisations. The DiDok conversion systems almost exclusively require the GO no. (synonym: TC code) and not the transport company number.

8. English alias designation

(see VDV Guideline 454 [3])

9. Appendix: Transmission of forecast quality

(see VDV Guideline 454 [3])

For further implementation specifications in ÖV Schweiz, see chapters 6.1.18, 6.1.19 and 6.1.20.

10. Appendix: Value lists (ENUM)

(see VDV Guideline 454 [3] with the exception of the following sections).

The value lists for the compositions in Sections 10.1 to 10.8 contain the values currently supported by SBB. The [**Supported**] column indicates with "✓" whether the information, if it is available, is transmitted by SBB within the `<DatenAbrufenAntwort>` (data supply answer).

10.1. FoFahrzeugTyp (rolling stock type)

(see VDV Guideline 454 [3])

SBB transmits the type of rolling stock in accordance with the following values list:

Value	Meaning	Supported
"1"	1st class day coach	✓
"12"	1st and 2nd class day coach	✓
"2"	2nd class day coach (also "declassed" 1st class coaches)	✓
"CC"	Couchette	✓
"D"	Luggage van	✓
"K"	No-class passenger coach	✓
"FA"	Family coaches	✓
"LK"	Locomotive	✓
"WC"	Combined sleeping/couchette coach	✓
"WL"	Sleeping car	✓
"WR"	Restaurant car	✓
„W1"	Combined car: 1nd class restaurant and seats	✓
„W2"	Combined car: 2nd class restaurant and seats class	✓

10.2. Rolling stock equipment code (FoFahrzeugAusstattungsCode)

(see VDV Guideline 454 [3])

SBB transmits the features of individual rolling stock in accordance with the following values list:

Value	Meaning	Supported
AbteilBusiness	With business compartment	✓
AbteilFahrrad	Bicycle platform available	✓
AbteilFahrradResPflicht	Reserved bicycle spaces	✓
AbteilFamilien	Carriage with family zone	✓
AbteilKinderwagen	Carriage with children's section	✓
AbteilRollstuhl	Compartment for wheelchair users	✓

10.3. Rolling stock language code

(see VDV Guideline 454 [3])

10.4. Rolling stock technical attributes code

(see VDV Guideline 454 [3])

SBB transmits the following information about rolling stock:

Value	Meaning	Supported
NiederflurEinstieg	Vehicle with low-floor entry	✓

10.5. Composition change code at stop

(see VDV Guideline 454 [3])

SBB transmits the following change codes for changes to the composition at the stop:

Value	Meaning	Supported
GeaenderteWagenreihung	Train is operating in modified train composition (general composition change without more precise specification of the change)	✓
FehlendeFamilienwagen	Train with no family carriage	✓
FehlendeRestaurantwagen	Train with no restaurant car	✓
FehlendeWagen	Train operating with fewer carriages than originally planned	✓
FehlendeRollstuhlplaetze	No special facilities for wheel chair	✓
FehlendeNiederflurwagen	No Vehicle with low-floor entry	✓

Implementation note:
Data platforms must receive and forward the new values <FehlendeRollstuhlplaetze> (no wheelchair facilities) and <FehlendeNiederflurwagen> (no low floor coach). The following applies to all other systems: the new values <FehlendeRollstuhlplaetze> (no wheelchair facilities) and <FehlendeNiederflurwagen> (no low floor coach) must only be sent, received and evaluated in connection with the formations. If the new values are received, an XSD validation error must not be triggered.

10.6. Rolling stock status code

(see VDV Guideline 454 [3])

SBB transmits the following status codes for rolling stock:

Value	Meaning	Supported
geschlossen	Train closed	✓
offen	Train open	✓
nicht_bedient	Train open but no restaurant service	✓

10.7. Orientation of rolling stock

(see VDV Guideline 454 [3])

10.8. Direction of travel

(see VDV Guideline 454 [3])

Vehicles are always transmitted by default with "forward" direction of travel.
SBB does not support the transmission of direction of travel <FoFahrtrichtung>.

10.9. Product ID

See Section 3.3.

10.10. Vehicle text

See Section 3.3.

10.11. Service attribute (addition in VDV-RV 454)

Attributes and explanatory notes (see [6], Section 9) are transmitted via <ServiceAttribute>. The following values are defined in the Swiss public transport system:

Name of the service attribute	Meaning	Remarks
NF	Low floor	Phase 1, for date, see list of implementation deadlines
PH	No low floor	Phase 1, for date, see list of implementation deadlines
(… to be defined by INFO+)	Autonomous and spontaneous access for manual and electric wheelchairs.	Phase 2, for date, see list of implementation deadlines
(… to be defined by INFO+)	Access for manual and electric wheel-chairs with advance notice	Phase 2, for date, see list of implementation deadlines
(… to be defined by INFO+)	Limited access for manual and electric wheelchairs.	Phase 2, for date, see list of implementation deadlines
(… to be defined by INFO+)	Limited access for manual and electric wheelchairs.	Phase 2, for date, see list of implementation deadlines
Z	Supplement payable	Phase 2, for date, see list of implementation deadlines
TX	Taxi	Phase 2, for date, see list of implementation deadlines
TT	Tilting technology	Phase 2, for date, see list of implementation deadlines

Clarification: Service attributes NF and PH are independent; in other words, "NF = no" does not automatically mean a high floor.

Service attribute value	Meaning	Remarks
NF = true	Low floor	
NF = false	Not low floor	Uneven high floor
NF missing	No information on low floor	Uneven high floor
PH = true	High floor	
PH = false	Not high floor	Uneven low floor
PH missing	No information on high floor	Uneven low floor

11. Appendix: XML examples

(see VDV Guideline 454 [3])