DFL Data Library

Positional Data Match Raw Feed Documentation

Convenient Translation

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Document history

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1   Introduction

The **Data Library** is an information system belonging to the DFL Deutsche Fußball Liga GmbH, which collects, stores, refines and distributes the **Official Match Data** for matches in the Bundesliga and Bundesliga 2, the Relegation Play-Offs and the Supercup.

The "DFL-04-PositionalData-Match-Raw" feeds described here provide raw positional data on all objects monitored by the tracking system (players, officials and ball). The "DFL-04.02-PositonalData-Match-Raw_Live" feed is available live (see section 2.1) and the "DDFL-04.02-PositonalData-Match-Raw_Postmatch" feed can be used after the match (see section 2.2).

For the Bundesliga and Bundesliga 2 competitions, post-analysis is also provided for the raw positional data from the match after the final whistle. This is available in the "DFL-04.03-PositonalData-Match-Raw_Observed" feed (see section 2.3).

All content is based on the catalogue of the Official Match Data definitions ("Definitionskatalog Offizielle Spieldaten 5.0", available in German).

Please be aware that the content of this document is a convenient translation of the German language original. Where available official statistics labels must be used in outputs displaying Official Match Data. The official statistics labels are specified in the document ["Master-Dok Statistik-Übersetzungen tbf"].

2   Technical description

2.1   DFL-04.02-PositionalData-Match-Raw_Live

The feed is provided live in the following structure.

Element	Attribute	Value	Description
Positions	EventTime	Datetime	Provides the time of the first frame for the positional data
	MatchId	String	Specifies the unique DFL ID for the match
	CDATA	String	Provides the data range

XML example:

```
<Positions MatchId='DFL-MAT-0025JI' EventTime='2015-08-14T18:30:03.040+02:00'>
 CDATA[...]
</Positions>
```

The element provides the live positional data in a period of one second within the CDATA section. The CDATA section is made up of the following subelements.

2.1.1   Frame metadata

Structure:

Field	Description
FrameNumber	This is a continuous, whole value. Counting for each section of the match begins from the values listed below: • First half: 10,000 • Second half: 100,000 • First half of extra time: 200,000 • Second half of extra time: 250,000 The value increases throughout the entire section of the match.
Minute	Provides the current minute of play from the kick-off of the half. The first minute of the first half is the first minute of play; the first minute of the second half is the 46th minute of play. The usual +/- notation is not included in stoppage time.
Section	Describes the current section of the match • First half = 1 • Second half = 2 • First half of extra time = 3 • Second half of extra time = 4
TimeStamp	Specifies the time stamp of the frame. Extended UTC Format including offset is used as the format

Format example:

```
10045673,1,1, 2015-08-24T19:02:29.56+1:00;

Corresponding to:

FrameNumber,Minute,Section,Timestamp;
```

2.1.2 Personal data

Structure:

Field	Description
PersonId	Specifies the unique DFL ID for the person
x-Position	Provides the person's current x-position
y-Position	Provides the person's current y-position
Speed	Provides the person's current speed in km/h
Acceleration	The person's current acceleration in m/s^2
Distance	The distance covered from the previous frame in cm

Format example:

```
DFL-OBJ-0000UI,20.87,12.94,12.78,1.03,5.05;

Corresponding to:

PersonId, x-Position, y-Position, Speed, Acceleration, Distance;
```

2.1.3 Ball data

Structure:

Field	Description
x-Position	Provides the ball's current x-position
y-Position	Provides the ball's current y-position
z-Position	Provides the ball's current z-position in the air relative to the pitch
Speed	Provides the ball's current speed in km/h
BallStatus	Specifies the ball's current status (0 = dead, 1 = in play)
BallPossession	Specifies the team that is currently in possession of the ball (1 = home team, 2 = away team)
Acceleration	The ball's current acceleration in m/s2
Distance	The distance covered from the previous frame in cm

Format example:

20.87,12.94,0.45,12.78,1,1,1.03,5.05;

Corresponding to:

x-Position, y-Position, z-Position, Speed, BallStatus, BallPossession, Acceleration, Distance;

2.1.4 Overall structure

The individual elements, frame metadata, personal data and ball data are separated using the "#" symbol. A section's individual objects are separated using the ";" symbol. An object's values are separated using commas.

The character strings that make up the message payload are sent as a CDATA element within the position element. Individual frames are sent within a package and are separated by line breaks.

Example:

```
<Positions MatchId='DFL-MAT-0025JI' EventTime='2015-08-14T18:30:03.040+02:00'>
 CDATA[1,1,1, 2011-05-02T19:02:29.56+1:00;#DFL-OBJ-
0000UI,20.56,17.84,3.36,1.01,5.77;
   DFL-OBJ-0000ZQ,21.56,18.84,2.36,1.07,4.44; [...]DFL-OBJ-
0000NH,30.56,11.84,3.01,0.98,4.23;#20.56,17.84,3.36,1,1;]
</Positions>


Corresponding to:

Frame-Metadaten;# Personendaten;# Balldaten;
```

2.1.5 Data definition

Coordinates are always provided relative to the centre of the pitch in absolute figures. The unit for the x-position and y-position is metres; the ball's z-position is provided in centimetres; the figures are calculated to two decimal places, rounding up using the half-up rule. The speeds are provided in km/h and, as with the positions, are rounded to two decimal places.

2.1.6 Metadata for the pitch size

The "MetaData" element specifies the pitch size and is sent at the beginning of a session. If the definition is changed during a session, the edited definition is resent and replaces the previous definition in full.

Structure:

Subelement	Attribute	Value	Notes
	MatchId	String	Specifies the unique DFL ID for the match
	Type	String	Indicates the expected message content (here: pitch-size)
PitchSize	X	Gleitkommazahl	Provides the pitch size along the x-axis. The size is provided in metres to two decimal points.
	Y	Gleitkommazahl	Provides the pitch size along the y-axis. The size is provided in metres to two decimal points.

XML example:

```
<MetaData MatchId="DFL-MAT-0002WQ" Type="pitch-size">
<PitchSize X="100.00" Y="68.00" />
</MetaData>
```

Metadata corrections

If there are corrections to the data during live play, subsequent partial transmissions will be sent to make these corrections known (see also section 2.4) in the corrected section.

Structure:

Subelement	Attribute	Value	Notes
	MatchId	String	Specifies the unique DFL ID for the match
	Type	String	Indicates the expected message content (here: correction)
Correction	FirstFrame	Integer	Specifies the start of the corrected section
	LastFrame	Integer	Specifies the end of the corrected section

XML example:

```
<MetaData MatchId="DFL-MAT-0025GX" Type="correction">
<Correction FirstFrame="133160" LastFrame="136006"/>
</MetaData>
```

2.2 DFL-04.02-PositionalData-Match-Raw_Postmatch

The "DFL-04.02-PositionalData-Match-Raw_Postmatch" feed is provided after the match and details positional data on all players and the ball. The x and y-coordinates are provided in metres; the coordinate system's origin is the centre spot (see 2.1.5); the ball's z-coordinate is provided in centimetres.

The positional data for a match can be spread over several PutDataRequest messages when sent.

Structure:

Subelement	Attribute	Value	Notes
	EventTime	Datetime	Specifies the time stamp for the first frame of the positional data
FrameSet	GameSection	String	Specifies the game section (firstHalf, secondHalf, firstHalfExtra, secondHalfExtra)
	MatchId	DFL-ID	Specifies the unique DFL ID for the match
	TeamId	DFL-ID	Specifies the unique DFL ID for the team
	PersonId	DFL-ID	Specifies the unique DFL ID for the person and/or ball
Frame [n]	N	String	Specifies the frame number; the frame number can begin from different starting values depending on the game section: First half: 10,000 Second half: 100,000 First half of extra time: 200,000 Second half of extra time: 250,000
	T	Datetime	Provides the absolute time stamp in the extended UTC format incl. offset
	X	Float(.2)	Provides the x-coordinate
	Y	Float(.2)	Provides the y-coordinate
	Z	Float(.2)	z-coordinate, only available for the ball
	S	Float(.2)	Speed in km/h
	M	Integer	The current minute of play relative to the kick-off of the half. The first minute of the first half is the first minute of play; the first minute of the second half is the 46th minute. The usual +/- notation is not included in stoppage time.
	BallStatus	Integer [0,1]	Ball status (0 = dead, 1 = in play), only available for the ball
	BallPossession	Integer [1,2]	Ball possession (1 = home team, 2 = away team), only available for the ball

Subelement	Attribute	Value	Notes
	A	Float(.2)	The ball's current acceleration in m/s^2
	D	Float(.2)	The distance covered from the previous frame in cm

XML example:

```
<Positions EventTime="2015-05-16T17:13:10.800+02:00">
<MetaData ...>
</MetaData>
<FrameSet GameSection="firstHalf" MatchId="DFL-MAT-0002WQ" TeamId="DFL-CLU-
00000G" PersonId="DFL-OBJ-0000IQ">
<Frame N="10002" T="2015-05-16T15:30:40.920+02:00" X="7.38" Y="-6.34" S="0.00"
M="1" A="0.00" D="0.00"/>
<Frame N="10003" T="2015-05-16T15:30:40.960+02:00" X="7.38" Y="-6.35" S="0.18"
M="1" A="6.11" D="8.32"/>
<Frame N="10004" T="2015-05-16T15:30:41.000+02:00" X="7.39" Y="-6.36" S="0.44"
M="1" A="6.25" D="10.00"/>
...</FrameSet>
<FrameSet GameSection="secondHalf" MatchId="DFL-MAT-0002WQ" TeamId="DFL-CLU-
00000G" PersonId="DFL-OBJ-0000IQ">
... </FrameSet/>
</Positions>
```

The pitch size is sent once in the form of "MetaData" at the beginning of a session.

Structure:

Subelement	Attribute	Value	Notes
	MatchId	DFL-ID	Specifies the unique DFL ID for the match
	Type	String	Indicates the expected message content (here: pitch size)
PitchSize	X	Gleitkommazahl	Specifies the length of the pitch along the x-axis. The length is provided in metres, rounded to two decimal places using the half-up rule.
	Y	Gleitkommazahl	Specifies the length of the pitch along the y-axis. The length is provided in metres, rounded to two decimal places using the half-up rule.

XML example:

```
<MetaData MatchId="DFL-MAT-0002WQ" Type="pitch-size">
<PitchSize X="100.00" Y="68.00" />
</MetaData>
```

2.3 DFL-04.03-PositonalData-Match-Raw_Observed

The "DFL-04.03-PositionalData-Match-Raw_Observed" is provided 36 hours after the end of the match at the latest and contains positional data on all the players, officials and the ball following post-analysis. The structure is the same as that for the "DFL-04.02-PositionalData-Match-Raw_Postmatch" feed (see section 2.2). The origin for the coordinate system is the centre spot. The x and y-coordinates are provided in metres and the ball's z-coordinate is in centimetres. Observed positional data for a match can be spread over several PutDataRequest messages when sent. As with the "DFL-04.02-PositionalData-Match-Raw_Postmatch" feed, the "MetaData" is sent once at the beginning of a session.

2.4 Subsequent partial transmissions

Subsequent partial transmissions are used in live situations to make minor changes to the live positional data without having to correct whole blocks of data. For this, the following rules apply:

- Differentiation can be made between the tracking data sets that were sent as part of a subsequent partial transmission by using the current time stamp from the data sets that are being replaced; the frame number remains the same.
- In the case of a subsequent partial transmission, each message sent also contains a maximum of 25 frames. In total, a subsequent transmission can contain a maximum of 22,500 frames, i.e. it can be a maximum of fifteen minutes.

- A subsequent partial transmission will always refer to just one half of the match.

- If there are "missing" frames at the beginning of a game section, these frames will be provided by means of a subsequent partial transmission. This will modify the "start numbering" of the frames; the order of the frames and how they go up remain the same.

Further information on subsequent partial transmissions can be found in „Dokumentation_partielle Nachübertragung_v0.3 "[3].

3 Supplying data

3.1 Services and availability

The following provides information on the available services and technology used to supply the data.

Service	Description	FTP	WebService	WebSockets
DFL-04.02-PositionalData-Match-Raw_Live	Provides the live positional data in a period of one second within the CDATA section	No	No	Yes
DFL-04.02-PositionalData-Match-Raw_Postmatch	Provides the positional raw data on all players, officials and the ball	Yes	Yes	-
DFL-04.03-PositionalData-Match-Raw_Observed	Provides the observed positional data on all the players, officials and the ball	Yes	Yes	-

Live data through the DFL-04.02-PositionalData-Match-Raw_Live feed starts being supplied from kick-off. Live data is supplied in full from the first minute of the match regardless of when the registration is made (even in the case of a late registration). The data compiler stops the live data feed 60 minutes after the full-time whistle at the latest.

The "DFL-04.02-PositionalData-Match-Raw_Postmatch" data is made available 60 minutes after the full-time whistle at the latest.

The "DFL-04.03-PositionalData-Match-Raw_Observed" data is made available 36 hours after the full-time whistle at the latest. For this, registration takes places after the end of the match.

3.2 FTP

The following table contains the naming convention for the feed. All of the service's files are stored in a directory that can be freely configured.

Service	Naming convention
DFL-04.02-PositionalData-Match-Raw_Postmatch	DFL_04_02_positions_raw_[competitionID]_[matchID]
DFL-04.03-PositionalData-Match-Raw_Observed	DFL_04_03_positions_raw_observed_[competitionID]_[matchID]

3.3 WebService

Calling up data using WebService must be parameterised and restricted to the match ID. A list of the available match IDs can be obtained via the *DFL-01.06-BaseData-Schedule* feed described in the *DFL-01-BaseData* Feed [2] documentation.

4   References

The following documents are referenced in the text:

[1]   Deutsche Fußball Liga: catalogue of the Official Match Data definitions
        ("Definitionskatalog Offizielle Spieldaten 5.0", available in German)

[2]   Deutsche Fußball Liga: Documentation „DFL-01-BaseData" Feed

[3]   Deutsche Fußball Liga: „Dokumentation_partielle Nachübertragung_v0.3"

[4]   Master-Dok Statistik-Übersetzungen tbf