2. Data usage

Below is an explanation of the elements that are specific for the journey en segment profile provided by NS and zoom into the differences between the NS and the default SFERA standard [REF 1]

The following components are included in JP/SP, which will be further explained below:

- Journey profile (JP) – (dynamic)
    - List of segments
    - Timetable (in seconds – tenths of minutes)
    - Stopping locations based on the actual material
    - Temporary speed restrictions
        - Temporary speed restriction (ASR)
        - Planned signal aspects
    - Features included in the JP

- Segment Profile (SP) - static
    - Length of your track
    - Timingpoints
    - Track location (GPS locations of track)
    - Kilometer reference points.
    - Signals
    - Static speed profile
    - Balises (if there are)
    - Gradients
    - Named Track

General

- SFERA major versions 2 is in use
- Operational Train Number (OTN) is in use, the TAP/TAF identification is not use
- Keep in mind that this data is not guaranteed to be of high enough quality to use for any safety-related function. [REF 2]. Data might be out-of-date with the outside world due in that changes outside are not in the data yet, this can ben up to 6 months.

JP

There 6 main things in the journey profile:

1. List of segments

The route of the train is explained in a list of segments. A choice has been made (by NS and Prorail) to split segments from switch to switch, these are the so-called functional track branches. Every segment has been described twice, each for both travel direction. This is explained further on.

Details of the functional track branches can be requested from the map services of Prorail (mapservices.prorail.nl). For these map services, a viewer of Prorail is available at railmaps.nl or

possibly via an open-source tool like QGIS or other GIS tools such as ESRI.

Below is an example from the JP of train 9334. Based on the SP_ID in the JP, you can request all details of the infrastructure at the SP service with the SP_ID from the journey profile.

Segment list in the JP

```
<SegmentProfileList SP_ID="3169226" SP_VersionMajor="1" SP_VersionMinor="20183122"
SP_Direction="Nominal">
```

Segment details are in the SP

```
<SegmentProfile SP_ID="3169226" SP_Length="336.334" SP_Name="586_133AV_80.7_M"
SP_Status="Valid" distance_EoA_Offset="25" UTC_Offset="60"
SP_Altitude="5.59799999">
```

The SP_NAME is the long name (NAAM_LANG) of the functional track branche and the second part is the direction in which we travel this track. In this the model it's "upwards (Mee in Dutch) or opposite (**T**egen in Dutch).

2. Timingpoints

In the JP only the timetable points which apply for the request trip are mentioned, this based on actual length of the material for this trip, the way we enter the train station and the available stopping sign's along the platform. In the SP all the possible timing points are mentioned and the link between them is based on the TP_ID.

The TP_ID (string) holds information about the location of the timingpoint and can be split by a '_'

The different parts are explained below:

- First part: Abbreviation of the station (or passing), when it's a passing point only this part will be filled.

  On a stopping point:

- Second part: The track of station, this optional an can be empty on rare cases.

- Third and Fourth part: says something about the exact stopping point location

  In most cases, there are the outside stopping signs along the platform as in the image below.

  For example, the TP_ID will end with:

  9_Recht, reference stop to stopping sign 9
  10_Recht, reference stop to stopping sign 10

  If there is a switch in the middle of the platform there is a sign which holds two values, liked displayed the image below.

  12_Recht, reference stop a stopping sign 12 (driving along the platform)
  4_Krom, reference stop a stopping sign 4 (driving through switch).

  The are some other possible values:

  - Overig, this means the signal along the platform at the end of the platform
  - Onbekend, which is unknown and this the default value (is a fictive place ¾ of the platform)
  - Sein, which means signal this means stopping in front of the signal
  - Stootjuk, which means stop in front of the bufferstop.

There are some NSP in the JP

multiple_tracks
Indication on a stopping point, if the train will stop on multiply stopping zones. This happens

when there is a switch in the middle of the platform, so there is fase A and B. This NSP will say we will use A and B for stopping (true) of only of them (false).

ATO_ID
We use a string to identify a stoppingping (TP_ID) for example Amr_3. When using subset-126 for driving ATO an integer is needed as TP ID. This NSP is used for sending the integer value which is reference to the TP ID.

ChangeReason
In case the tracked is changed, this will be filled with “TrackChanged”

3. Additional Speed Restrictions

Is following the SFERA standard, below there is axample of ASR.

```
<TemporaryConstraints startLocation="900" endLocation="1200"
startEndQualifier="StartsEnds" startTime="2022-05-01T04:20:00Z"
temporaryConstraintType="ASR">

      <AdditionalSpeedRestriction ASR_Front="false" ASR_Speed="80"/>
      <TemporaryConstraintReason
messageString="{&amp;quot;kmVan&amp;quot;:43.0,&amp;quot;kmNaar&amp;quot;:43.3,&amp;quot;maxGoederen&amp;q
uot;:null,&amp;quot;aanvraagnummer&amp;quot;:&amp;quot;2022-
06B&amp;quot;,&amp;quot;regelnummer&amp;quot;:&amp;quot;291&amp;quot;}"/>
</TemporaryConstraints>
```

In the messageString which is html encode the Kilometer reference points and the speed for freight trains (maxGoederen) are mentiond if there is difference between passengers and freight trains.

4. JourneyProfileFeatures

Gives an indication which information is included in the JP and which is not. When for example the ASR is not included you might show a message to the driver.

Example :

```
<NetworkSpecificParameter name="JourneyProfileFeature"
value="TrainCharacteristics"/>

<NetworkSpecificParameter name="JourneyProfileFeature" value="GladdeSporen"/>
<NetworkSpecificParameter name="JourneyProfileFeature" value="TSB"/>
<NetworkSpecificParameter name="JourneyProfileFeature" value="Seinbeeldrelaties"/>
<NetworkSpecificParameter name="JourneyProfileFeature"
value="TijdkritischePunten"/>
<NetworkSpecificParameter name="JourneyProfileFeature" value="Halteerlocaties"/>
```

Possible values:

- TrainCharacteristics and Halteerlocaties : Actual material is in the JP and the stopping points had been selected based on this information.
- GladdeSporen : Low Adhesion information are added to the JP

- TSB : Additional Speed Restrictions are added to the JP.
- Seinbeeldrelaties : Plannend signal aspects (tempory signal constraints) have been added to the JP
- TijdkritischePunten : TiminingPoints with a lower arrival windows are added.

5. Timecrititcal

When te arrivalWindow of a timingpoint is 1 minute, then is critical. Currently the Dutch TMS is not have arrival windows by default it's still zero.

6. Cancelled trip

It is possible that a scheduled train is canceled. When a train is canceled, a JourneyProfile will be sent without any TimingpointConstraints or SegmentProfile. The JourneyProfile will be provided with a network specific parameter in the General_JP_Information with the name Canceled and the value true. [REF 2]

7. Planned signal aspect

When entering the station the Dutch ATP system (ATB) may apply. In this cases there is an planned signal aspect which influence the speed profile and time calculation.

There are 2 flavors:

The most common is that there is no EndSignalApplication given. In this case you have to start breaking at this signal. In this example on signal 1046 (at a certain location) you have to start breaking to the given speed (40), this speed has to be reached at the next signal. There might be another TemporarySignalConstraints in the JP at that signal.

```
<TemporarySignalConstraints temporarySignalConstraintType="TemporarySignal">
	<Signal_ID signal_ID_Physical="02558fec-b198-43a2-998a-b5636a1a5094"
signal_ID_Object="1046" location="4662.944"/>
	<SignalApplication>
		<StartSignalApplication SP_ID="3170261" location="716.857"/>
	</SignalApplication>
	<SignalInformation>
		<MaxSpeed speed="40"/>
	</SignalInformation>
</TemporarySignalConstraints>
```

The other case is that EndSignalApplication is given, this means you are not allowed to pass the signal with a higher speed then given. The EndSignalApplication is at the given location.

```
<TemporarySignalConstraints temporarySignalConstraintType="TemporarySignal">
	<Signal_ID signal_ID_Physical="9c6d42ee-f9cb-4ad2-a342-9eff0a057ab7"
signal_ID_Object="396" location="32951.648"/>
	<SignalApplication>
		<StartSignalApplication SP_ID="4164618" location="32951.648"/>
		<EndSignalApplication SP_ID="4176359" location="536.414"/>
	</SignalApplication>
	<SignalInformation>
```

```
            <MaxSpeed speed="60"/>
        </SignalInformation>
</TemporarySignalConstraints>
```

8. TrainCharacteristicsRef_NSPs

Reference to the material type, train running number will be replaced by a the material type in short period of time.

NSP in use:

- CoupleDecouple : Gives in a JP if the train is going to couple or decouple at the given location.

- CouplebackCouplefront : Gives the train is couple at the front of the train, from the drivers pespective or is going to couple at the back of the train. This influcences the stopping point location.

SP

The following items are filled in the SP.

1. Length of your track

The length of the track is given in the SP Length.

```
<SegmentProfile SP_ID="3169226" SP_Length="336.334">
```

2. Timingpoints
Is following the SFERA standard.

NSP ATO_ID is in use to give every timingpoint a unique number. The stopping point zone can be used to group timingpoints at platform level.

3. Track location (GPS locations of track) and Kilometer reference points.

Is following the SFERA standard. At every 100 meters, and at the beginning and end of the Segment, a VirtualBalise and a matching KilometreReferencePoint is placed. This means each VirtualBalise have a matching KilometreReferencePoint. [REF 2].

Example of a virtual balise:

```
<VirtualBalise identifier="80.7_Awhv-Asd" location="0">
      <VirtualBalisePosition latitude="52.379463" longitude="4.899752"/>
</VirtualBalise>
```

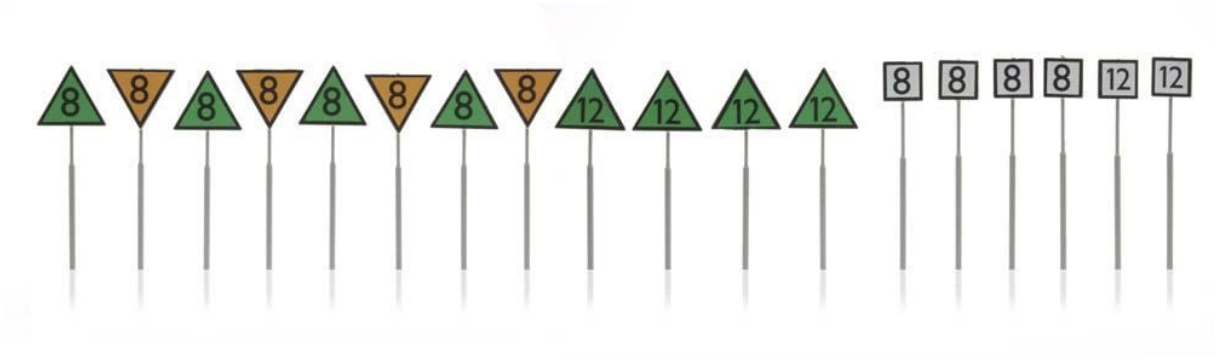
Example of KilometreReferencePoint

```
<KilometreReferencePoint identifier="80.7_Awhv-Asd" location="0">
      <KM_Reference kmRef="80.7"/>
</KilometreReferencePoint>
```

4. Signals

These are physical signs and signals both are part of the Dutch ATP national system called ATB, both types are in the signal part of the SP. On ECTS tracks the Stop Marker Board (SMB) are code as a signal as well, because it's marks the EOA.

Speed signs
In the image below you can see examples of the signal, the yellow triangle ones are announcement of a speed, this is the place where the driver needs to start breaking (in case not there will be intervention for the ATP). In this case the MaxSpeedAnnouncement is filled. The square ones (the white) and the green triangle will represent a maximum speed.



Example of a speed sign:

```
<Signal>
	<Signal_ID signal_ID_Physical="b1905981-f34d-40f7-8d90-ce5c9f7b85c2"
location="11.343"/>
		<SignalInformation>
			<MaxSpeed speed="60"/>
		</SignalInformation>
		<Signal_NSPs>
		<NetworkSpecificParameter name="ATO_ID" value="25562003"/>
	</Signal_NSPs>
</Signal>
```

Signal

Two of the available types of LightSignals are included on the SegmentProfiles as Signals with a predefined type. These are "Automatic Permissive" (Automatisch Permissief) which is given the type Permissive on the SegmentProfiles and "Controlled" (Bediend) which is given the type CTC (Centralized Traffic Control) on the SegmentProfiles. [REF 2]

Example of a signal:

```
<Signal>
	<Signal_ID signal_ID_Physical="8d0a3bf4-53fc-49a5-b4f3-bf20f82815f5"
signal_ID_Object="610" location="168.284"/>
	<SignalPhysicalCharacteristics signalType="Permissive">
		<PhysicalCharacteristics_NSPs>
			<NetworkSpecificParameter name="PositionSignalHighLow"
value="High"/>
			<NetworkSpecificParameter name="LevelCrossingSignal"
value="False"/>
		</PhysicalCharacteristics_NSPs>
	</SignalPhysicalCharacteristics>
	<Signal_NSPs>
		<NetworkSpecificParameter name="ATO_ID" value="25963008"/>
	</Signal_NSPs>
</Signal>
```

There are some NSP in use at the signal

- LevelCrossingSignal
  Gives an indication if the signal is connected to a level crossing, this influences the time arrival and ETA calculation.

- PositionSignalHighLow
  Gives an indication if the signal on top of something (high) (sign post for example) or on the ground (low). Will be replaced by the verticalOffset. This can be used for s search area for object detection.

- Section
  At the signal a certain tracakname ends, in the NSP is name of the track. Is replaced by a network specific area named tracks is it's deprecated.

SMB

A SMB is of the Permanently

Example of the SMB.

```
<Signal>
	<Signal_ID signal_ID_Physical="5f234773-98bd-4b69-b07a-b53e33de9eb9"
signal_ID_Object="2068" location="18821.37"/>
	<SignalPhysicalCharacteristics signalType="Permanently">
		<PhysicalCharacteristics_NSPs>
			<NetworkSpecificParameter name="PositionSignalHighLow"
value="Low"/>
			<NetworkSpecificParameter name="LevelCrossingSignal"
value="False"/>
			<NetworkSpecificParameter name="Section" value="MJ"/>
		</PhysicalCharacteristics_NSPs>
	</SignalPhysicalCharacteristics>
	<Signal_NSPs>
		<NetworkSpecificParameter name="ATO_ID" value="25565518"/>
	</Signal_NSPs>
</Signal>
```

5. Static speed profile

The Netherlands have 2 ATP systems, ATB is the national specific ATP and some pieces have ECTS track like the high speed line. For both a speed profile is filled in, but be AWARE that meanwhile both are filled I doesn't say it's available at that ATP piece of track. This information is not available at the moment.

Note that for the ATB part (ATBFG) only the start is filled in and the signal's with a maxspeed and maxspeed accountment should be used to come to speedprofile driving under ATB. For the ECTS part the speed profile is correct.

Example of ATB

```
<StaticSpeedProfile>
	<StaticSpeedProfileStart SSP_Speed="140" SSP_Front="false"/>
	<ATP_System_Identifier>ATBFG</ATP_System_Identifier>
</StaticSpeedProfile>
```

Example of ECTS:

```
<StaticSpeedProfile>
	<StaticSpeedProfileStart SSP_Speed="300" SSP_Front="false"/>
	<StaticSpeedProfileChange SSP_Speed="140" SSP_Front="false"
location="32563.098"/>
	<ATP_System_Identifier>ETCS</ATP_System_Identifier>
</StaticSpeedProfile>
```

6. Balises
If there are any balises this will be filled in conform the SFERA standard.

For every balise there is NSP Point which hold the GPS coordinates for this balise.

```
<NetworkSpecificPoint identifier="427_00093_0" location="159.287">
	<NetworkSpecificParameter name="latitude" value="52.193632"/>
	<NetworkSpecificParameter name="longitude" value="4.607782"/>
</NetworkSpecificPoint>
```

6. Gradients
The gradients are filled in and is following the SFERA standard.

7. Named Track
Some parts of the track are identified with a spoornaam (literally translates to trackname). These are useful reference points as these names are also known by the rail traffic controllers (treindienstleiders).

Named tracks are generally defined by a start and end position on the Segment. Exceptions to this are when the track ends in terra incognita or a buffer stop (stootjuk), in which case the named track ends at the location of the buffer stop, or the beginning of terra incognita.

Named parts of the track are included in the SegmentProfiles as NetworkSpecificAreas in the SPAreas. The Name of the NetworkSpecificArea is the type of NetworkSpecificArea (named_track). The NetworkSpecificParameters for NetworkSpecificAreas contain the area name as name track_name. [REF 2].

8. Special segments

Fallback
It's possible that the infra data is not in sync with the outside world, in most cases a piece of track is changed outside but is not in the segment data yet (this can be up to 6 or 7 months).

In this case there might be a so called 'fallback' segment. This segment is in 'degraded' mode only the a timingpoint and virtual balises are given, and the details are less accurate.

A fallback is recognizable by the name starts with 'FB,' and NSP is used, see in the example below.

```
<SP_Characteristics>

	<NetworkSpecificCharacteristics name="fallbacksegment">
		<NSP_Start>
			<NetworkSpecificParameter name="fallbacksegment" value="True"/>
```

```
            </NSP_Start>
        </NetworkSpecificCharacteristics>
</SP_Characteristics>
```