Subject: Extension rolling stock for capacity planning
Posted by Torben Brand on Wed, 10 May 2017 09:36:13 GMT
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For the use case capacity planning we need to have unambiguous defined rolling stock. This has become ever so more important as we now have a more fragmented sector with legally binding values between the entities. Rolling stock capabilities therefore must be precisely and efficiently defined. A railML file describing the rolling stock can solve this need.

As far as I can see the following elements are available in the software tools Opentrack and Treno. The values are necessary for an adequate precise running time calculation. As far as I can see I cannot find them in railML 2.3.

- Resistance factors for calculating train resistance
- Minimum time to hold speed
- Deceleration table for formations and per brake supervision type

Resistance factors for calculating train resistance

According to the Wiki:
"The sum of vehicle resistances is not the total of train resistance due to aerodynamic effects of vehicle formations. Therefore the resistance value is preferable given for the entire formation of the train. Dependent on the purpose there are different formulas used for the calculation of speed related values. RailML offers two basic possibilities of train resistance value representation - valueTable oder mathml."

As we have well established formulas in the sector (Strahl, Sauthoff and Davies) that are used directly in the calculation/simulation tools. I suggest to add the factors (Koefizienten) for these three most common resistance equations in/of the formation. It would still be possible to add either values in value tables or define other formulas by way of mathML. It needs to be made clear in the documentation that only either one of the three should/can be modelled.

Strahl/Sauthoff (Strahl for locomotives and freight wagons and Sauthoff for passenger wagons)
Davies formula (mass dependent) [F=m*g/1000*(A+B*v+C*v^2]
Davies formula (mass independent) [F=A+B*v+C*v^2]

I suggest extending the rolling stock schema with the following elements, this first in the Norwegian extension railML2.3NO: and if the community and RS coordinator agrees later in railML 2.4:

<formation><trainResistance>@strahlFactor [N]
<formation><trainResistance>@daviesMassdependant [bolean] (YES=mass dependent formula, NO=mass independent formula)
<formation><trainResistance>@daviesFactorA [kN]
<formation><trainResistance>@daviesFactorB [kN]
<formation><trainResistance>@daviesFactorC [kN]

I suggest to be more precise in the documentation/wiki to define if the existing attribute <vehicle>@resistanceFactor can also be applied in the Strahl formula for locomotives in a formation.

Minimum time to hold speed

Some railways have rules specifying that a train may only increase its speed if it can maintain this speed for a specified time (e.g., 30 seconds) before it must brake. This rule only applies for punctual trains traveling over 40 km/h. This rule gives a more energy efficient and passenger comfortable driving style.

I suggest extending the rolling stock schema with the following elements, this first in the Norwegian extension railML2.3NO: and if the community and RS coordinator agrees later in railML 2.4:

<formation><trainEngine>@trainMinTimeHoldSpeed

Deceleration table for formations and per brake supervision type

In railML2.3 it is possible to describe the brake under:
<vehicle><vehicleBrakes><vehicleBrake>@meanDeceleration
or
<vehicle><vehicleBrakes><vehicleBrake><rail:valueTable>
From [km/h] - to [km/h] - Deceleration [m/s^2]
Or under
<formation><trainBrakes>@meanDeceleration

A vehicle or formation can have a technical @vehicleBrake capability according to @brakeType. This braking capability is taken advantage of differently by the driver under different situations and under different train protection regimes (line side) modeled as @trainProtectionElements in railML IS. This needs to be reflected according to the capacity planning use case. This as the normal driving behaviour is calculated in run time calculations and simulations.
Thus we will get a @vehicleBrake per @brakeSupervision value available in the train.
I suggest if no @brakeSupervision is set the described @vehicleBrake values are the trains technical/emergency brake capabilities.

I suggest extending the rolling stock schema with the following elements, this first in the Norwegian extension railML2.3NO: and if the community and RS coordinator agrees later in railML 2.4:

<vehicle><vehicleBrakes><vehicleBrake>@brakeSupervision:"none/ATP/ETCS/other:" (The values must match the values used under IS:@trainProtectionElement)
<vehicle><vehicleBrakes><vehicleBrake>@decelerationDelay [s] (average brake application time)
<vehicle><vehicleBrakes><vehicleBrake>@releaseSpeed [km/h] (for a generic default none lineside value. Lineside values override this value. For a speed below release speed the applied

@vehicleBrake value table is always applied for the value "none")

The same needs to be defined under formation. This as a formation may have different braking values than the sum of its vehicles.

<formation><trainBrakes><trainBrake>@brakeSupervision:"none/ATP/ETCS/other:" (The values must match the values used under IS:@trainProtectionElement)
<formation><trainBrakes><trainBrake><rail:valueTable>
<formation><trainBrakes><trainBrake>@decelerationDelay (average brake application time)
<formation><trainBrakes><trainBrake>@releaseSpeed [km/h] (for a generic default none lineside value. Lineside values override this value. For a speed below release speed the applied @vehicleBrake value table is always applied for the value "none")