Functional interface for railML differential data exchange

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Motivation

- Synchronisation of timetables and vehicle working schedules modeled in railML
- Use cases:
  - Import: TrenItalia, MAV – Differential import for timetables (planning)
  - Export: VR (Finland), Export for dispositional schedule changes
  - All use cases have strong non-functional (performance) requirements
- railML 2.2 - Standard has no support for „data telegrams“
- Aim: Consolidated solution, symmetry for import and export
**Motivation: From the railML-Forum**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay Causes Representation in RailML</td>
<td>Matteo Anelli, Joachim Rubröder, Dirk Bräuer, Andreas Tanner, Dirk Bräuer, Andreas Tanner</td>
</tr>
<tr>
<td>Internationalized message text in connection</td>
<td>Susanne Wunsch, Andreas Tanner, Andrea Titaner, Andreas Tanner</td>
</tr>
<tr>
<td>stop probability</td>
<td>Süßane Wunsch, Andreas Tanner, Andreas Tanner, Andreas Tanner</td>
</tr>
<tr>
<td>Re: Steckenunterbruch/line blocking</td>
<td></td>
</tr>
<tr>
<td>RFE for connection, DE:Anschluss</td>
<td></td>
</tr>
<tr>
<td>wiki: missing attribute description for additionalTrainNumber at</td>
<td></td>
</tr>
<tr>
<td>constraints for OperatingPeriod</td>
<td></td>
</tr>
<tr>
<td>Extension of places and service</td>
<td></td>
</tr>
<tr>
<td>Stop posts for different train types (was: Haltetafel / stop post)</td>
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<tr>
<td>train annotations</td>
<td></td>
</tr>
<tr>
<td>circulations should be optional</td>
<td></td>
</tr>
<tr>
<td>Explizite Kennzeichnung von gelöschten Zügen und Zugausfällen</td>
<td>Christoph Wermelingen, Andreas Tanner, Andreas Tanner, Christoph Jobmann</td>
</tr>
</tbody>
</table>
Solution concept

- Functional interface, SOAP based
- Requirement: Functional or technical keys for railML entities
  - <train>
  - <ocpTT> within <train>
  - <formation>
  - ...
- TODO: define key for train
- Key for <ocptt> index
Solution concept

1. Full Resynchronisation of a train
   - <synchronizeTrain>
     - Complete transmission of state of a train identified by functional key
Solution concept

2. Modification telegrams
   - `<modifyTrain>`
     - `trainKey` (trainNumber, additionalTrainNumber, operatingPeriod)
     - Attribut „state“ with values originalData/changed/new/deleted
     - Simple attributes (if changed)
     - List of `<modifyOcptt>` for changes of itinerary and track occupancy
2. Example for telegram

```xml
<modifyTrain>
  <ocps>
    <ocp id="ocp1" code="H"/>
    <ocp id="..."/>
  </ocps>
  <formations>
    <formation id="..."/>
  </formations>
  <operatingPeriods>
    <operatingPeriod id="..." startDate="..." endDate="..."/>
  </operatingPeriods>
  <trainKey trainNumber="1" additionalTrainNumber="11" operatingPeriodRef="...">
    <formationTT state="changed" formationRef="..."/>
    <modifyOcpTT index="13"/>
    <times state="changed"/>
  </trainKey>
</modifyTrain>
```
Example for changed stop

...  
<trainKey trainNumber="1" additionalTrainNumber="11" operatingPeriodRef=...>
<formationTT state="new" formationRef="..." />  
<modifyOcpTT index=13>
<ocpTT state="changed" ocpType="pass" ...><times>...</ocpTT>
<ocpTT state="originalData">...
<modifyOcpTT/>
Example for deleted stop

...  
<trainKey trainNumber="1" additionalTrainNumber="11" operatingPeriodRef=...>
<formationTT state="new" formationRef="..." />
<modifyOcpTT index=14>
<ocpTT state="deleted"/>...

Example for new stop

...<trainKey trainNumber="1" additionalTrainNumber="11" operatingPeriodRef="...">
<formationTT state="new" formationRef="..." />
<modifyOcpTT index=10.5>
<ocpTT state="new">...
...<modifyOcpTT index=-1>
<ocpTT state="new">...

New stop between 10th and 11th stop

New Stop at beginning
Use cases to cover

- Partial cancellation of a train
- Data transfer
- Activating contingency plan
- Track assignment
- Track change
- Track un-assignment
- Stop pattern change
- Increase vehicle number(s)
- Decrease vehicle number(s)
- Trip class change
- Departure time change
- Arrival time change

- Change of planned vehicle type
- Commercial line change
- Assigning vehicle
- Vehicle un-assignment
- Change of vehicle assignment
- Partial extension of a train path
- Change of vehicle formation
- Position change of vehicle inside one track section
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modifyTrain

Yes, if formation change. No, if changes on coupling level
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Summary

- Extending standard to support data changes would be helpful.
- Data telegrams could cover popular use cases.
- IVU will implement (proprietary, for now) solution.
- For standardisation, collaboration is required.
Thanks for your attention.

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