ITEF - INTEGRATED TEST AND EVALUATION FRAMEWORK

Domains
- Field Operational Tests
- Connected Driving
- Maps
- Sensor data processing (e.g. Lidar)

Application Scenarios
- Preparation/Conduction:
  - Setup/ Planning
  - Orchestration
  - Control incl. Validation
  - Evaluation
- Data Ingestion
  - Mobile and stationary sources
  - Real and synthetic data
- Existing connections for mobile nodes, e.g. vehicles, smart phones, sensors, virtual data sources
**Data ingestion for analysis**
- Real data, e.g. vehicle, smartphone, sensors
- Synthetic data, simulations

**Setup**
- Definition of scenarios/ data baskets for evaluation

**Monitoring**
- Supervision and Control

**Evaluation**
- Quality Assurance
- Verification of data collection
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Frontend
- Completely web-based

Backend
- Tomcat / J2EE
- Hadoop
- Accumulo
- Flink

Client
- DCF & LDM++ Libraries in Java
- Wrapper for Android, OSGi, C#
Every measurand is pre-defined, including a data type
Individual measurands can be combined to log entries
API with type-safe logging functions for developers
Mapping of different measurands across different projects
LDM++ (combined data sink and source)
- Cloud-based, locally deployed instances, online data access, low frequency changes, small amounts of data, e.g. traffic signs, parking spots

Monitoring (Speed Layer)
- Infrastructure deployment, online access and visibility, high frequency changes, small amounts of data, e.g. vehicle status, traffic light phases

Evaluation (Batch Layer)
- Infrastructure deployment, offline, any frequency, big amounts of data
LOCAL DYNAMIC MAP++

- Location-based data distribution
- publish/subscribe model
- Locally deployed LDM++ instance on each participating node
- Event based close-to-realtime distribution of data
- Best effort synchronisation to cloud
Example: Change Detection in HD Maps

**Observation** Use Case: Operator inspects measurements

1\(^{st}\) level of automation: Inspection of thresholds → immediate validation

2\(^{nd}\) level of automation: Aggregation by pipelining

- Aggregation of speeds of vehicles per road segment over place/ time
  → Generation of traffic jam DENM

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MONITORING / SPEED LAYER

Agentive - Prefer more recent data

Segment Velocity
Segment Velocity
Segment Velocity

Segment Speed Limit

Segment Aggregation

Traffic Situation Indicator
Traffic Situation Indicator

Merge nearby segments

Congestion DENM

Comparison

Fraunhofer FOKUS
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- Analysis of **big** amounts of data
- Definition of **data baskets**
- Queries in **5 dimensions**:
  - time
  - location
  - node/ station id
  - signal type
  - signal values

- Plot functions and data export
SUMMARY

- FOT as basis for big data, complemented by Simulations
- Challenges due to distributed collection, formats
- Additional value by employing Big Data techniques

- With new sensor technologies, amount of data will again increase, higher demand for proper tooling