A PROCESS-ORIENTED SUPPLY CHAIN EVENT MANAGEMENT SYSTEM WITH DISRUPTION REPAIR SUPPORT

Innovation
Innovation

Neutralität
Neutrality

Beratung
Consulting

Prof. Dr.-Ing. Uwe Clausen

Dr.-Ing. Alexander Wiedenbruch

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Motivation

- Unexpected events can occur in a supply chain, for instance
  - Delays
  - Outages
  - Environment
- Objective of Supply Chain Event Management
  - Monitor the order fulfilment
  - Notify about disruptions
  - Provide decision support to repair disruption

➔ Fulfil the plan as much as possible

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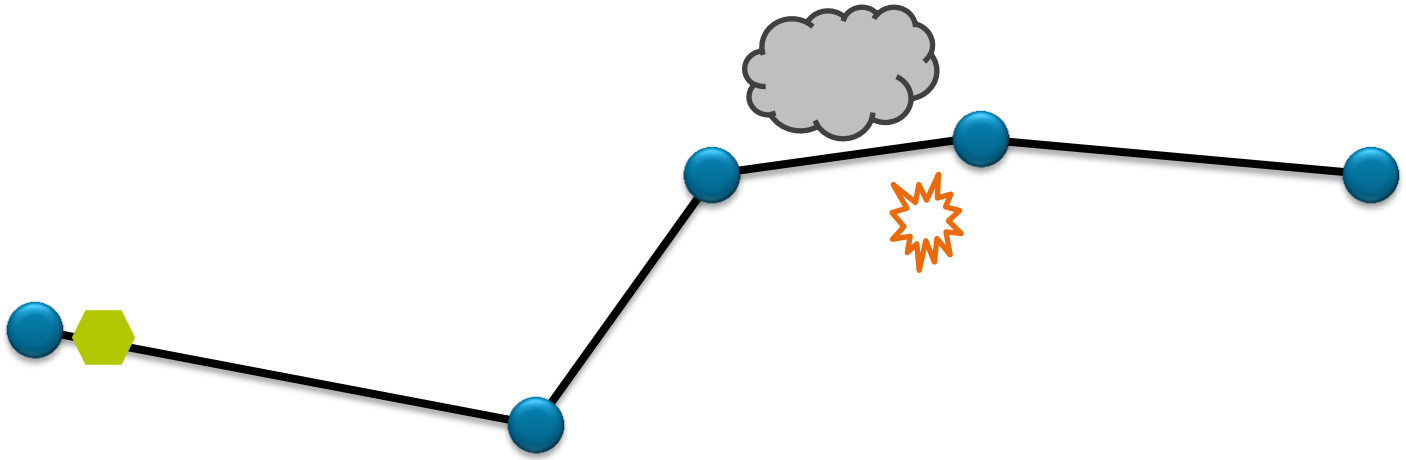
Benefits

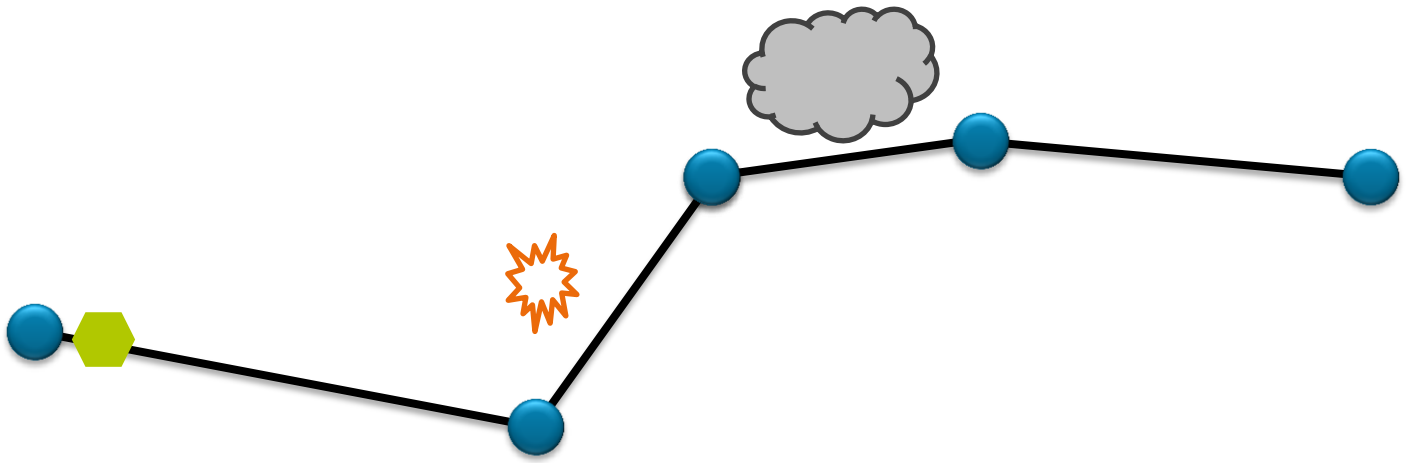
- No distinction between documented supply chains and their implementation in the information system
- No errors in the interpretation of models by IT specialists, reduction of costs
- Supply chains can be modeled and executed in the supply chain event management system by the user
- Documentation of disruptions and solutions
- Logistics is becoming more agile and improves competitiveness

Existing Solutions



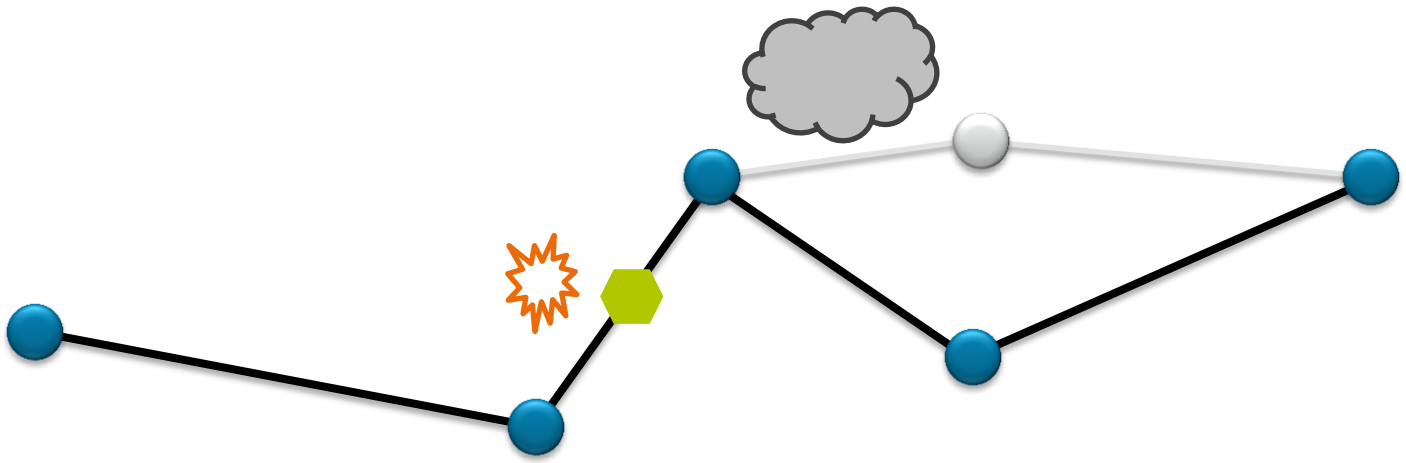
- Existing Supply chain event management systems
  - No reactions to disruptions possible
  - No disruption repair support
  - Limited focus on transportation

Proposed Solution



- Detect disruption pro-actively
- Allow to change the supply chain process
- What-if-scenarios with disruption repair support

Proposed Solution



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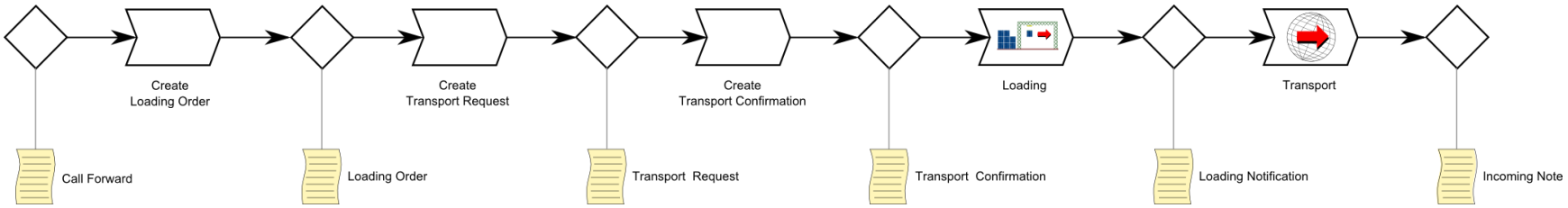
Requirements

- **Monitor:** Handle all possible supply chains without software implementation
- **Notify:** Identify the person in charge when a disruption is detected
- **Simulation:** Provide a disruption repair support and the analysis of what-if-scenarios
- **Control:** Enable the adaption of the concrete supply chain at runtime
- **Measure:** Allow to show the state of each supply chain and their aggregated values with performance indicators

Implementation

- Supply chains are modeled as processes and events
- Documents describe physical processes
- Alarms can be added to modeled supply chains
- Performance indicators allow to monitor the supply chain execution
- Supply chains adapted for mitigating disruptions can be described with instance models

Supply Chain Processes



- Events are triggered by a document that is exchanged
- Representation of the supply chain as
  - Processes
  - Events
- Processes can be specialized for less abstract physical processes (transport, stuffing, …)
- Allows to formulate disjunctive or parallel control flows
- Easy to transform into Petri Nets
- Modeling of instances
  - Mitigation of disruptions
  - Simulation

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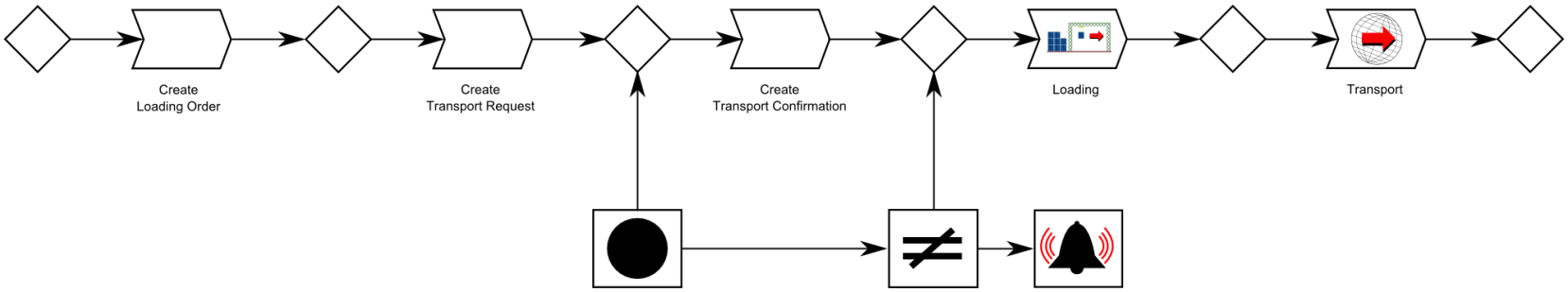
Supply Chain Processes



- Relative temporal alarms

  E.g.: Alarm, if an event is not triggered 1d after the transport request was sent

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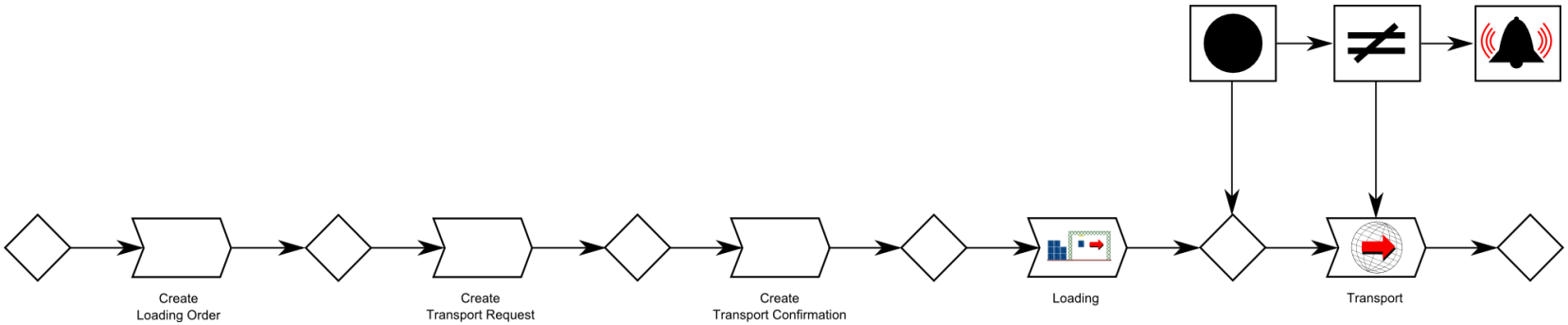
Supply Chain Processes



- Absolute temporal alarms

  E.g.: Alarm, if an event is not triggered 1d before the barge departs

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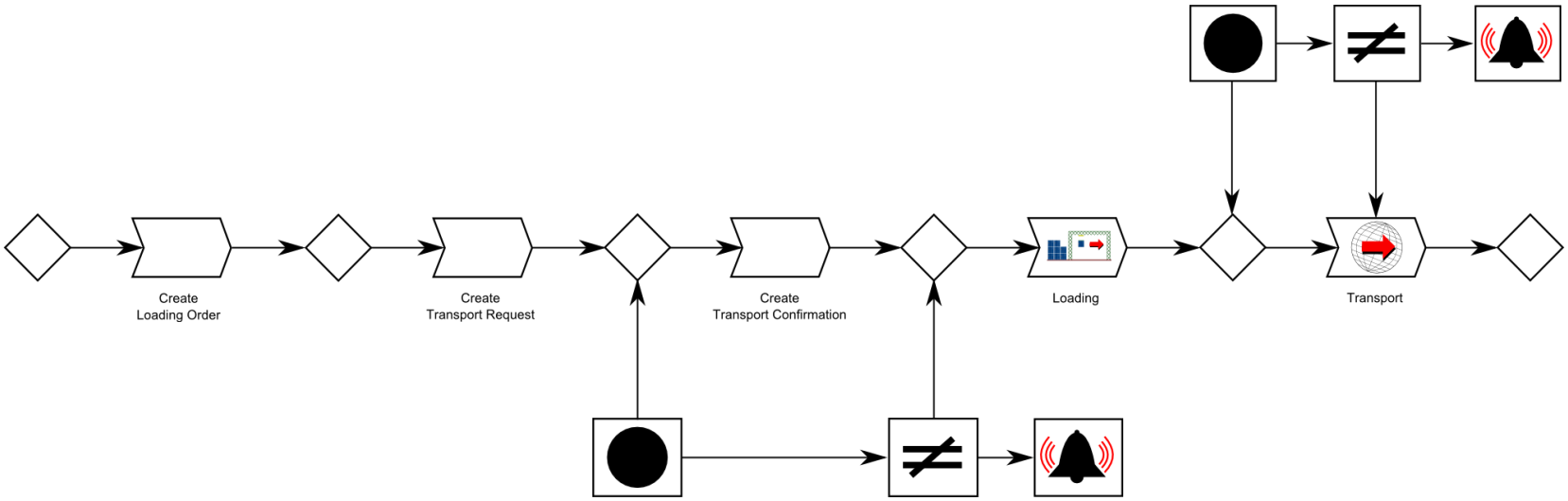
Supply Chain Processes



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- Absolute temporal alarms

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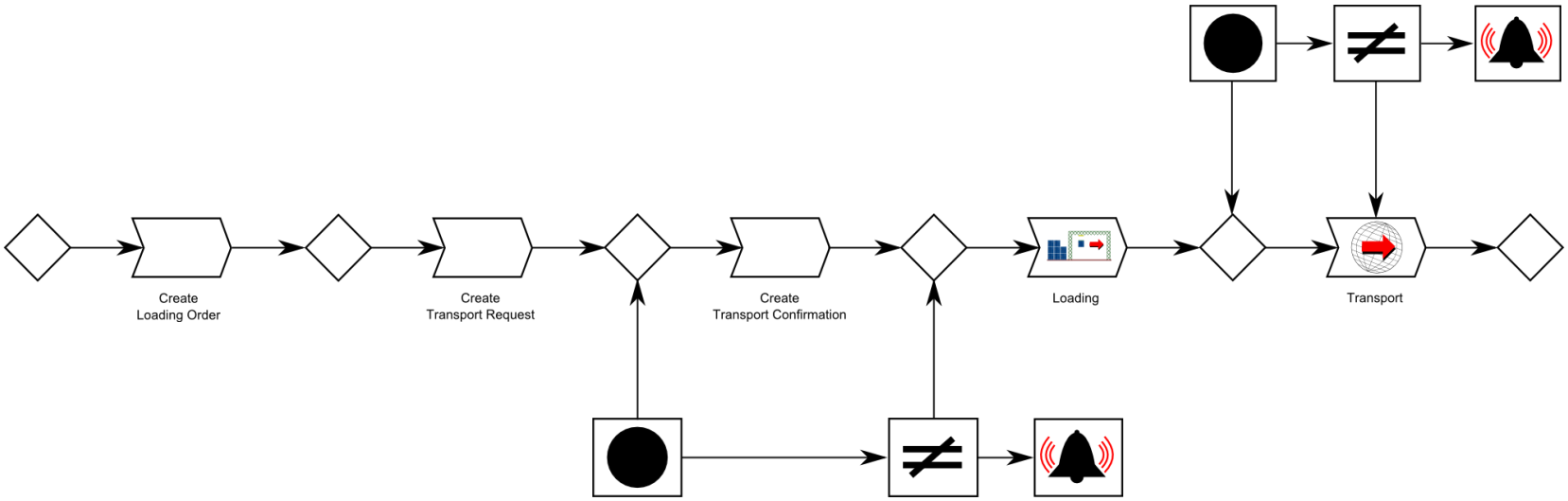
Supply Chain Processes



- Relative temporal ala… temporal alarms

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Implicit
- Control flow alarms
- Quantitative alarms

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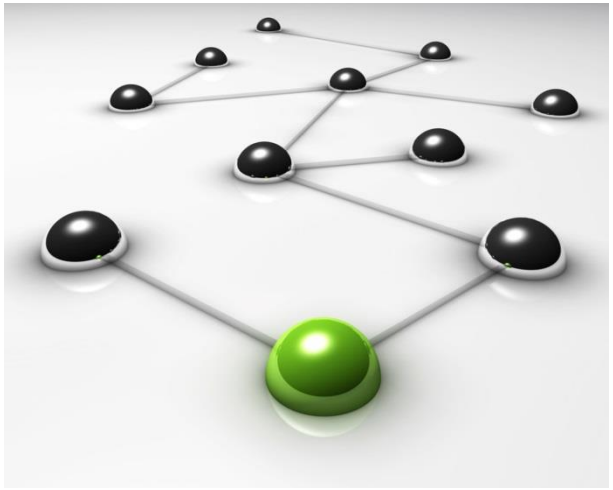
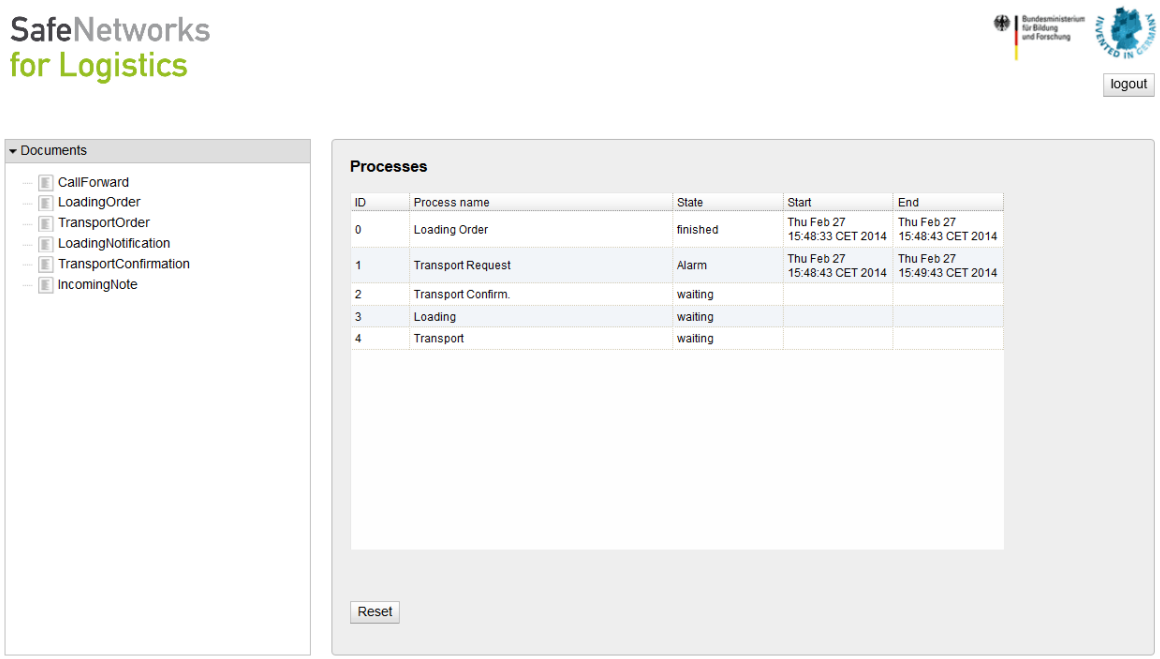
Disruption repair support



- Basis: Intermodal routing algorithm
- Assumptions
  - Manager can decide during transport
  - Information about disruptions is available
  - Alternative transport relations known
- Procedure
  1. Information about a disruption is received
  2. Validate if disruption is relevant
  3. Extract location of disruption
  4. Mark node/edge as disrupted
  5. Extract time windows
  6. Determine alternative schedules/relations
  7. Present supply chain manger the alternatives

Evaluation



- Intended users
  - Supply chain managers
  - Schedulers
  - Material planners
  - Customers
- Development of a prototype for evaluating use cases

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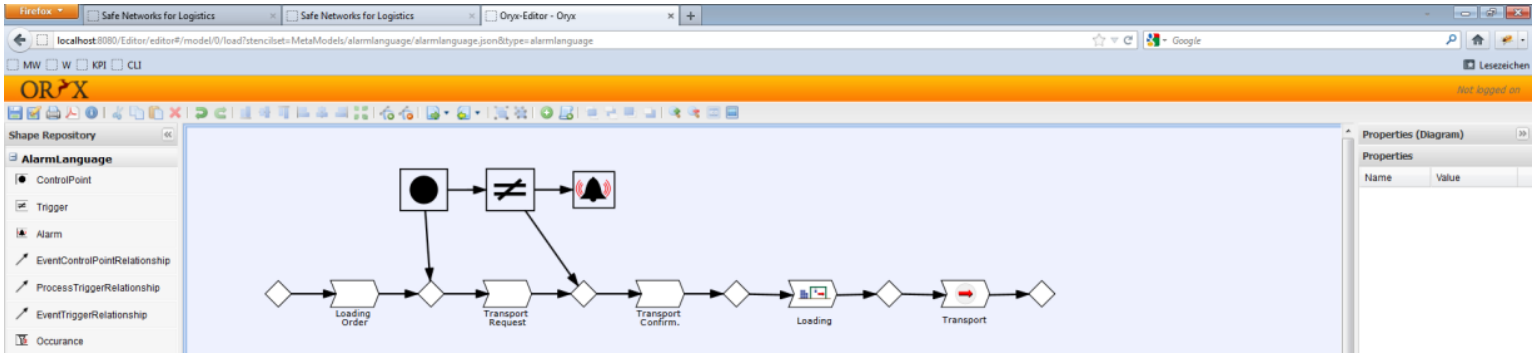
Evaluation



- Full use case: Distribution of steel tubes
  - Trimodal (street, rail, waterways)
  - Conventional and containerized transport
  - Physical and scheduling processes
  - Multiple actors

- Procedure
  1. Process Modeling
  2. Normal execution
  3. Extensions
  4. Alarms
  5. Performance indicators
  6. Disruption handling

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Conclusion

- Presentation of a process-oriented supply chain event management system with disruption repair support
- Promises a faster monitoring of supply chains and quicker response to disruptions
- The system also assists in the disruption repair
- Evaluation shows the feasibility of the concept
- Further empirical studies necessary to show that benefits can be achieved in practice

Thank you for your attention!

Prof. Dr.-Ing. Uwe Clausen
uwe.clausen@iml.fraunhofer.de
+49 (0) 231 9743 400

Dr.-Ing. Alexander Wiedenbruch
alexander@wiedenbruch.de
+49 (0) 178 18 999 81

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