

# Using BPMN-Q to show violation of execution ordering compliance rules

Business Process Technology Seminar 2008

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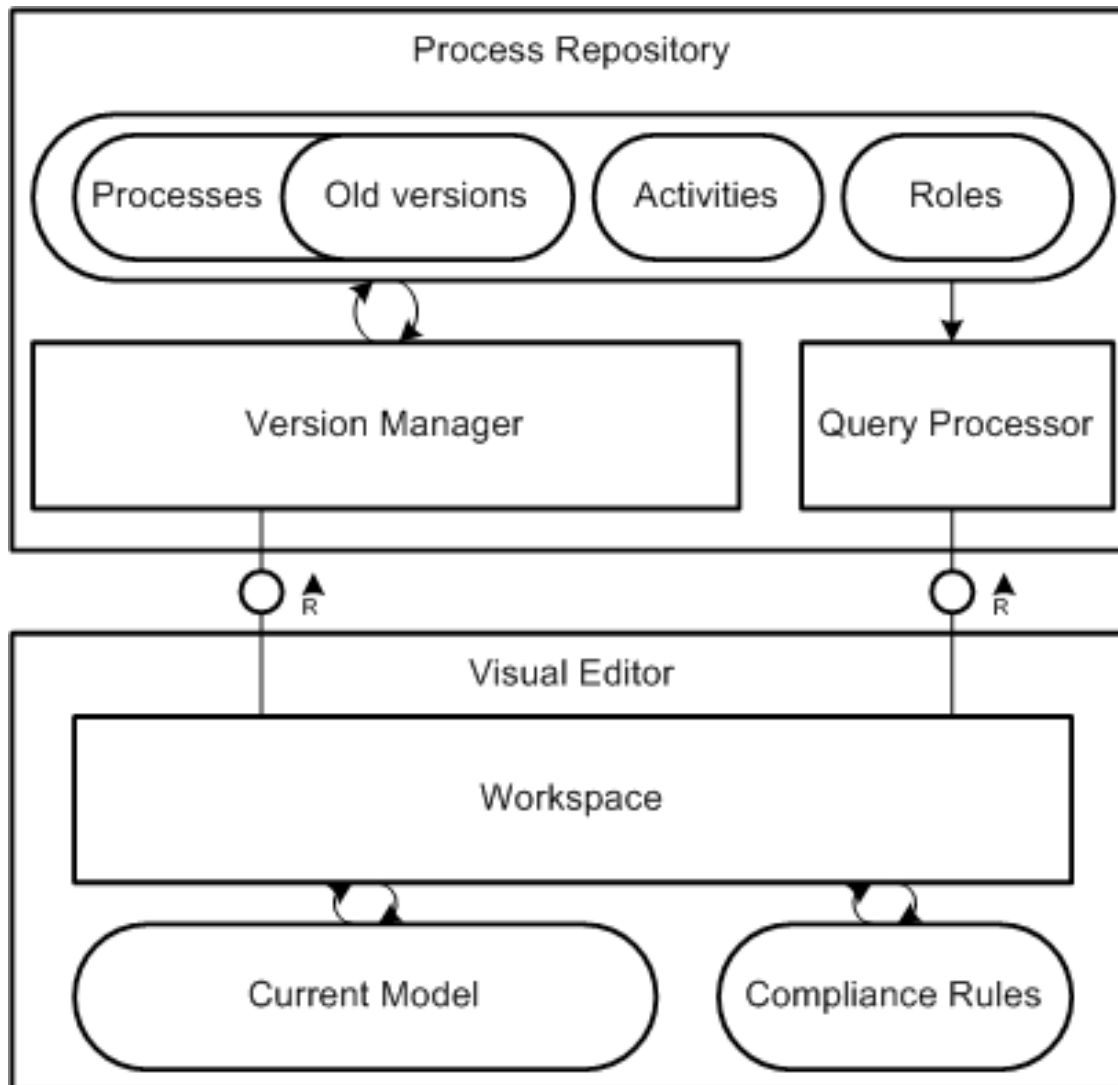


- Problem Domain and Description
- Vision
- Architecture
- Approach
  - BPMN-Q
  - Pattern + Anti Pattern
- Implementation
- Related work
- Conclusion
- Possible Next Steps

- Problem domain of Business Process Management
  - a lot of companies in germany are organized with processes
  - e.g. AOK Brandenburg maintains about 4000 process models
- Repositories grow and change over the time
- Laws and standards are released and improved
  - e.g. new insurance laws in germany that ensure consulting before signing contracts (ref. VVG) or Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch (ref. LFGB release 2006-04-26 last change 2008-02-26)
  - ISO 9000 family for quality ensurance standards (1987, 1994, 2000, 2008 not yet finished)

- How to maintain these repositories?
  - How to check that the processes in the repositories are valid?
  - How to check if processes does already exists in repository?
  - How to reengineer processes for example rename activities, add predecessors or parallel branches?

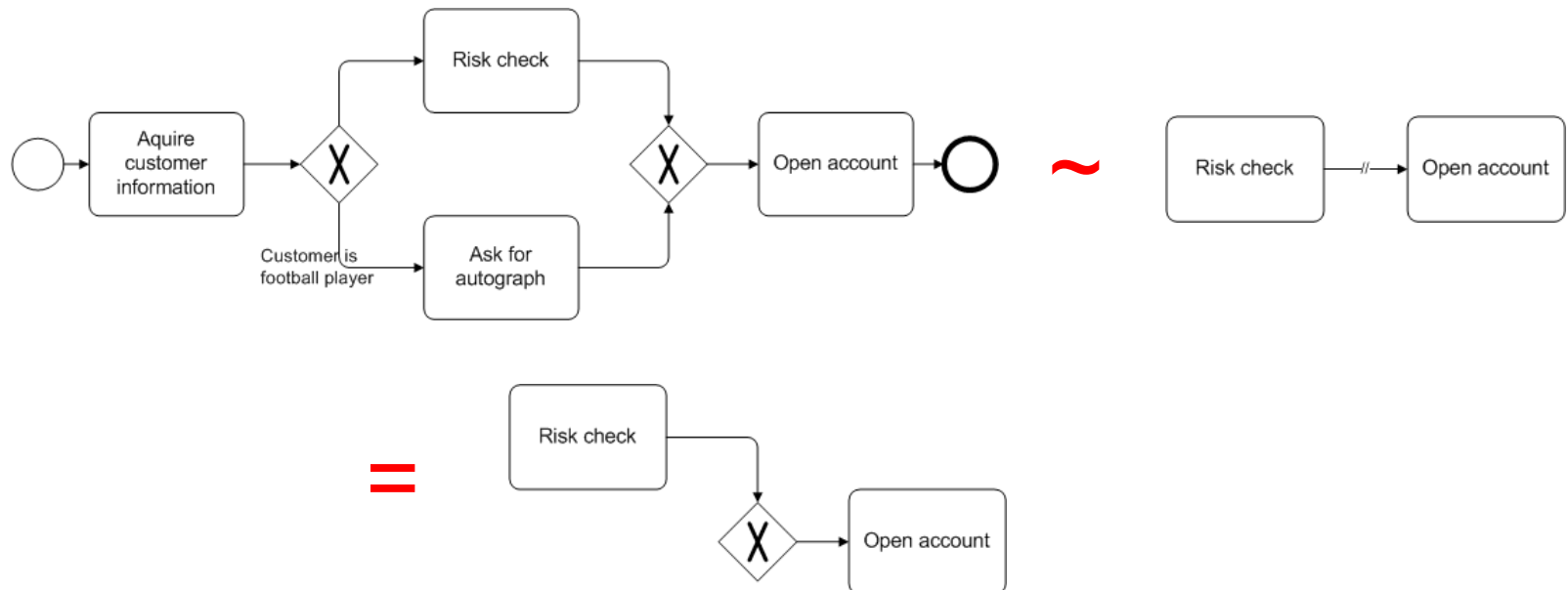
- People in a company are working according to processes
- Laws and standards can be expressed as business processes and compliance rules
- Companies are maintaining all processes in one repository
- Companies are maintaining all compliance rules in the same repository
- The repository knows automatically which processes need to be reengineered presents them to the user and suggests quick fixes



In new implementation  
compliance rules should  
be stored in repository

- This presentation will show an approach which can be integrated into a repository
  - The approach searches for ordering compliance violations
  - It can check if certain activities are happening in conjunction and in the correct order
  - If a violation is found it can be visualized and the end user can correct the problem

- BPMN-Q is a visual language to extract matches out of a process
  - In a nutshell BPMN-Q is for BPMN what is RegEx for Strings
- Example:



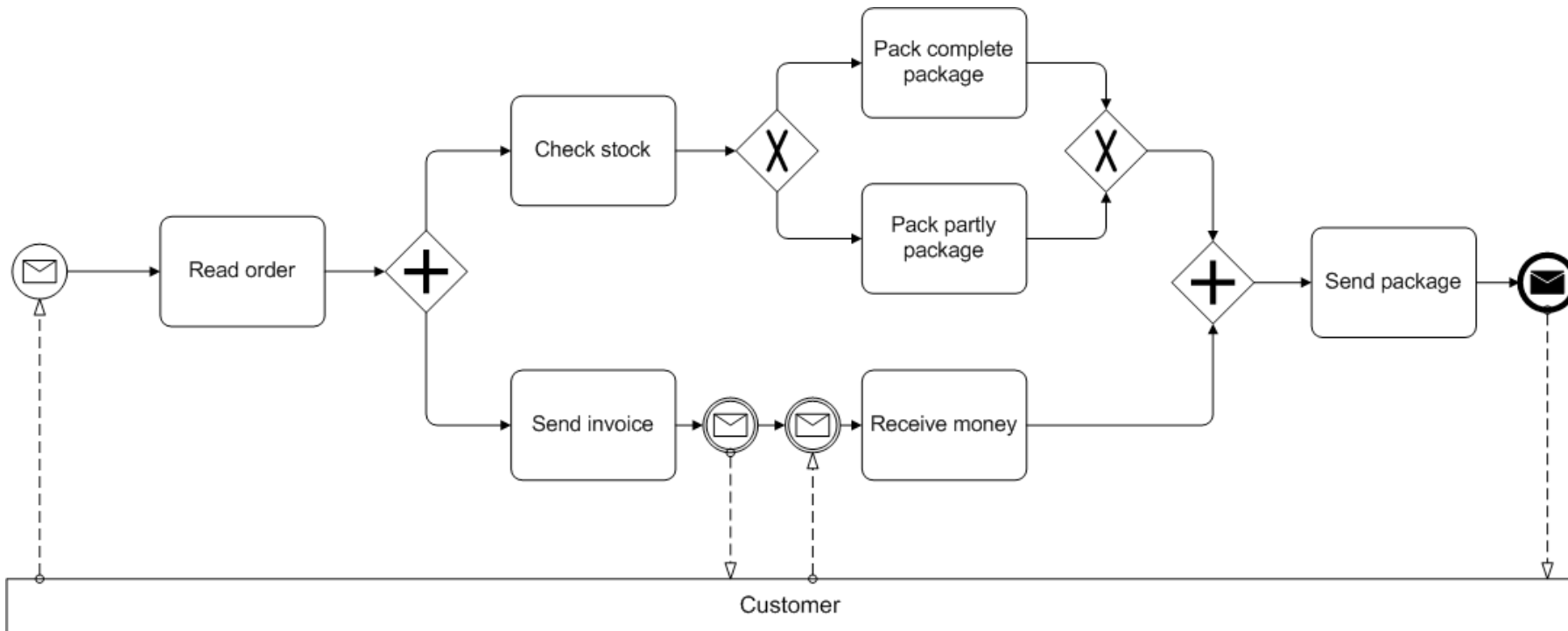


## ■ Validation process

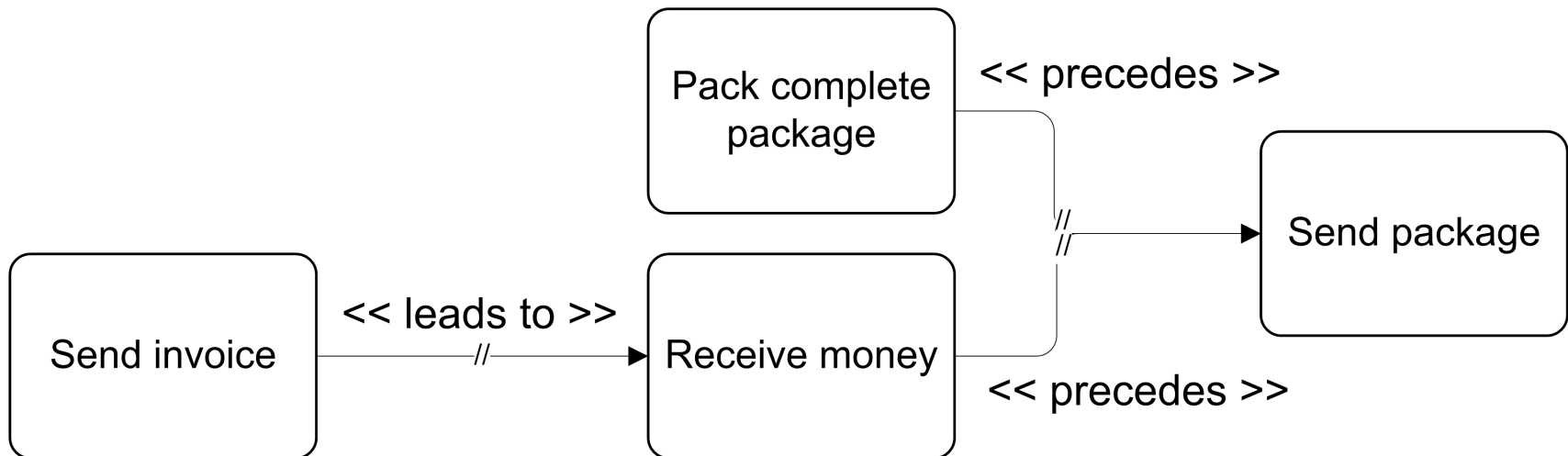
- Identify process (possibly by running BPMNQ against repository)
- Create pattern
- run pattern against process to ensure that at least one valid execution path exists
- if no match is found validation failed
- Derive anti pattern
- run anti pattern against process to find counter example
- if one is found visualize violation with match otherwise accept

# Example

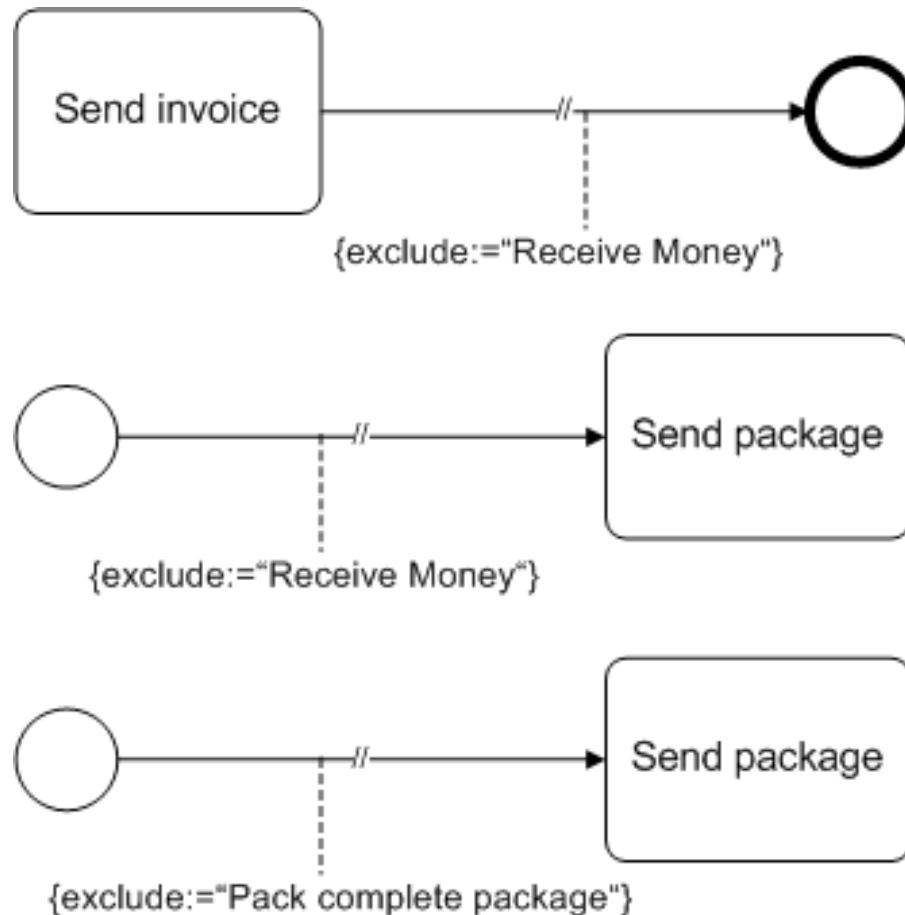
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- Every package should be complete
- After sending an invoice it must be checked if the money arrived
- Money should always be received before package is send



- Anti pattern are generated for the generated query



- Implementation based on code of Ahmed Awad
- Microsoft Visio as visual editor
- PostgreSQL as repository server
- Communication to upload processes between repository and editor via ODBC implemented in Visual Basic for Applications
- Query Processor implemented in Java
  - Communicates with repository over jdbc
- Communication between query processor and editor over command line and file system

- Efficient Compliance Checking using BPMN-Q and Temporal Logic.
  - Based on temporal logic math
  - can only give a boolean answer
- Symbolic Model Checking of UML Activity Diagrams
  - finite state machine approach
  - Based on NuSMV, a symbolic model verifier

- Visualization of violation is a huge help
- Implementation lacks of some bugs
  
- No mathematical proofs yet
- No quantification possible
  - for example for every car produce 4 times a tire
- No classification of activities
  - e.g. after every financial transaction a consistency check should be done

# Possible next steps

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- Debug implementation
- Implement BPMN-Q for oryx
  - Is already in progress by Steffen Ryll
- Implement validation in oryx
  - Use models from repository
  - Implement quick fixes
  - save compliance rules in repository
- Research about quick fixes for compliance validations



Questions?

- Ahmed Awad: BPMN-Q: A Language to Query Business Processes. EMISA 2007: 115-128
- Ahmed Awad, Gero Decker, and Mathias Weske: Efficient Compliance Checking using BPMN-Q and Temporal Logic. 6th International Conference on Business Process Management BPM 2008
- Aditya Ghose and George Koliadis: Auditing Business Process Compliance
- Rik Eshuis: Symbolic Model Checking of UML Activity Diagrams
- Shazia Sadiq, Guido Governatori, Kioumars Naimiri: Modeling Control Objectives for Business Process Compliance
- OMG BPMN 1.1 - OMG Final Adopted Specification, January 2008

- Artem Polyvyanyy, Sergey Smirnov, Mathias Weske: Process Model Abstraction: A Slider Approach, 2008
- Bundesregierung Deutschland: VVG Gesetz über den Versicherungsvertrag [http://www.gesetze-im-internet.de/bundesrecht/vvg\\_2008/gesamt.pdf](http://www.gesetze-im-internet.de/bundesrecht/vvg_2008/gesamt.pdf), 2008
- Bundesregierung Deutschland: LFGB Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch <http://www.gesetze-im-internet.de/bundesrecht/lfgb/gesamt.pdf>, 2006