

# Dynamic Condition Response Graphs for Trustworthy ACM

**Thomas Hildebrandt<sup>1</sup>**

joint position paper with

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Denmark

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Graz University of Technology, Graz



IT UNIVERSITY OF COPENHAGEN

# Background

- *Computer Supported Mobile Adaptive Business Processes*

(2007-2011, Research Council for Technology and Production # 274-06-0415, [www.Cosmobiz.dk](http://www.Cosmobiz.dk)) joint with Copenhagen Business School and Microsoft Development Center Copenhagen

- *Trustworthy Pervasive Healthcare Services*

(2008-2012, The Strategic Research Council # 2106-07-0019, [www.TrustCare.eu](http://www.TrustCare.eu)) joint with Computer Science Department, Copenhagen University (DIKU) and Resultmaker A/S



- *Case Studies of Best Practice Workflow and Case Work in Practice*

(Fall 2010, Infinit mini project) Resultmaker, Exformatics A/S, Dafolo, Job Center Cph, KL, Kombit, CBS

- *Cross-organizational workflows*

(Spring 2011-, Research Council for Technology and Innovation, Knowledge Voucher & industrial PhD) Exformatics A/S

# DCR Graphs

- the knowledge workflow GPS



<https://www.youtube.com/watch?v=1eDdyCK8Lsk>

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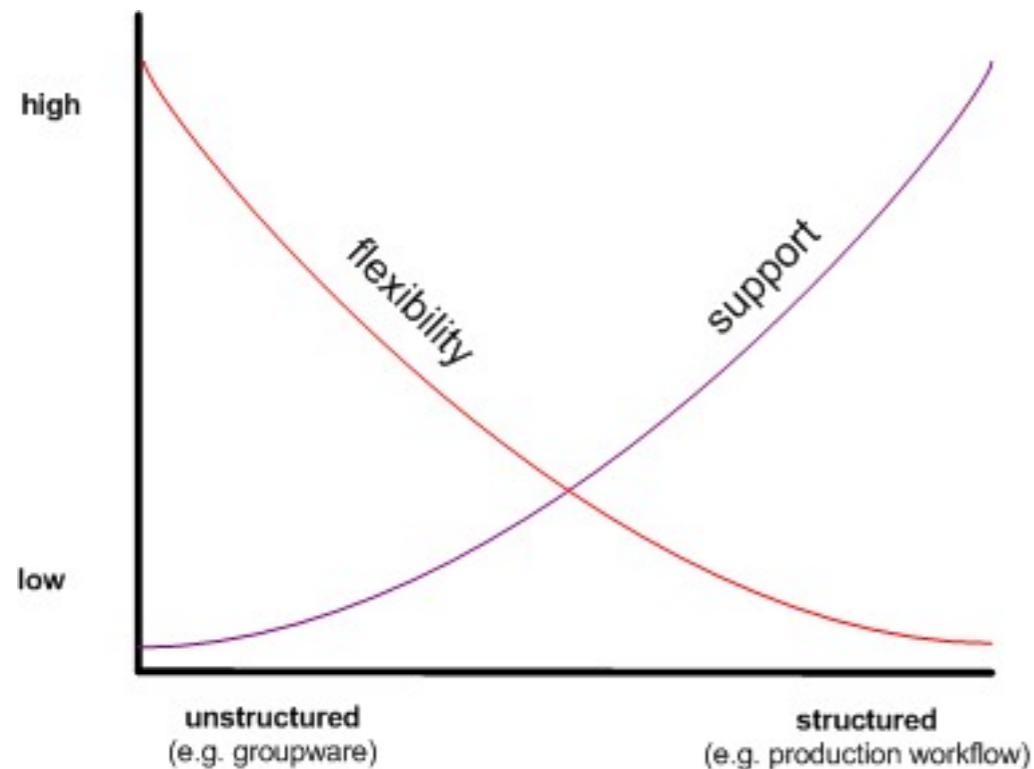


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# Is work a procedure?

- The motivation for basing BPMN on (imperative) flow-graphs is that business people have used them for decades....
- But which kind of business processes can be supported by enacting/executing such diagrams ?

# Flexibility vs support?



Classical trade-off between flexibility and support<sup>1</sup>

[1] W.M.P. van der Aalst et al. Declarative workflows: Balancing between flexibility and support


[Schmidt & Bannon: Taking CSCW Seriously: Supporting Articulation Work, 1992]

“Good standards for business process modelling are still missing and even today’s WFMSs are too rigid”


**Process-Aware Information Systems:  
Design, Enactment, and Analysis**

Wil M.P. van der Aalst

# Challenges

- To offer both support, flexibility - and adaptability:
- Today's systems are too rigid - introduces unjustified dependencies between tasks and/or wrong distributions of tasks, and are difficult to adapt
- Result: People work around the system
- To bridge between requirements  & process model
- To get a good standard for business process modeling!

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system. One of the problems is that software developers and computer scientists are typically inspired by processes inside a computer system rather than processes outside a computer. As a result, these engineers think in terms of control systems rather than support systems. This explains that few of the existing WFMSs allow

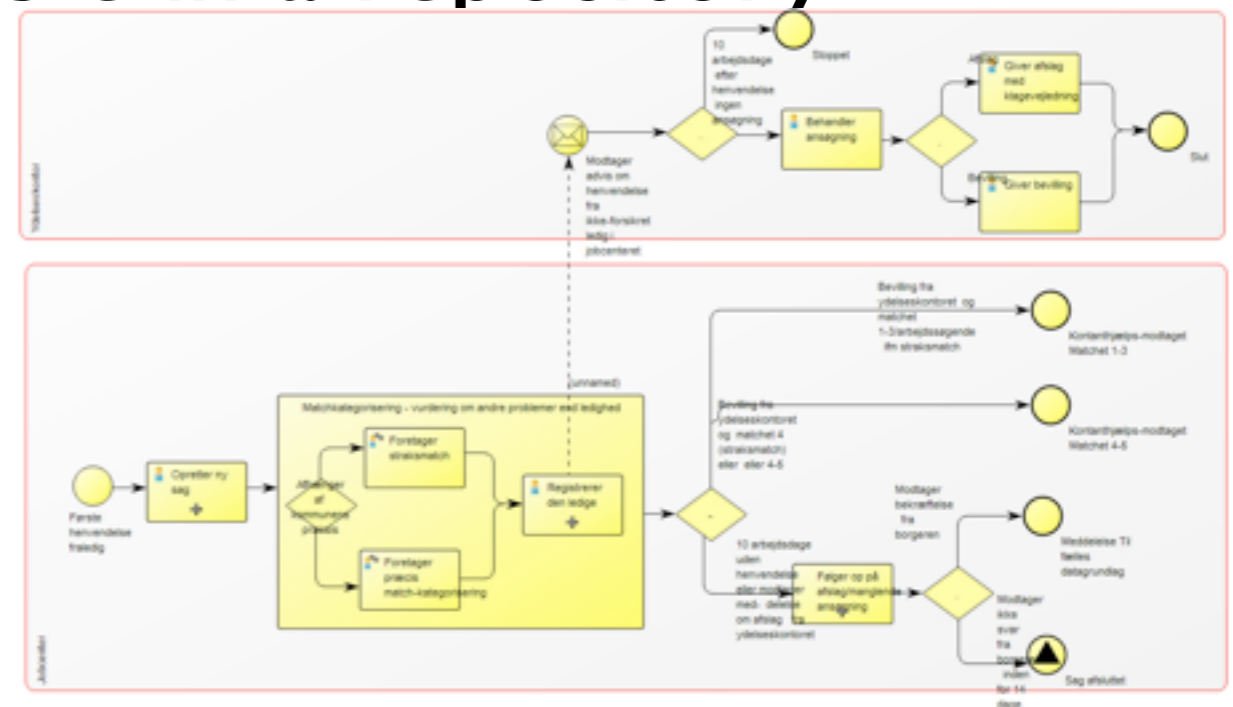
Process-Aware Information Systems:  
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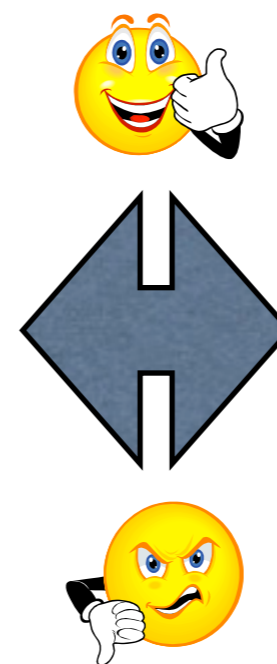
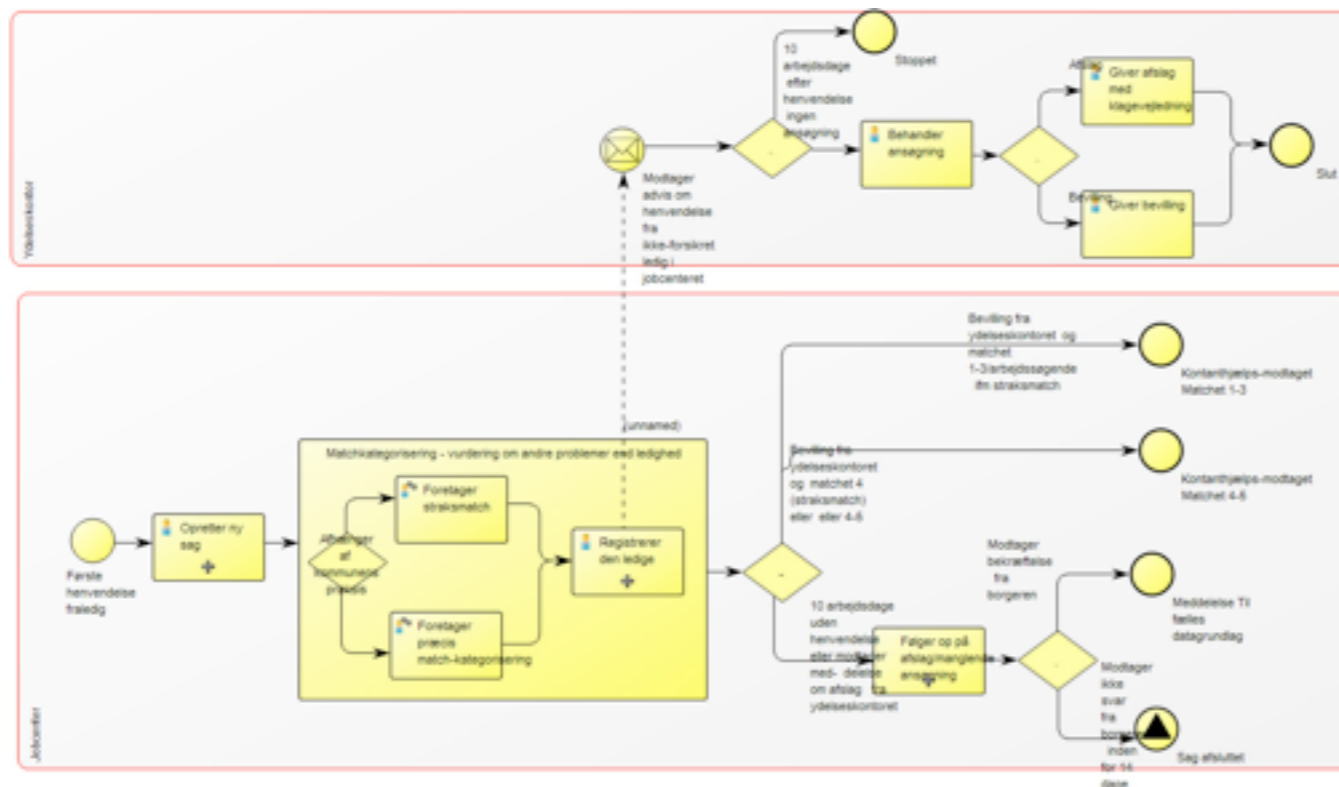


# Example from Denmark

- Arbejdsgangsbanken.dk (workflow bank) created by Local Government Denmark (KL)
- More than 800 best practice and legally correct workflows identified within municipalities described in BPMN and made available in a repository



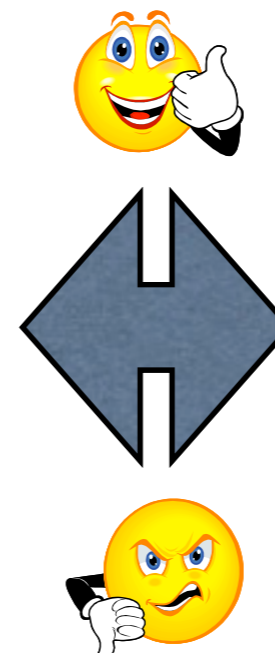
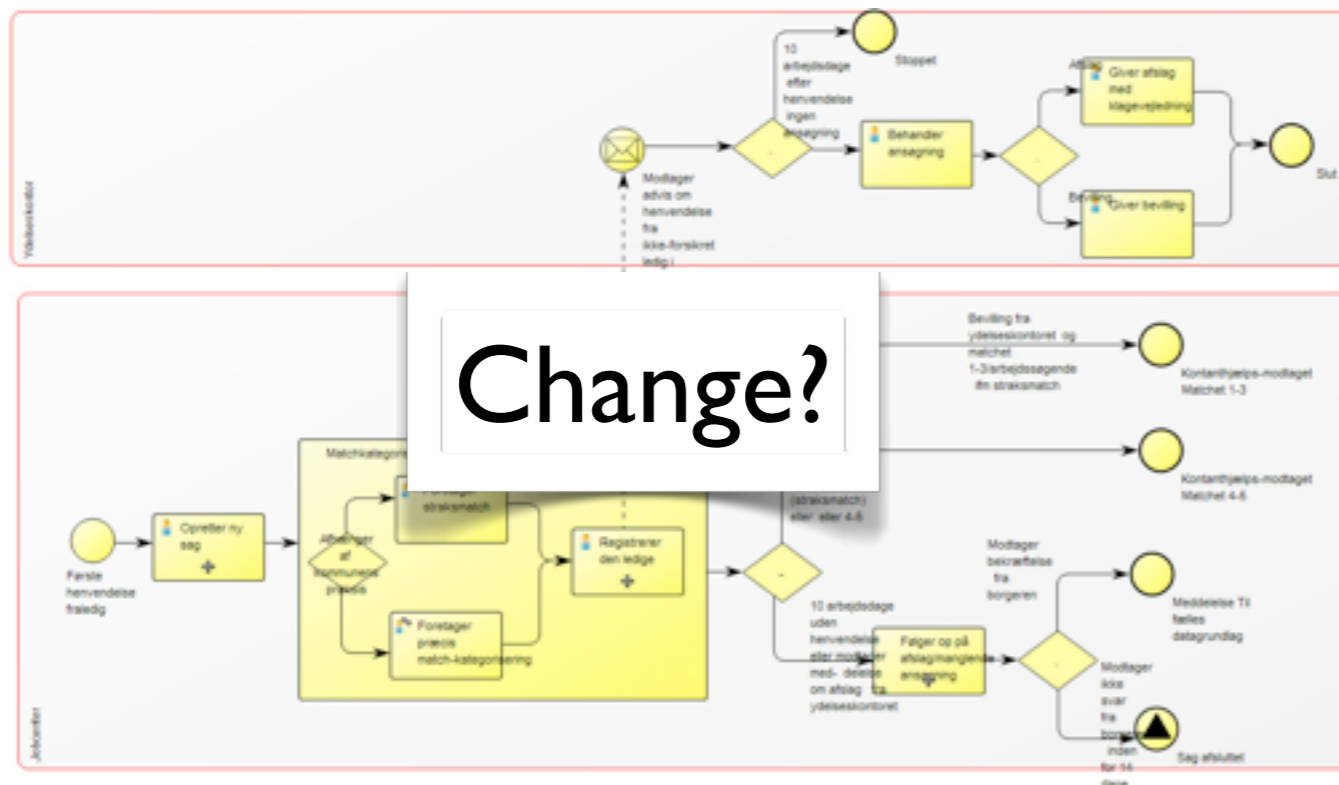
# Relating flows & law



requirements/law

Who can understand/model/certify the process?

# Process and law changes



- Lov om Aktiv beskæftigelsesindsats (LBK nr 1428 af 14/12/2009)

- Lov om Aktiv socialpolitik (LBK nr 946 af 01/10/2009)

- Lov om Arbejdsløshedsforsikring

Change?

- Lov om Sygedagpenge (LOV nr 563 af 09/06/2006)

- Retssikkerhedsloven (LBK nr 1054 af 07/09/2010)

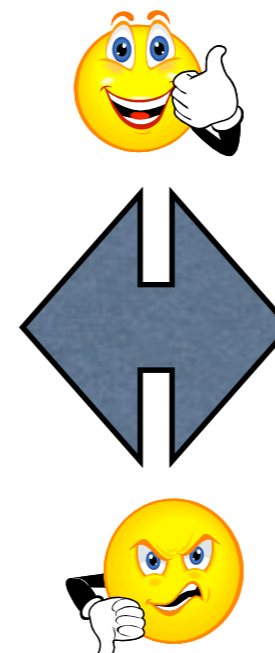
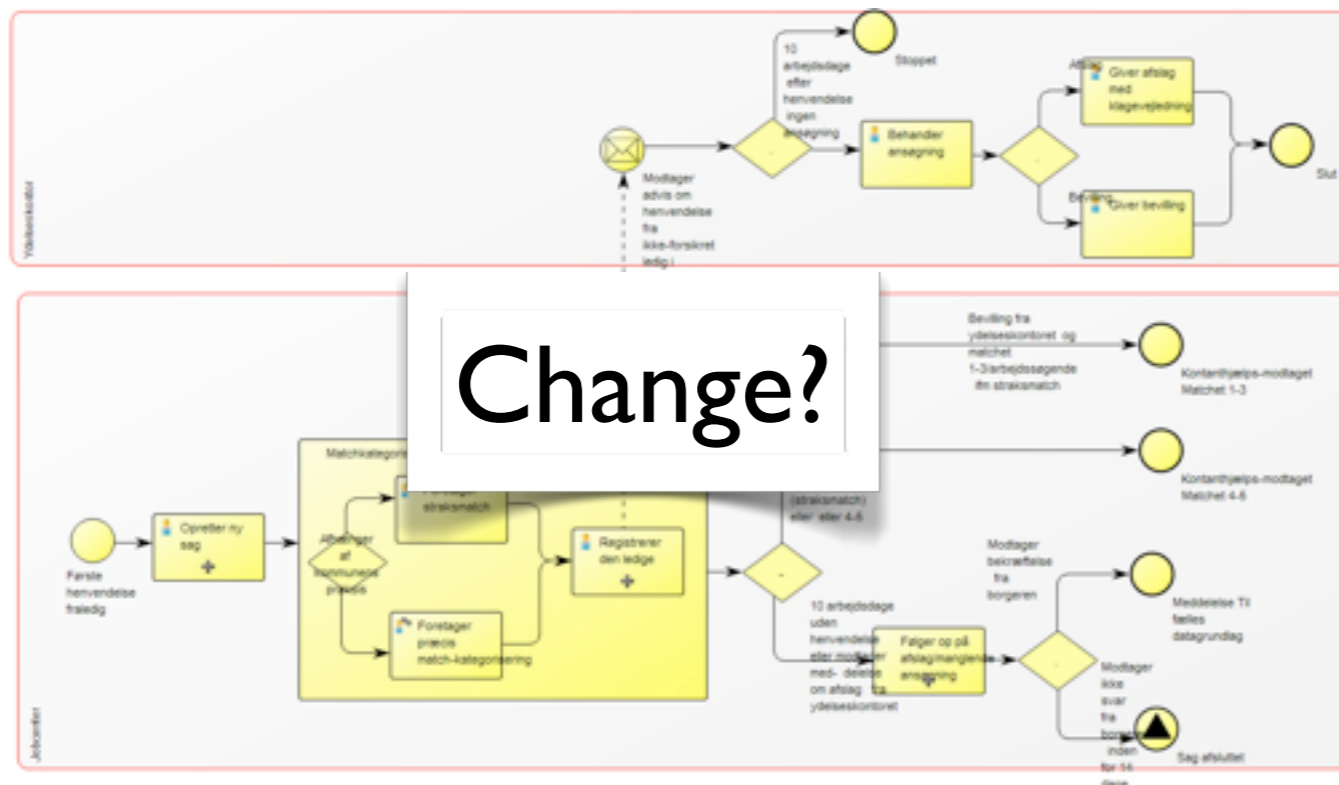
- Datagrundlag

## Nyligt opdaterede arbejdsgange!

Skrevet af Jacob Jeppesen d. 16/12-2011

KOMBIT og KL har i samarbejde udvalgt de arbejdsgange, inden for vores mest besøgte område – Uddannelse og Arbejde (FORM 10) – hvor det var nødvendigt at opdatere diagrammerne. Hovedsageligt grundet lovændringer på området, der har medført en nødvendig ændring i den kommunale arbejdsgang.

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# Exformatics

- Danish company founded in 2003
- Electronic Case- and Document handling
- Example customers

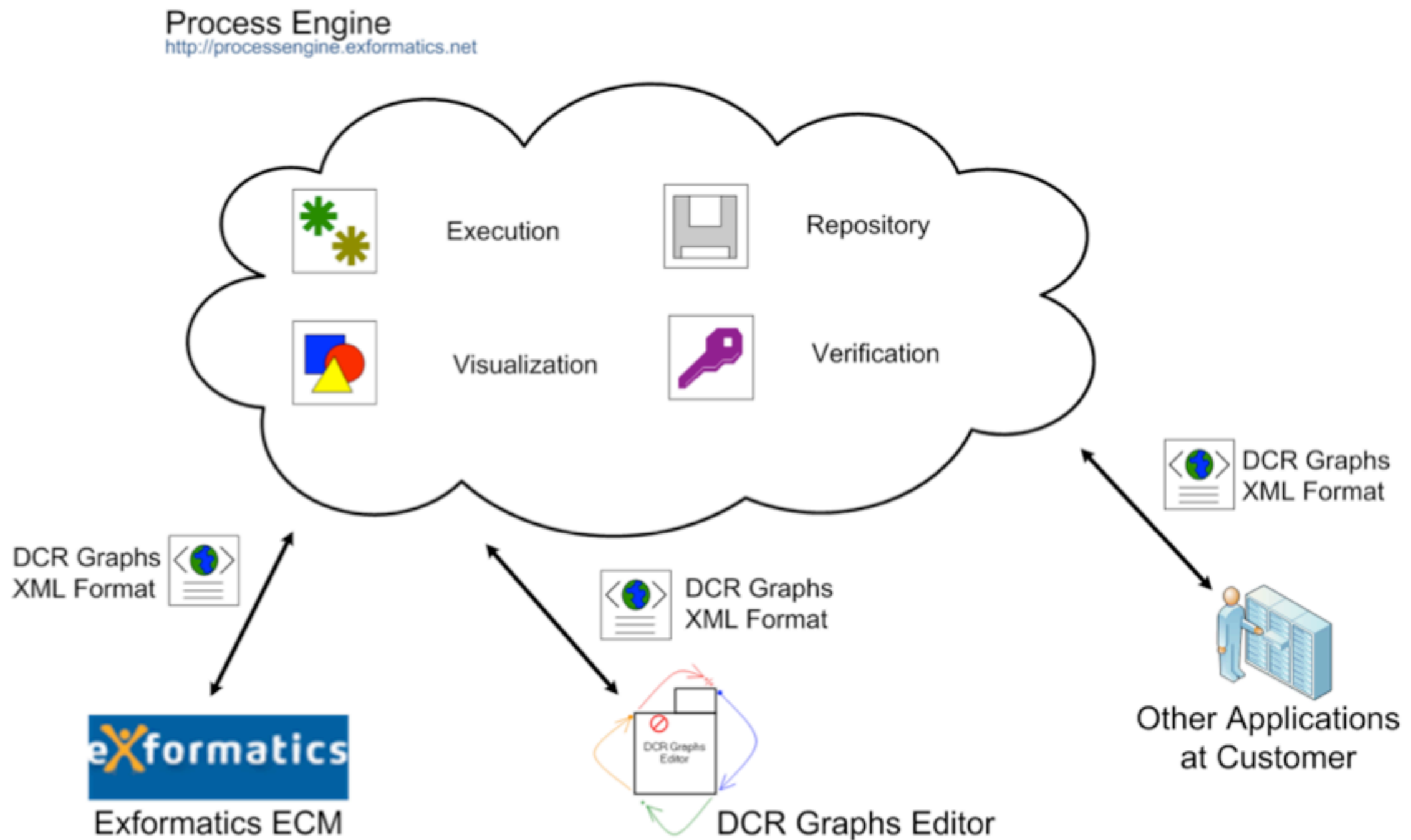


Intellectual property, legal



Sales and delivery processes

# Tools



# Case Management Client

Workflow: Test Workflow -

Loan request - Documentation - Decision - Completed

QuickSearch

Linked

Recent

**Loan for Mr Hildebrandt**

DCR - adaptive object modeling - september-october  
RD 2013 - SPIKE: javascript framework - AngularJS  
RD2012 - SPIKE: JQuery based DynamicForm - to repl  
VBA002 - VAKS - hjælp til VBA - september-oktober  
RD 2013 - Sprint 9 - stream, DCR, ECM 7.1 (minor b  
PHD001 - DCR - adaptive object modeling - june-aug  
RD 2013 - Stream: Referencing activities  
Bug sprint 9  
VBA001 - Scope afklaring - mulig videreførsel af p

Activity

**Loan for Mr Hildebrandt** 13-0608

Last modified 10-09-13 05:30 by **ts**

★ Bookmarked | [View activity stream](#)

Activity stream

▼ Filter stream

---

**@ts** Activities EXWFDCRSQCLCLRUnitTest updated by Morten Marquard

By Morten Marquard | 17 hours ago | [Like](#) | [Delete](#)

---

**@mmq** Task D - test updated by Tijs Slaats

By Tijs Slaats | 18 hours ago | [Like](#)

---

Task E completed by Tijs Slaats

By Tijs Slaats | 18 hours ago | [Like](#)

Document packages

Links

Classification

Choose a classification

Metadata

Folders Document basket (1)

Activities/13/13-0608

- Documents
- Emails
- Linked Documents
- Chronology

/Activities/13Docs/13-0608/

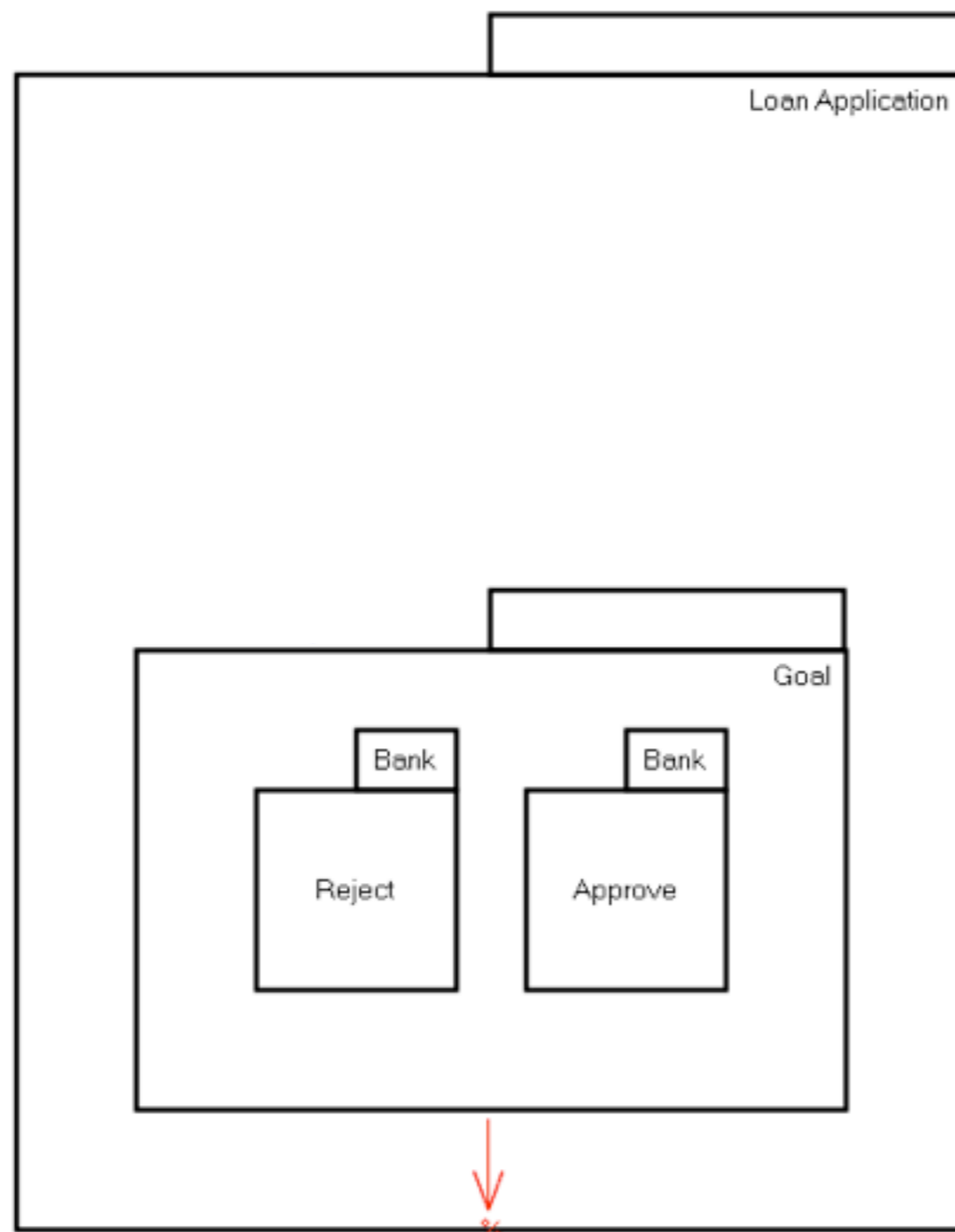
Folder is empty

Tasks

Receive paycheck	<b>ts</b>	06-09-13	
Approve	<b>ts</b>	06-09-13	
Loan request	<b>ts</b>	10-09-13	
Reject	<b>mmq</b>	16-09-13	

5 closed tasks. [Click to view](#)

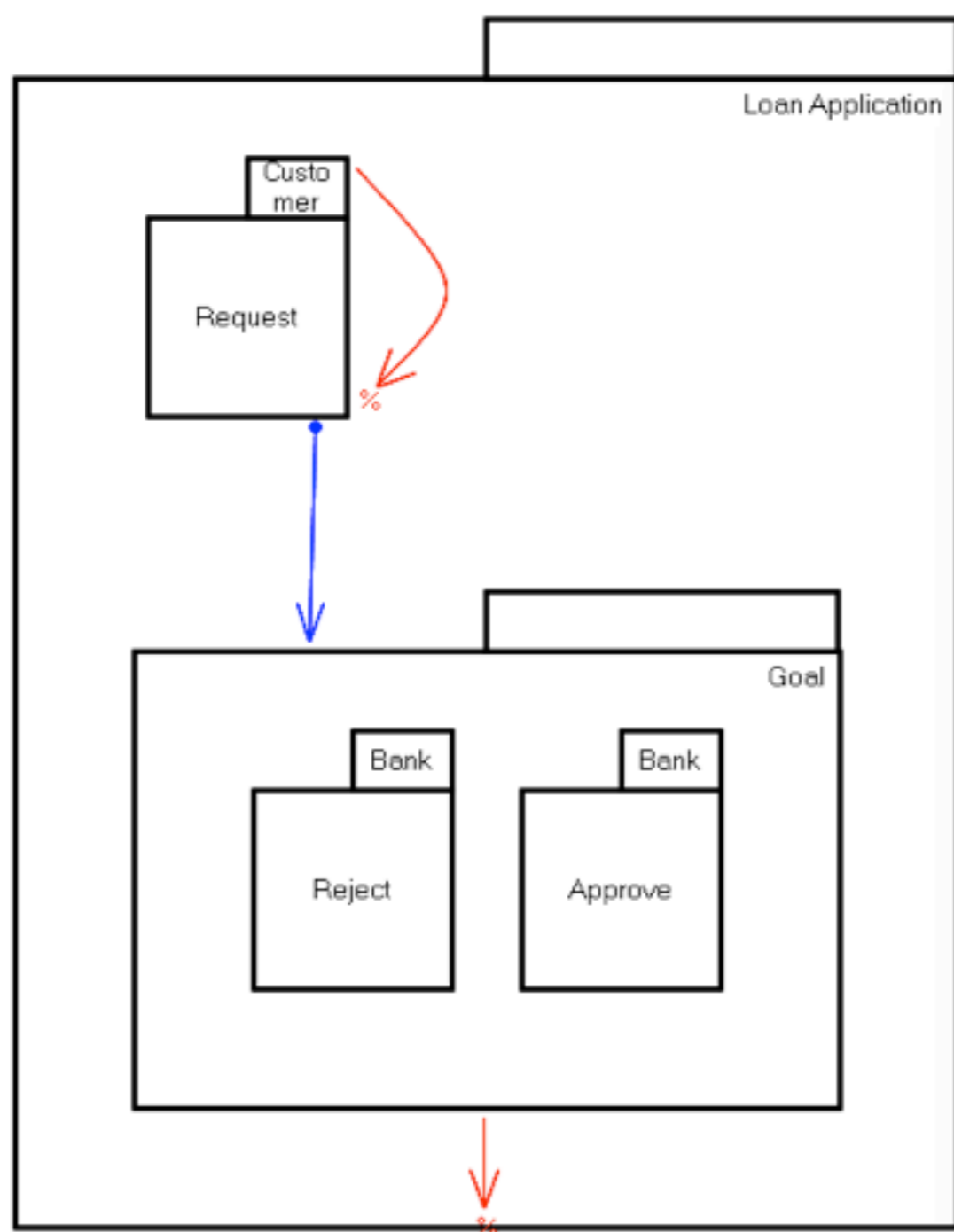
# Declarative Modelling



A process has a *goal*,

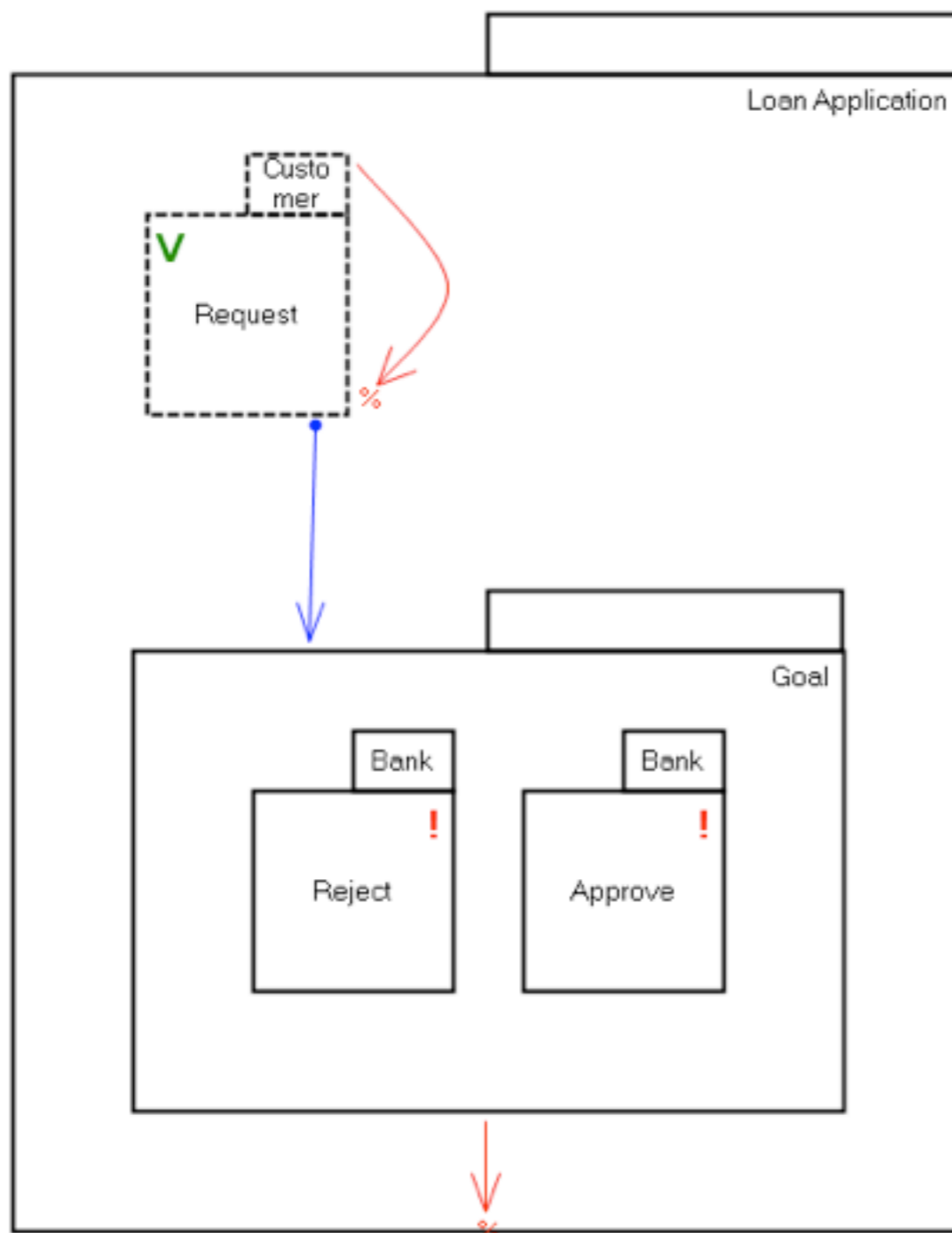


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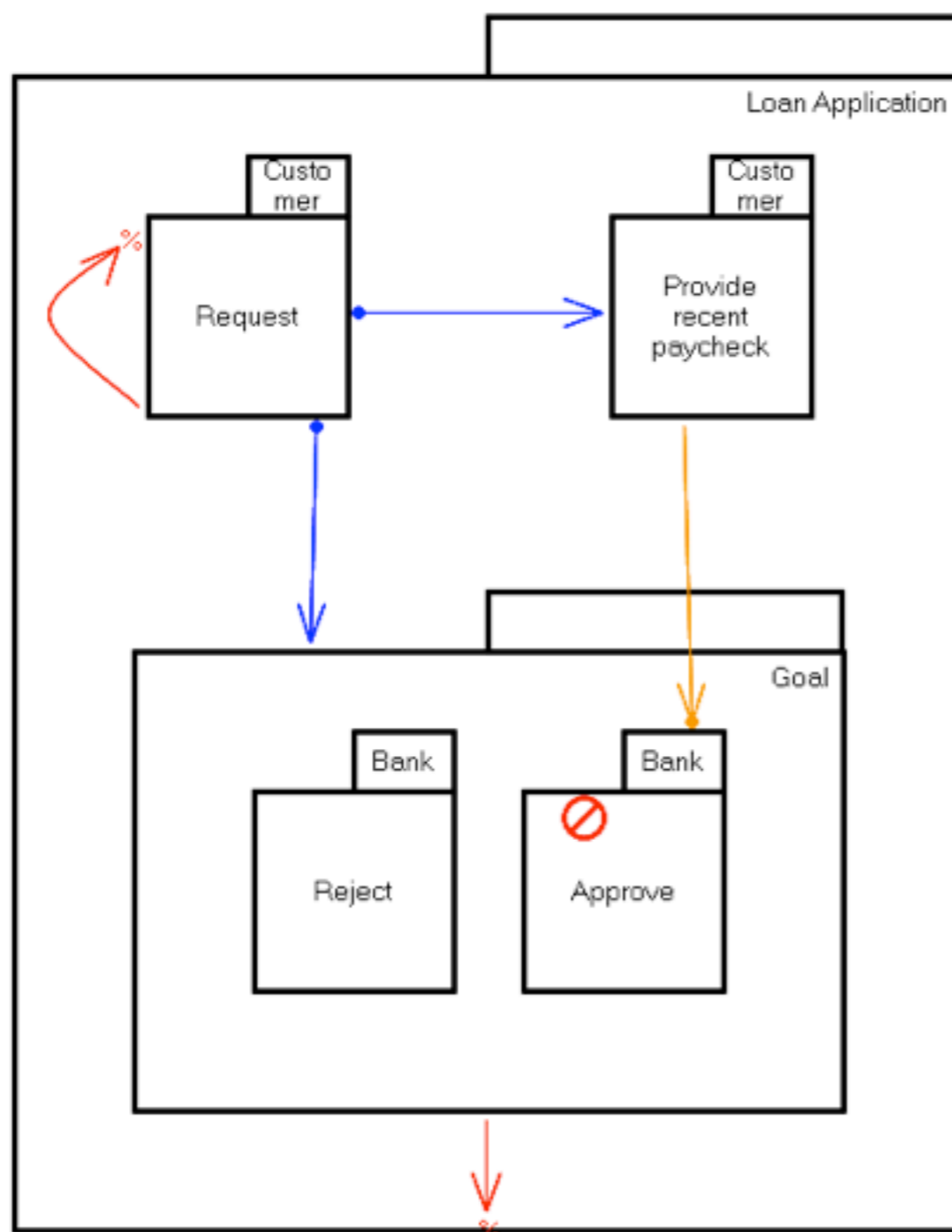
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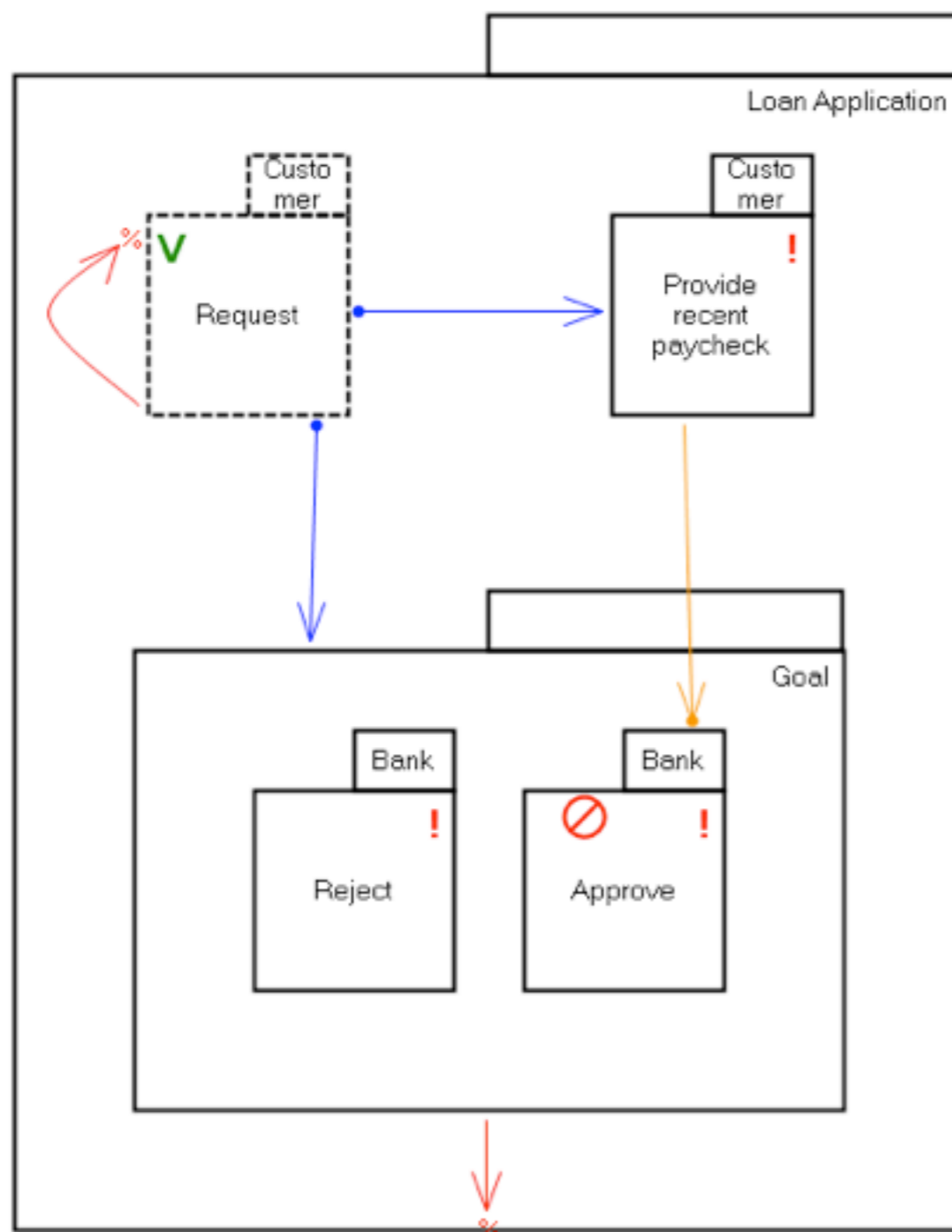
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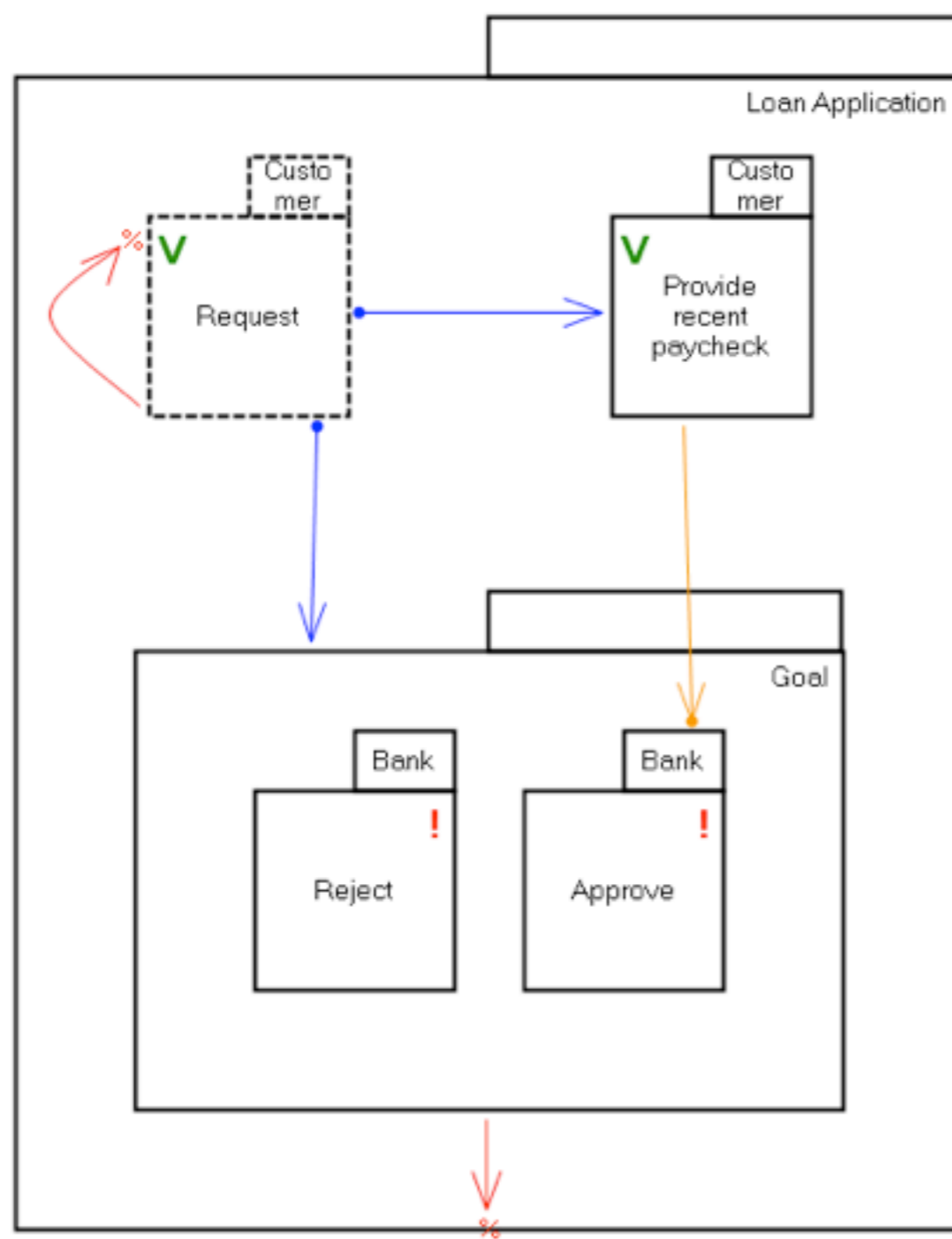
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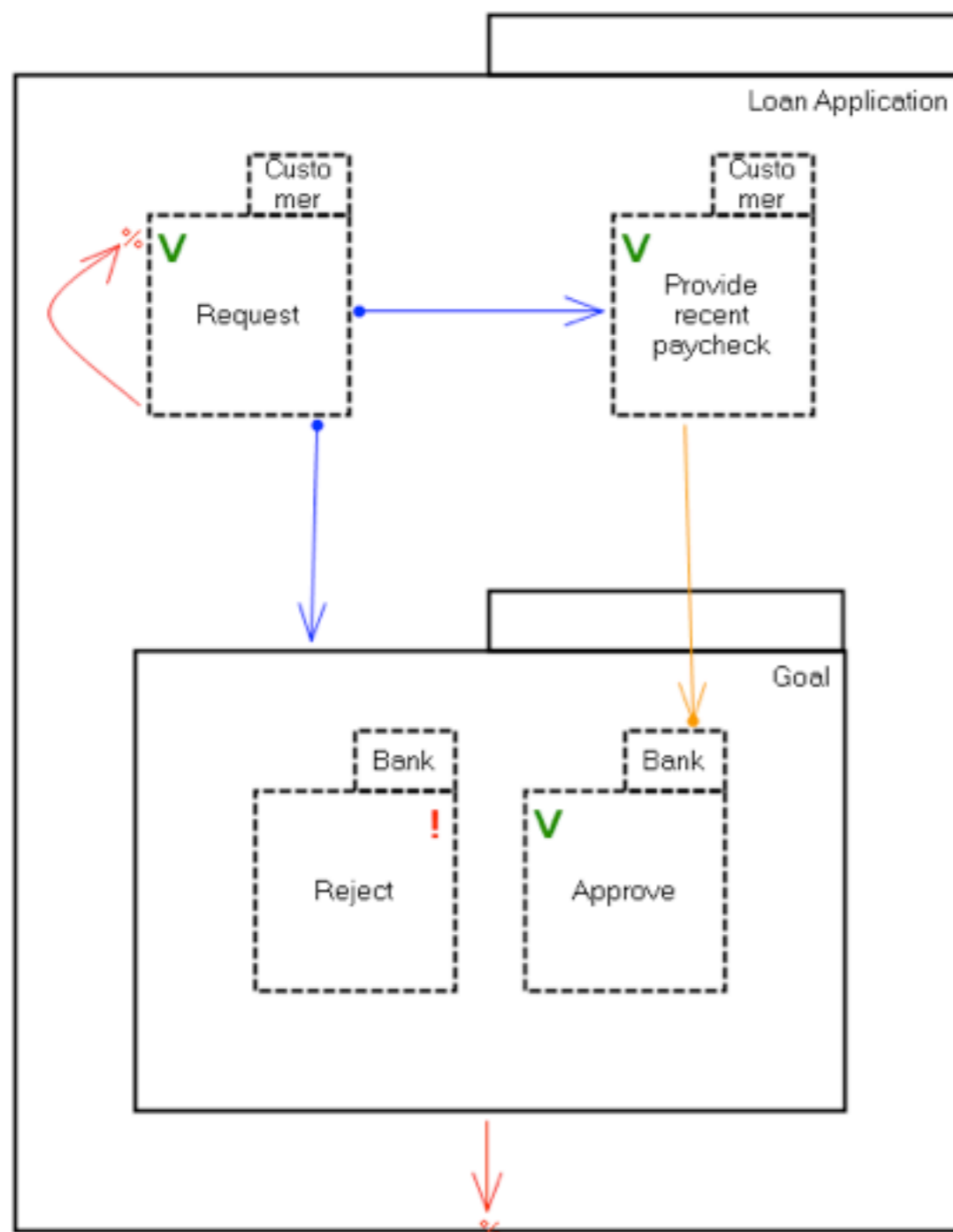
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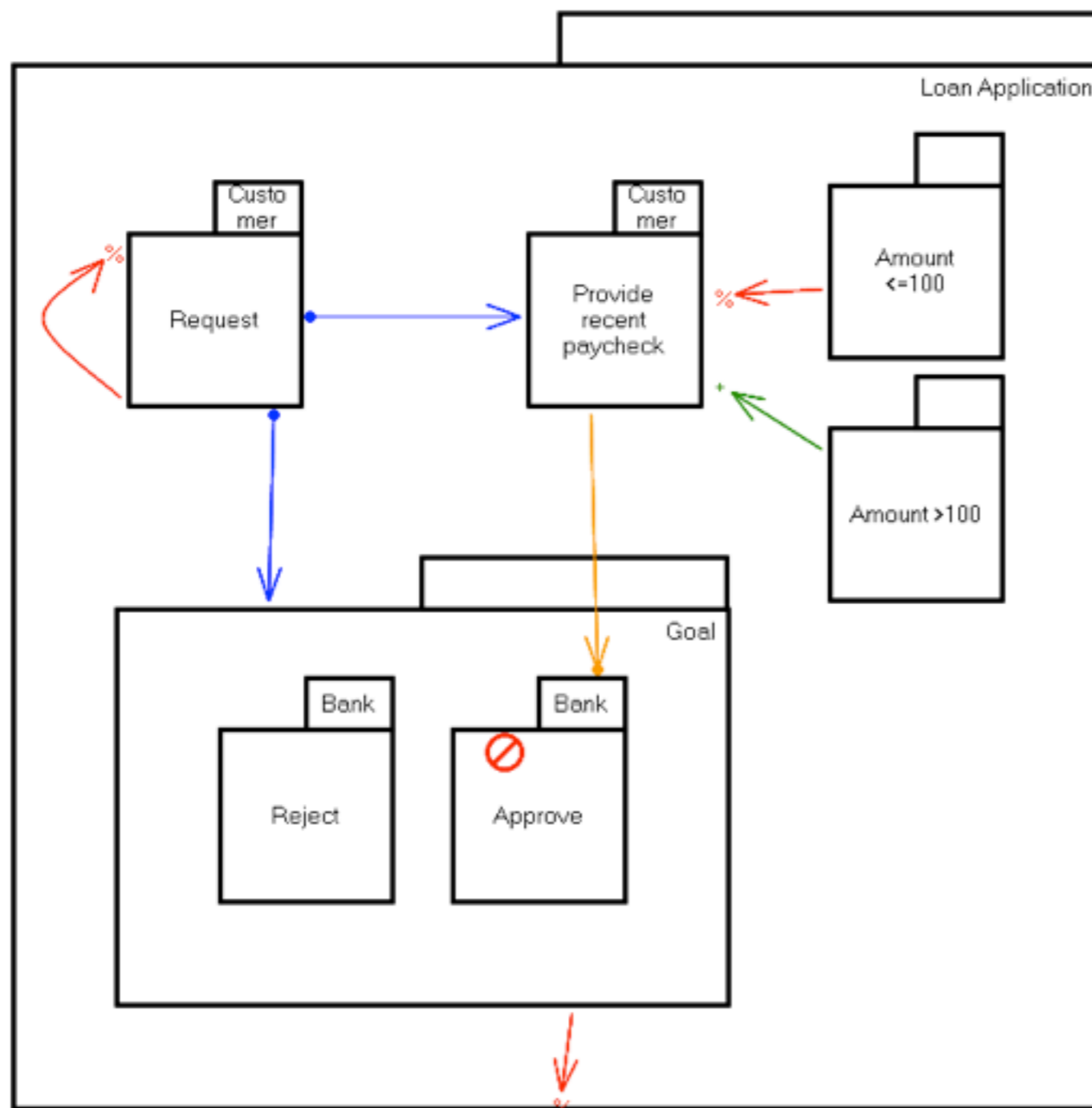


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# Context-dependency

[Foal 2013]

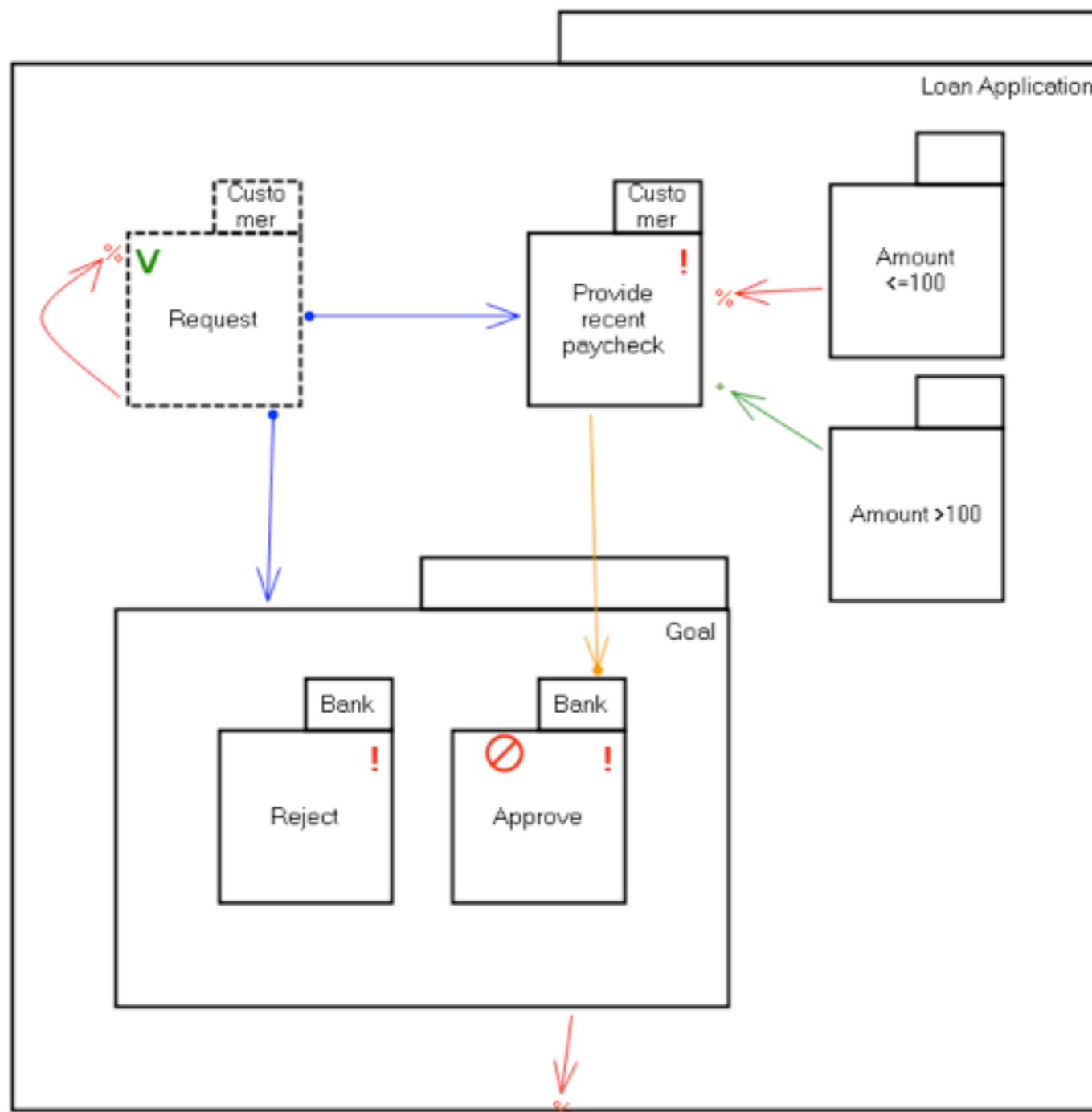
Some events may determine the relevance (inclusion/exclusion) of other events



# Context-dependency

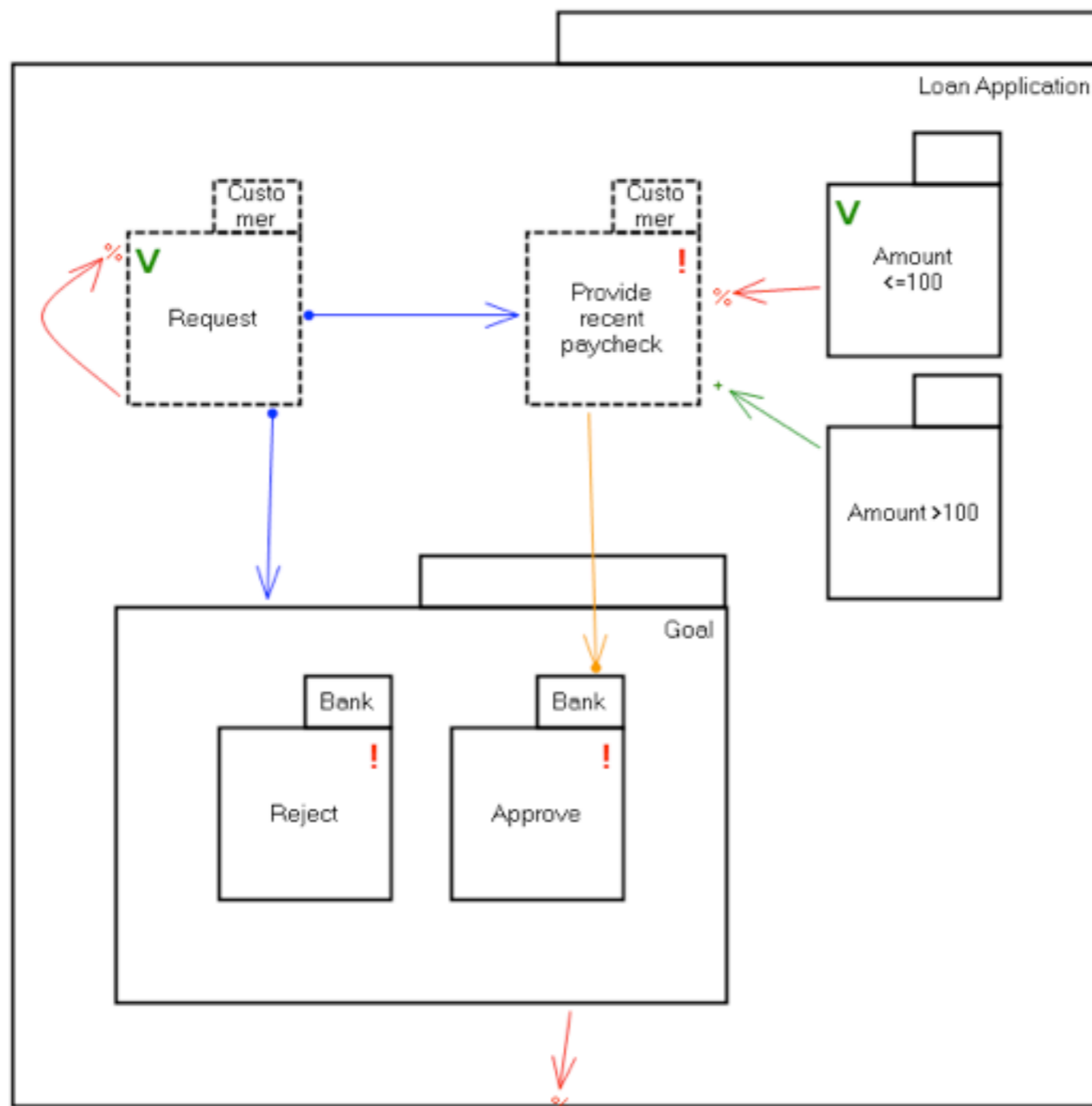
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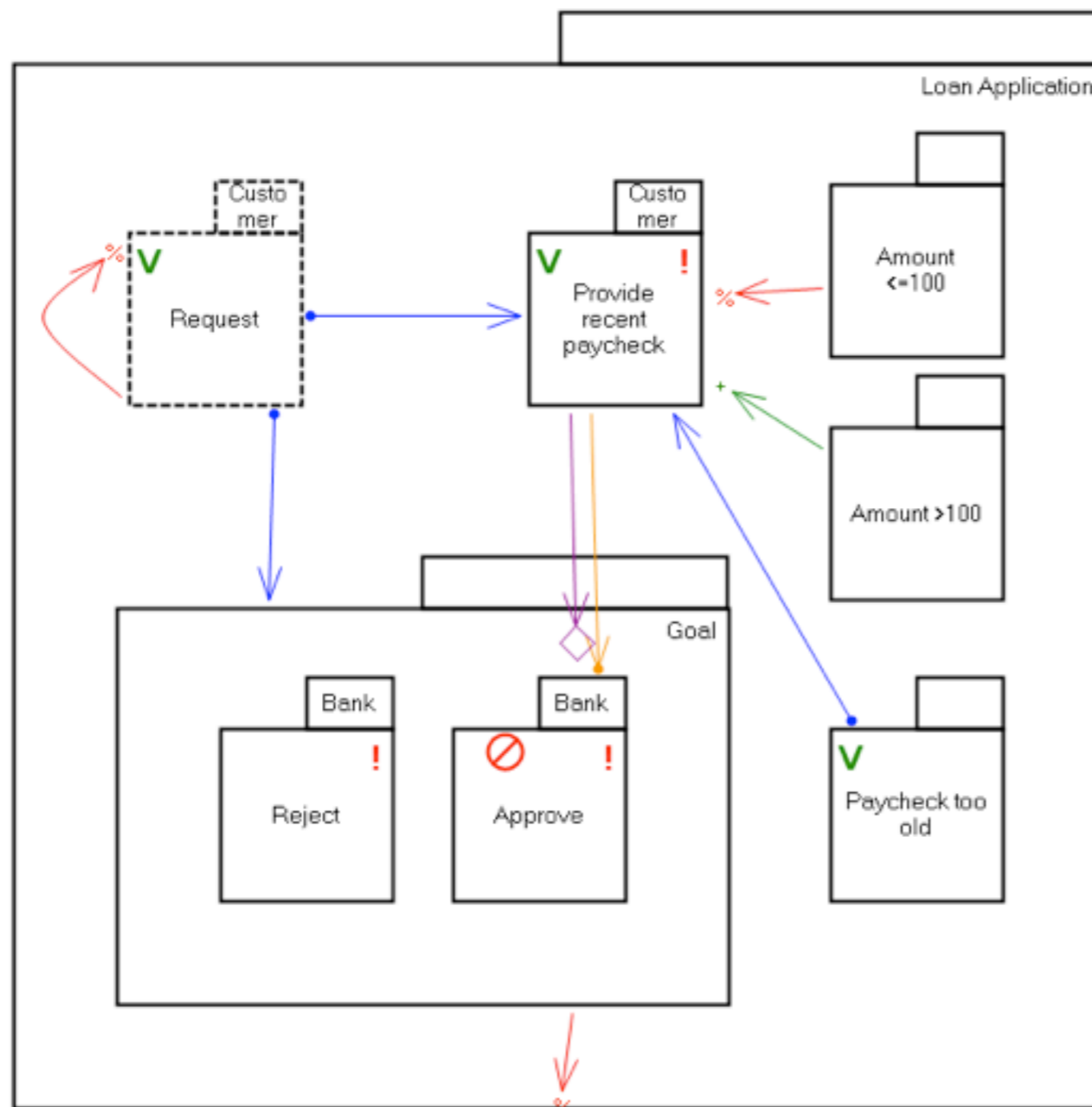


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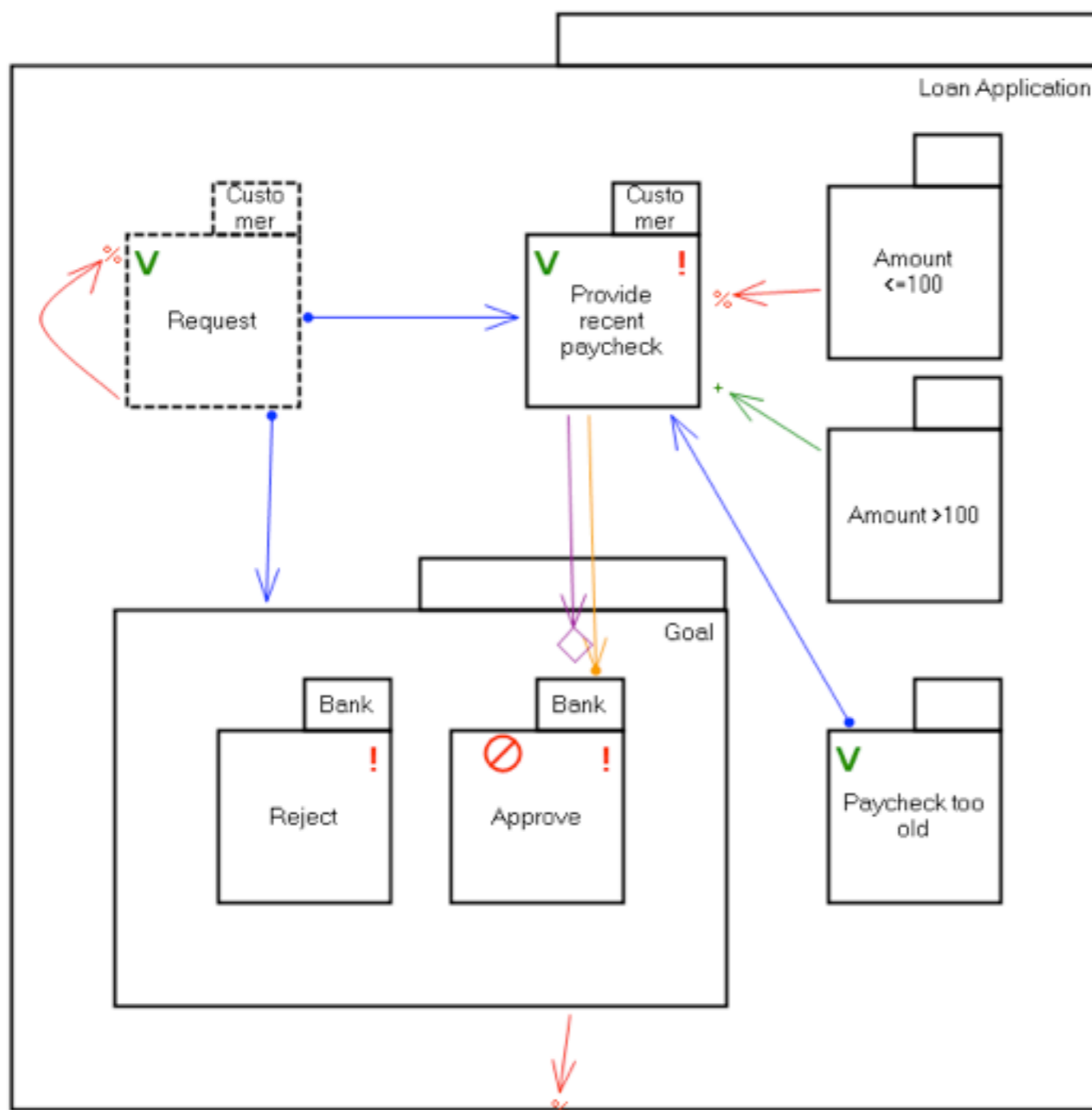
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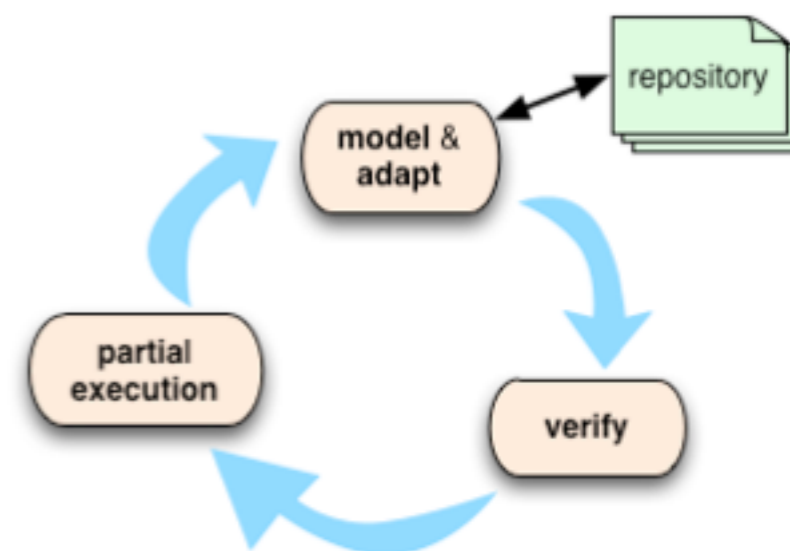
Declaring that “Provide recent paycheck” is a *milestone* for “Approve” means that approval is blocked if providing a recent paycheck is required as a response

# Trustworthy ACM

[EDOC 2013]

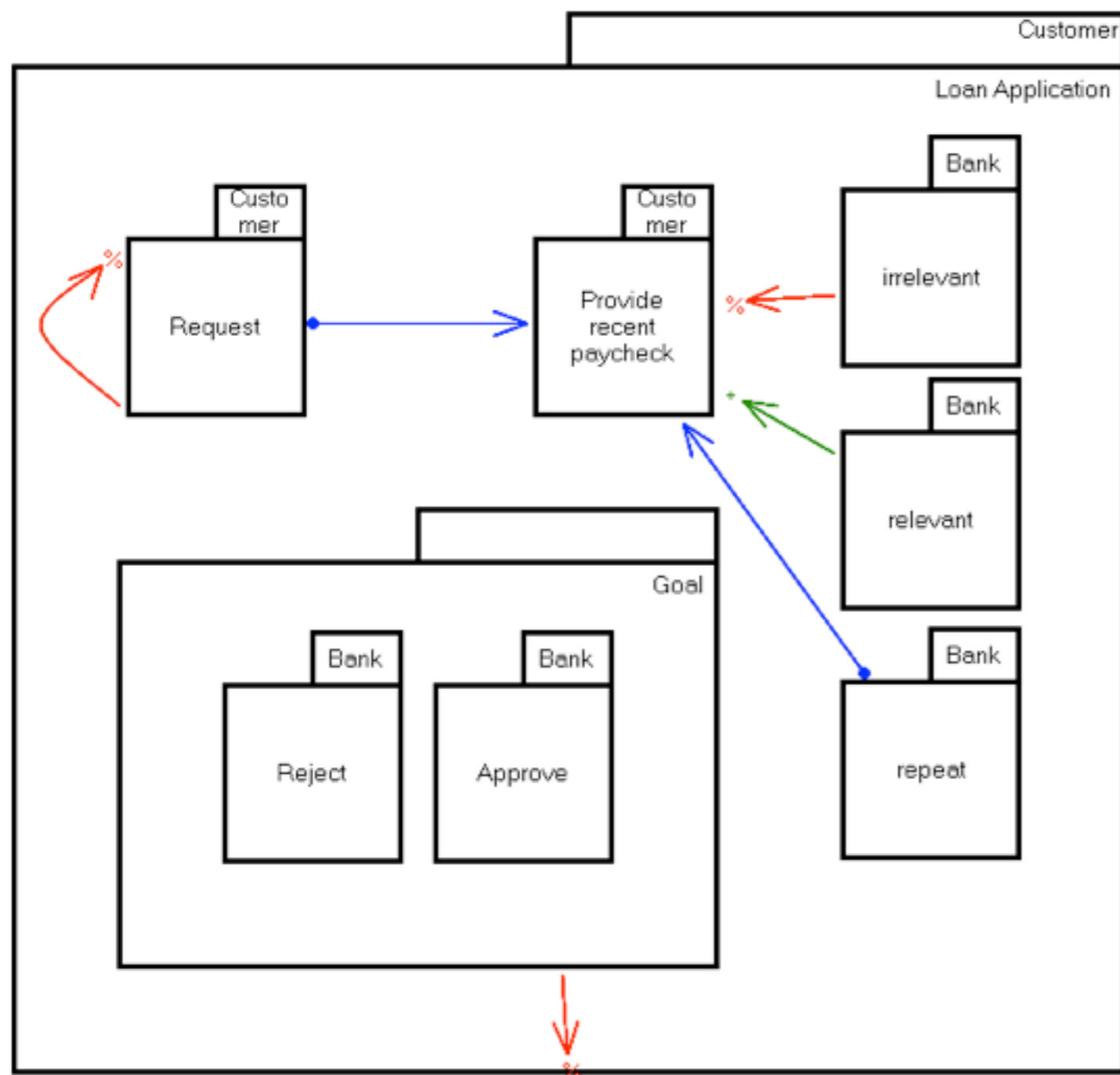


Intuitive runtime adaptation and model-checking



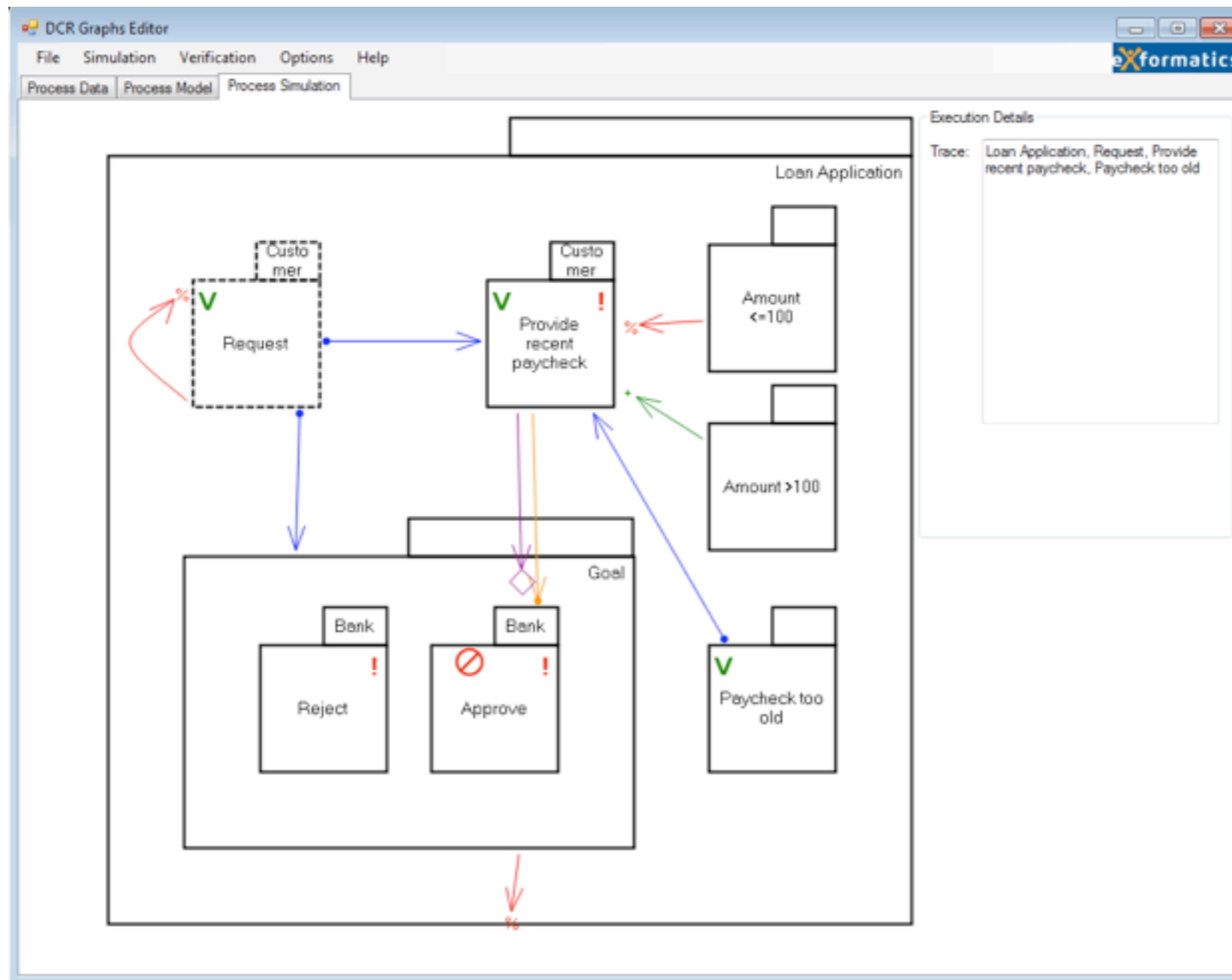
# Distribution

[SEFM 2012]

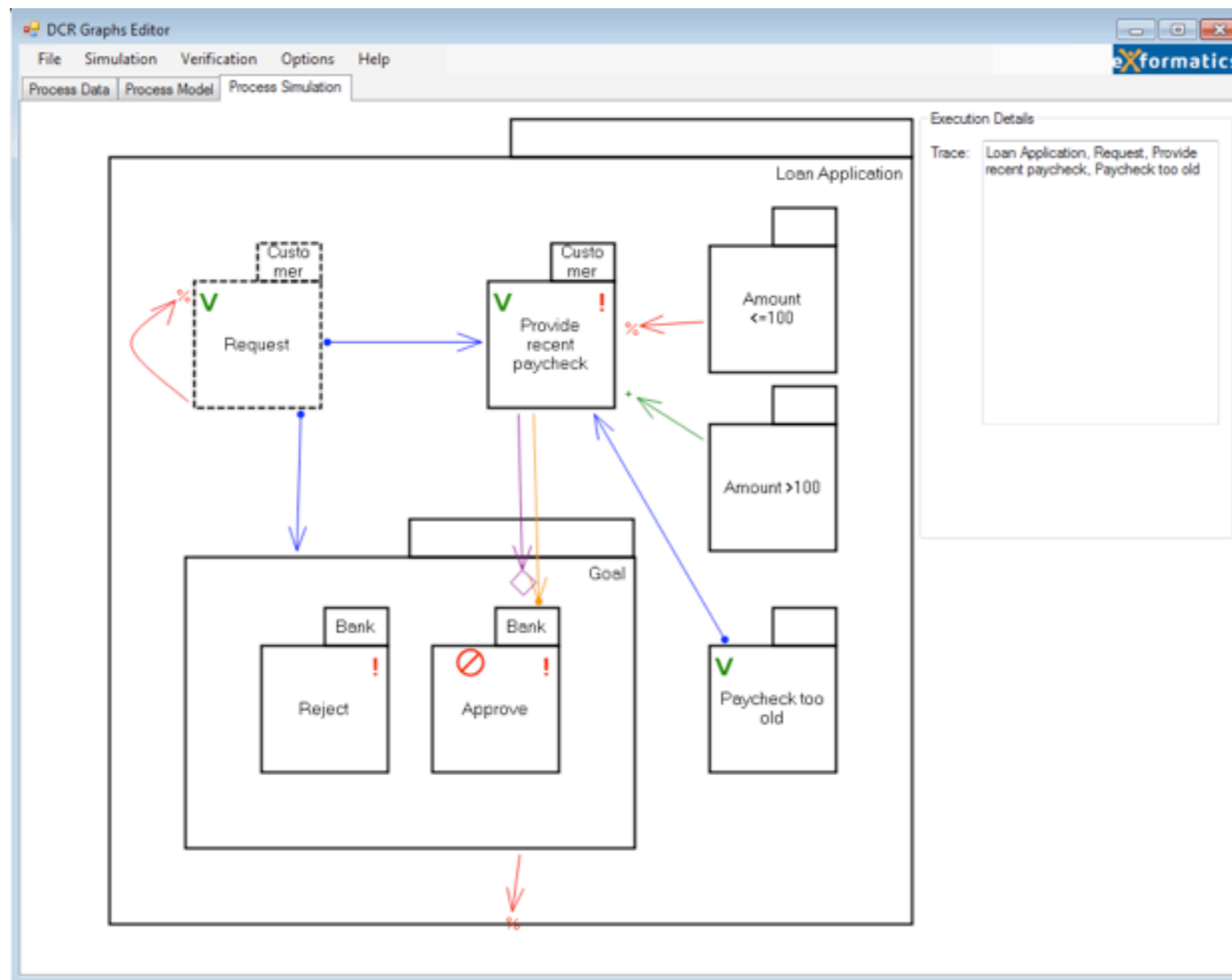


The customer process only needs (possibly anonymized events) and constraints that are relevant for the local execution state

# Tool Demonstration



# Tool Demonstration



[http://www.itu.dk/research/models/wiki/index.php/DCR\\_Graphs\\_Editor](http://www.itu.dk/research/models/wiki/index.php/DCR_Graphs_Editor)

# Related models

- Petri Nets: Transitions, places, tokens
  - *possible vs required tasks ?*
  - a token at a place can mean many things
  - adaptations are complex to support
- DECLARE: Graphical macros for LTL
  - complex semantics
  - run-time adaptation complex to support

# Related models

- BPMN ad-hoc sub processes
  - single role, no adaptation
- CMMN (based on Guard-Stage-Milestone)
  - promising declarative (beta) standard
  - data/artefact-centric
  - distribution (BPM 2013)
  - complex semantics



# Tests

- Modelling used internally in Exformatics
- The graphical notation, editor & simulator has been used successfully to teach (non-technical) students at ITU how to capture process requirements declaratively
- Only limited tests of the graphical notation so far on customers

# Future work

- More real challenges, cases & field observations
- Expected extensions to DCR Graphs:
  - pattern-based modelling
  - extended support for time, artifacts,
  - monitoring, “suggested routes”
  - analysis, process mining, uncertainty
  - generation of (session-typed) end-point code