ulm university universität ulm

Process and Data: Two Sides of the Same Coin?

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Databases and Information Systems Institute

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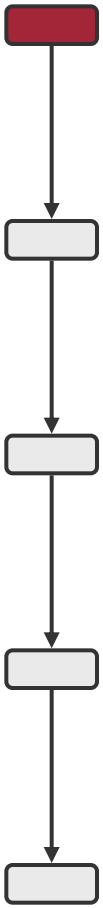
DBIS EXPERIENCE
processes for a flexible world

Agenda



Backgrounds

Data as Driver of Large Processes

Object-Aware Processes

The PHILharmonicFlows Framework

Summary

Process-Aware Information System (PAIS)

Registration

HIS

patient information

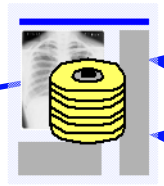
Orders Placed

examination orders

Orders Filled

RIS

report

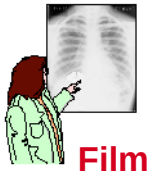


Report Repository

report

report

Diagnostic Workstation



Film Lightbox

PACS

images retrieved

Image Manager & Archive

Film Folder

procedure scheduled

Prefetch any relevant prior studies

modality worklist

Acquisition Modality

images stored

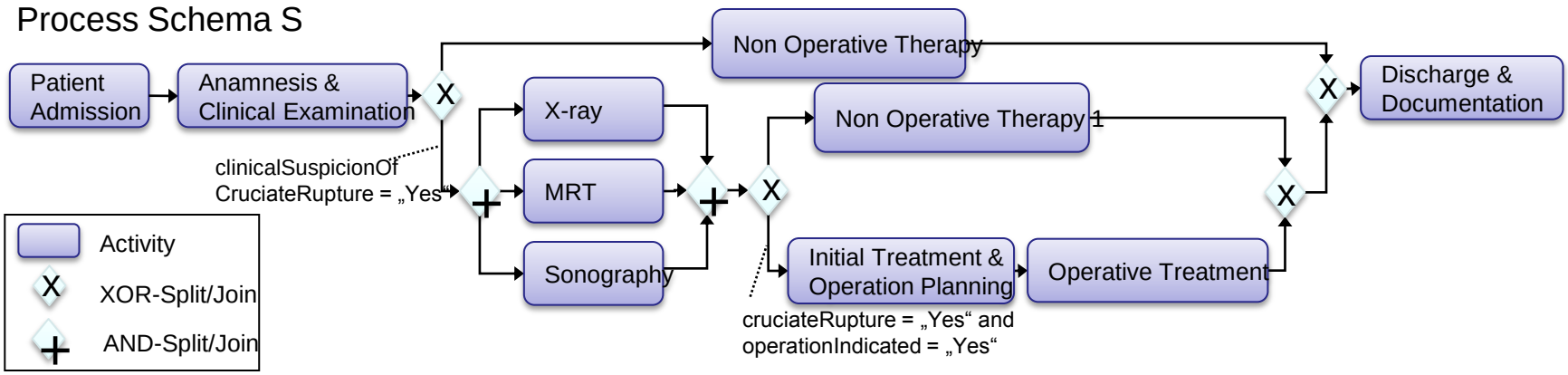
acquisition completed

Film

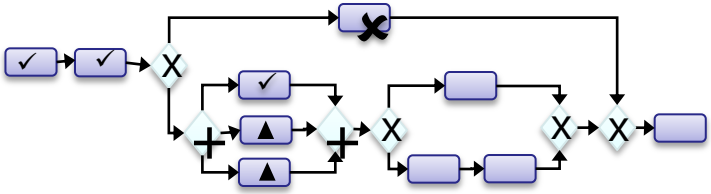
acquisition completed

images printed

Process-Aware Information System (PAIS)

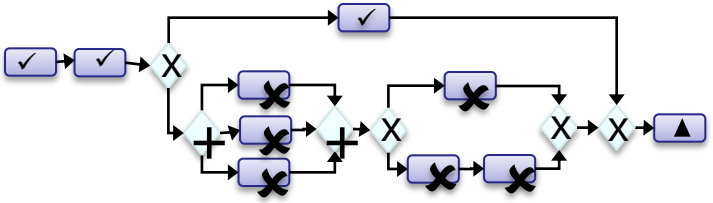


Process Instance I1



Execution Trace:
σ_1 = < „Patient Admission“, „Anamnesis & Clinical Examination“, „X-ray“>

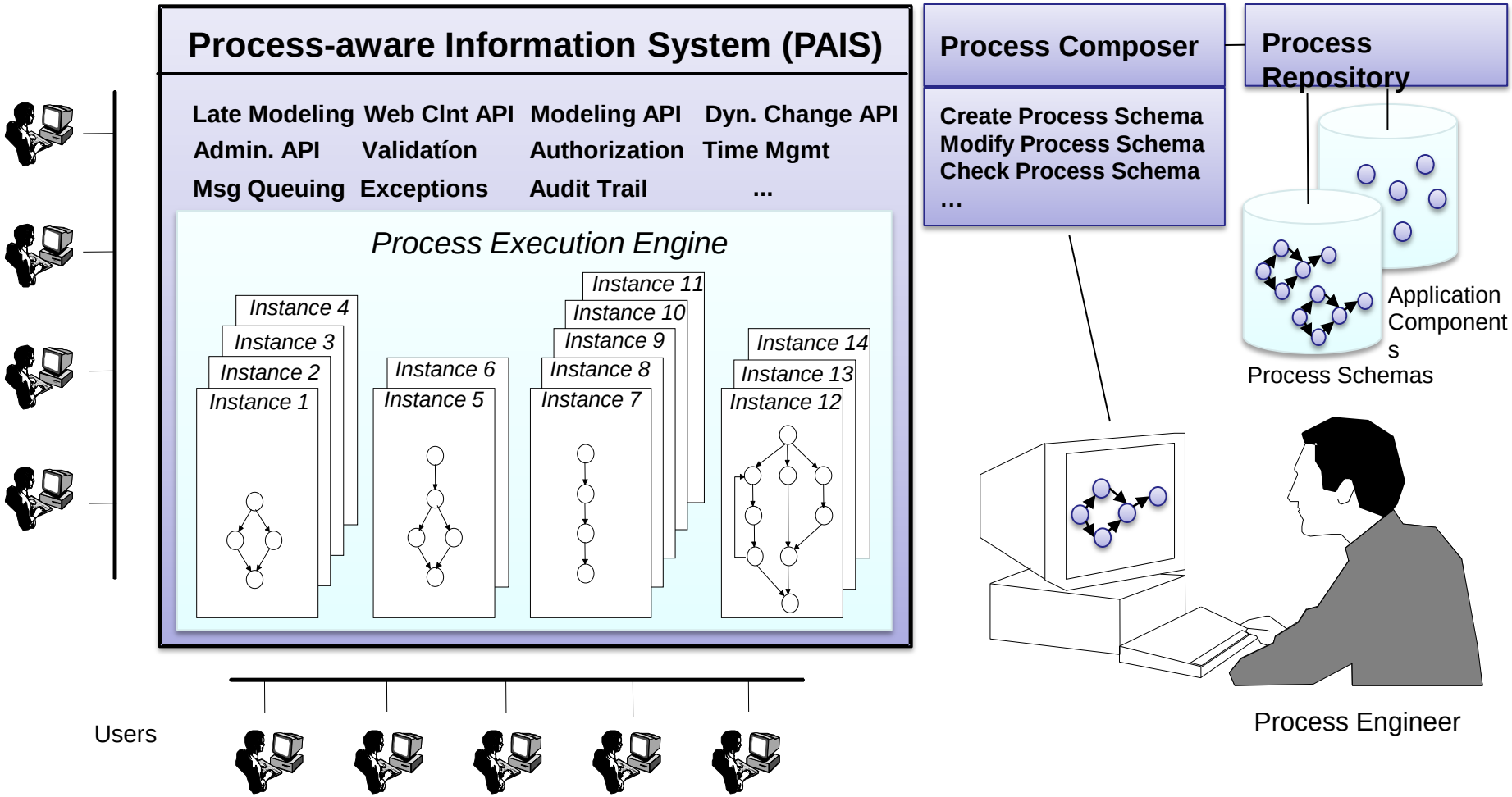
Process Instance I2



Execution Trace:
σ_2 = < „Patient Admission“, „Anamnesis & Clinical Examination“, „Non Operative Therapy“>

Activity States: ▲ Activated ✓ Completed ✘ Skipped

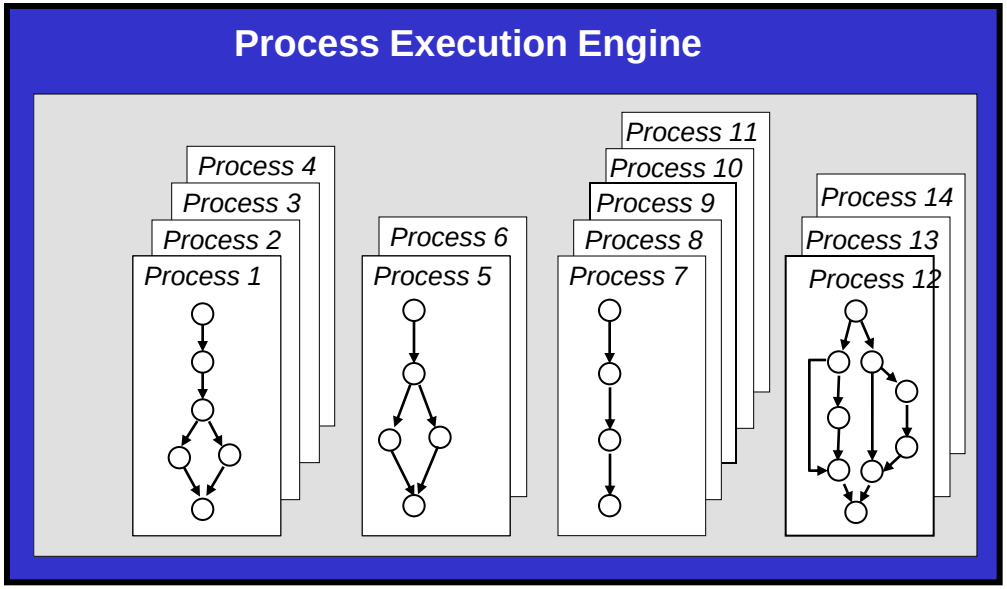
Process-Aware Information System (PAIS)



Enabling Flexibility in PAIS

ADEPT

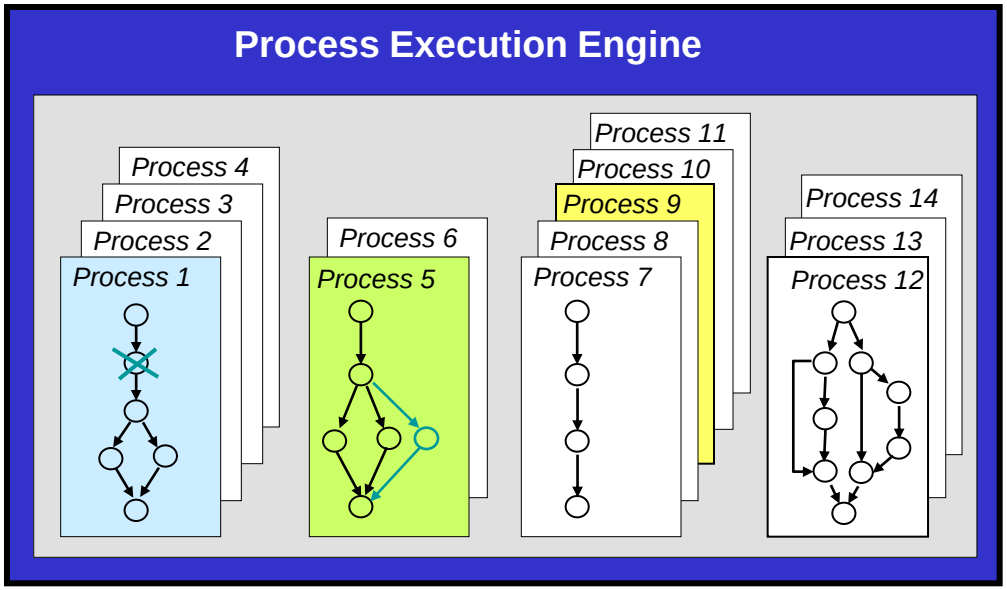
Individually adaptable Process Instances



Enabling Flexibility in PAIS

ADEPT

Individually adaptable Process Instances

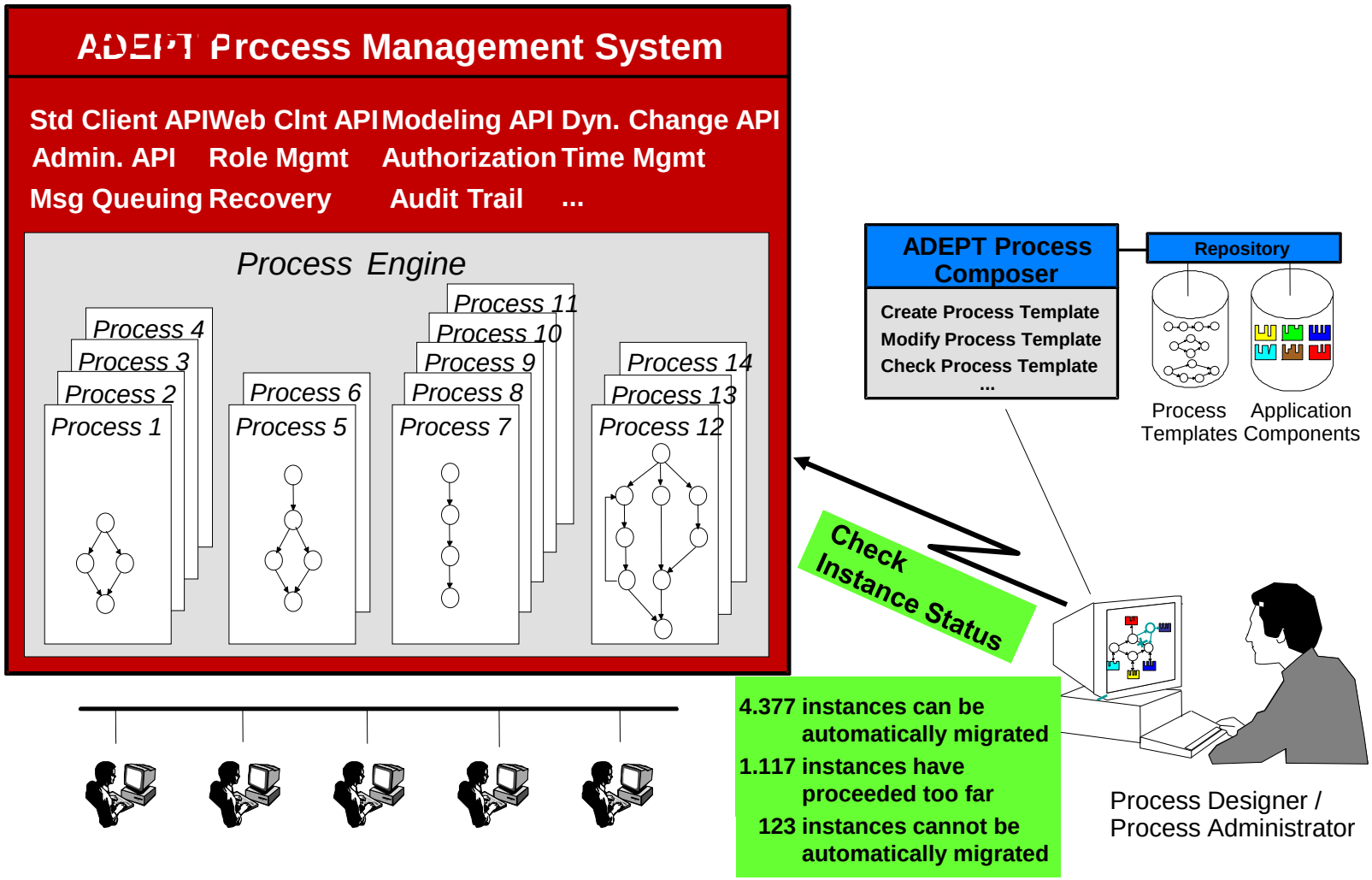


Achievements:

- **Formal and expressive process meta model**
- **Formal Criteria for Change Correctness**
- **Efficient, build-in consistency checks** („no bad surprise")
- **Support of a high number of change patterns**
- **API for accomplishing ad-hoc changes**

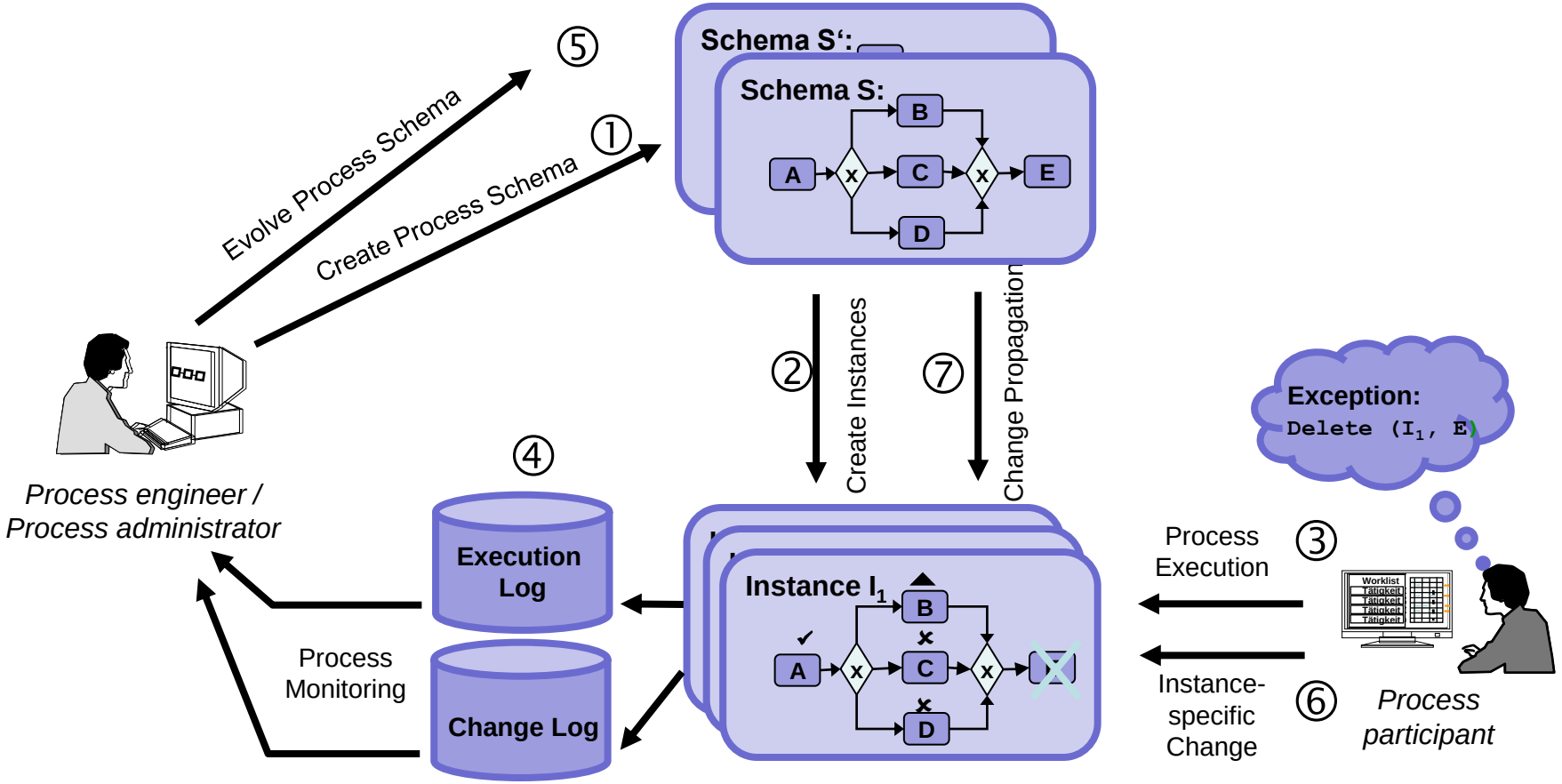
Enabling Flexibility in PAIS

Process Schema Evolution in ADEPT



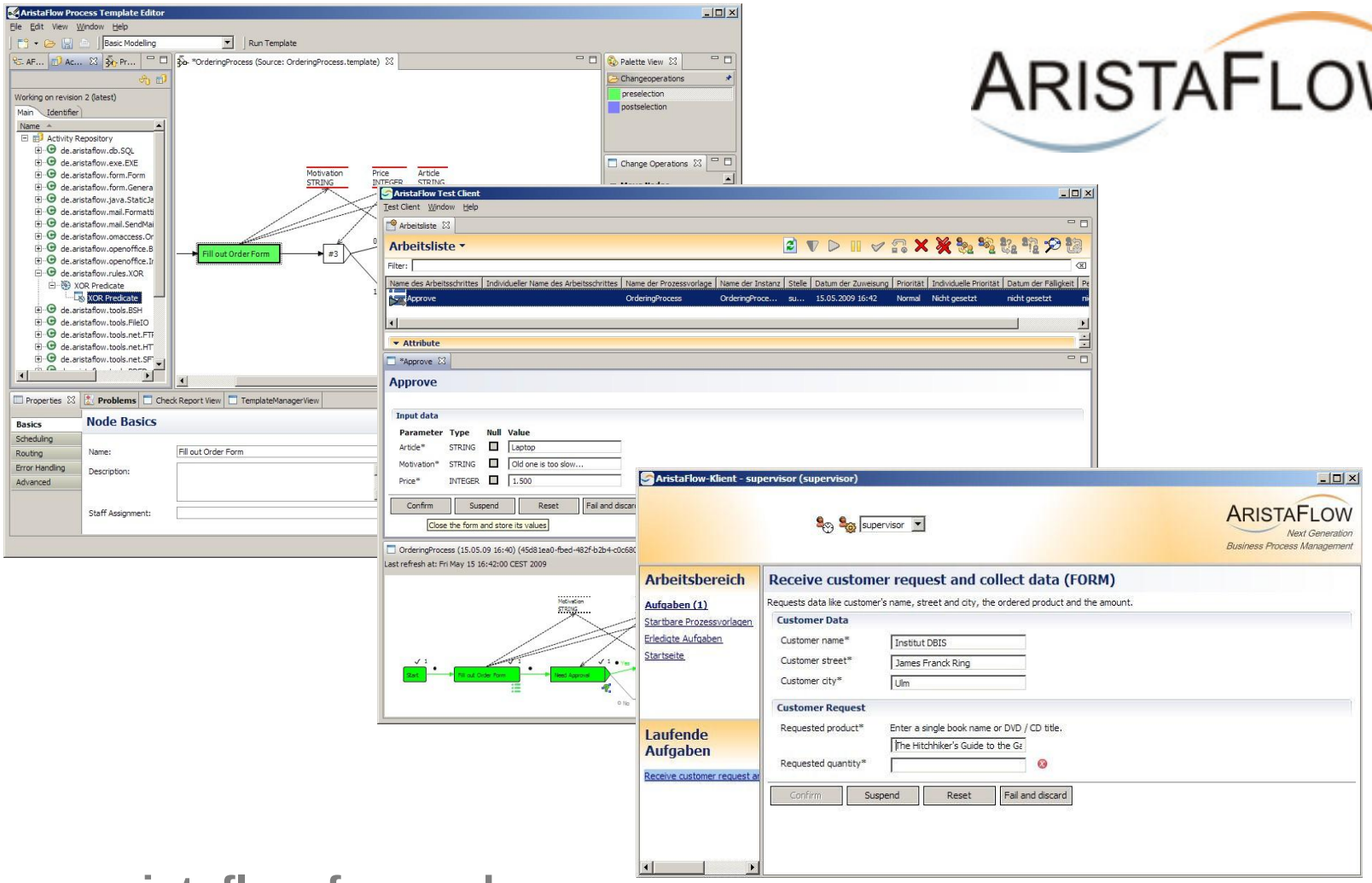
Enabling Flexibility in PAIS

The Extended Process Lifecycle



Enabling Flexibility in PAIS

Transferring ADEPT to Industrial Practice



ARISTAFLOW

www.aristaflow-forum.de

Reichert · Weber

Enabling Flexibility in Process-Aware Information Systems

Manfred Reichert
Barbara Weber

Enabling Flexibility in Process-Aware Information Systems

Challenges, Methods, Technologies

Springer

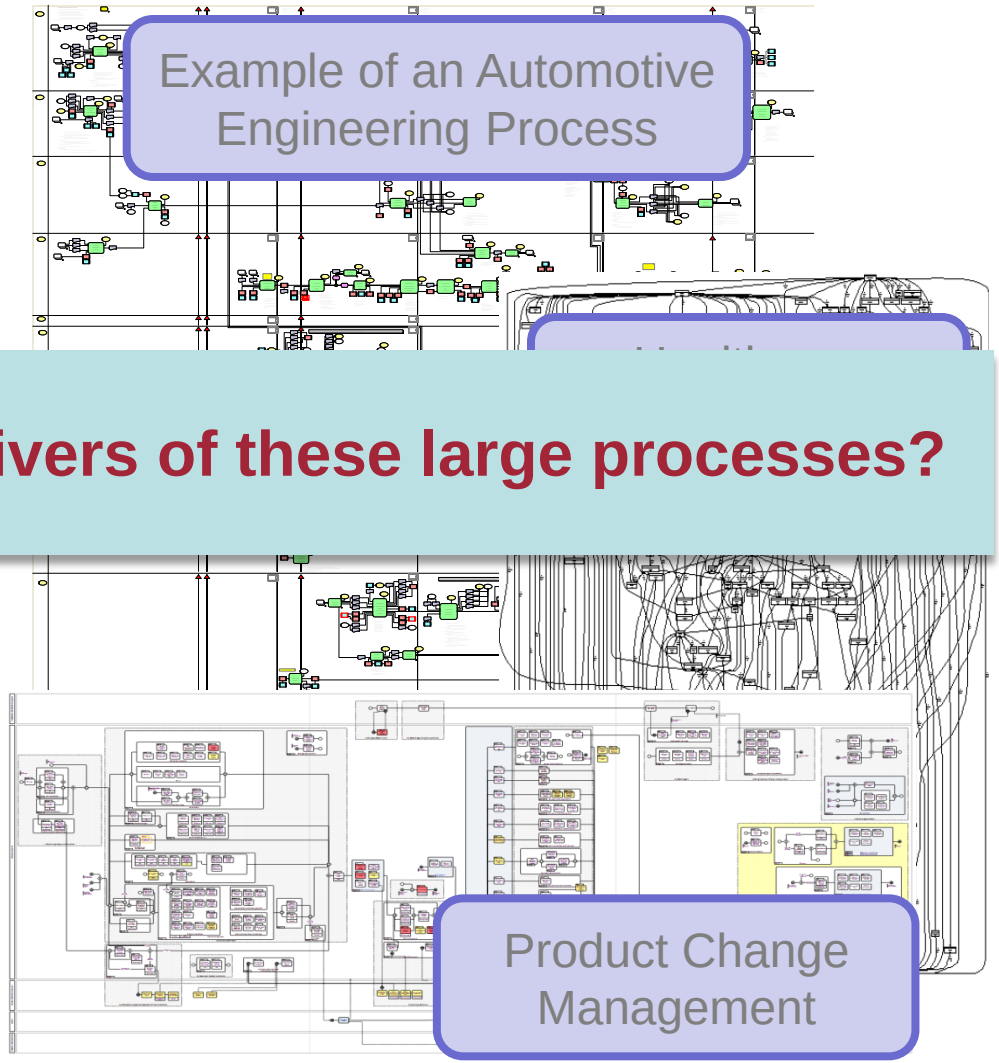
Agenda

- Backgrounds
- Data as Driver of Large Processes
- Object-Aware Processes
- The PHILharmonicFlows Framework
- Summary

Large Processes

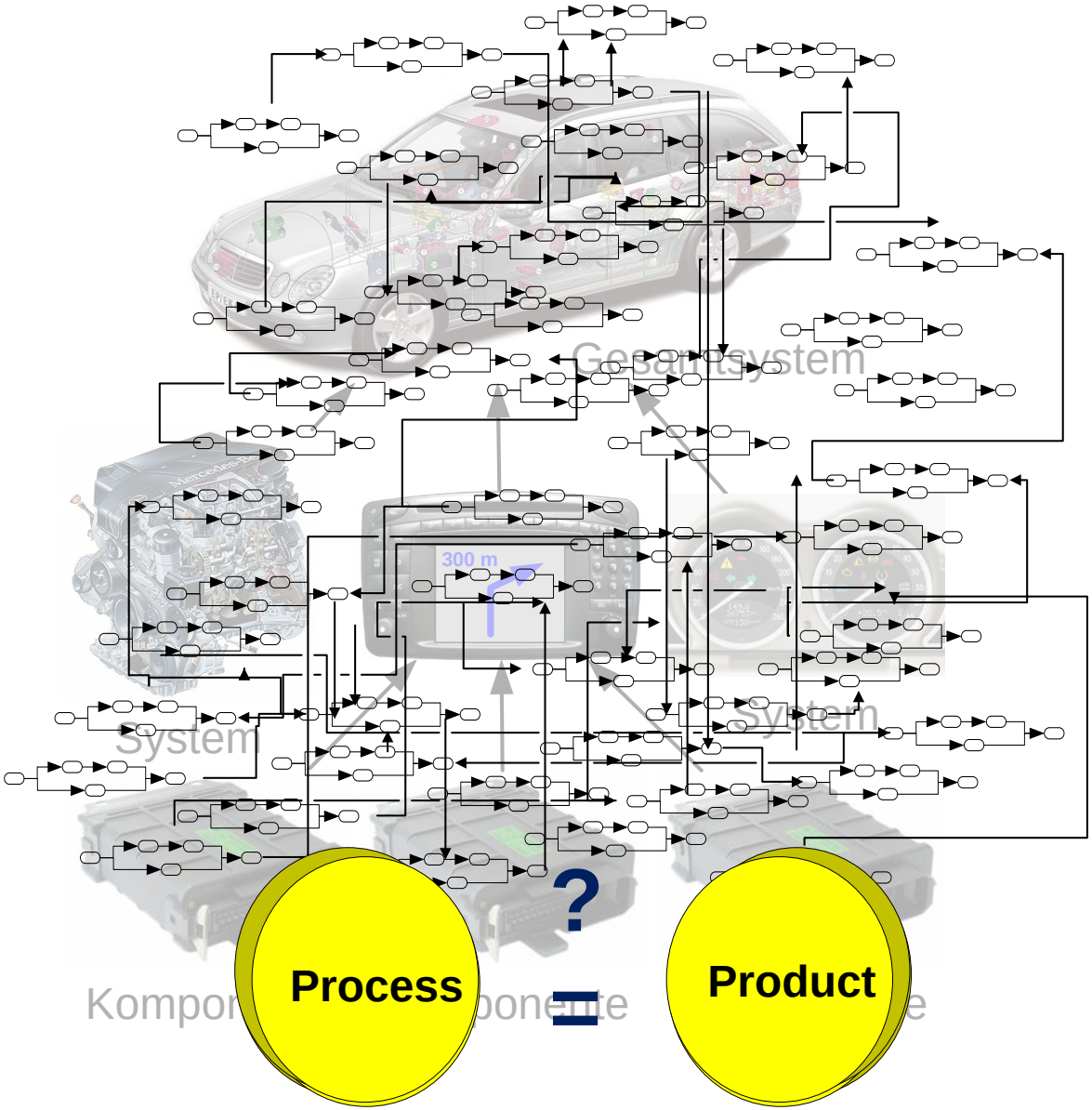
Processes in the Wild World:

- Business processes can be very large and complex
- Thousands of concurrently executed process instances
- H
  fl
- Comprehensibility and usability are crucial factors
- PAIS correctness and robustness are fundamental



But: What are the drivers of these large processes?

Large Process Structures

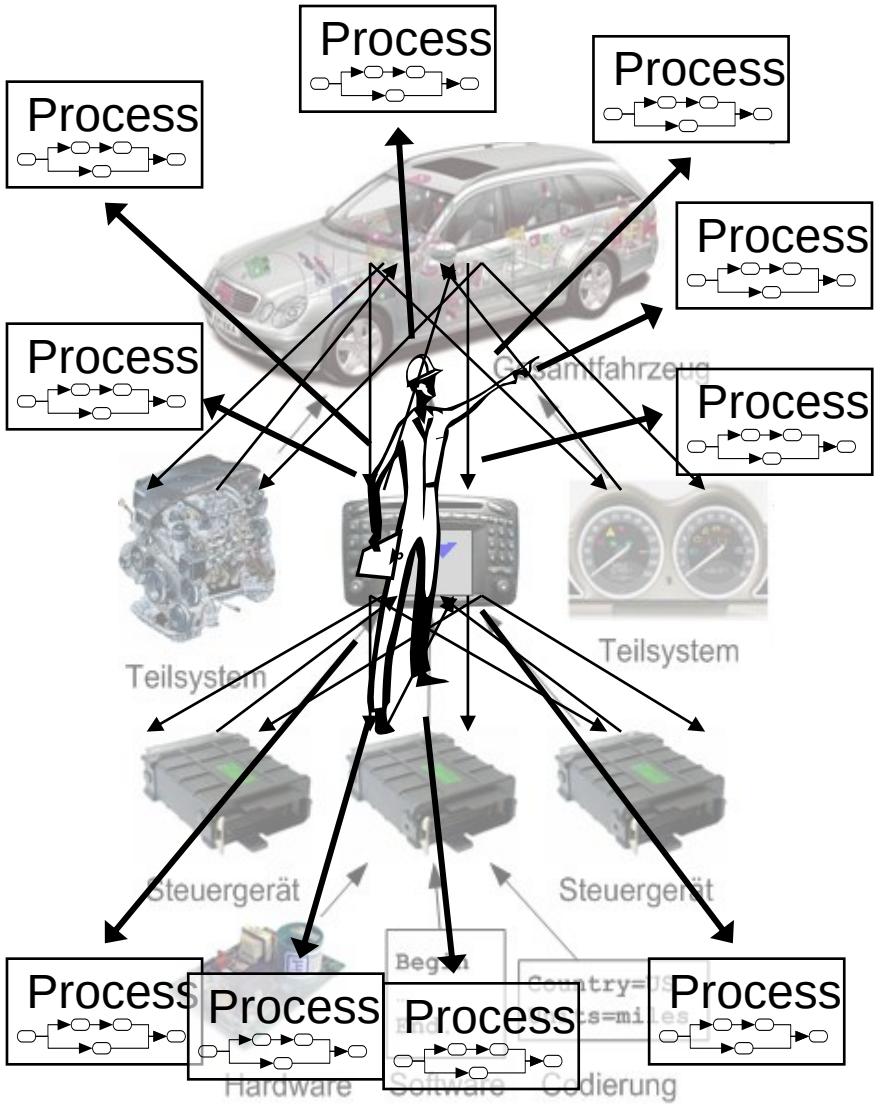


Drivers of Large Process Structures

- Modeling
- Execution
- Dynamic Adaptation
- Exception Handling

Process

Product



The Corepro Approach

Modellebene

Datenmodell

Data Model

Life Cycle Coordination Model

Object Life Cycles / Life Cycle Coordination Model

Instanzebene

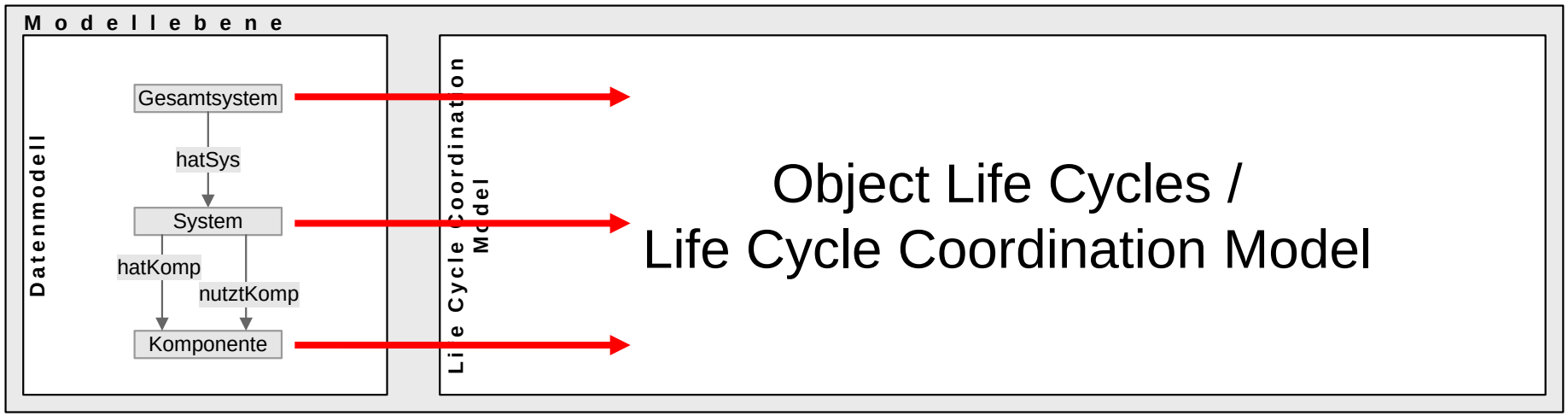
Datenstruktur

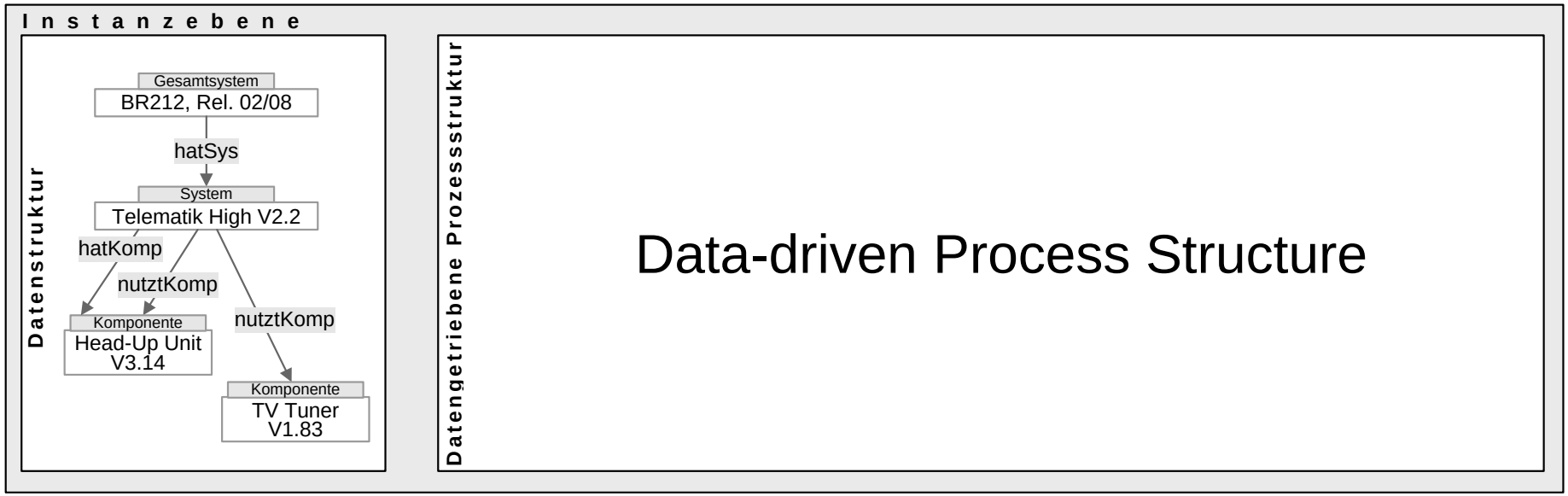
Data Structure

Datengetriebene Prozessstruktur

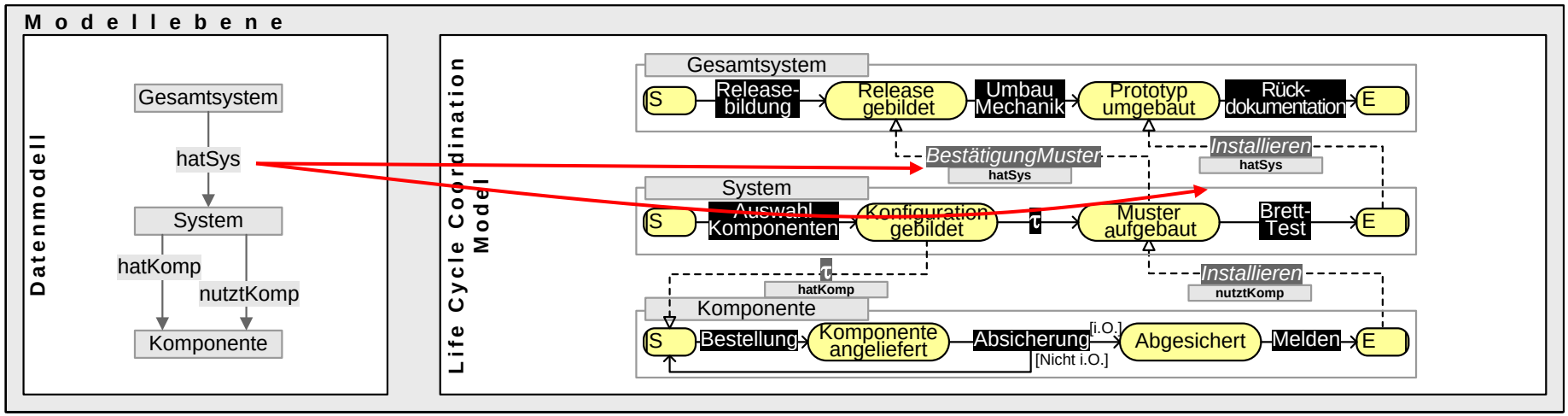
Data-driven Process Structure

The Corepro Approach

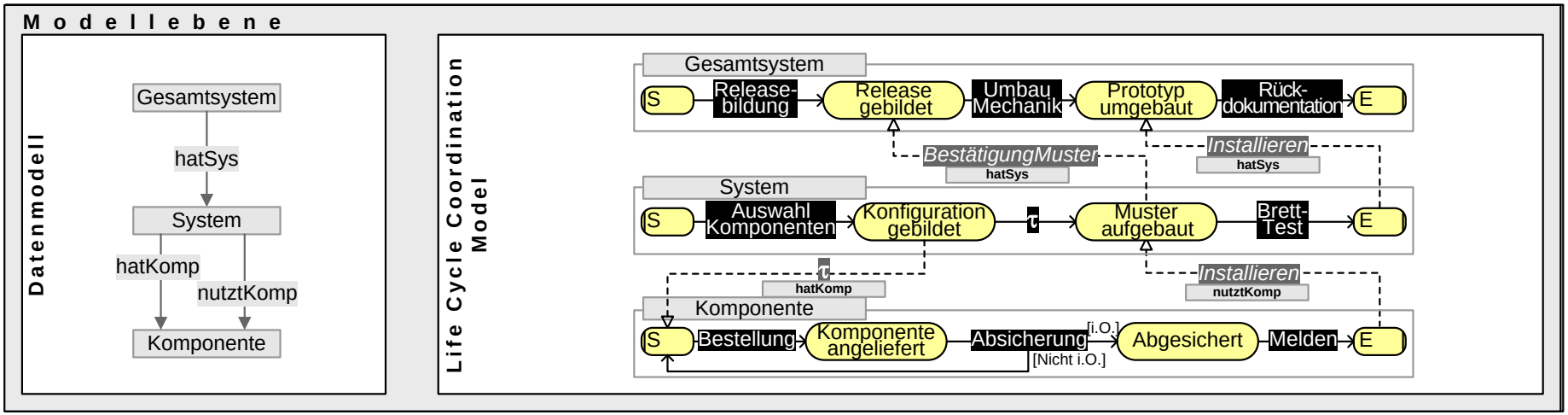


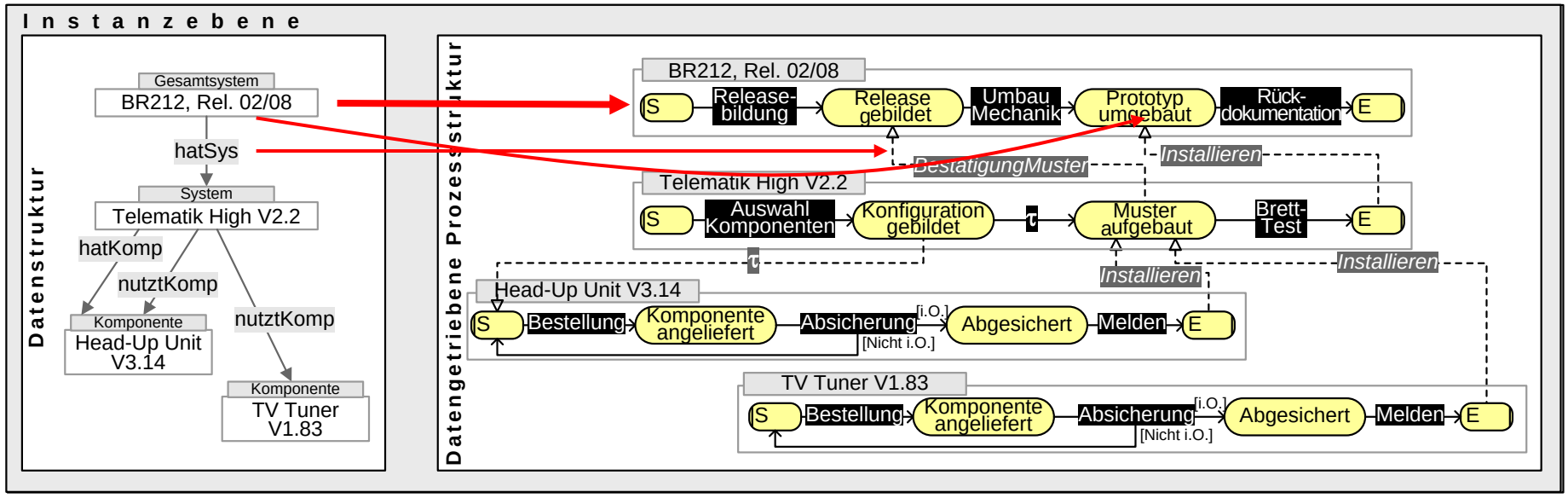


The Corepro Approach

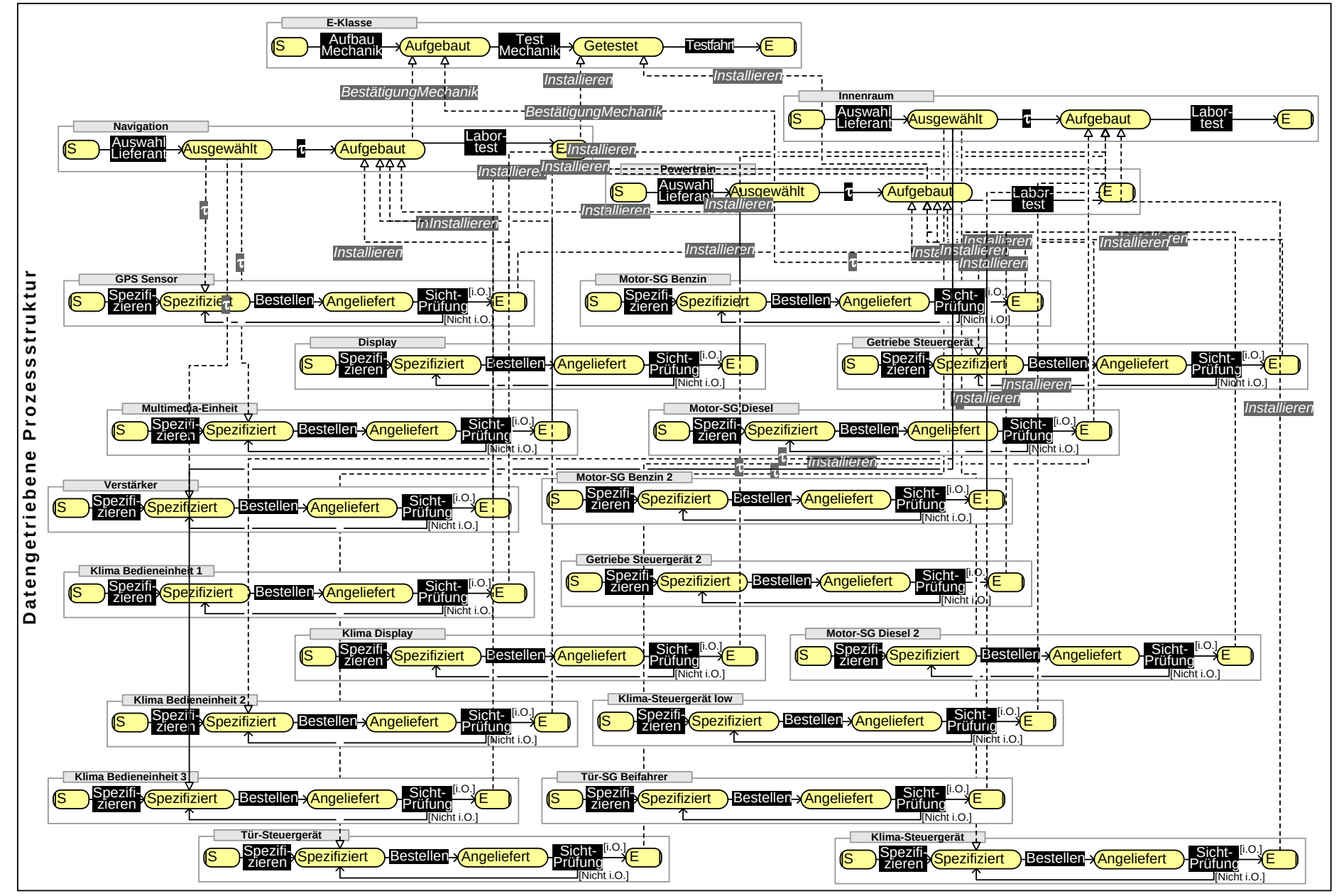


The Corepro Approach

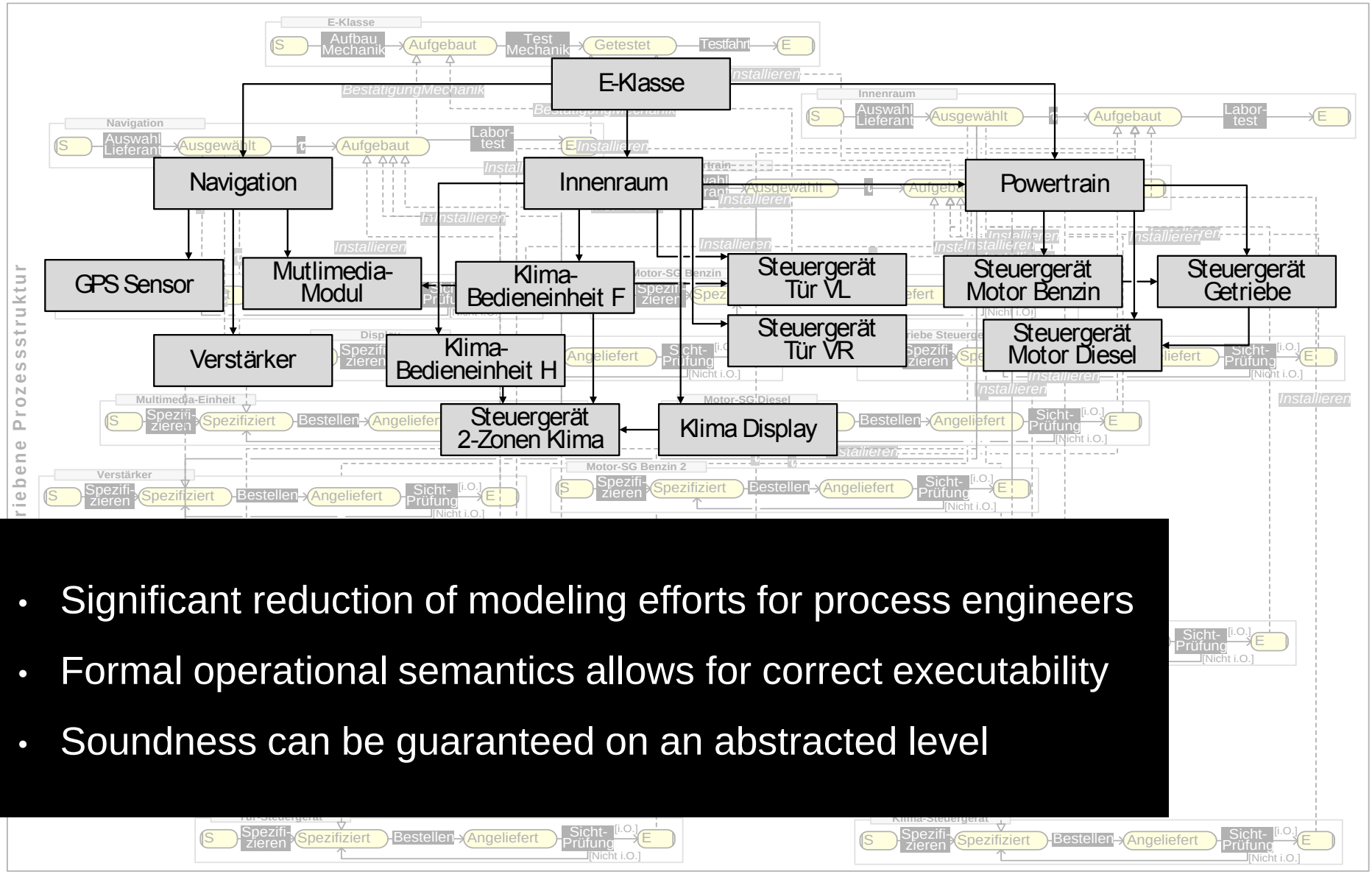




The Corepro Approach



The Corepro Approach



- Significant reduction of modeling efforts for process engineers
- Formal operational semantics allows for correct executability
- Soundness can be guaranteed on an abstracted level

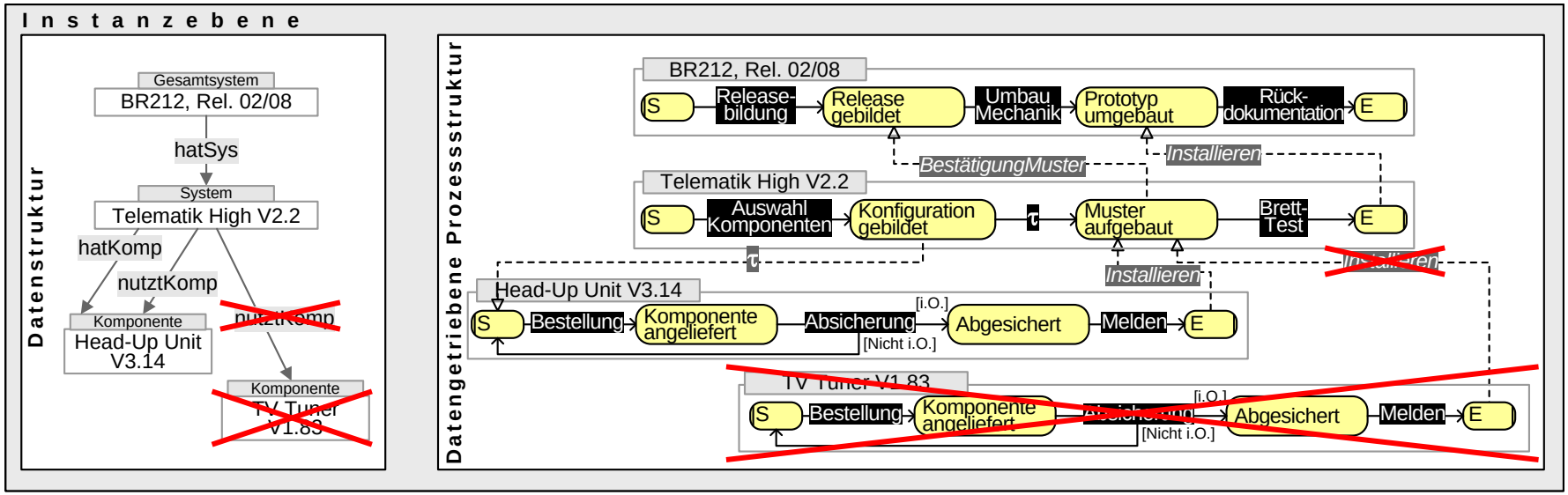
The Corepro Approach: Data-driven Change

Change Operation (Data Structure)

```
1) removeRelation(Telematik High
   V2.2, TV Tuner V1.83,
   nutztKomp);
2) removeObject(TV Tuner V1.83);
```

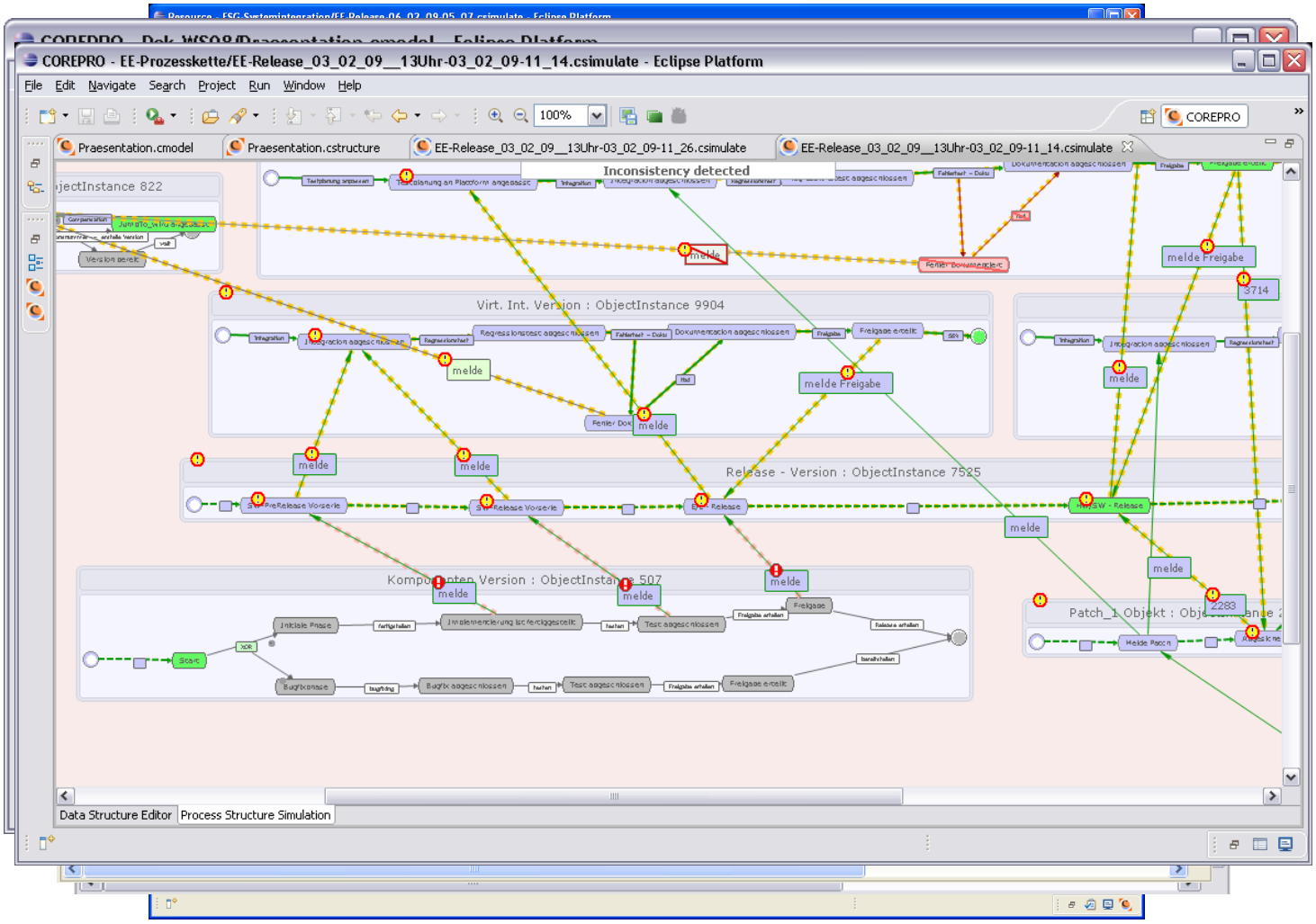
Change Operation (Process Structure)

```
1) removeExtTrans(Telematik High V2.2 .
   Muster Aufgebaut, Installieren, TV
   Tuner V1.83 . E);
2) removeOLC(Tuner V1.83);
```

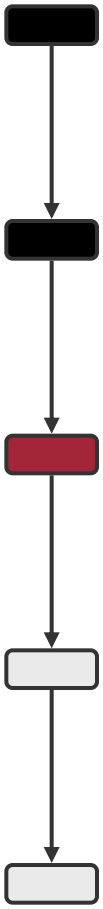


The Corepro Approach

Automatic Support for Changing Structure



Agenda



Backgrounds

Data as Driver of Large Processes

Object-Aware Processes

The PHILharmonicFlows Framework

Summary

Object-Awareness

Data Model

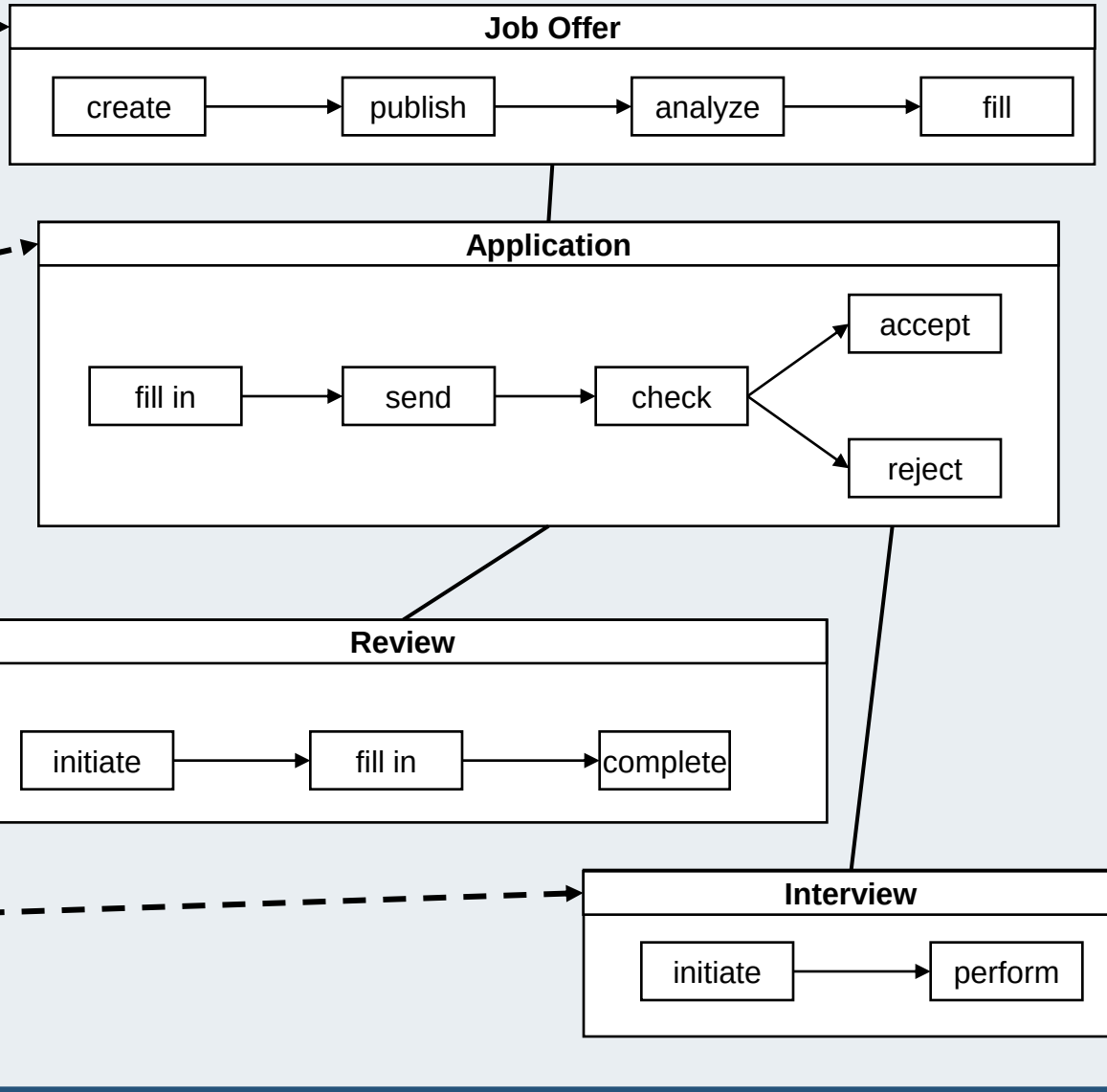
Job Offer
- identifier
- description
- vacant from
- vacant until

Application
- name
- e-mail
- appl. letter
- decision
- evaluation

Review
- priority
- return date
- remark
- proposal
- evaluation
- reason
- comment
- committed

Interview
- date
- time
- location

Process Model



Object Behavior

User Integration

staff member
department

personnel officer
human resources

Form Logic

priority:
return date:
remark:
proposal:
evaluation:
reason:
comment:

priority:
return date:
remark:
proposal: * invite reject
evaluation: *
reason: *
comment:

remark:
proposal:
evaluation:
reason:
comment:

priority: *
return date: *
remark:

priority:
return date:
remark:

remark:
proposal:
evaluation:
reason:
comment:
committed: *

Object Instance

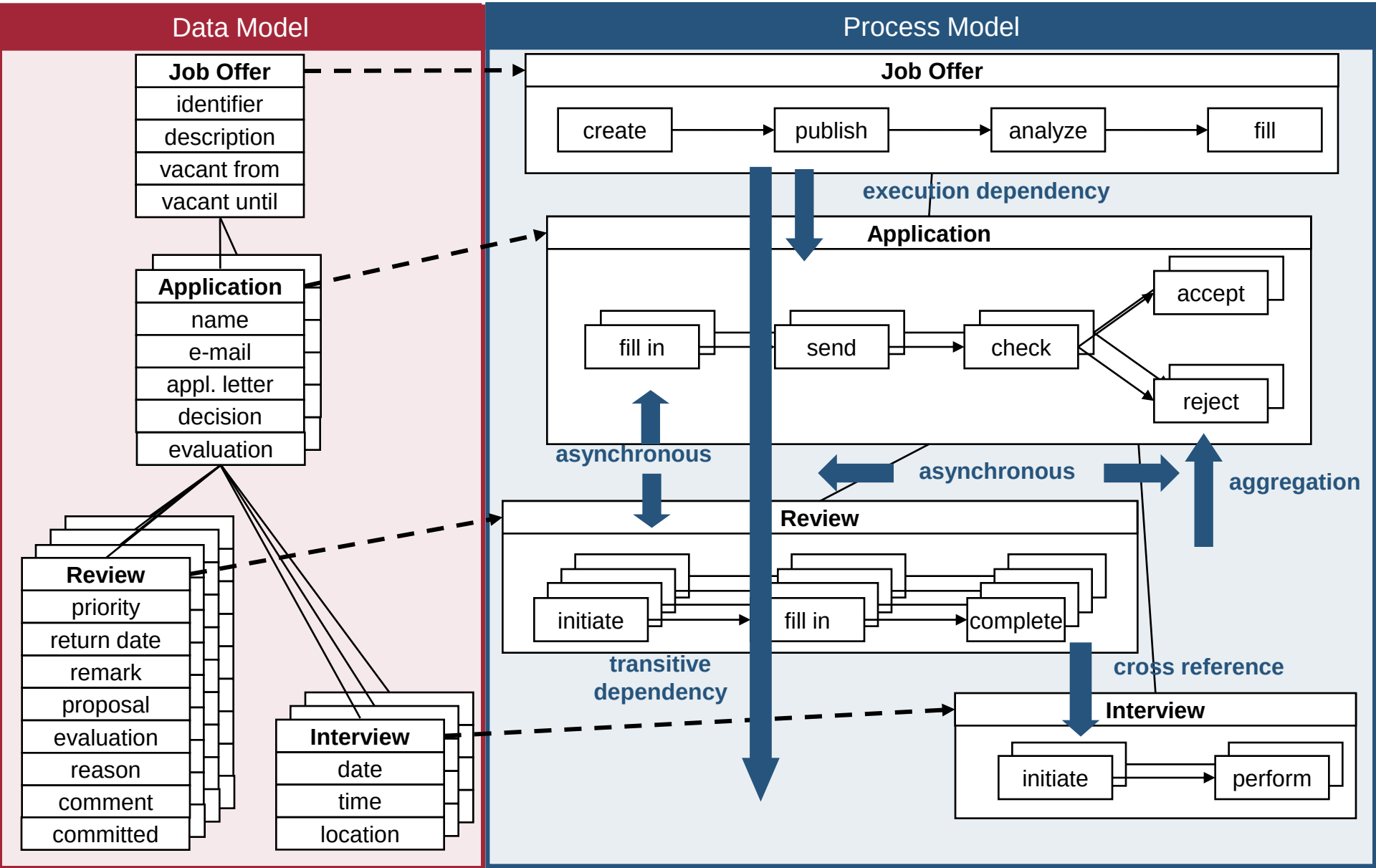
Review	
remark	
return date	
priority	
proposal	
evaluation	
reason	
comment	
committed	

Process Instance

initiate → fill in → complete

staff member
department

Object Interactions



Flexible Activity Execution

User Integration

staff member
department

context-sensitive activity

Job Offer

identifier: *salesman*

description:

vacant from: *10.09.2011*

vacant until: *01.01.2012*

Application

batch activity

decision: *reject*

Review

priority: *high*

return date: *12.12.2011*

remark: *complete soon*

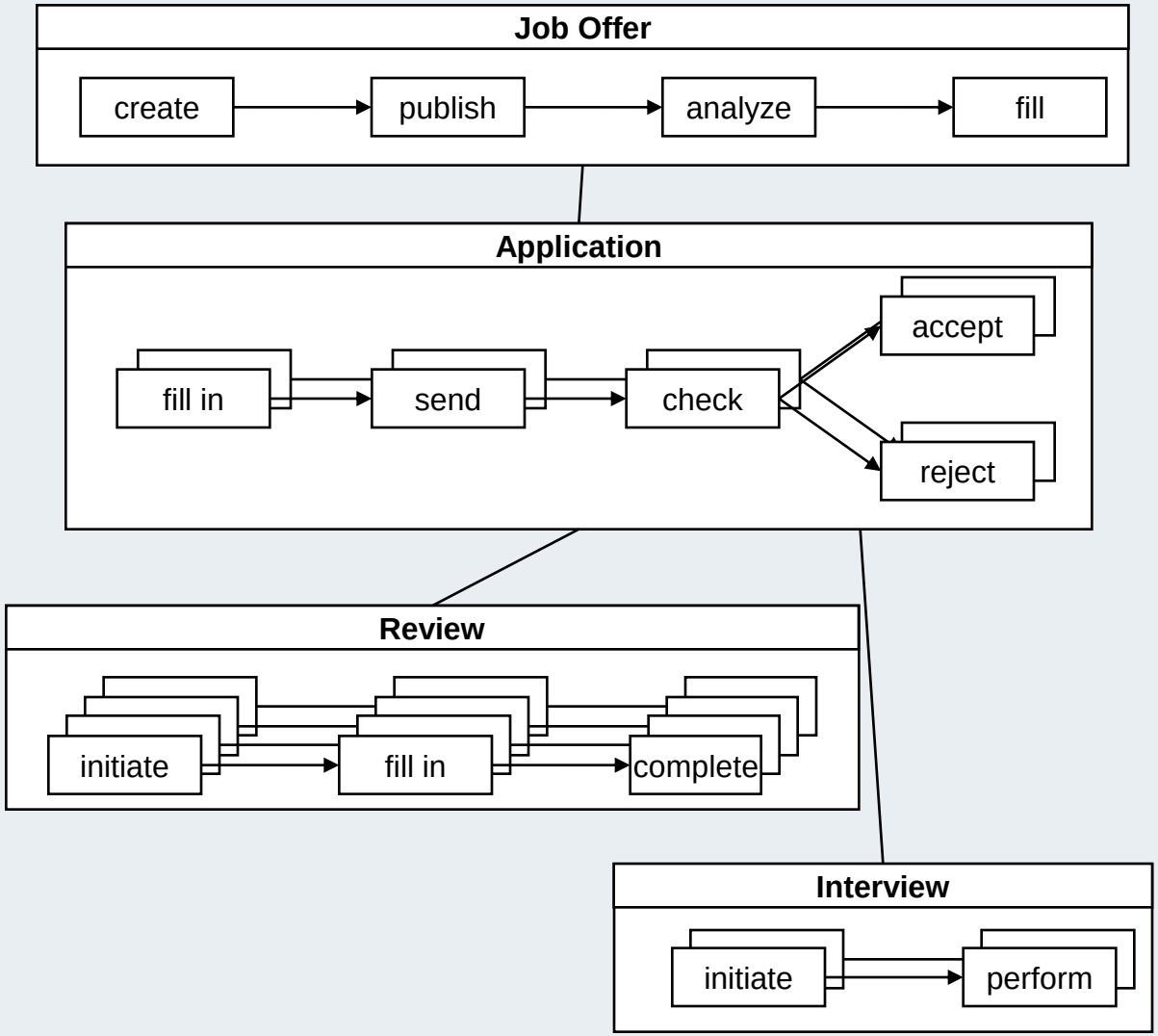
proposal: *invite*

evaluation: *very good*

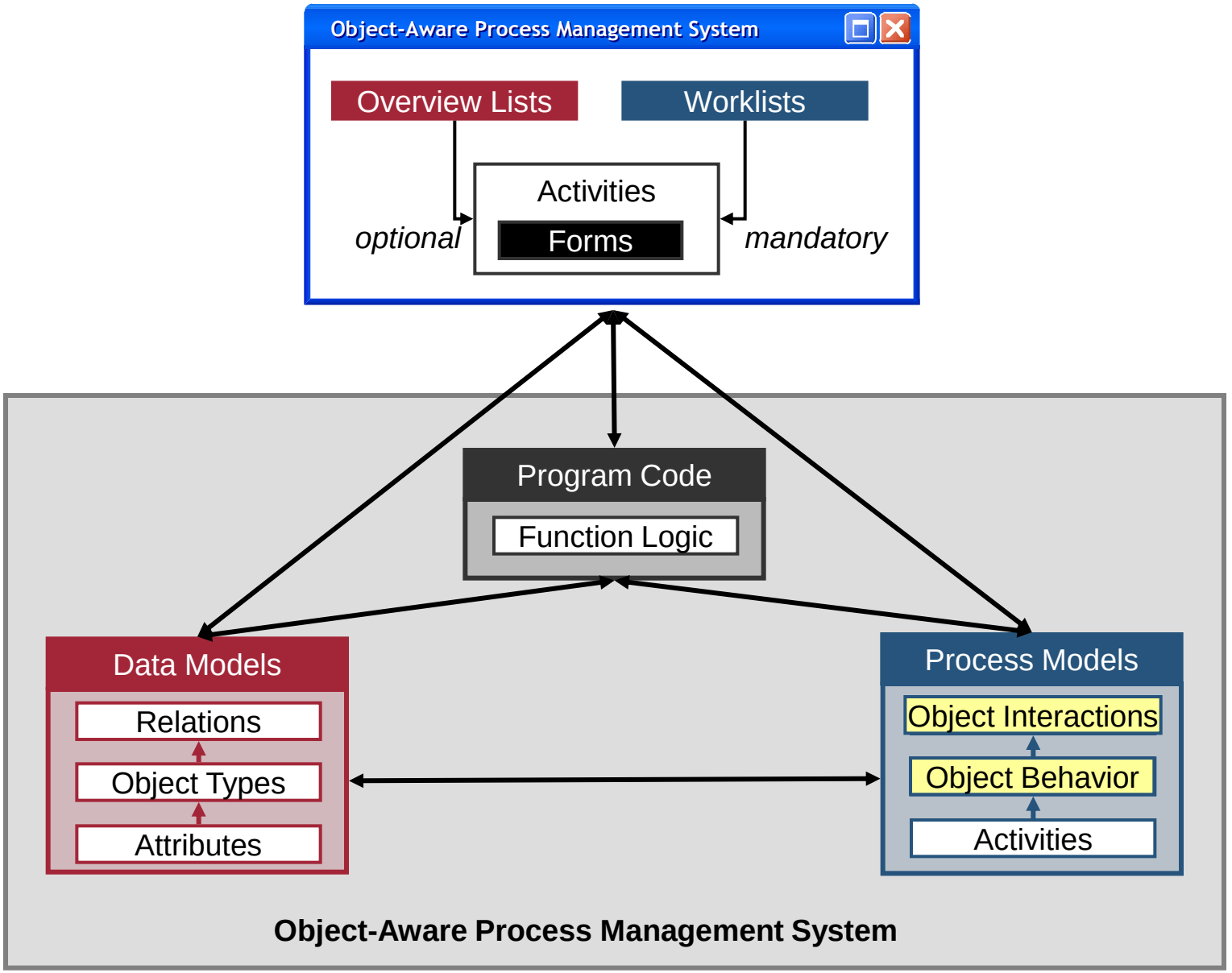
reason:

comment: *many competencies*

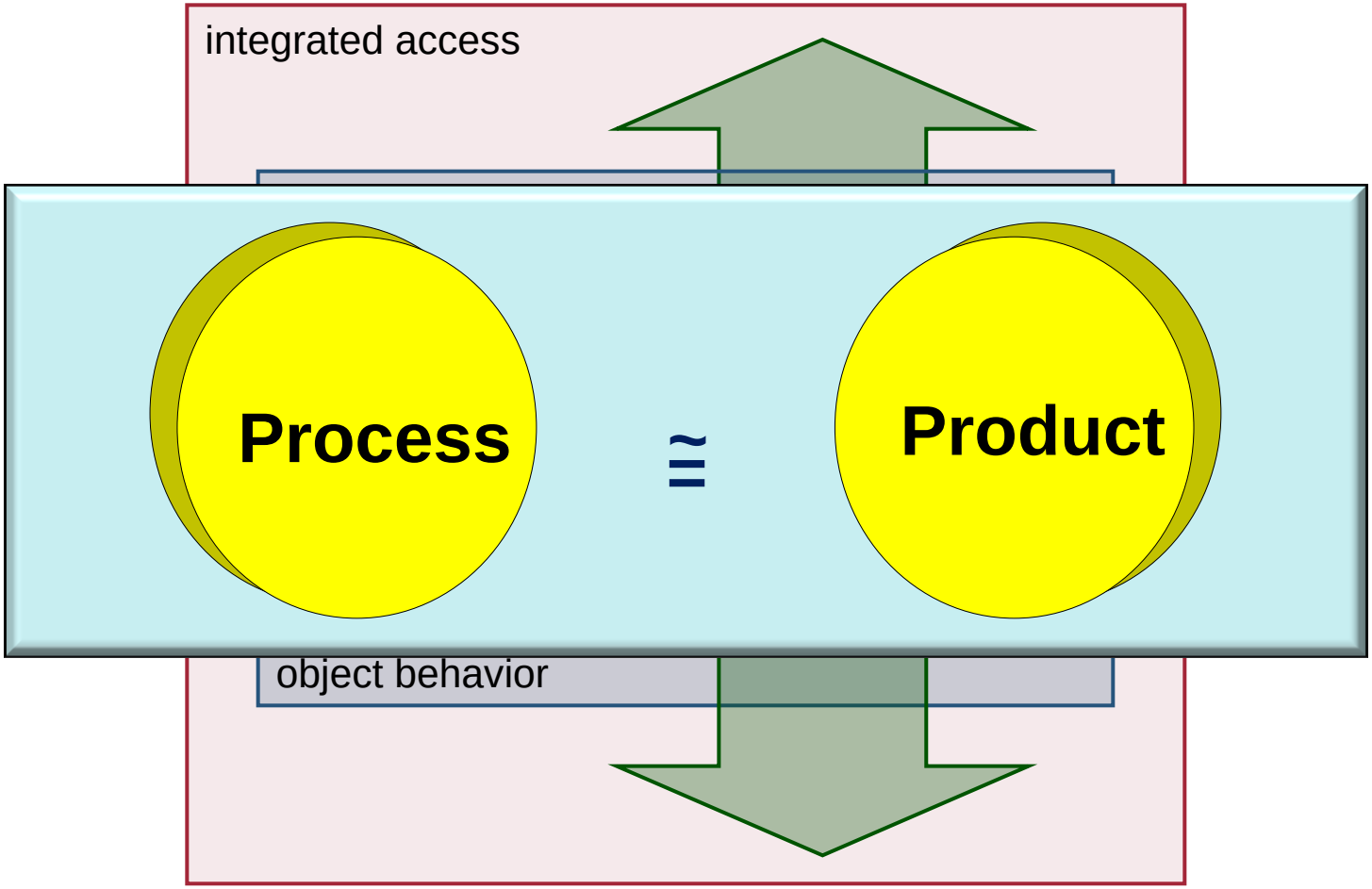
Process Model



Object-Aware Process Management

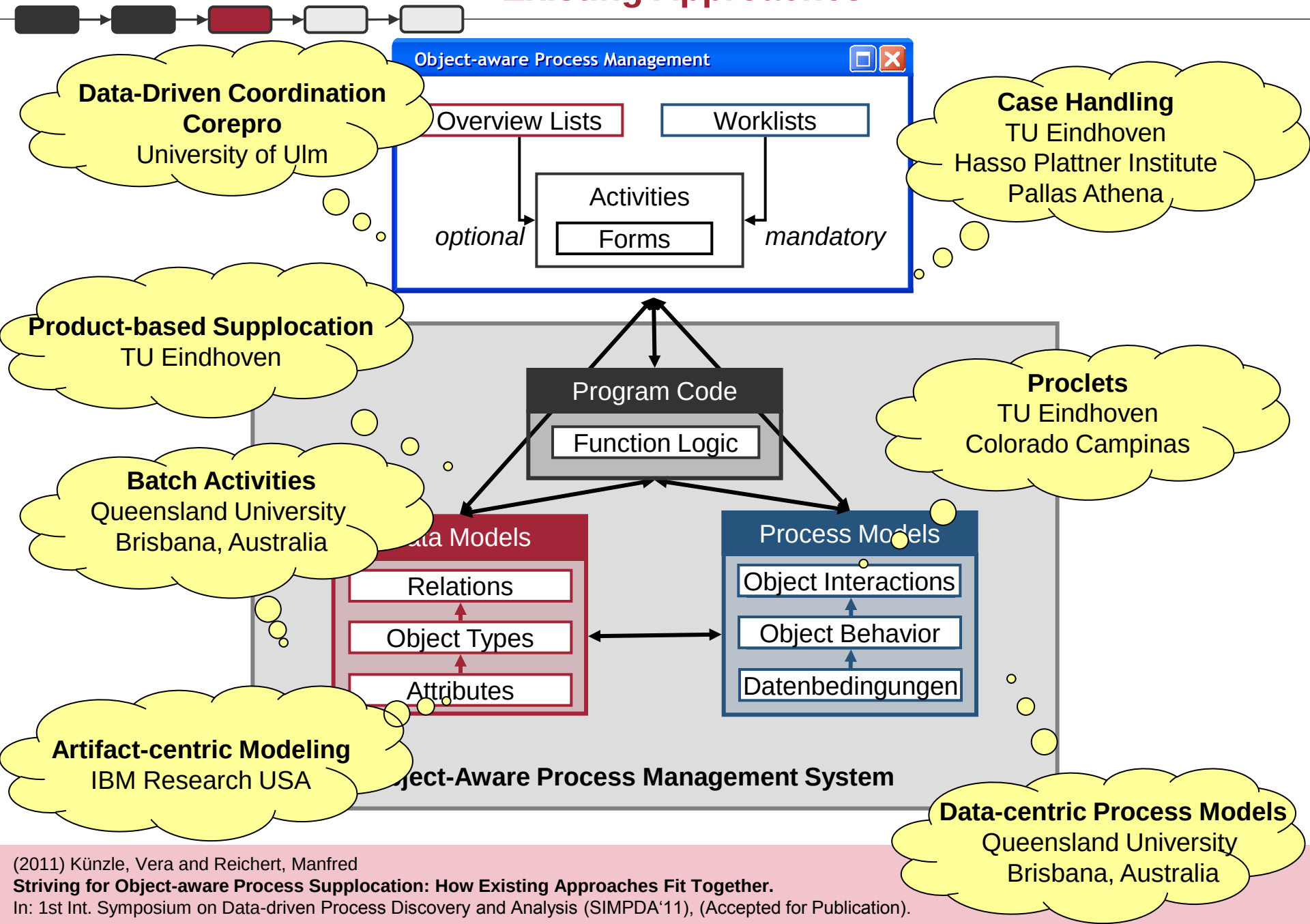


Characteristics of Object-aware Processes



Activities do not coincide to particular process steps!

Existing Approaches



(2011) Künzle, Vera and Reichert, Manfred
Striving for Object-aware Process Supplocation: How Existing Approaches Fit Together.
In: 1st Int. Symposium on Data-driven Process Discovery and Analysis (SIMPDA'11), (Accepted for Publication).

Existing Approaches

	object behavior	object interactions	data-driven execution	activity granularity	integrated access
Proclets (1)		X		(X)	
Case Handling (2)	X		(X)		(X)
Business Artifacts (3)	X	(X)	(X)		
Data-driven Coordination (4)	(X)	X	(X)		
Data-centric Process Models (5)		X			
Product-based Workflow Support (6)	X		(X)		
Batch Activities (7)				X	

(1) *van der Aalst, W.M.P.,Weske, M., Grünbauer, D.: Case Handling: A new Paradigm for Business Process Support. DKE 53(2) (2005) 129-162*

(2) *van der Aalst, W.M.P., Barthelmess, P., Ellis, C.A.,Wainer, J.: Workow Modeling using Proclets. In: Proc. CoopIS'00. (2000) 198-209*

(3) *Bhattacharya, K., Hull, R., Su, J. In: A Data-Centric Design Methodology for Business Processes. IGI Global (2009) 503-531*

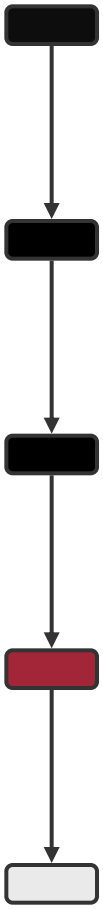
(4) *Müller, D., Reichert, M., Herbst, J.: Data-Driven Modeling and Coordination of Large Process Structures. In: Proc. CoopIS'07. LNCS 4803 (2007) 131-149*

(5) *Redding, G.M., Dumas, M., ter Hofstede, A.H.M., Iordachescu, A.: A flexible, object-centric approach for business process modelling. Service Oriented Computing and Applications (2009) 1-11*

(6) *Vanderfeesten, I., Reijers, H.A., van der Aalst, W.M.P.: Product-based Workow Support. Information Systems 36(2) (2011) 517-535*

(7) *Sadiq, S.W., Orlowska, M.E., Sadiq, W., Schulz, K.: When workows will not deliver: The case of contradicting work practice. In: Proc. BIS'05. (2005)*

Agenda



Backgrounds

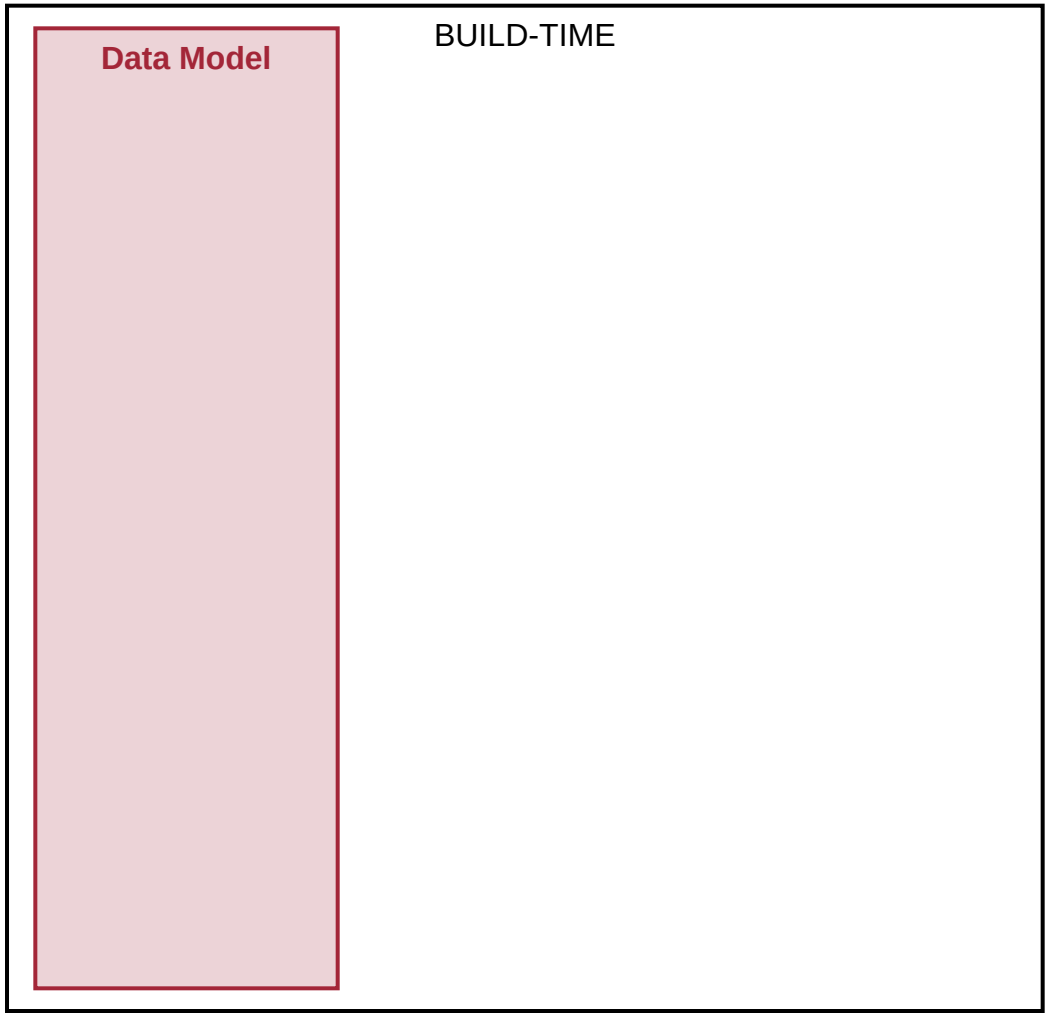
Data as Driver of Large Processes

Object-Aware Processes

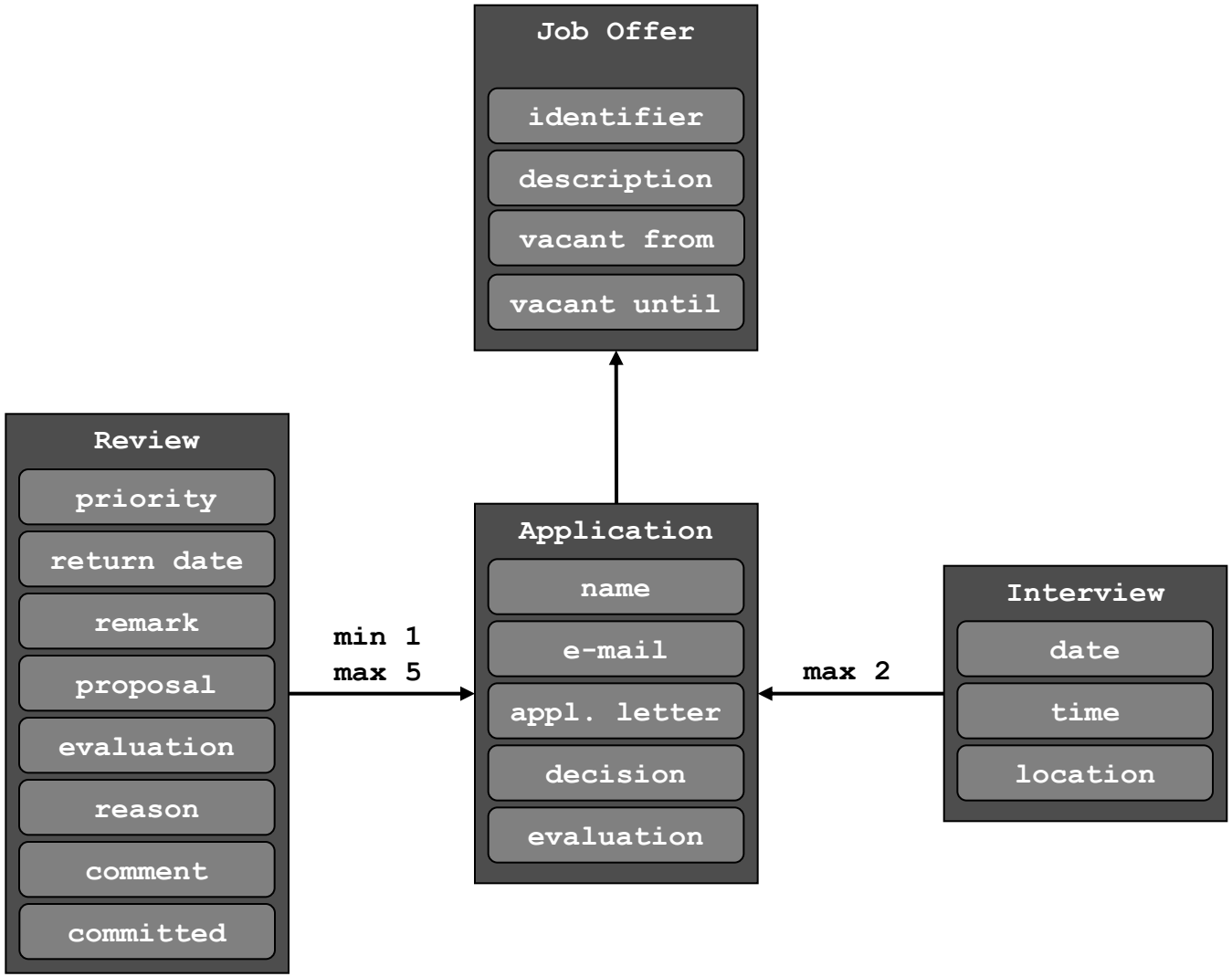
The PHILharmonicFlows Framework

Summary

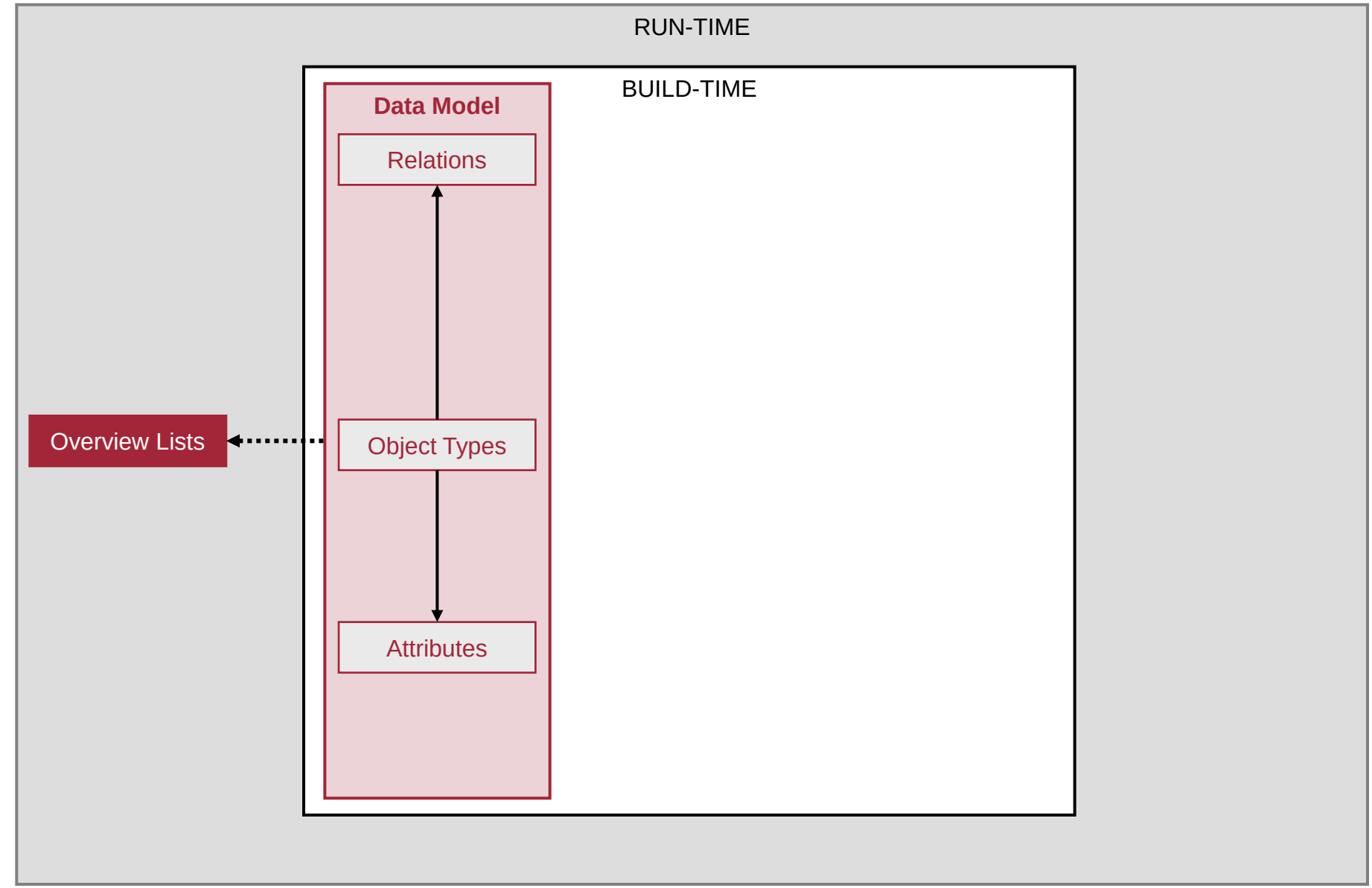
Meta Model



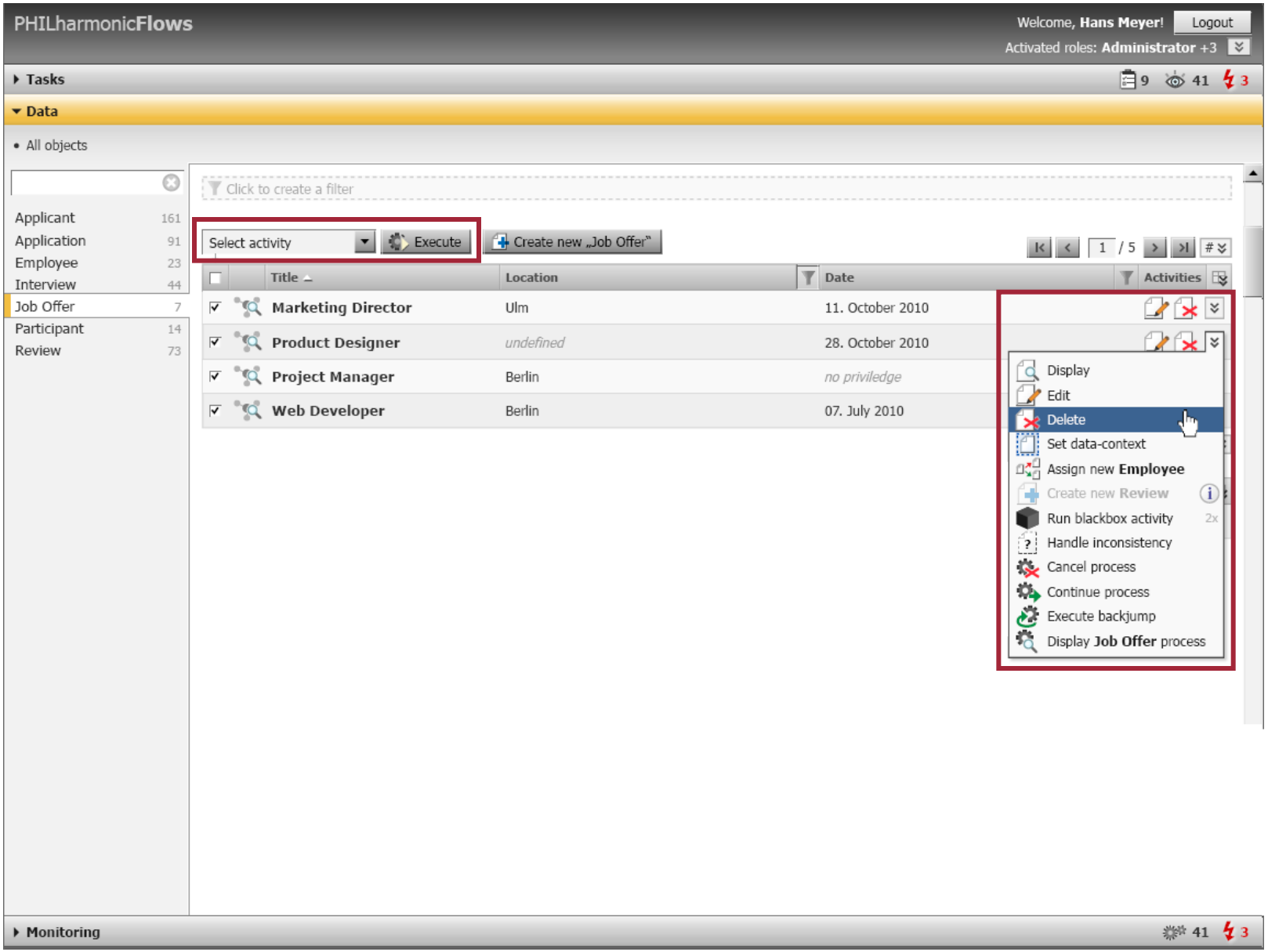
Data Model



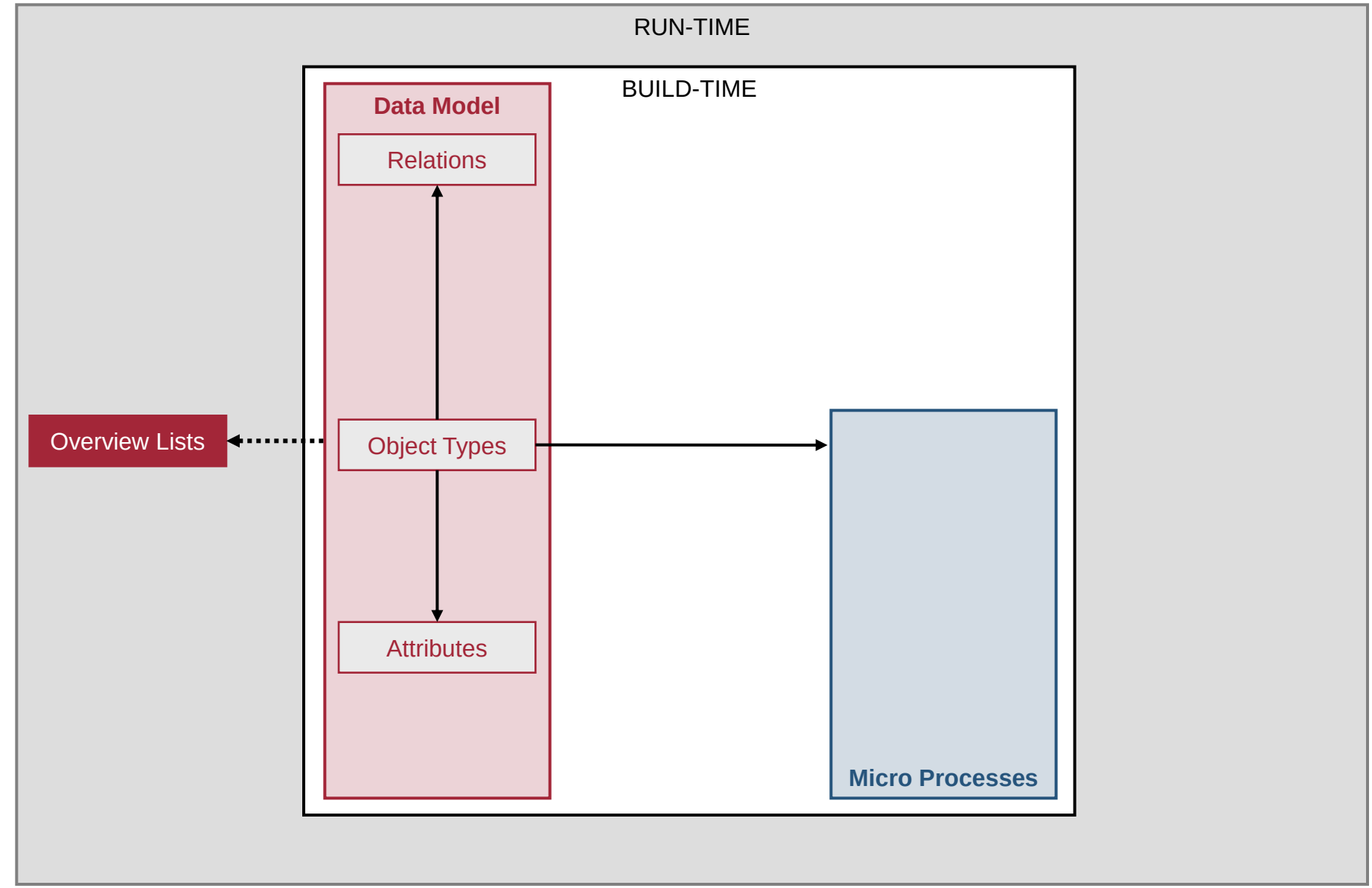
Meta Model



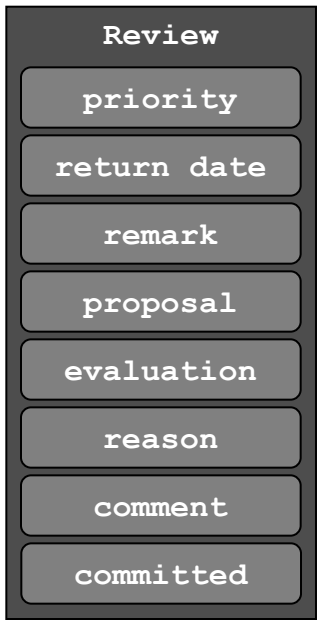
Overview Lists



Meta Model



Micro Processes



personnel officer

state

actor assignment

staff member

personnel officer

initialized

priority

return date

processing

proposal

reject

invite

reason

evaluation

reject

committed

completed

invite

committed

personnel officer

Internal micro transitions

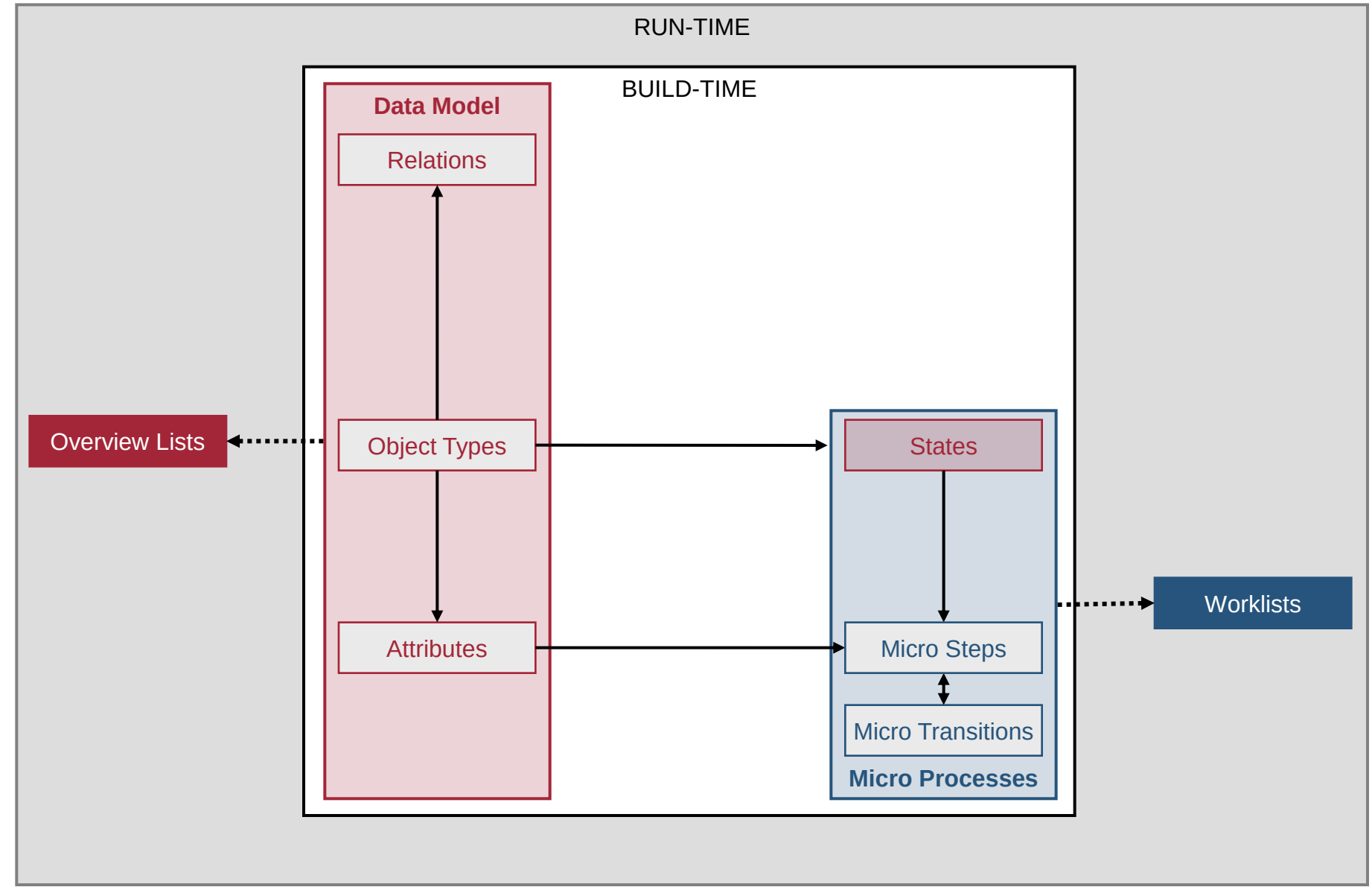
micro step

implicit micro transition

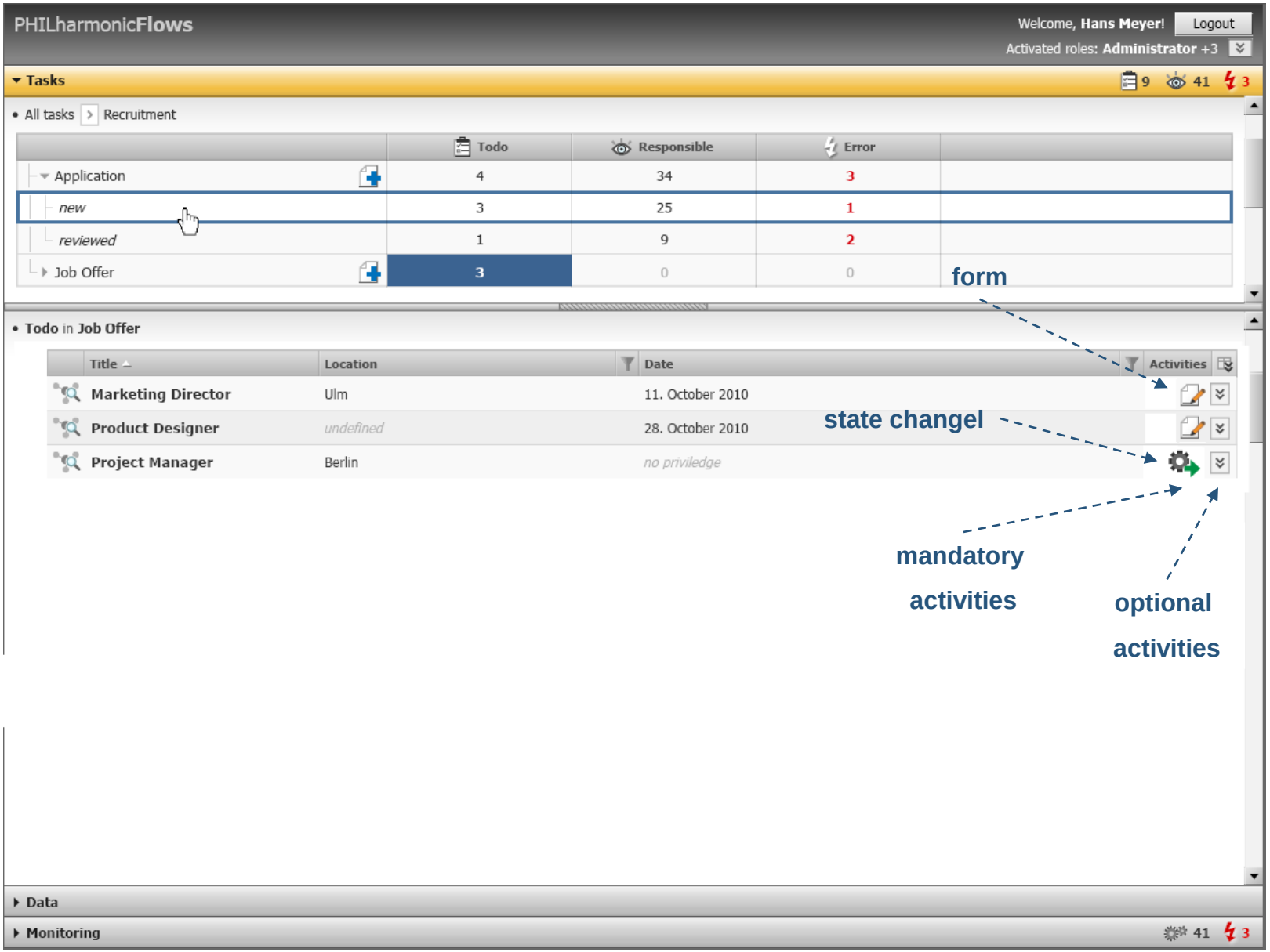
value-specific micro step

explicit micro tranistion

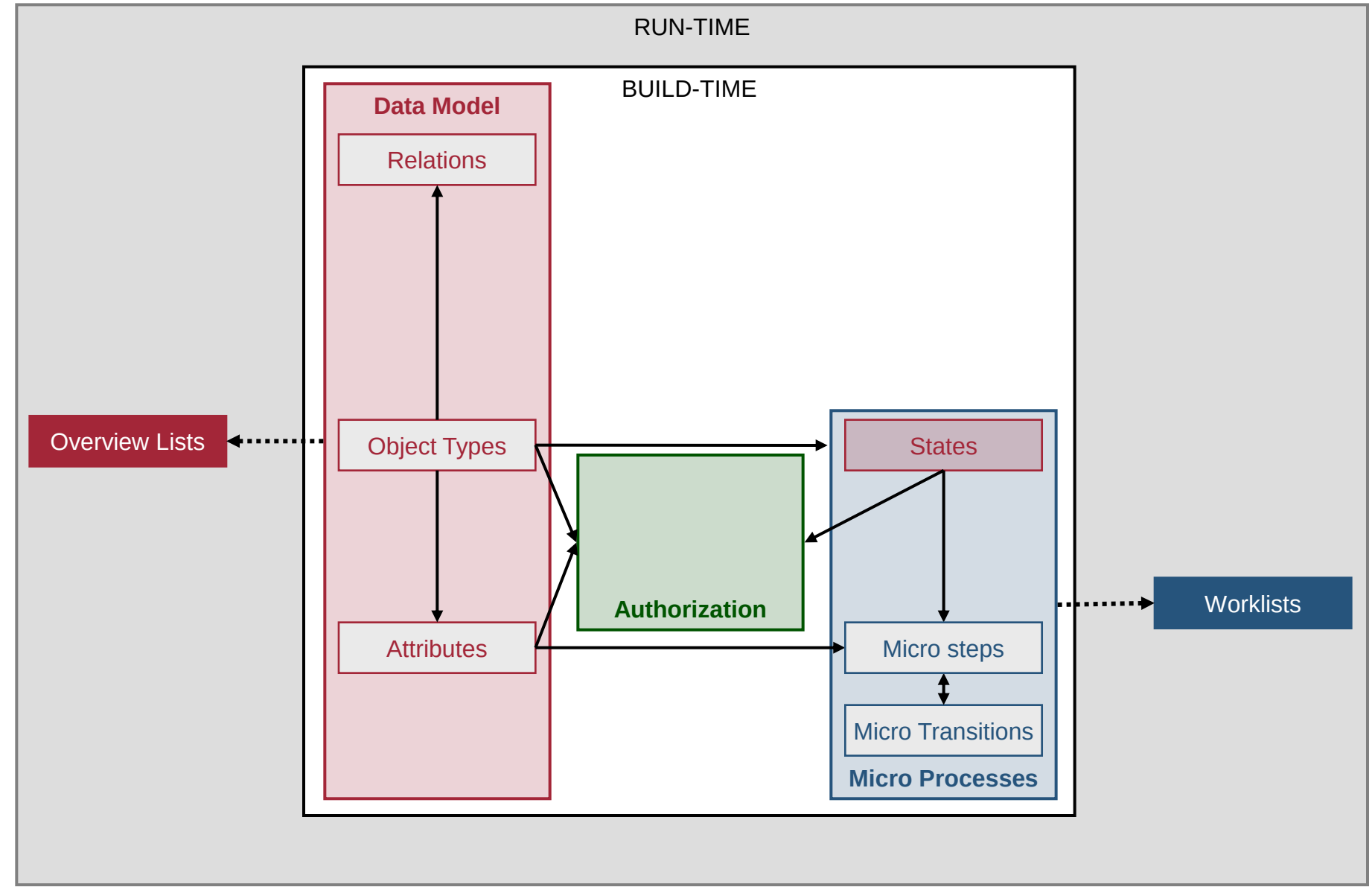
Meta Model



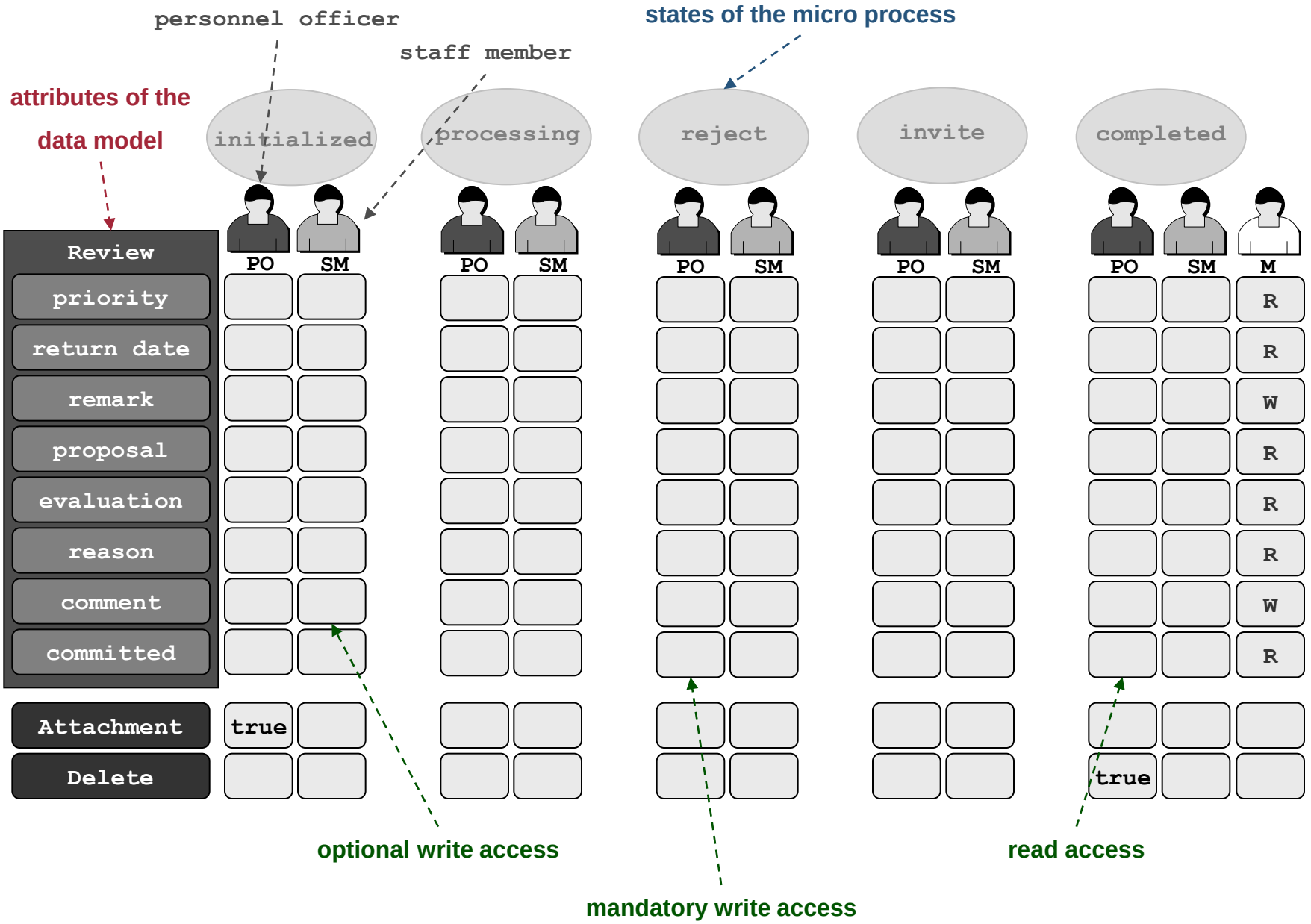
Worklists



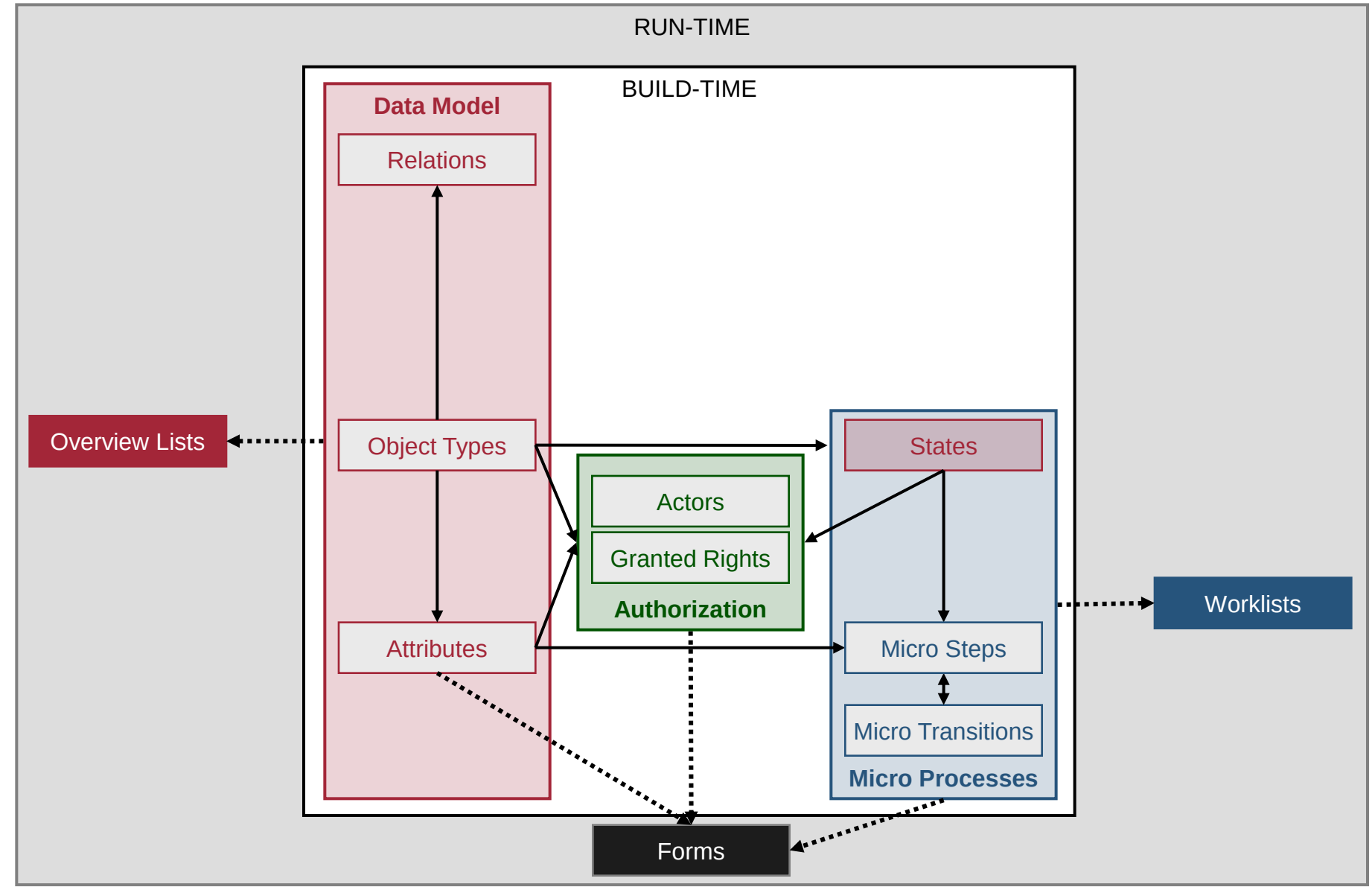
Meta Model



Authorization Table



Meta Model



Form Generation

Data Model

Review

- priority
- return date
- remark
- proposal
- evaluation
- reason
- comment
- committed

Authorization

processing

SM

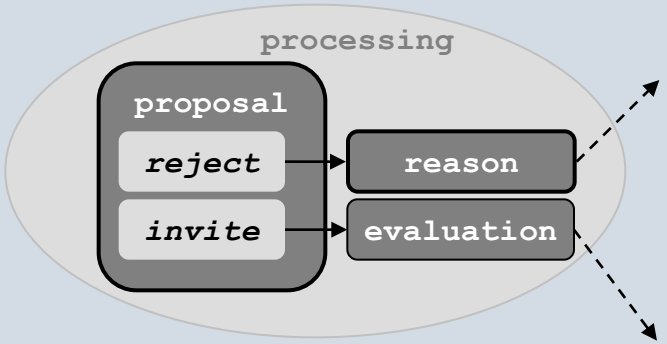
R
R
R
MW
MW
MW
W

SM

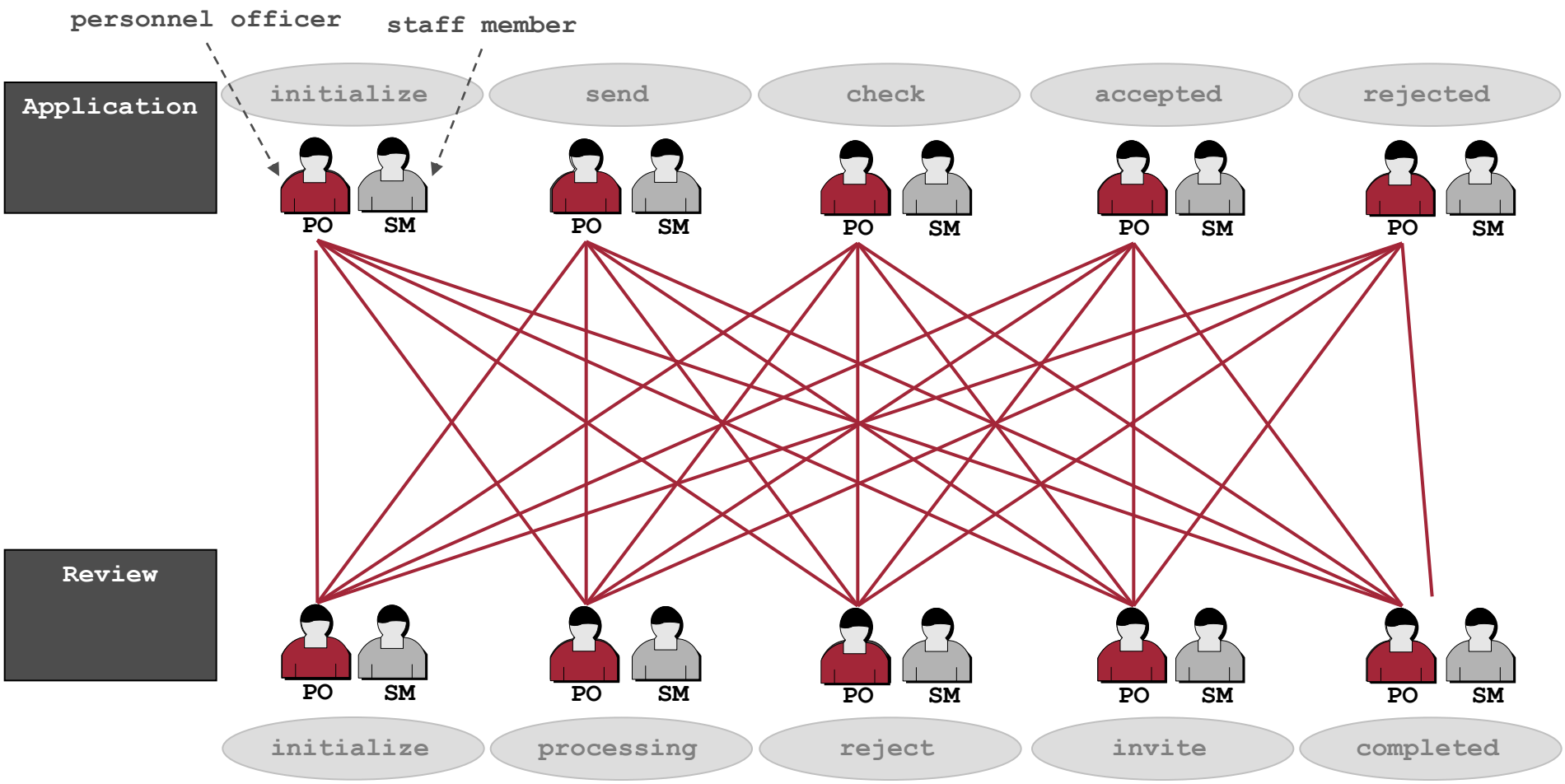
priority:	high	
return date:	12.12.2011	
remark:	complete soon	
proposal:	*	reject
evaluation:	*	
reason:	*	
comment:		
committed:		

store abort

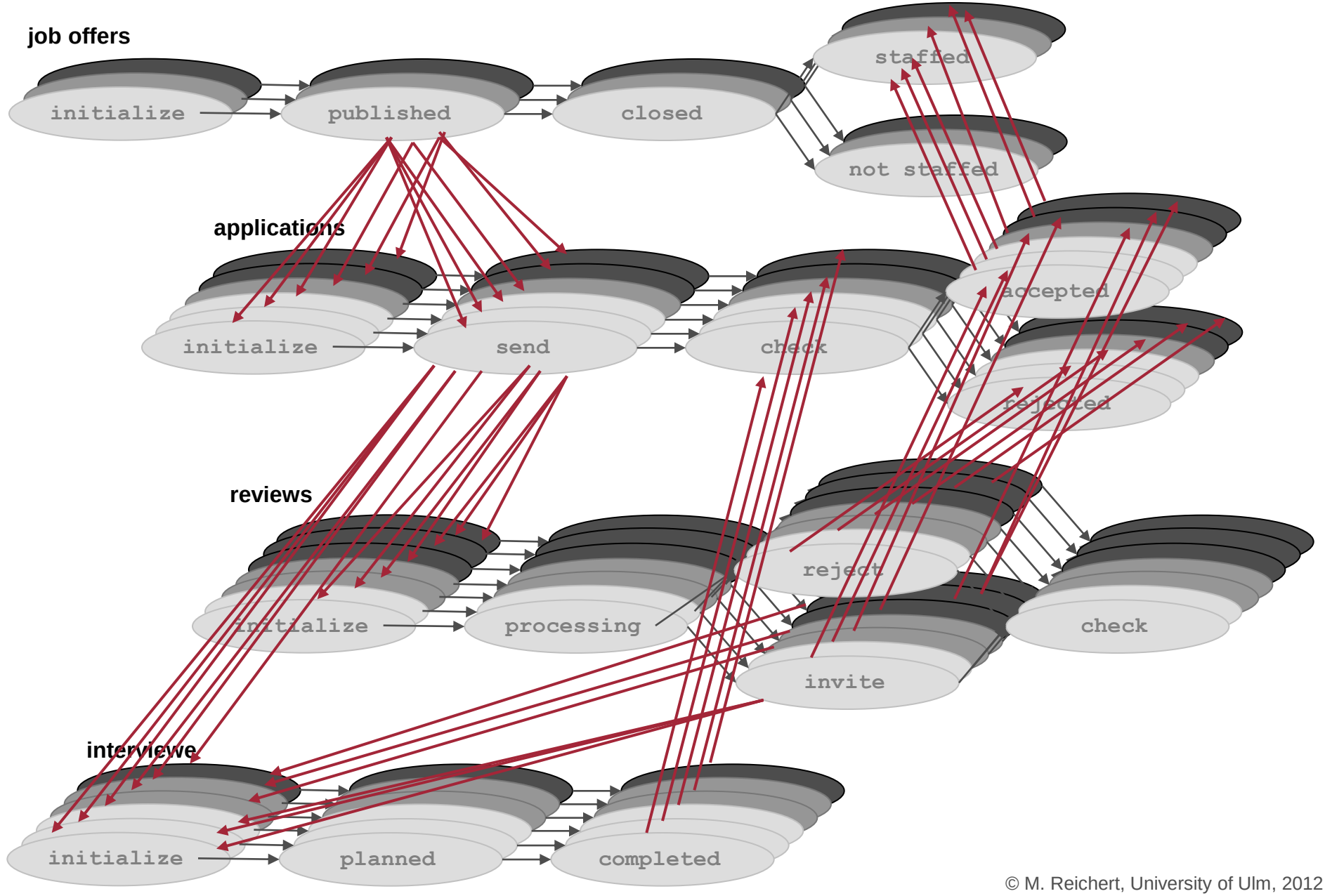
Micro Process



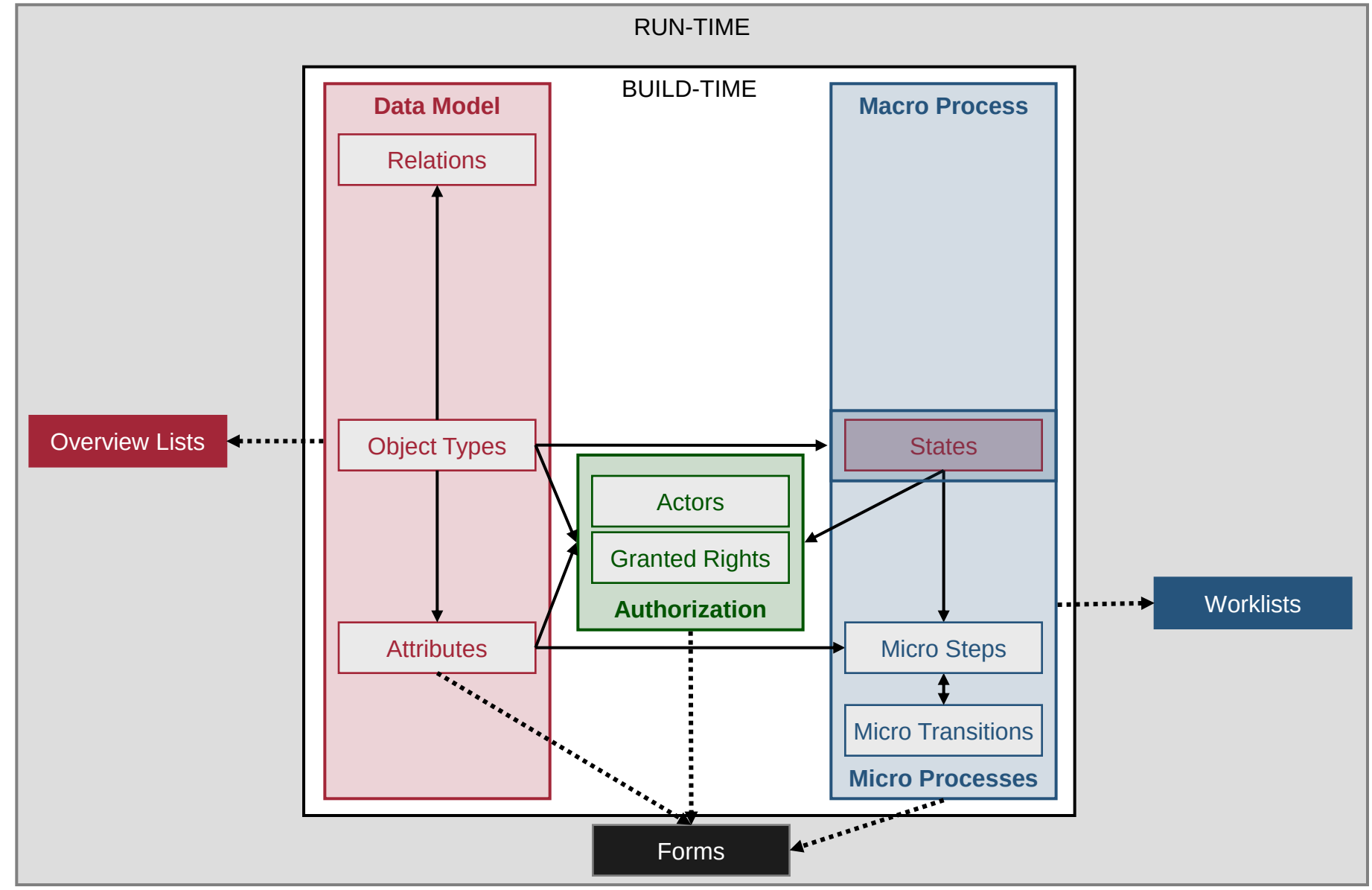
Flexibility of Activities



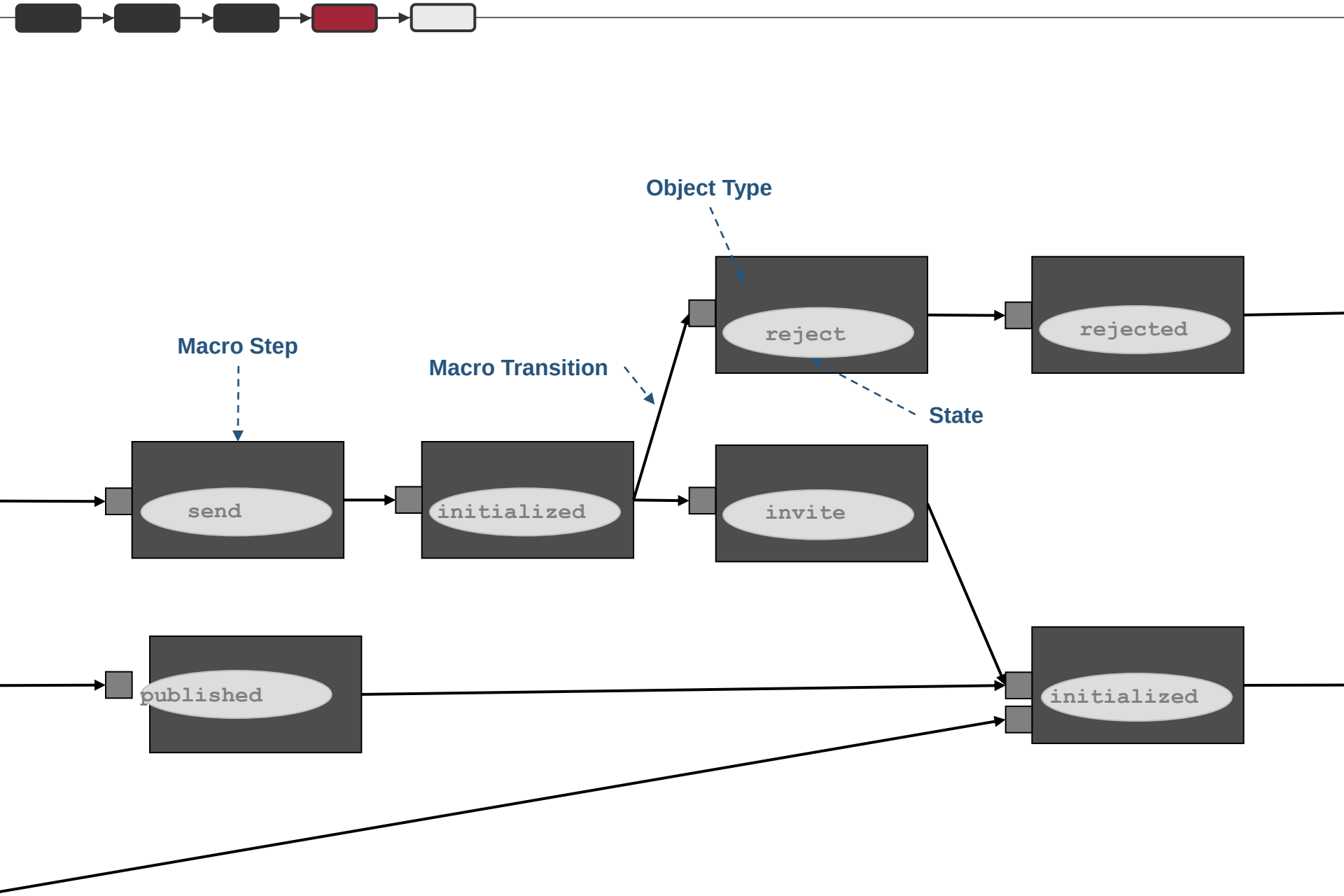
Complex Process Structure



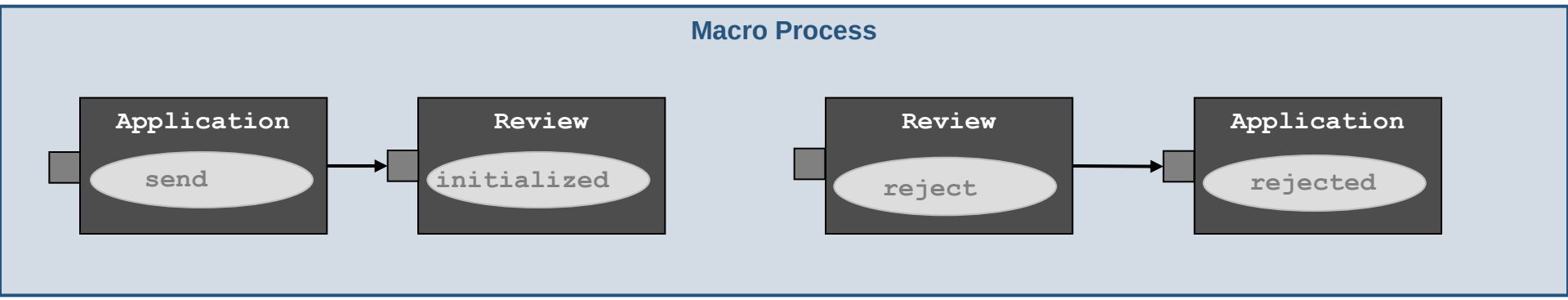
Meta Model

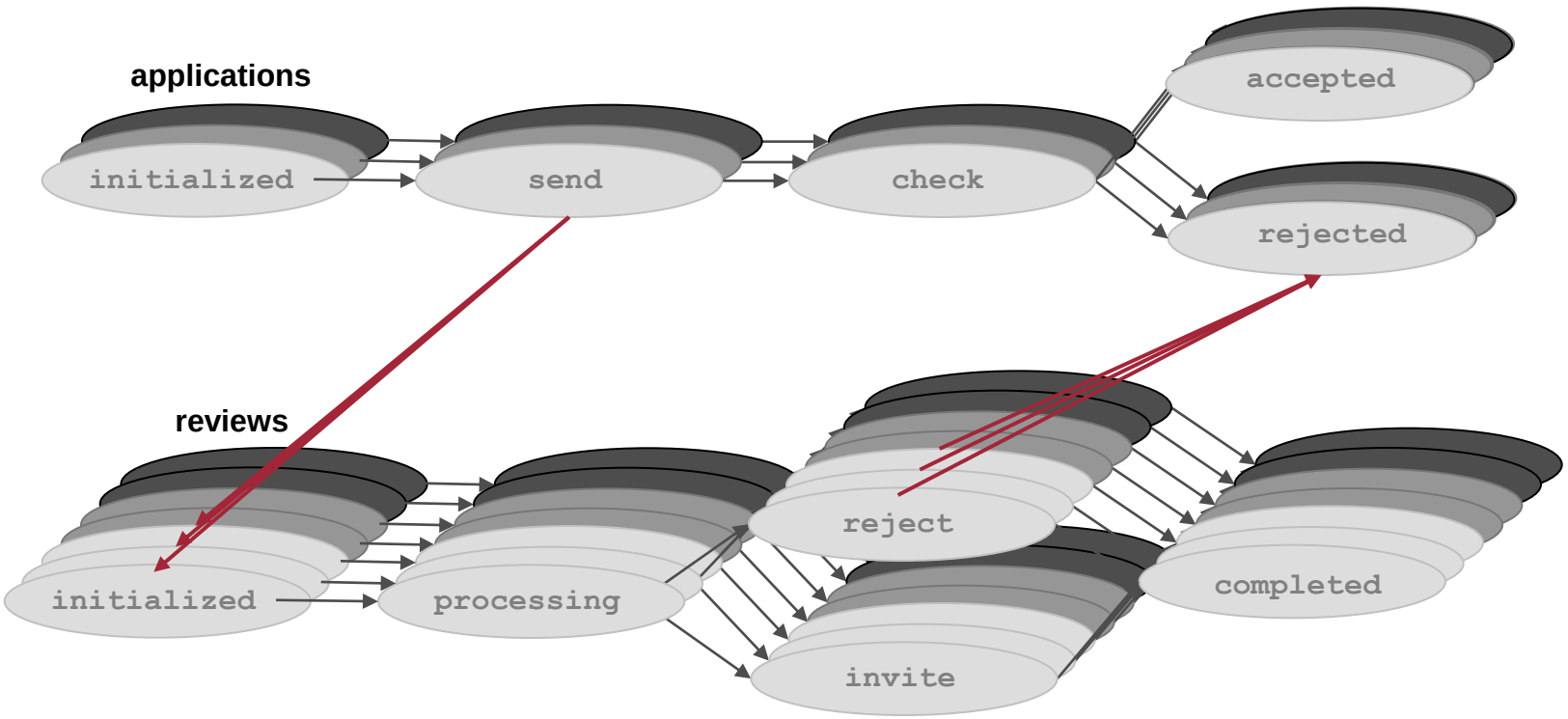


Macro Process

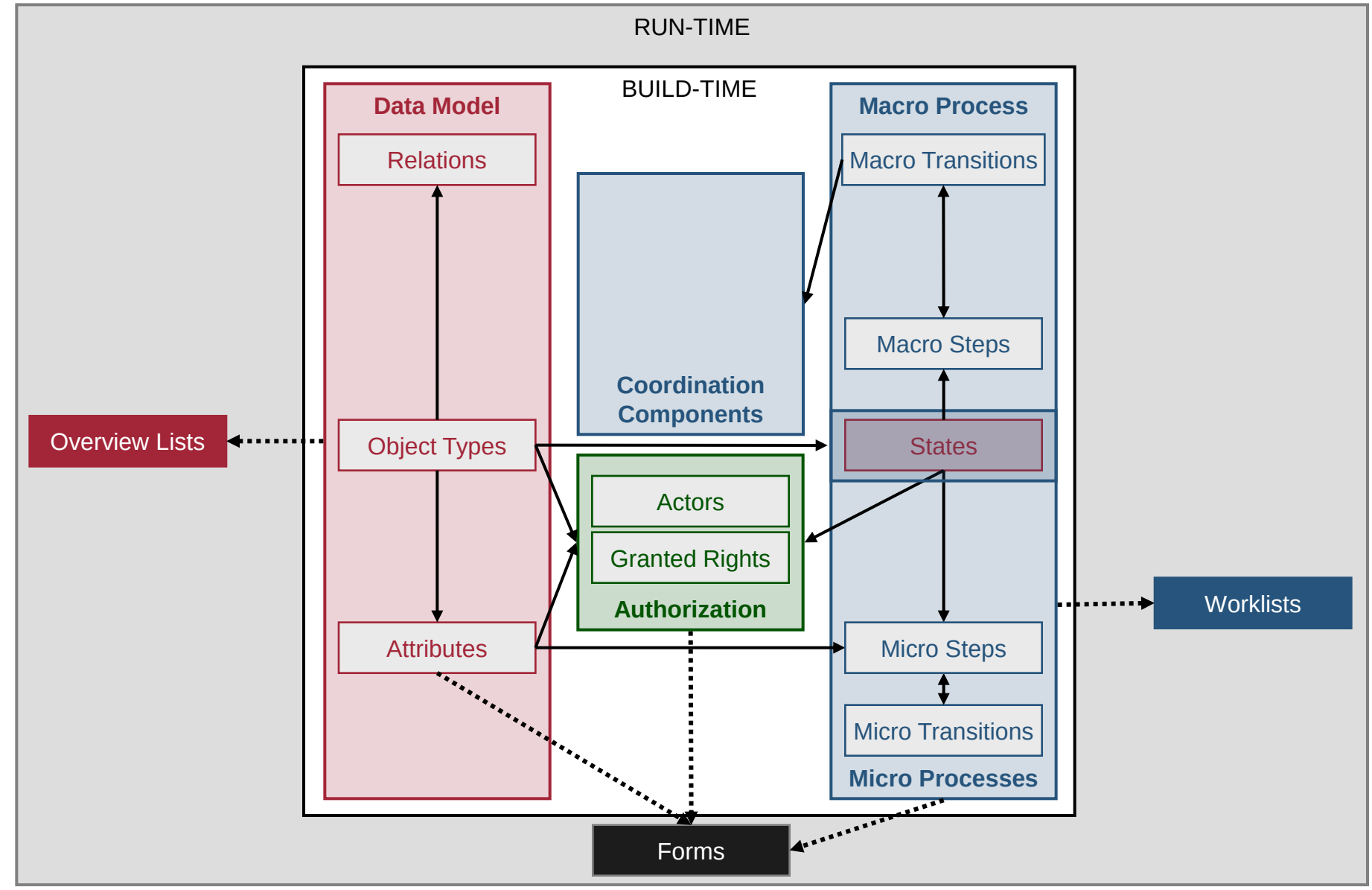


Set Relations in a Macro Process

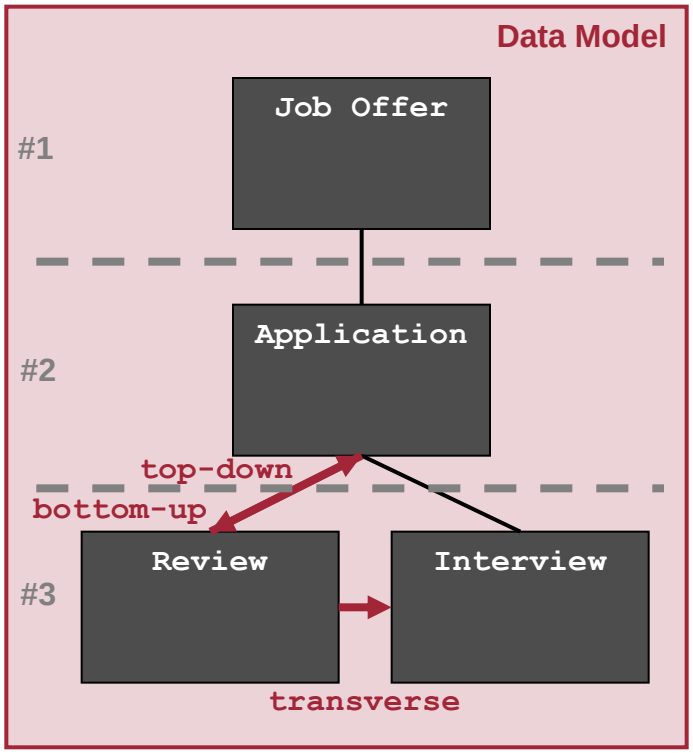


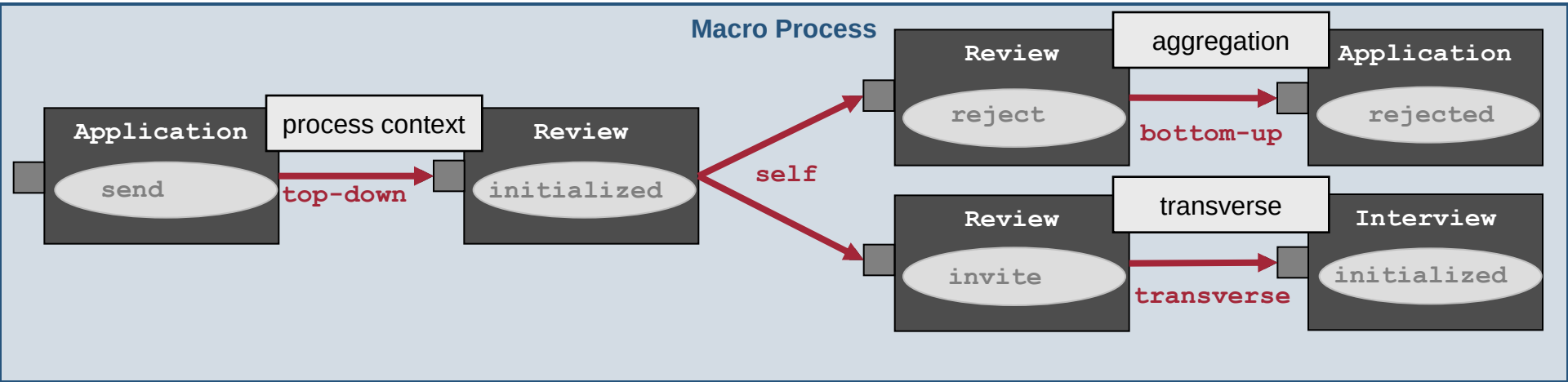


Meta Model

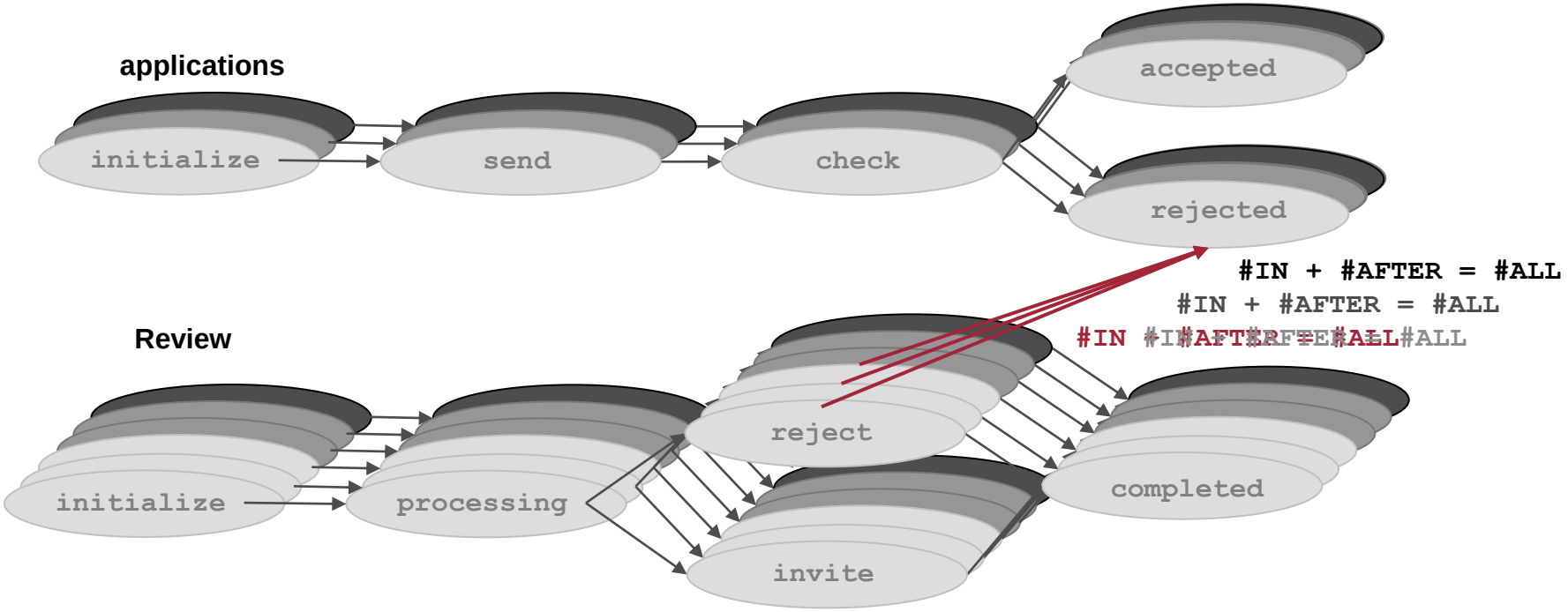


Defining Coordination Components

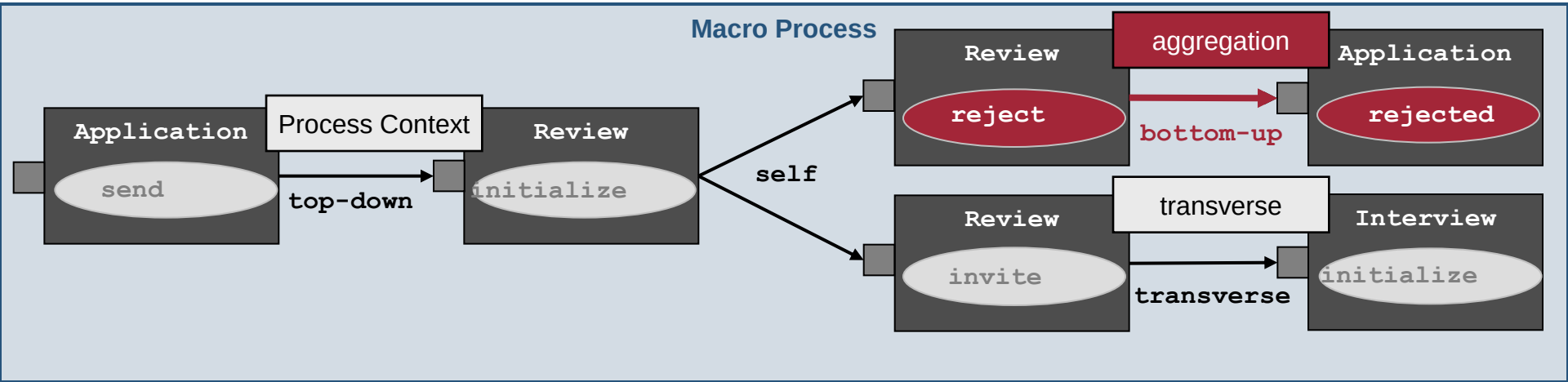




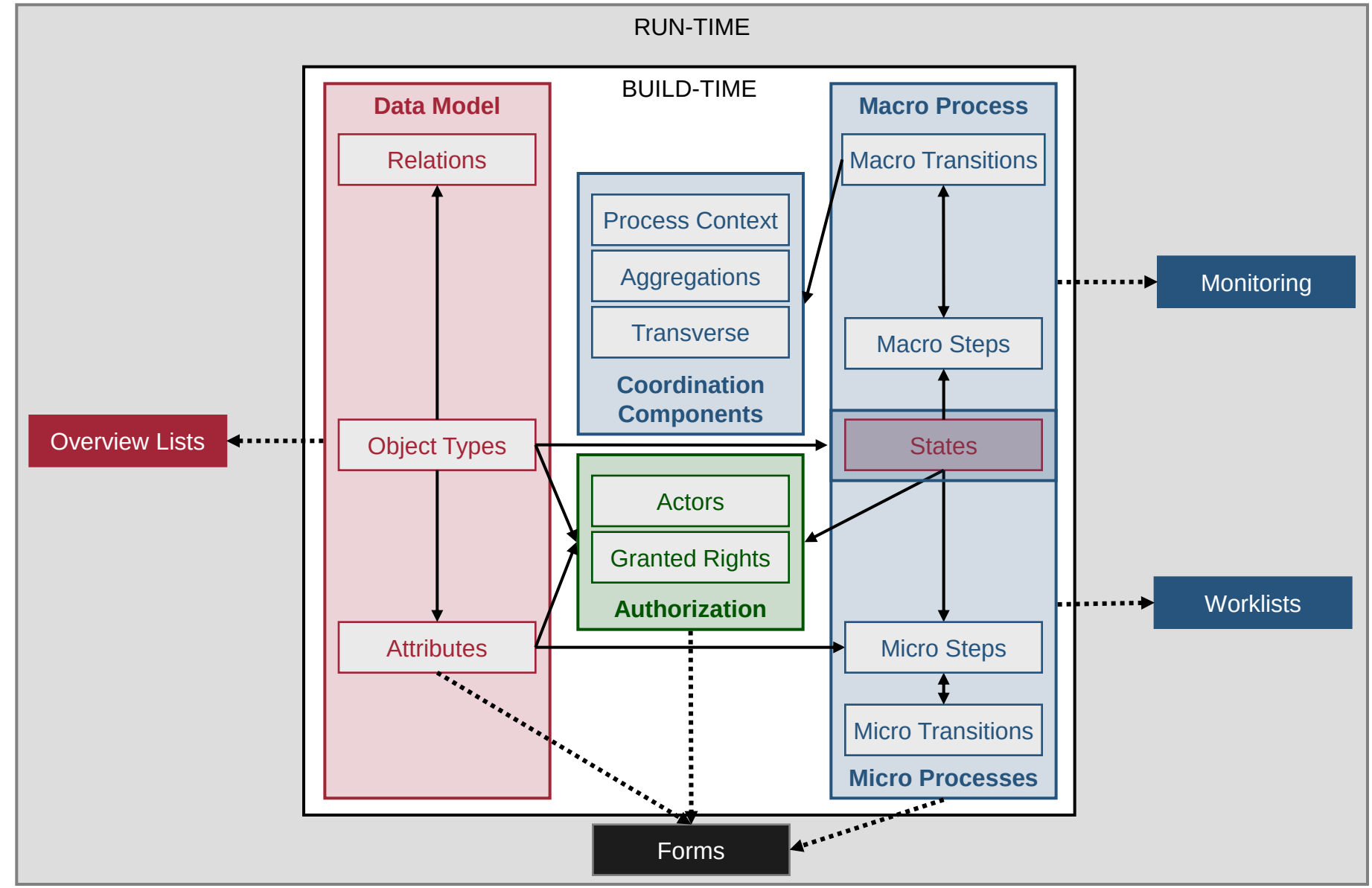
Aggregations



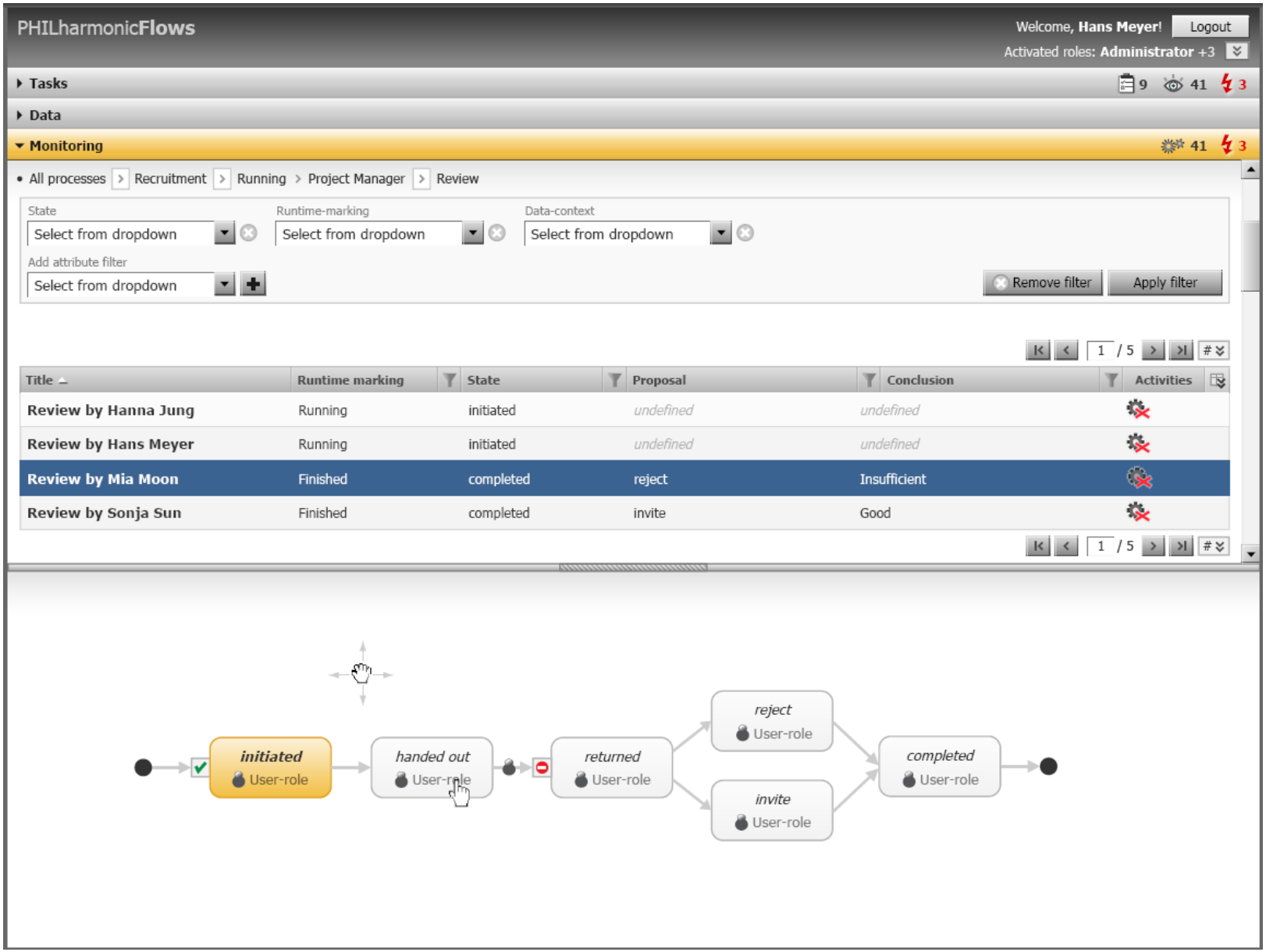
#ALL #IN #BEFORE #AFTER #SKIPPED



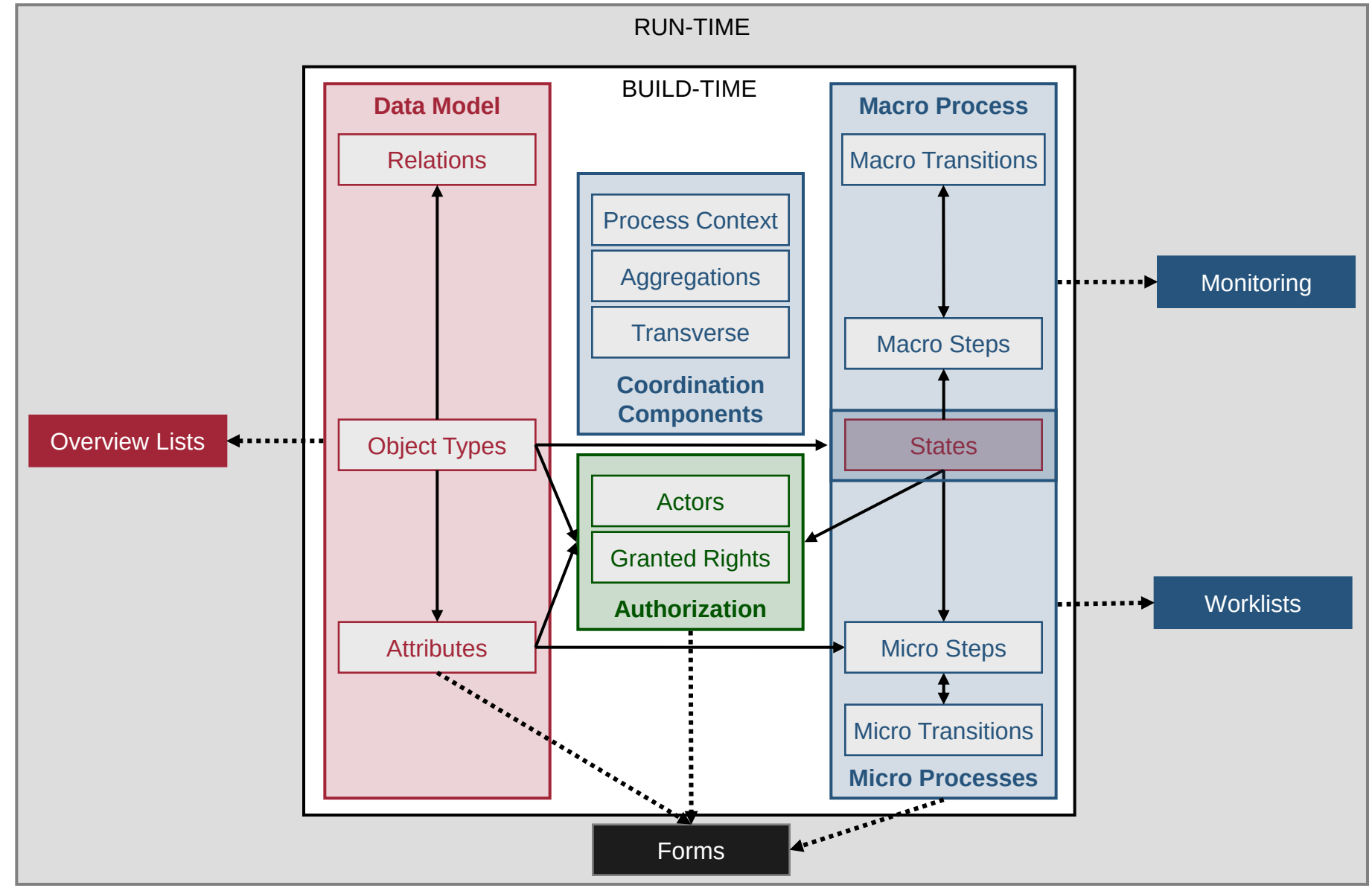
Meta Model



Monitoring



Meta Model



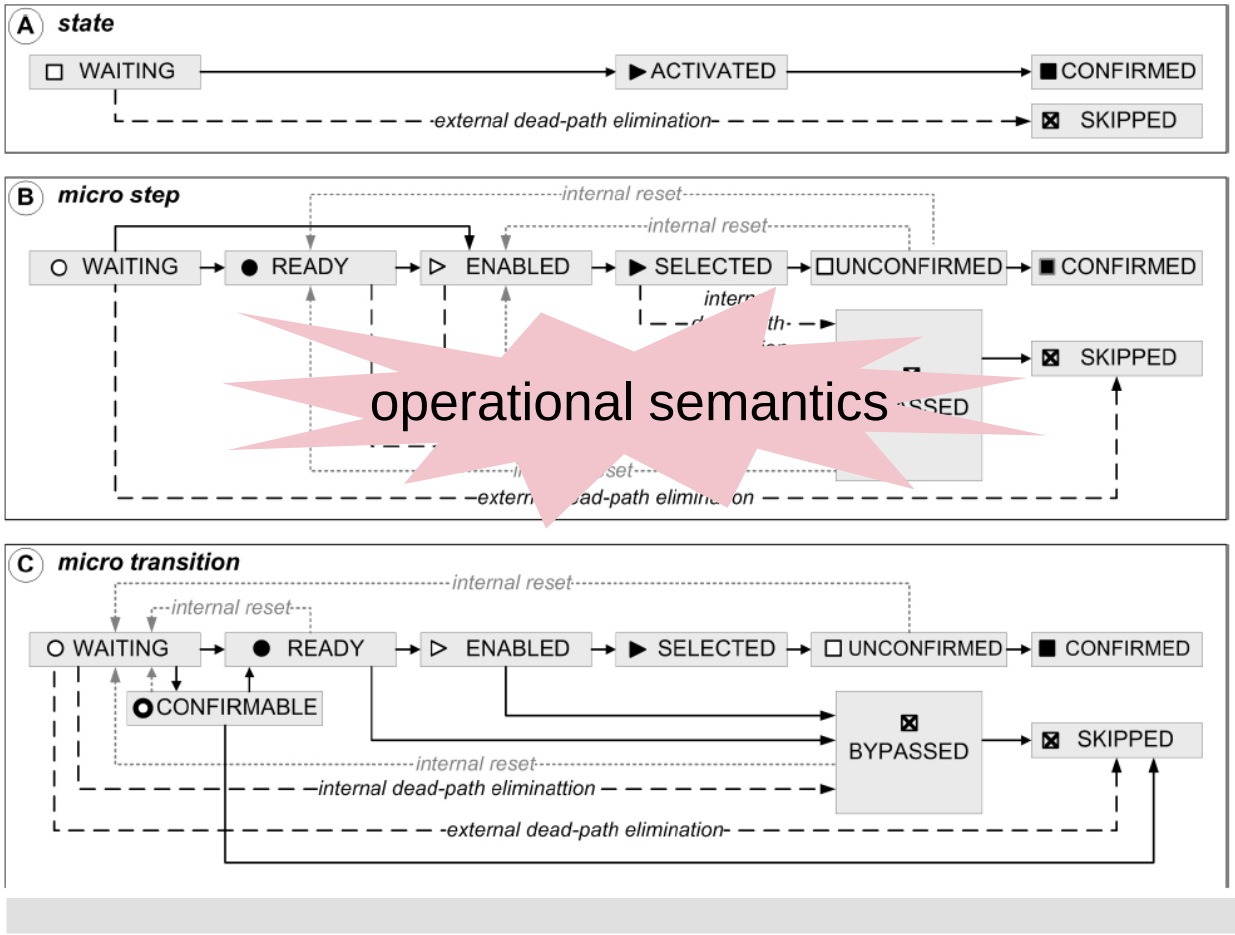
Covering all Phase of the Process Lifecycle

Formal semantics

Modeling

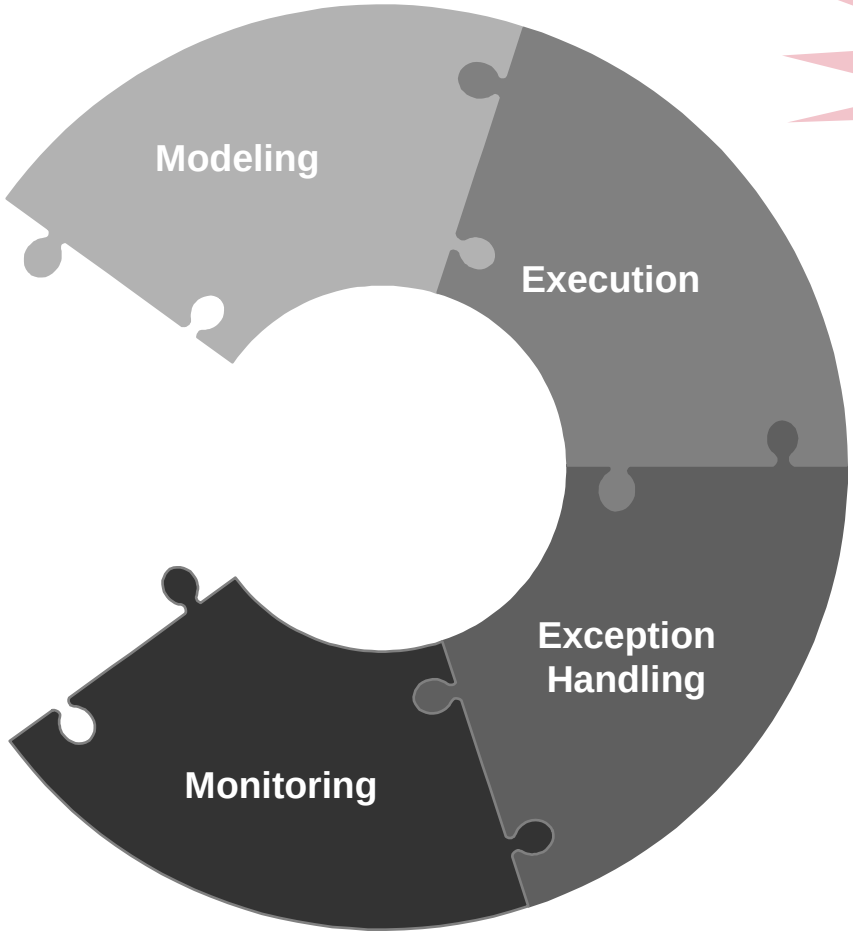
Exe

operational semantics



(2011) Künzle, Vera and Reichert, Manfred
A Modeling Paradigm for Integrating Processes and Data at the Micro Level
In: 12th Int. Working Conference on Business Process Modeling, Development and Supplocation (*BPMDS,11)*. Springer, LNBIP 81, pp. 201-215.

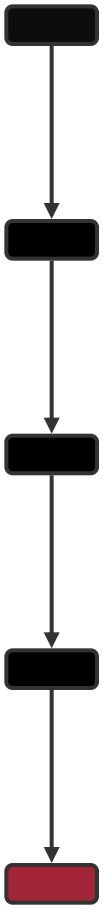
Covering all Phases of the Process Lifecycle



Deadlocks

Abstraction & Aggregation
(for concurrent micro processes)

Agenda



Backgrounds

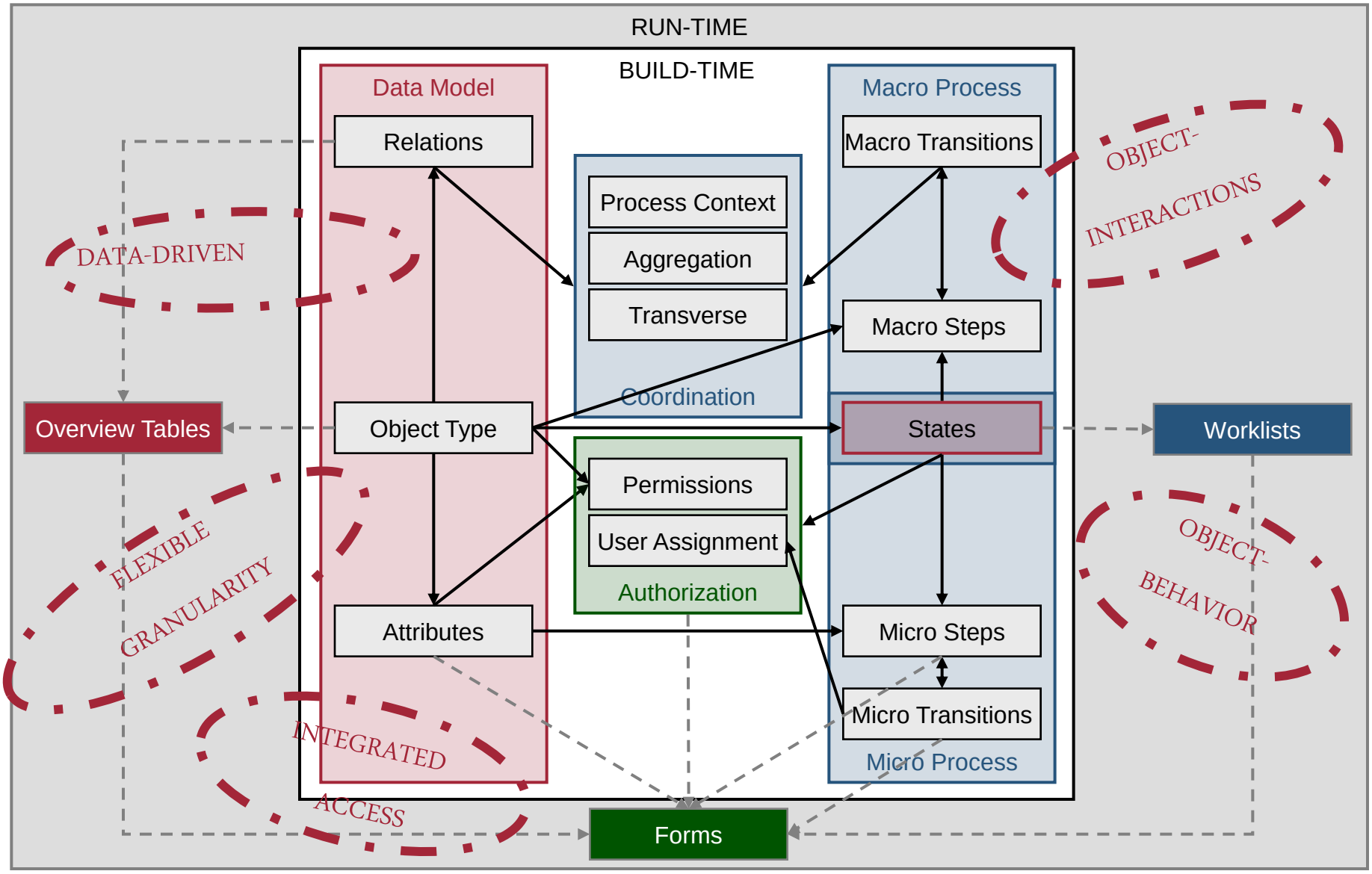
Data as Driver of Large Processes

Object-Aware Processes

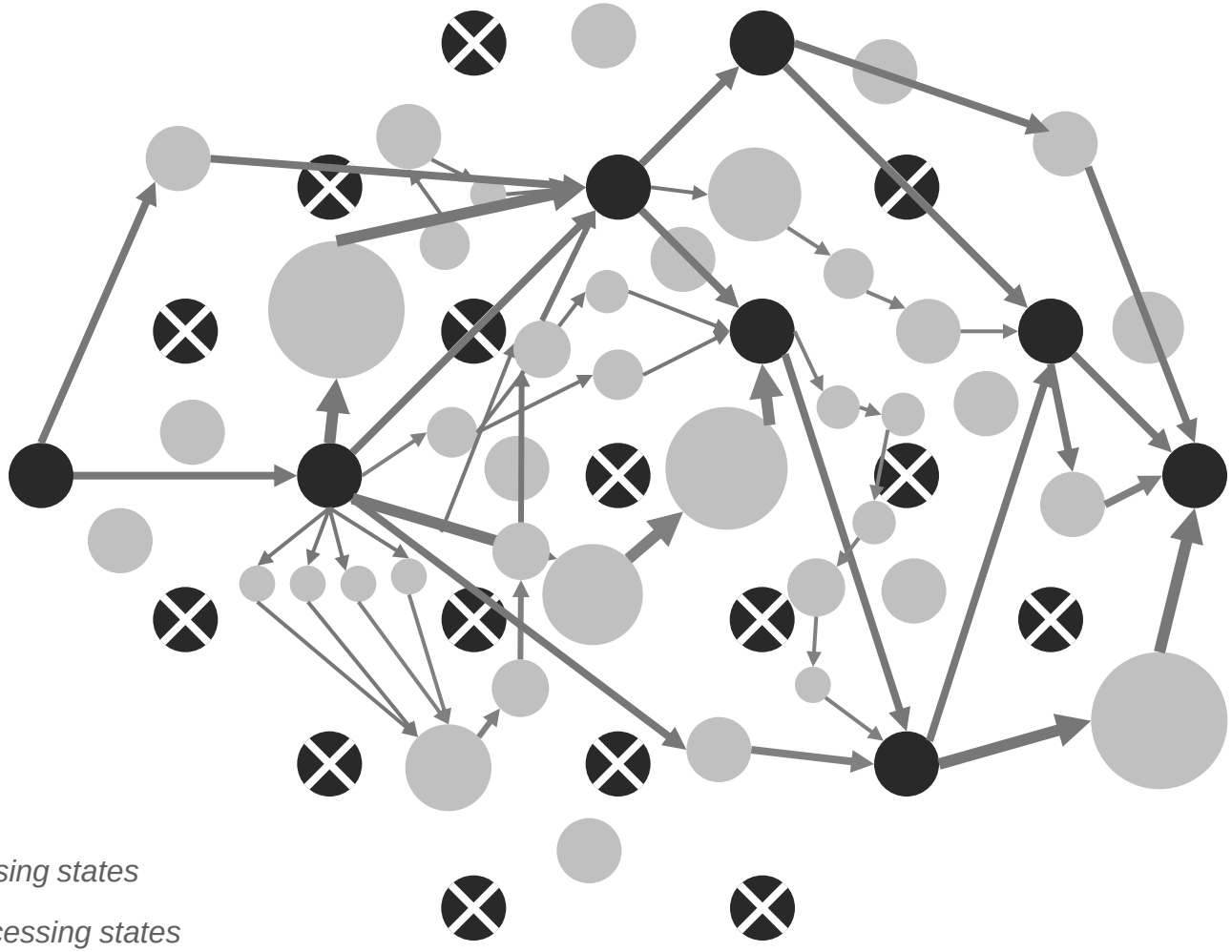
The PHILharmonicFlows Framework

Summary

Object-Aware Processes in PHILharmonicFlows



Benefit: Increased User Flexibility



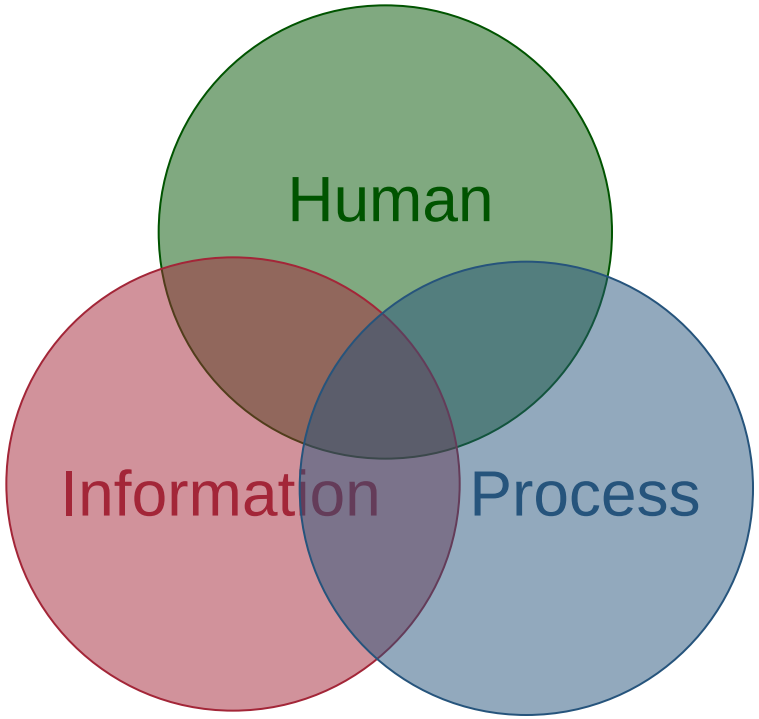
Defined processing states

Disallowed processing states

Optional processing states

Activities

Research Contribution



PHILharmonicFlows

Process, **H**umans and **I**nformation **L**inkage for **harmonic** Business **Flows**

http://www.uni-ulm.de/in/iui-dbis/forschung/projekte/philharmonic-flows.html