

From Business Application Execution to Design through Model-Based Reporting

Ta'id HOLMES (福尔摩斯·大山)
SAP Research

EDOC 2012, Beijing (北京), China (中国)
September 14, 2012

Context and Background

Enterprise Systems Become Increasingly Complex

- unify different technologies
- are adapted for new and emerging technologies
- need to comply with imposing requirements

Model-Driven Engineering (MDE)

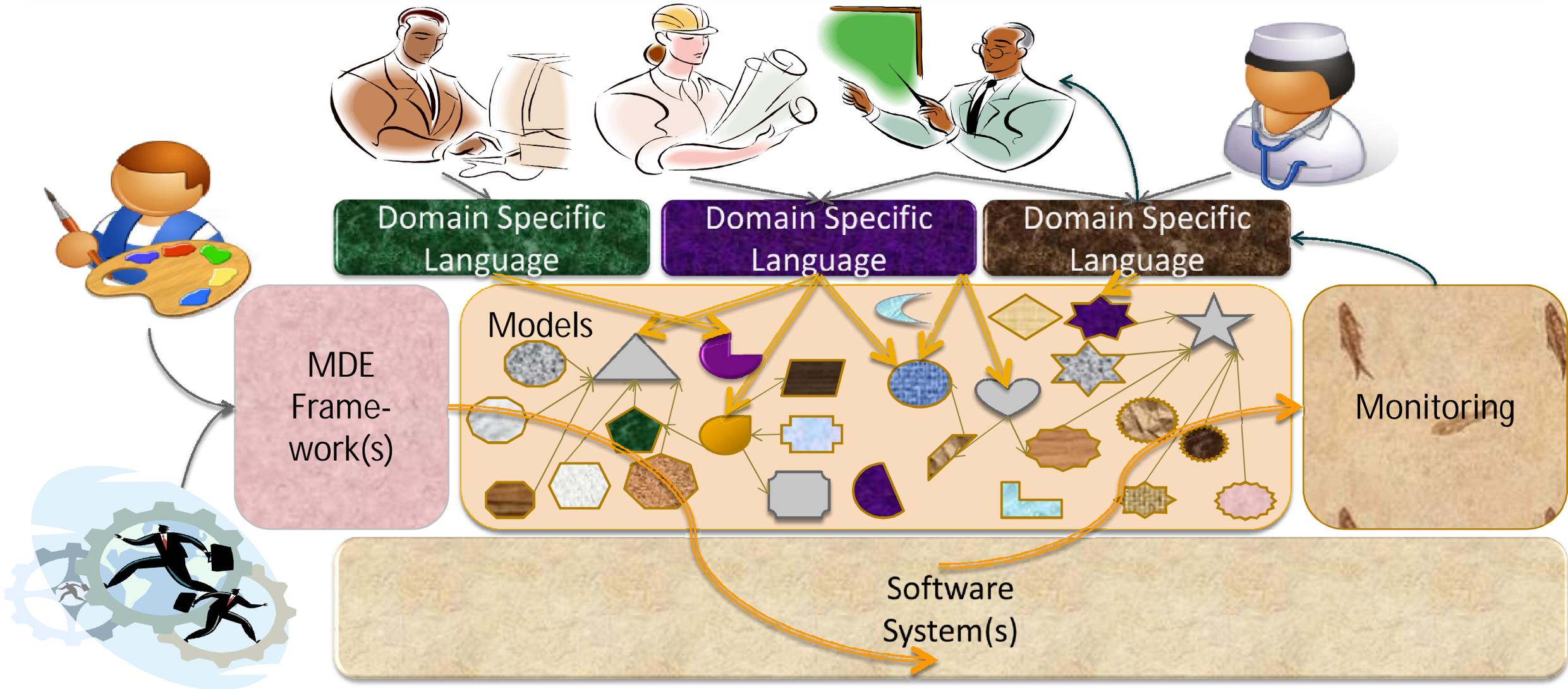
- helps to master complexity (design-time)
- utilizes **models** as central artifacts

Motivation: Foster the Use of Models in Software Systems

Models are cross-disciplinary accepted as a means to deal with complexity.

- precisely specified
- instances can be validated
- can be (d|r)efined at different abstraction levels
- are suitable to be represented to stakeholders
- can be bound to tailored domain specific languages (DSLs)
- a view-based approach can support the separation of concerns (SoC) principle

A Model-Centered World



Problems

MDE does not (yet) cover the whole lifecycle.

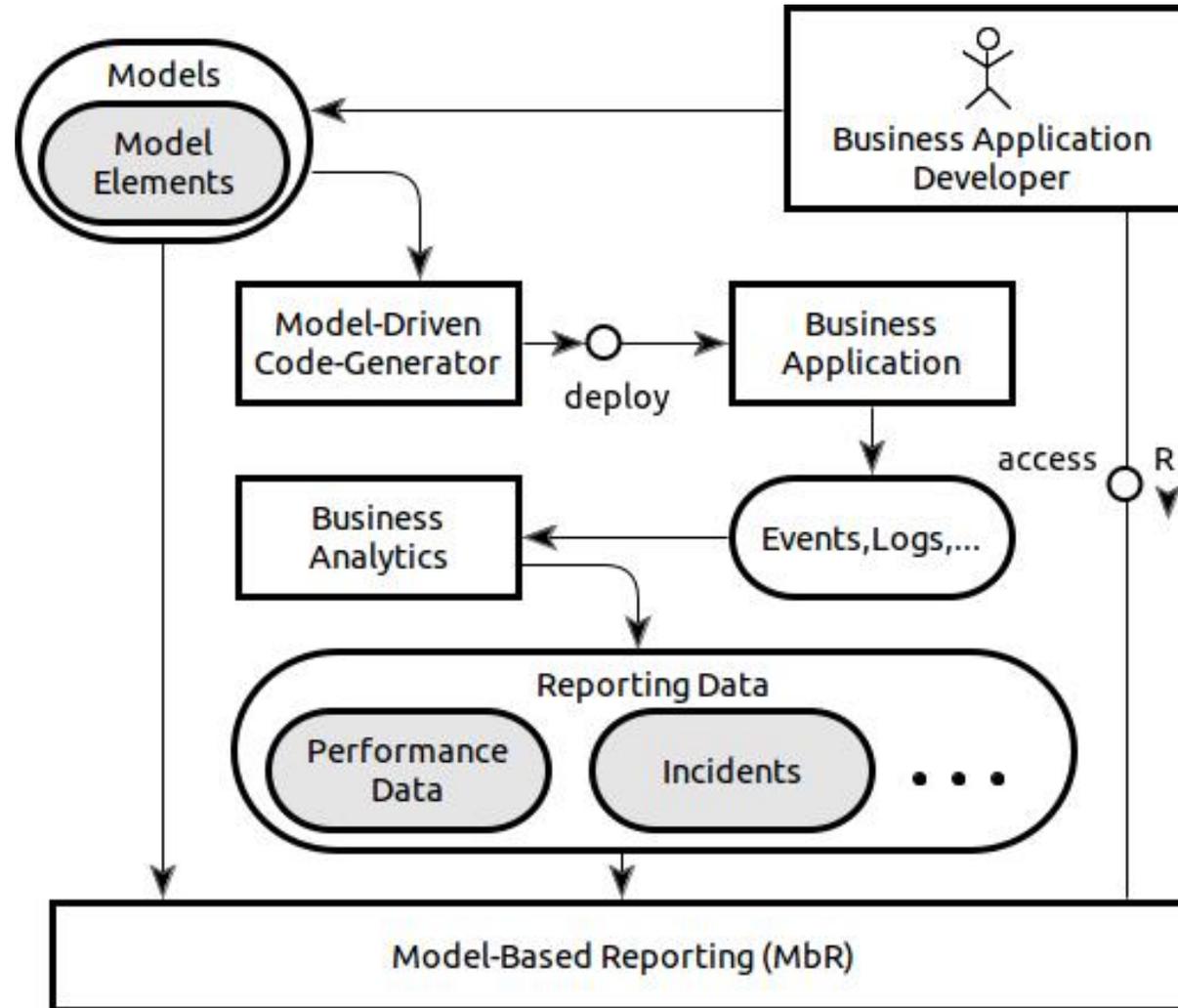
- Traceability is often lost after a generation step.
- Model-driven systems have no relation to their models.

Legacy systems are not connected to conceptual models at all.

In other cases

- synchronization is expensive.
- model-related reporting is specific to a domain (e.g., BPM) or product
- and is not easily extensible towards new types of reporting data.

Contribution: Model-Based Reporting



Some Assumptions for Model-Based Reporting

1. model: apply the MORSE Principle [1]

- i.e., assign a universally unique identifier (UUID) to every model and model element (`modelElementID`)
 - via annotations directly in the model
 - or by registering the model in a MORSE repository

2. application: provide for traceability

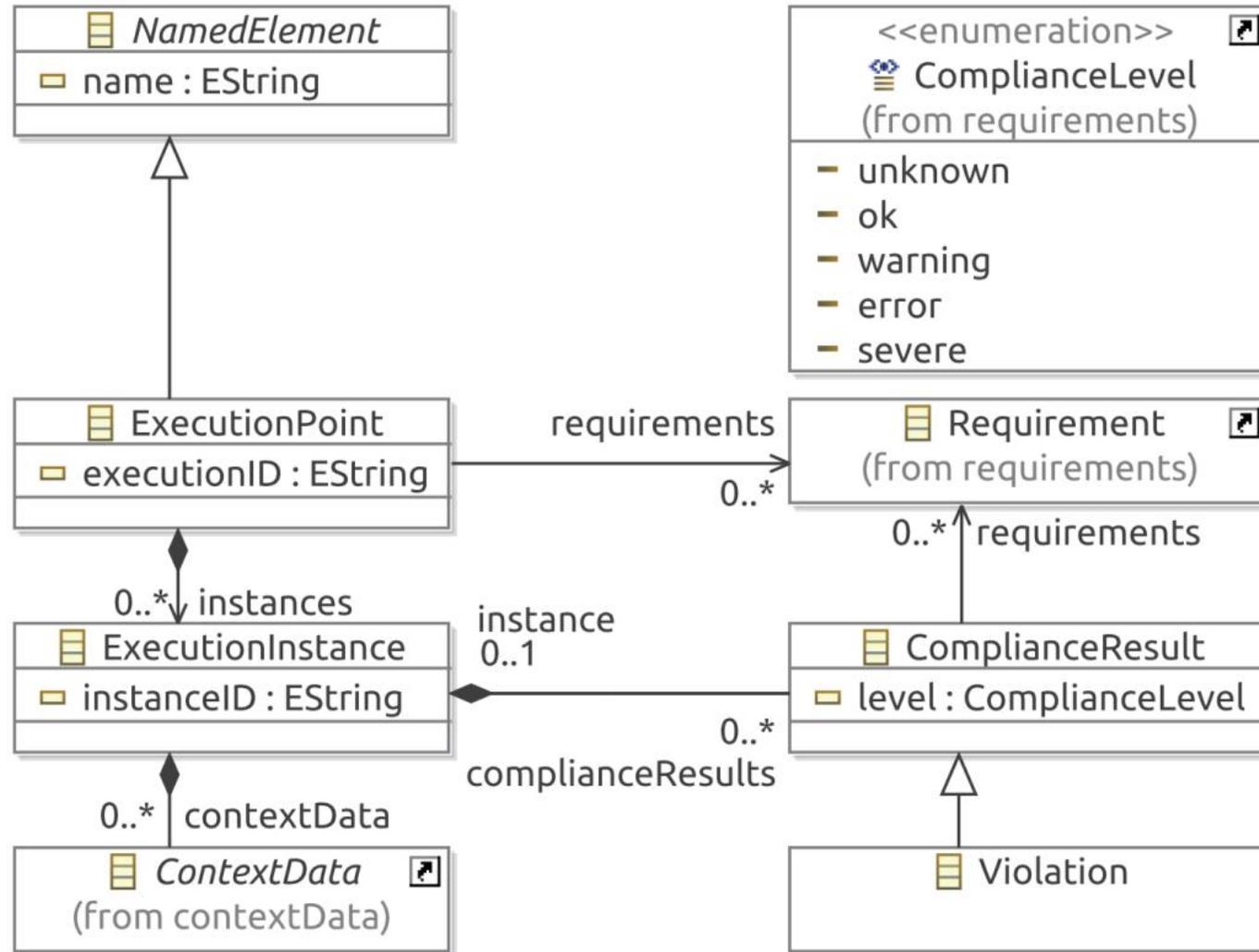
- generate UUIDs for execution points (`executionID`)
- instrument the code
 - with eventing: raise an event containing the `executionID` and an `instanceID`

3. MbR correlation service: create a MbR view

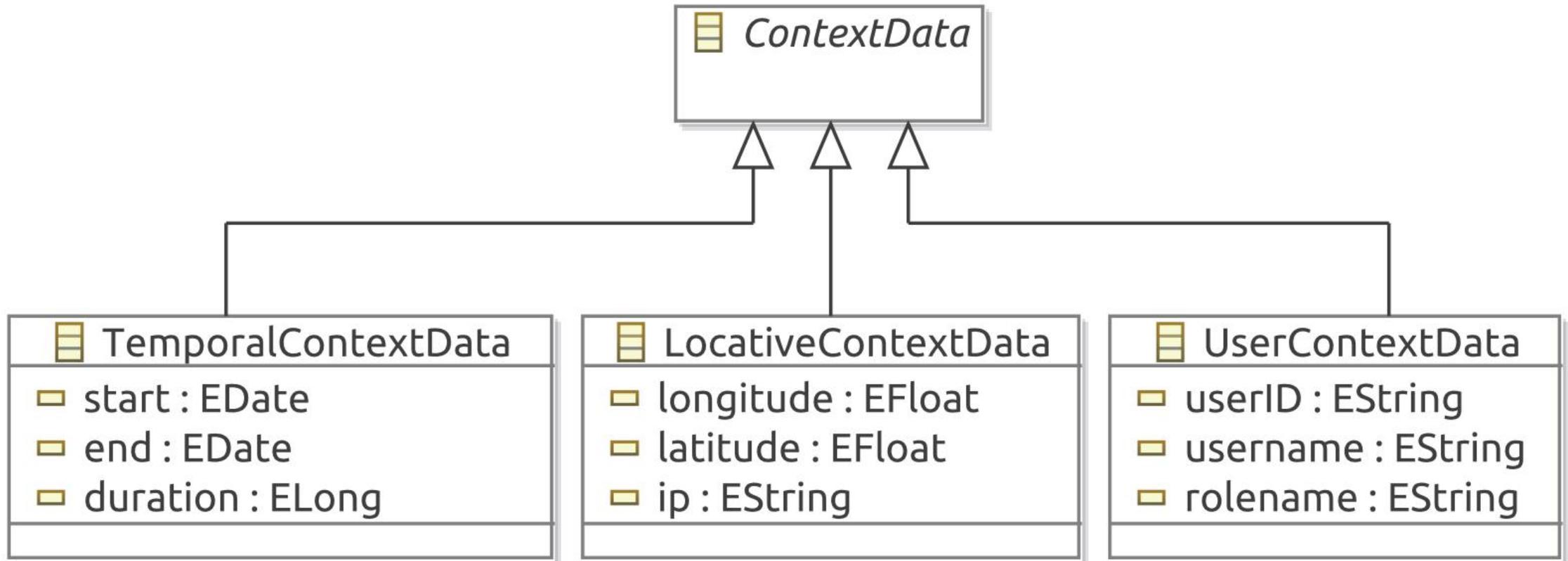
- register `modelElementIDs` with `executionIDs`

[1] Holmes, T.; Zdun, U.; Dustdar, S. "MORSE: A Model-Aware Service Environment", *APSCC*, **2009**, 470-477

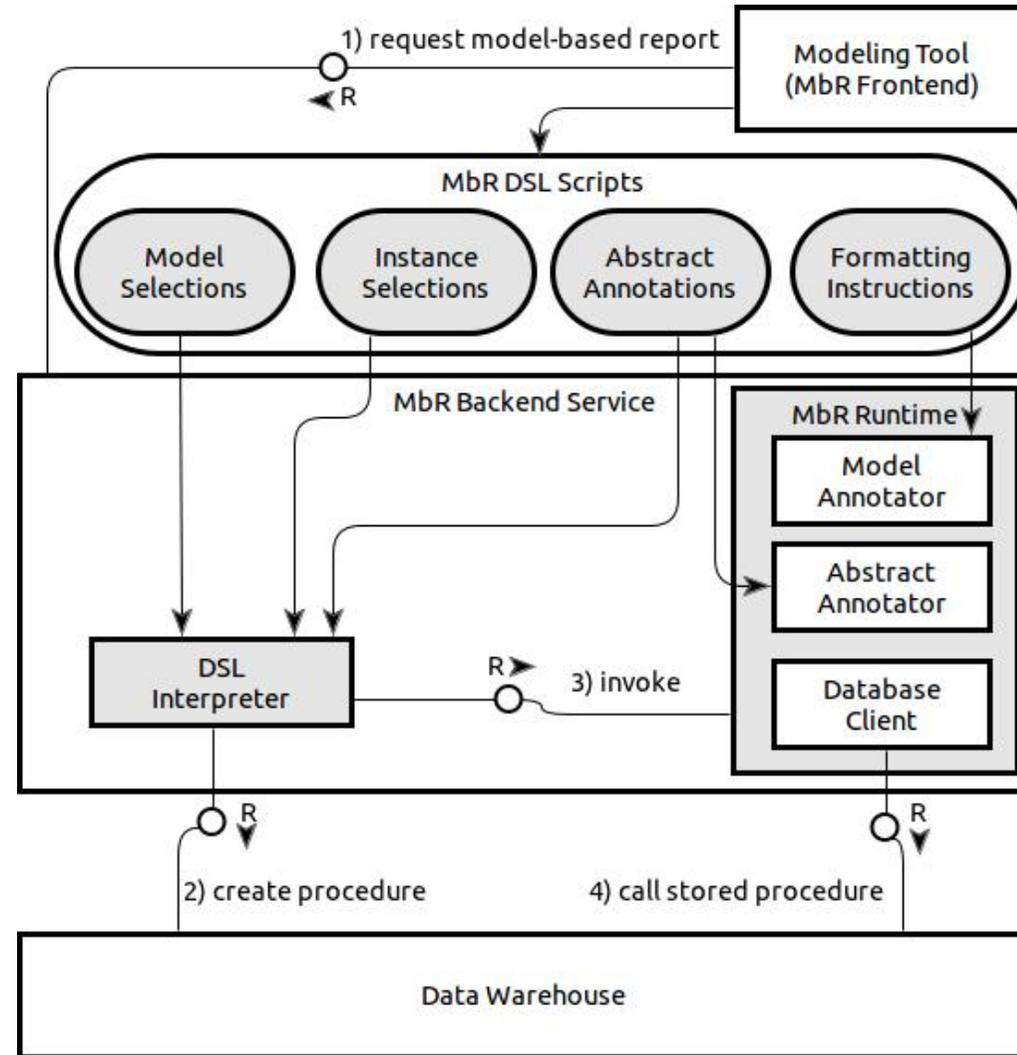
Reporting Data (Proof of Concept) Metamodel



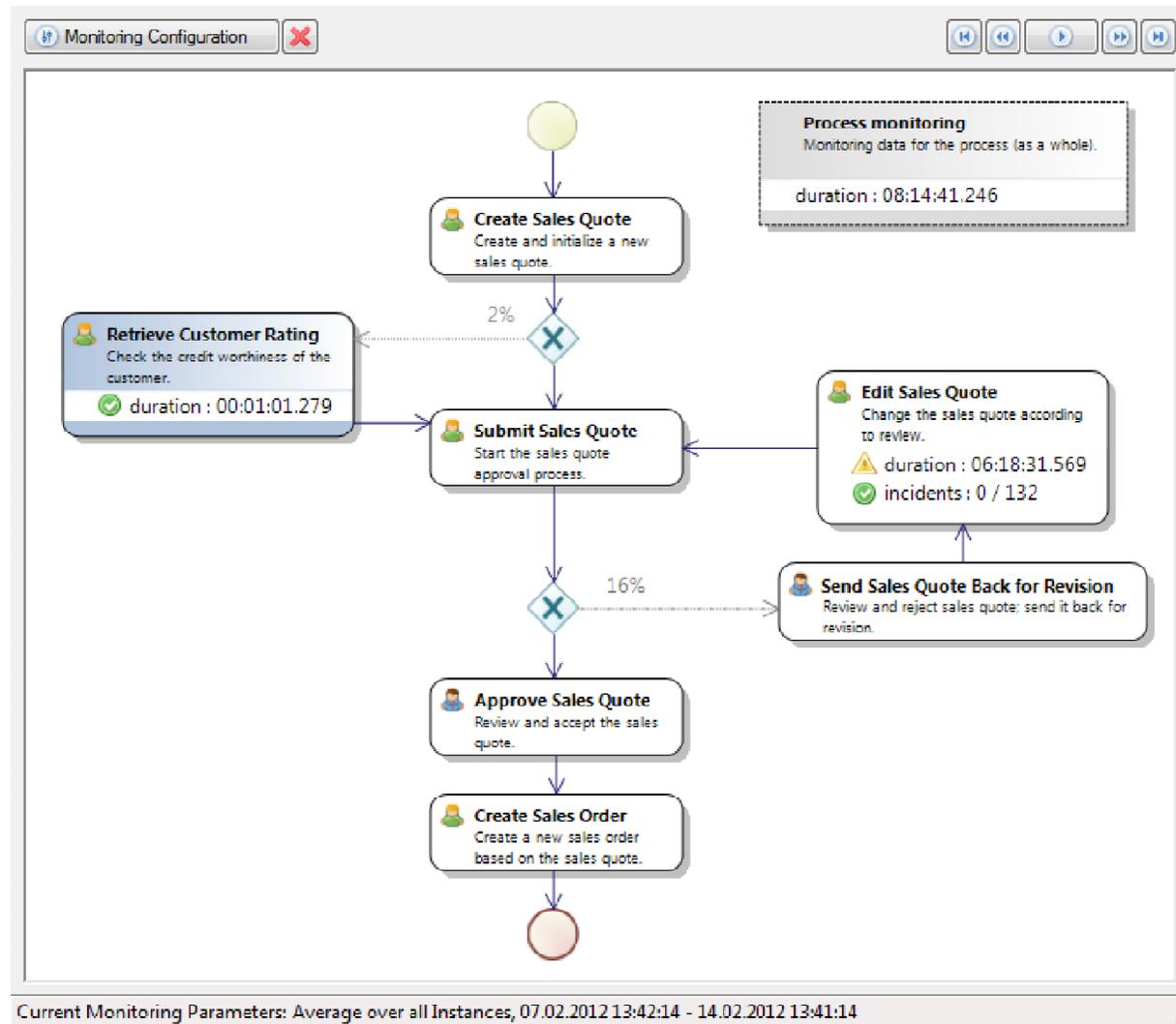
Runtime Context Data (Proof of Concept) Metamodel



Model-Based Reporting — Architectural Overview



Business Process Monitoring – Powered by MbR



MbR DSL Script – Sales2Order Example

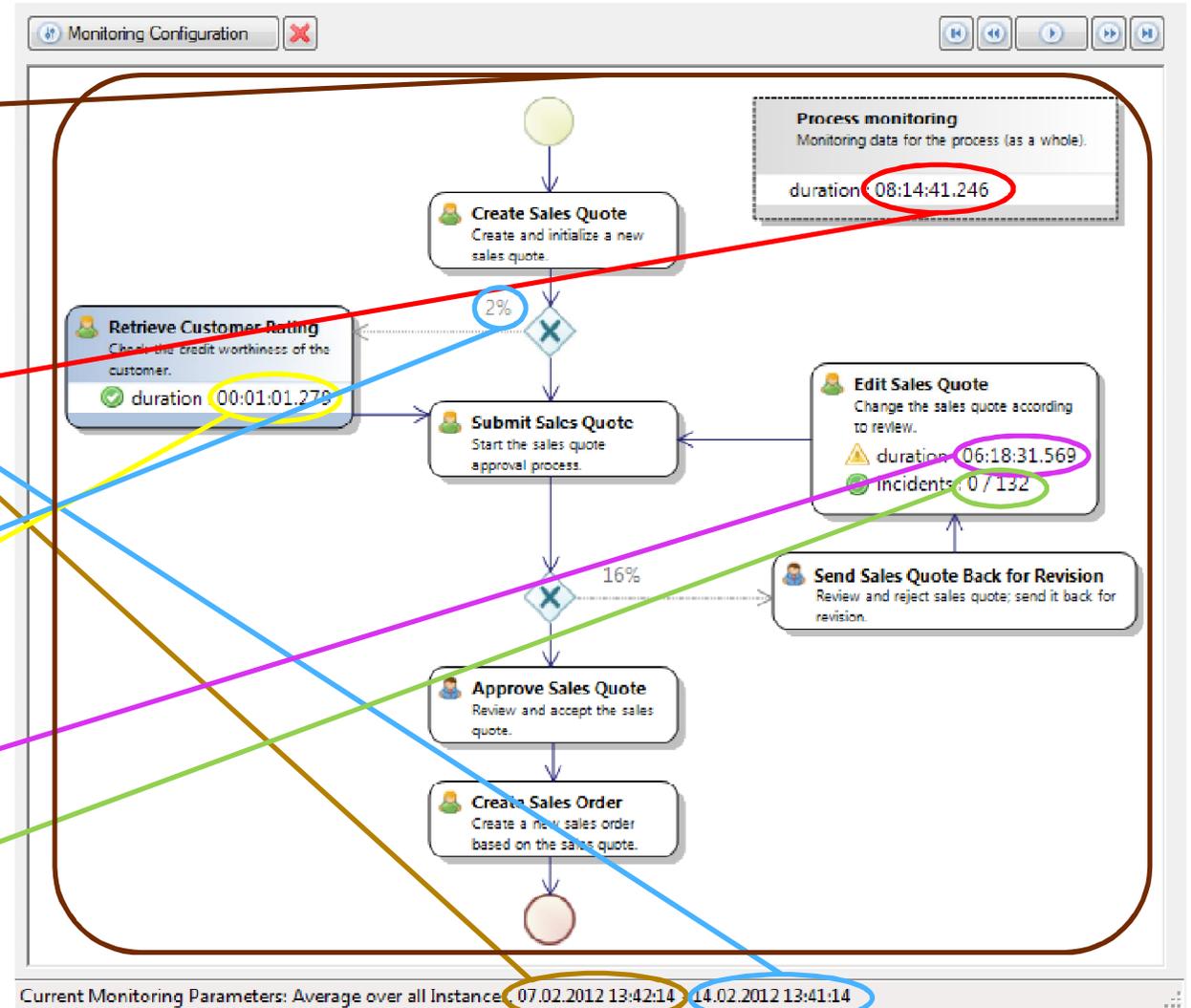
```
1 // Model Selection (1st part)
2 m: Order2Cash
3
4 // Instance Selection (2nd part)
5 b: m.start >= "2012-02-07 13:42:14"
6     & m.end < "2012-02-14 13:42:14"
7
8 // Abstract Annotation (3rd part)
9 m << duration = AVG(b.duration)
10
11 557dbb5d-7558-4f8e-acc6-d618f12487a6
12 b3b6e8e5-3b30-44a3-8dd5-29f354c60877
13     << rate = COUNT(b.visit)/COUNT(b*)
14
15 8ee48a10-01f0-49a3-b4f5-e13acb5829c5
16     << durRCR = AVG(b.duration)
17
18 f35837fa-7fcc-4fc4-9e2a-ac2ddb696ed
19     << durESQ = AVG(b.duration)
20     << incidents = COUNT(b.violation)
21         + " / " + COUNT(b*)
22
23 // Formatting Instructions (4th part)
24 duration >> Rectangle {
25     display: absolute; x: 465; y: 60;
26     background: lightgray;
27     gradient: left2right;
28     gradient-color: white;
29     dashstyle: dash;
30 }{}
31 rate >> Edge {
32     display: relative; y: -15;
33 }{
34     color: $ < 50 ?
35         rgb(128,128,128) : rgb(255,255,255);
36     dashstyle: $ < 50 ? dot : dash;
37 }
38
39
40
41
42
43
44
45
46 durESQ("duration"),incidents >> Comment {
47     display: inline;
48 }{
49     display-compliance: true;
50 }
```

MbR DSL Script – Sales2Order Example

```

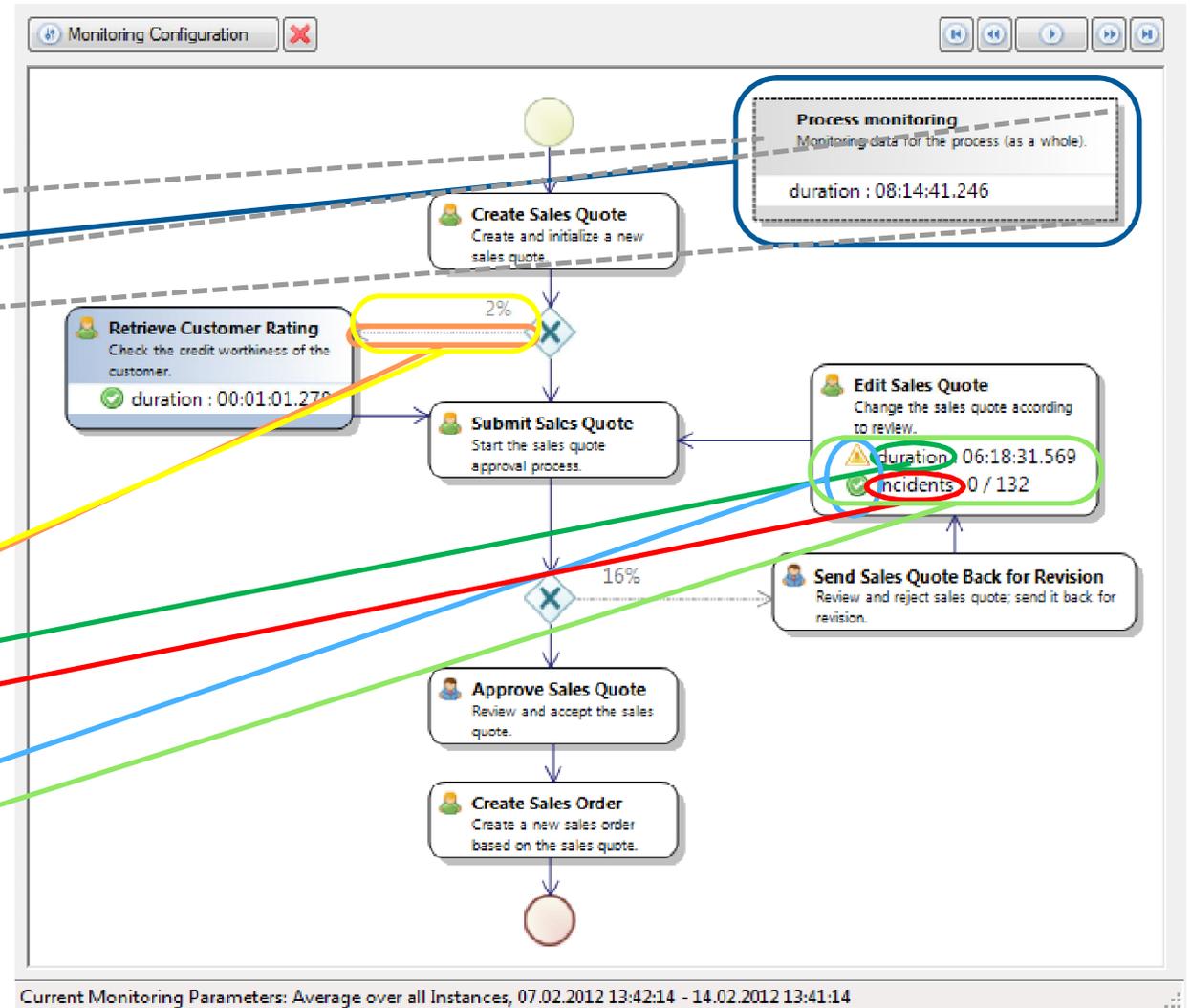
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21     + " / " + COUNT(b*)

```



MbR DSL Script – Sales2Order Example

```
23 // Formatting Instructions (4th part)
24 duration >> Rectangle {
25   display: absolute; x: 465; y: 60;
26   background: (lightgray);
27   gradient: left2right;
28   gradient-color: (white);
29   dashstyle: (dash);
30 }
31 rate >> Edge {
32   display: relative; y: -15;
33 }{
34   color: $ < 50 ?
35     rgb(128,128,128) : rgb(255,255,255);
36   dashstyle: $ < 50 ? dot : dash;
37 }
46 durESQ("duration"), (incidents) >> Comment {
47   display: inline;
48 }{
49   display-compliance: true;
50 }
```



Model Annotations: Results from the MbR DSL Script Execution

```
<ModelAnnotations>
  <annotationElements xsi:type="modelAnnotations:Comment",
    modelID="557dbb5d-7558-4f8e-acc6-d618f12487a6">
    <styles xsi:type="presentation:PositionStyle" display="relative" y="-15"/>
    <styles xsi:type="presentation:ColorStyle" color="#888888"/>
    <styles xsi:type="presentation:LineStyle" dashstyle="dot"/>
    <contents xsi:type="annotationContent:Metric" value="2" unit="Percent"/>
  </annotationElements>
  <annotationElements xsi:type="modelAnnotations:Comment",
    modelID="f35837fa-7fcc-4fc4-9e2a-ac2ddb696ed">
    <styles xsi:type="presentation:PositionStyle" display="inline"/>
    <contents xsi:type="annotationContent:KeyValuePair" complianceLevel="warning"
      key="duration">
      <value xsi:type="annotationContent:Metric" value="06:18:31.569" unit="Time"/>
    </contents>
    <contents xsi:type="annotationContent:Text" complianceLevel="ok" value="0 / 132"/>
  </annotationElements>
  <!-- ... //-->
</ModelAnnotations>
```

Benefits

- MbR approach is platform & technology independent through DSL
 - decouples the reporting (diverse products; one MbR service backend)
 - domain agnostic
- extensible reporting data metamodel
- unified environment for business application engineering
 - frontend for different phases of the lifecycle (e.g., modeling & reporting tool)
 - MbR frontend can be integrated into a modeling tool

Acknowledgments

- Heiko WITTEBORG
- Wei WEI (危巍)
- Andreas ROTH
- Anis CHARFI
- Dirk MAYER
- *reviewers*



GEFÖRDERT VOM





Thank You!

谢谢!

Dr.techn. Ta'id HOLMES, DEA (博士·福尔摩斯·大山)

Researcher | SAP Research

SAP AG | Bleichstraße 8 | 64283 Darmstadt | Germany

T +49 6227 7-77849 | F +49 6227 78-56288 | E taid.holmes@sap.com | W <http://research.taid.holmes.at>

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