

# Advanced Business Process Instance Monitoring in WSO2 Carbon

by

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# Overview

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Research on Process Views

Business Process Illustrator

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# Introduction



# Institute of Architecture of Application Systems (IAAS)

University of Stuttgart institute with

- about 25 researchers
- plus about 35 Diploma/Master theses students per year
- All do research on SOA / BPM / Cloud / Middleware subjects

→ One of the largest SOA/BPM research institute at an European University

Director: Frank Leymann

- Former IBM distinguished engineer
- “Father” of IBM workflow products and WS-BPEL

We are teaching 200+ students per year

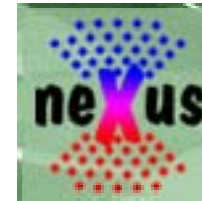
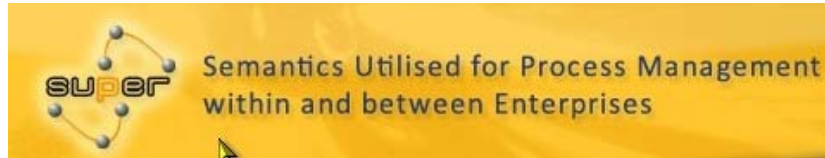
- SoC/SOA, BPM, Middleware, Application Architecture

We provide SOA/BPM consultancy for industry

...and perform projects directly funded by industry



# Projects Funded by Public Agencies



# With Whom We Cooperate (Selection)



N/A



# Bilateral Project-Related Cooperations

DAIMLER

IBM®

ERICSSON 

T · · Systems · · ·

 **BOSCH**

ORACLE®

\_betasystems

**Microsoft®**

 Bundesamt  
für Sicherheit in der  
Informationstechnik

icon  
Systemhaus GmbH

**IIR** | deutschland  
KONGRESSE & SEMINARE

**SAP**®

bwcon  
baden  
württemberg:  
connected

# Research on Process Views



# The Problem: Increasing Complexity in BPM

The problem we would like to address:

- Complexity of business processes is increasing fast - business processes are hard to grasp
- Up to hundreds of activities contained in a process - business processes are too large
- Multiple cross-cutting concerns to be considered (Security, Compliance, Performance ...)

*Process views* help us here: abstraction from details and making complex processes easier to understand



# Process Views: What can they be used for?

“Process views are the graphical presentation of the result obtained after specific *transformations* have been applied to a process model”

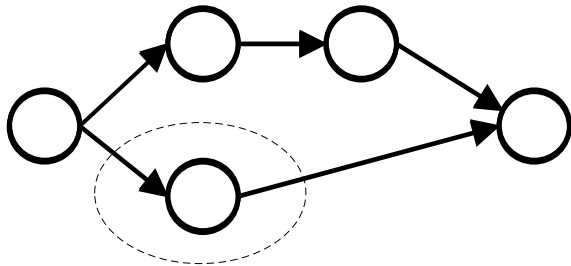
Manifold purpose of process views

- Abstract process complexity - summarize
- Omit what is unimportant to you - filter
- Support your way of thinking - translate
- Enrich processes with your data - link



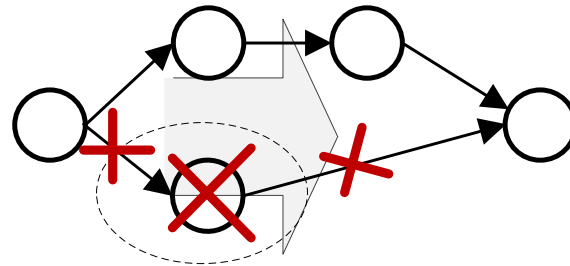
# Process View Terminology

Original Process

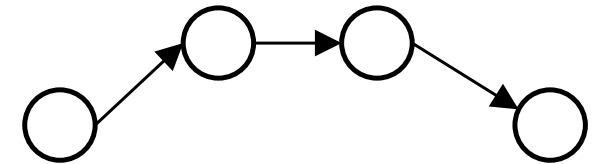


Target Set

View Transformation

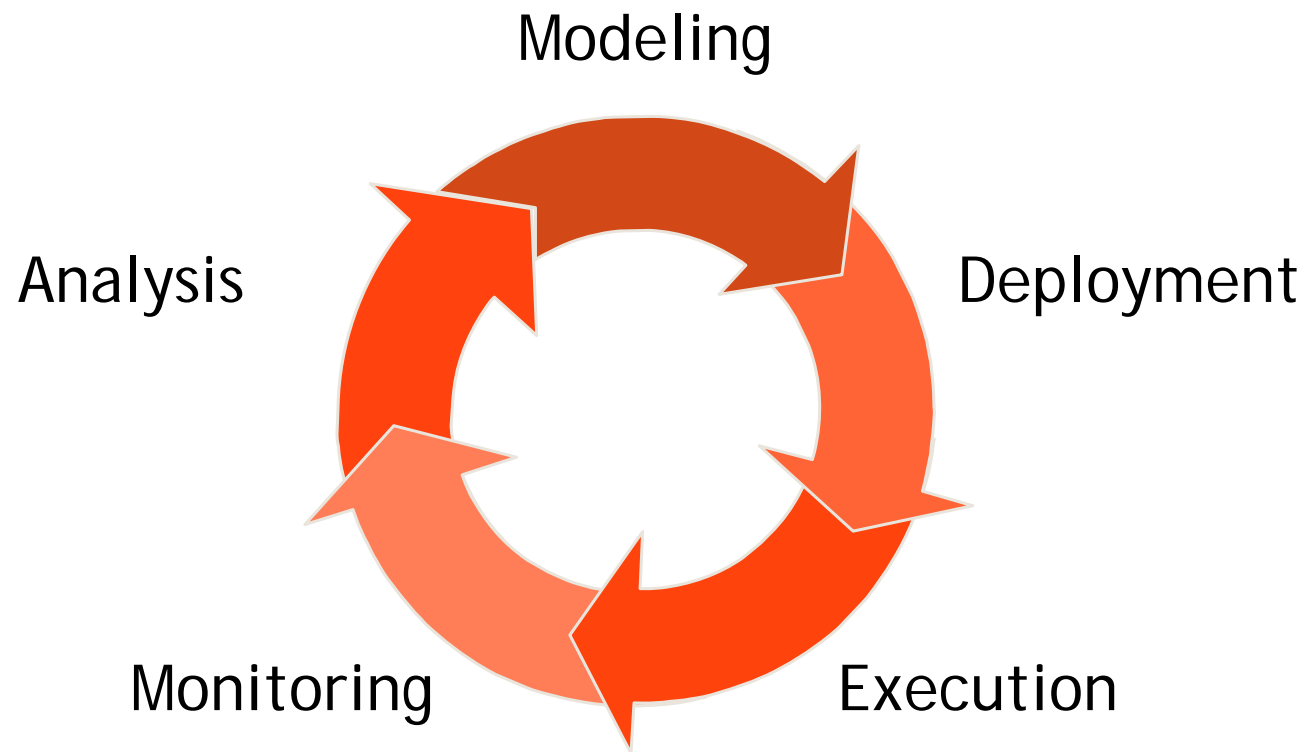


Process View



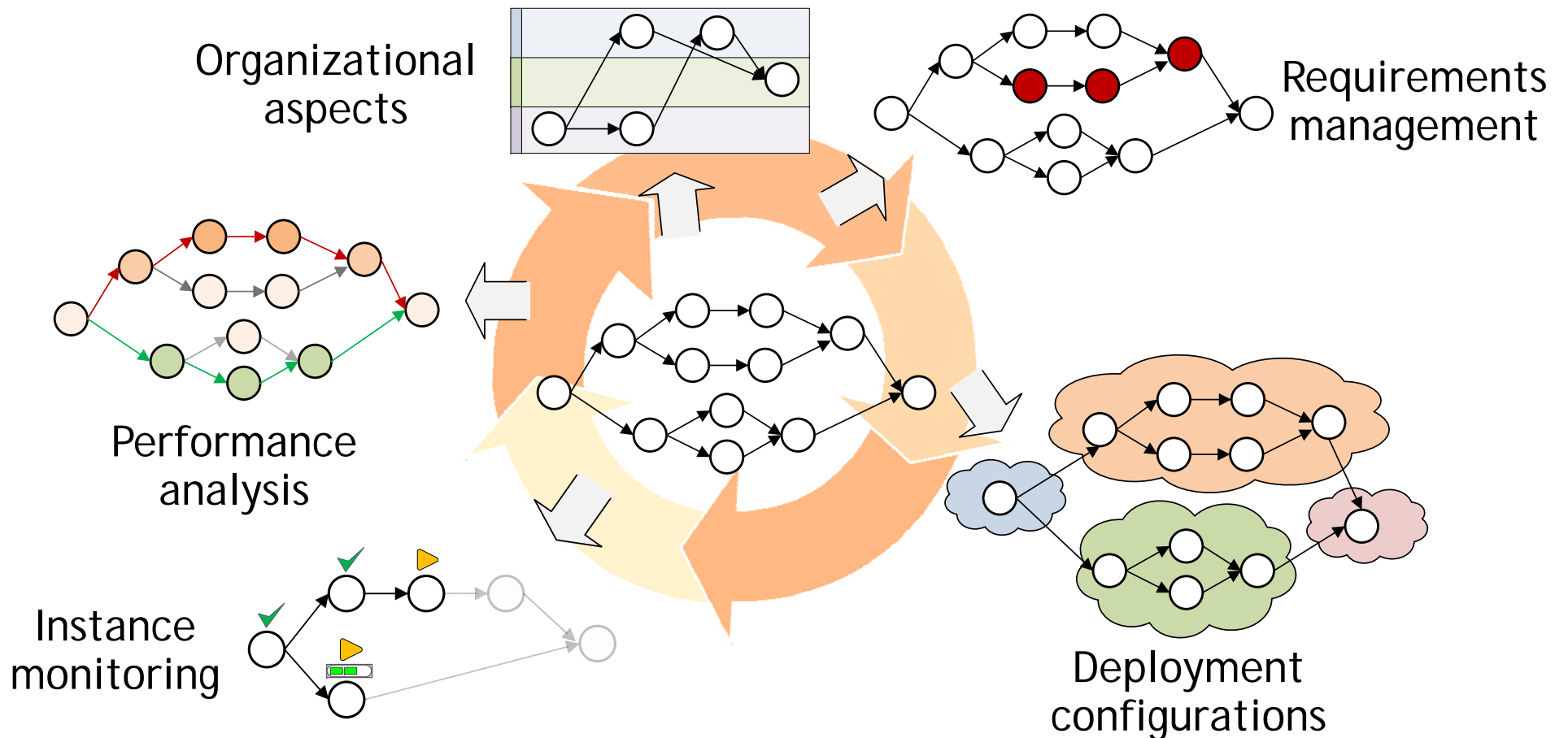
# Process Views - Some Examples

Process views can be used *along the lifecycle* of business processes



# Process Views - Some Examples

Process views can be used *along the lifecycle* of business processes



# Business Process Illustrator



# Business Process Illustrator

Graph of **Process Model for Testing (3)** with status information of **Process Instance 3.2** Reload interval: 1 min

<b>Highlight activities by type</b>	<b>Highlight activities by name</b>
<b>Omit activities by type</b>	<b>Omit activities by name</b>

**1. level of 8 abstraction levels of the Process Model** **0. level of 3 abstraction levels of the Process Instance**

```
graph TD; Start(( )) --> Flow[Flow]; Flow --> Receive[Receive]; Receive --> Reply2[Reply 2]; Receive --> Sequence[Sequence]; Sequence --> Reply1[Reply 1]; Reply1 --> End(( ))
```

# Business Process Illustrator

Business Process Illustrator (BPI) provides

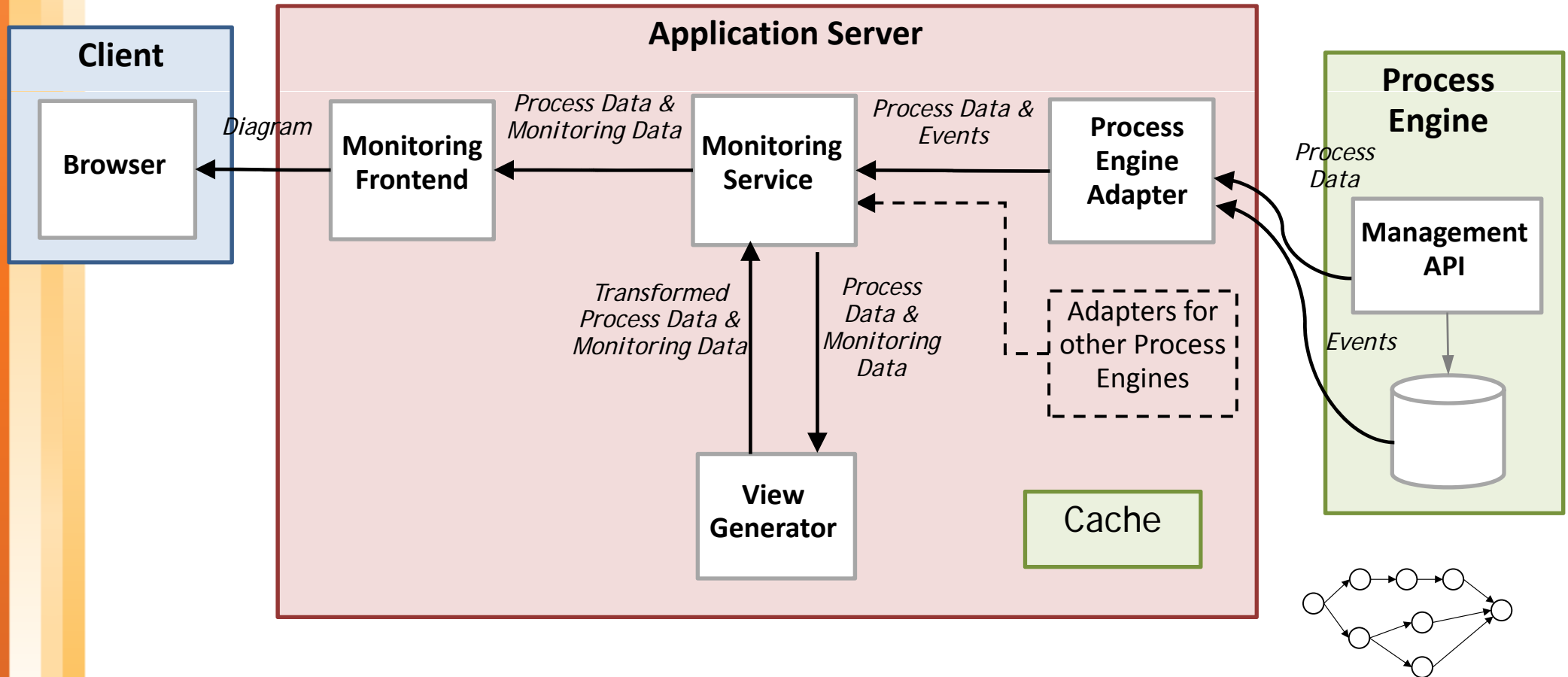
- Graphical, web-based process instance monitoring
- Various abstraction levels
- Performance visualization
- Highlighting of process structures

BPI is completely built using open source software

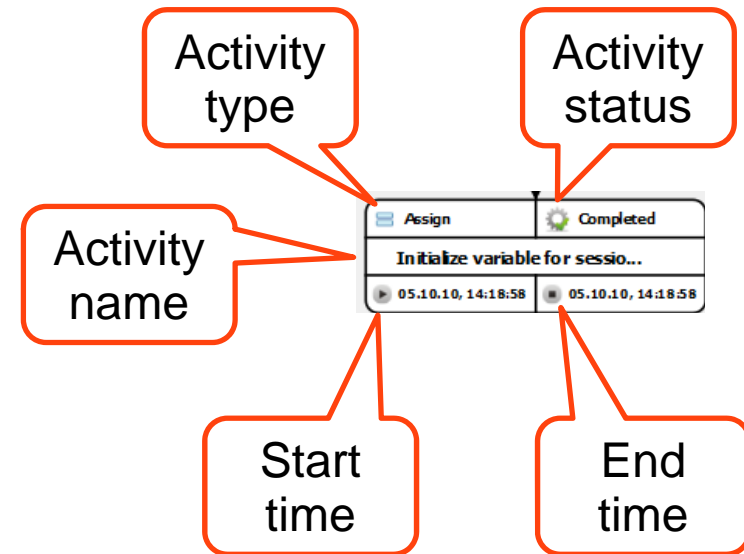
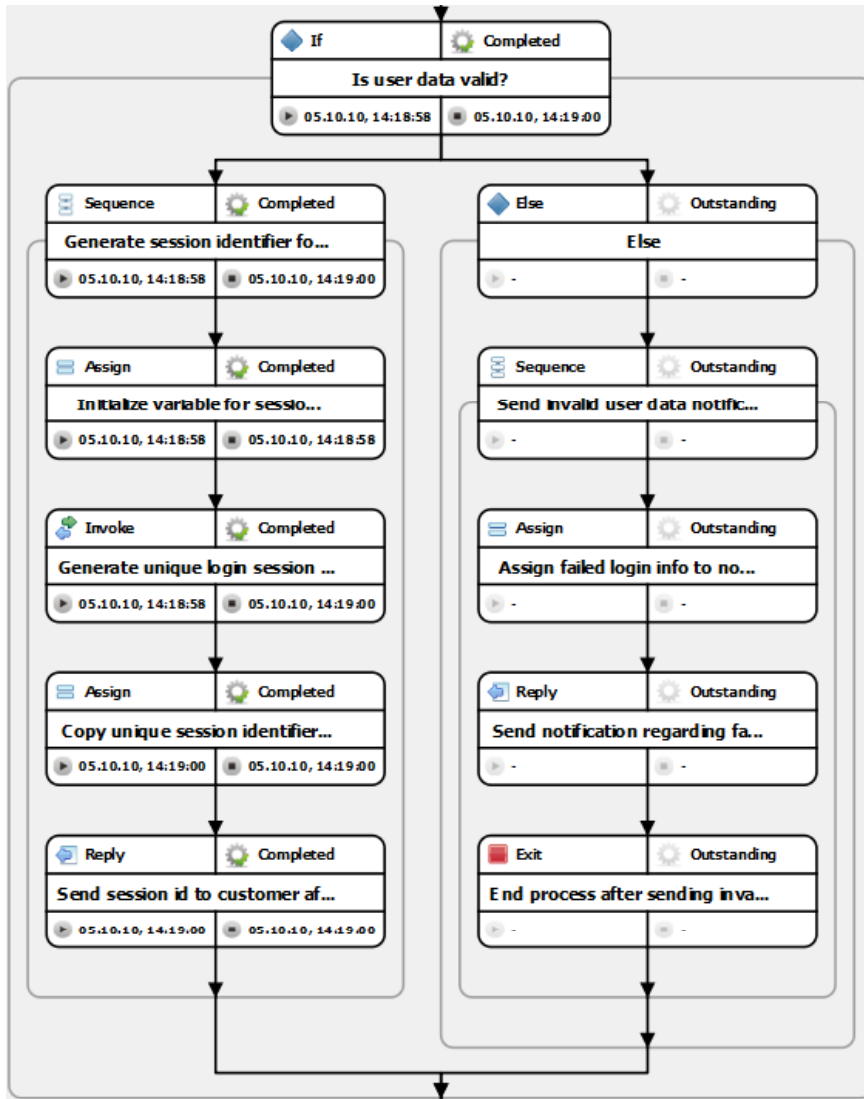
- Process engine: Apache ODE (BPEL engine)
- Database: MySQL
- Web services: Apache Axis
- Application server: Apache Tomcat
- Used technologies: Java, JSPs, JSF, AJAX, SVG



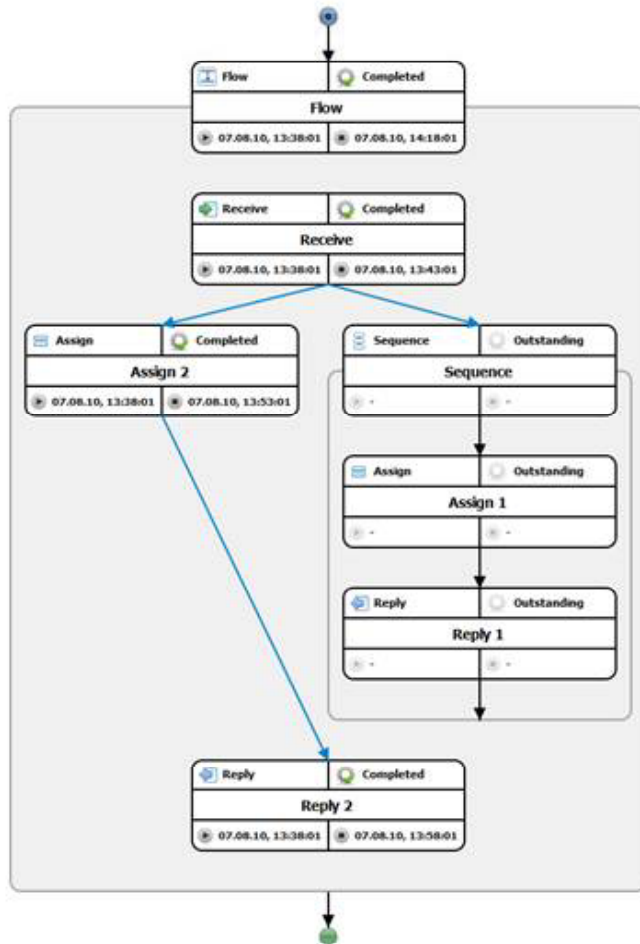
# Architecture



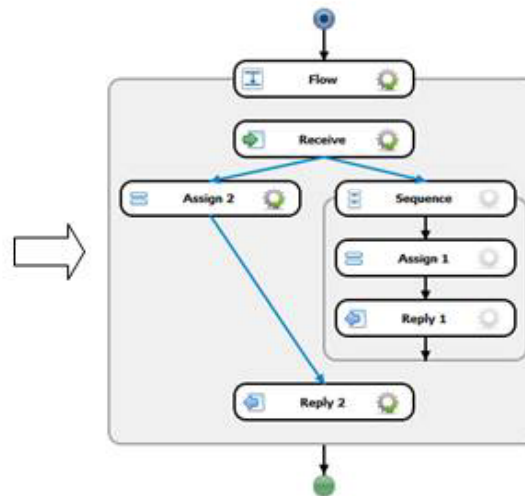
# A Process Graph in SVG - Full Mode



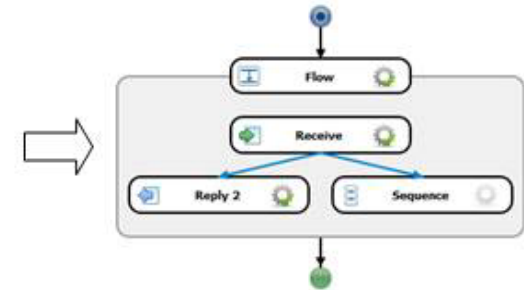
# Different Levels of Abstraction



Full mode

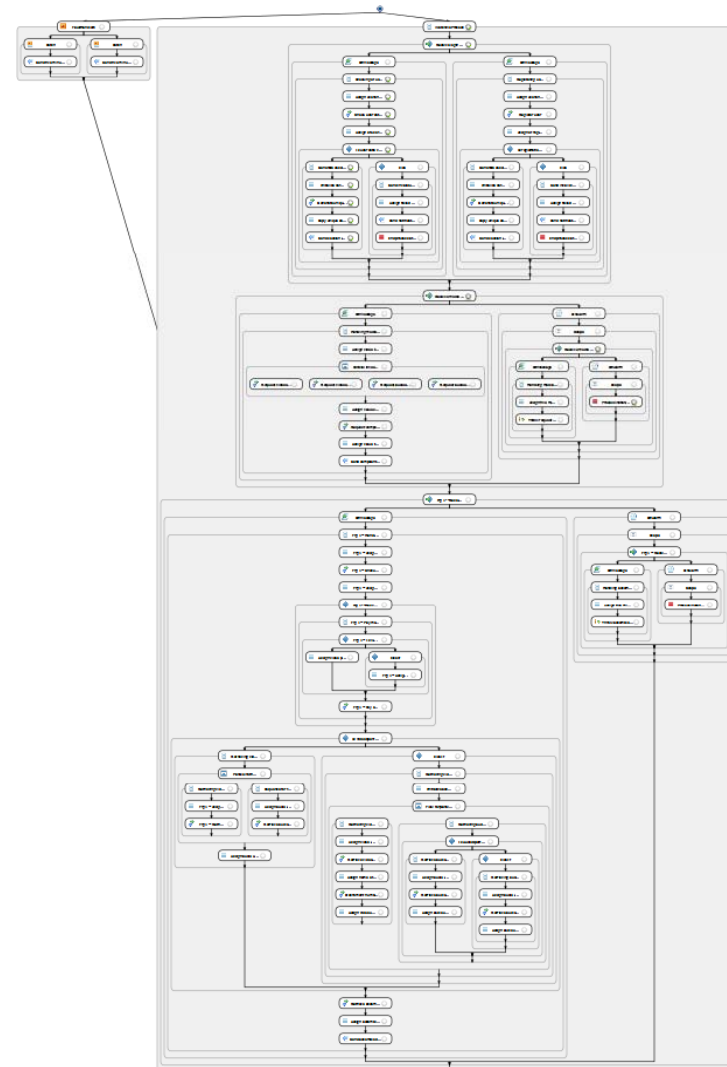
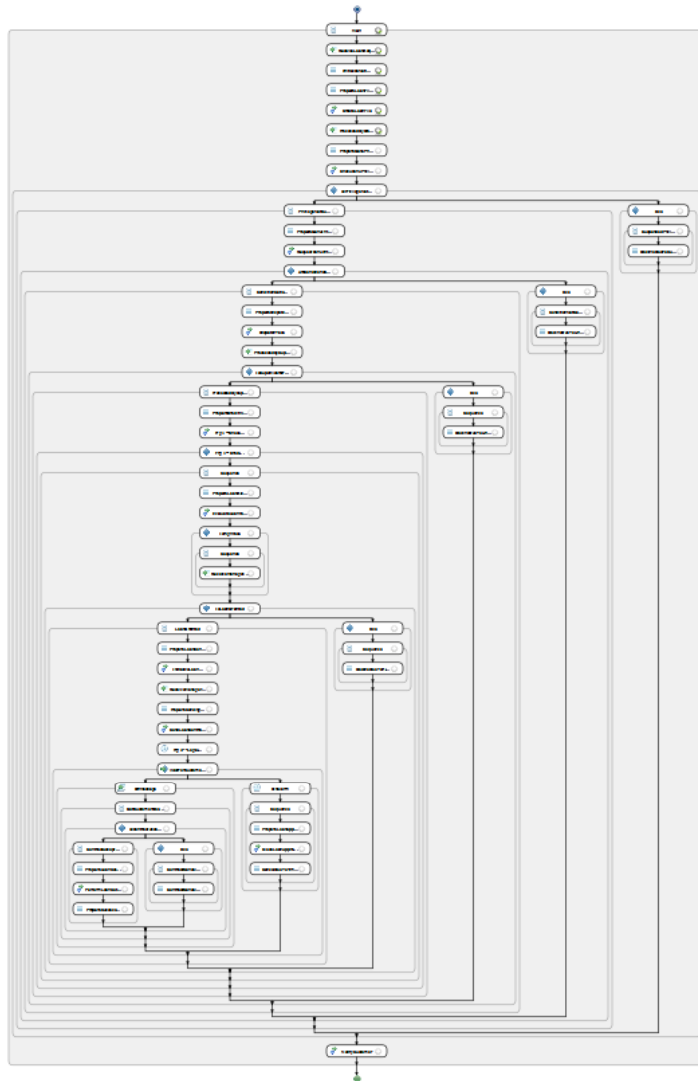


Compact mode



Abstracted

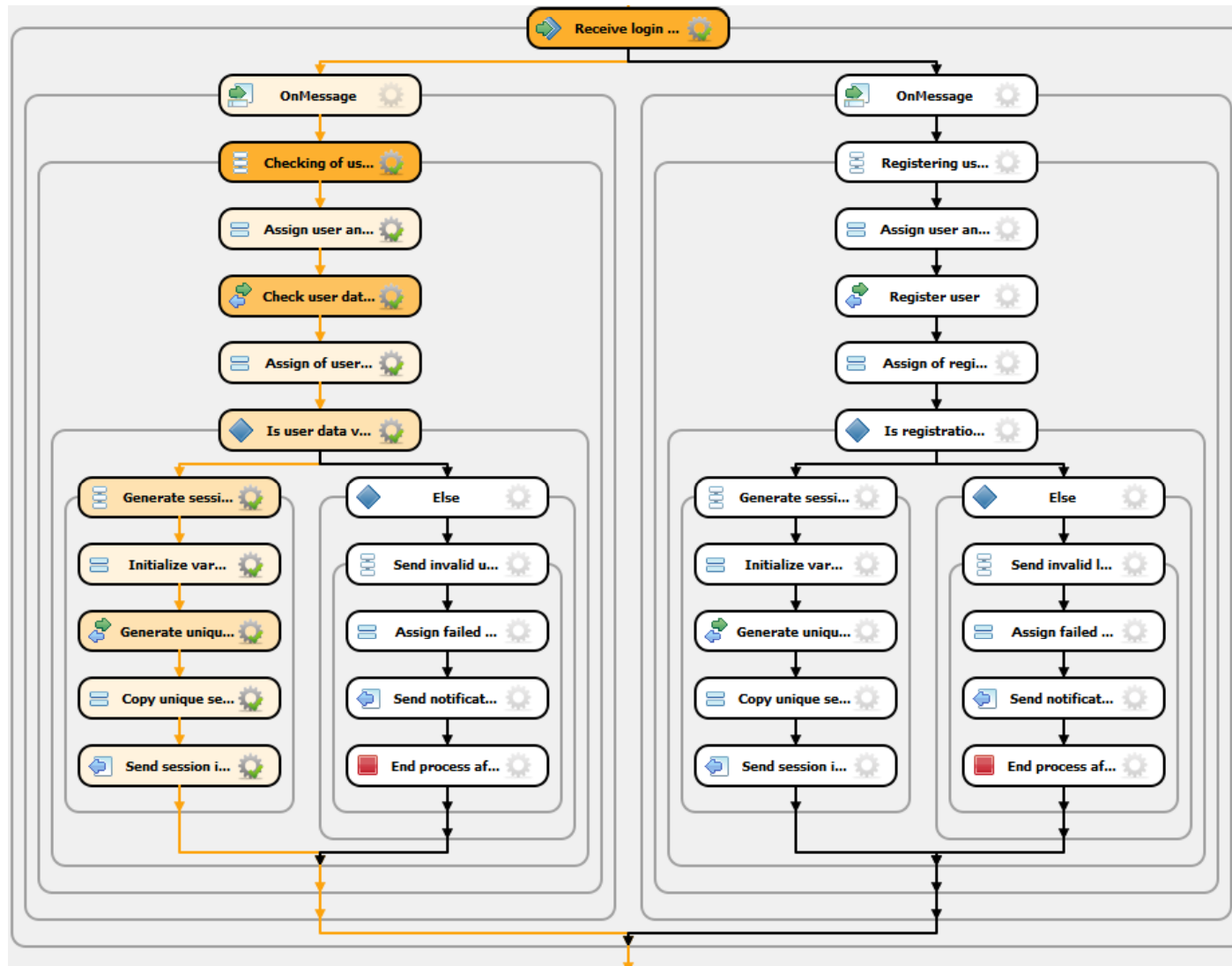
# Visualization of Complex Process Models



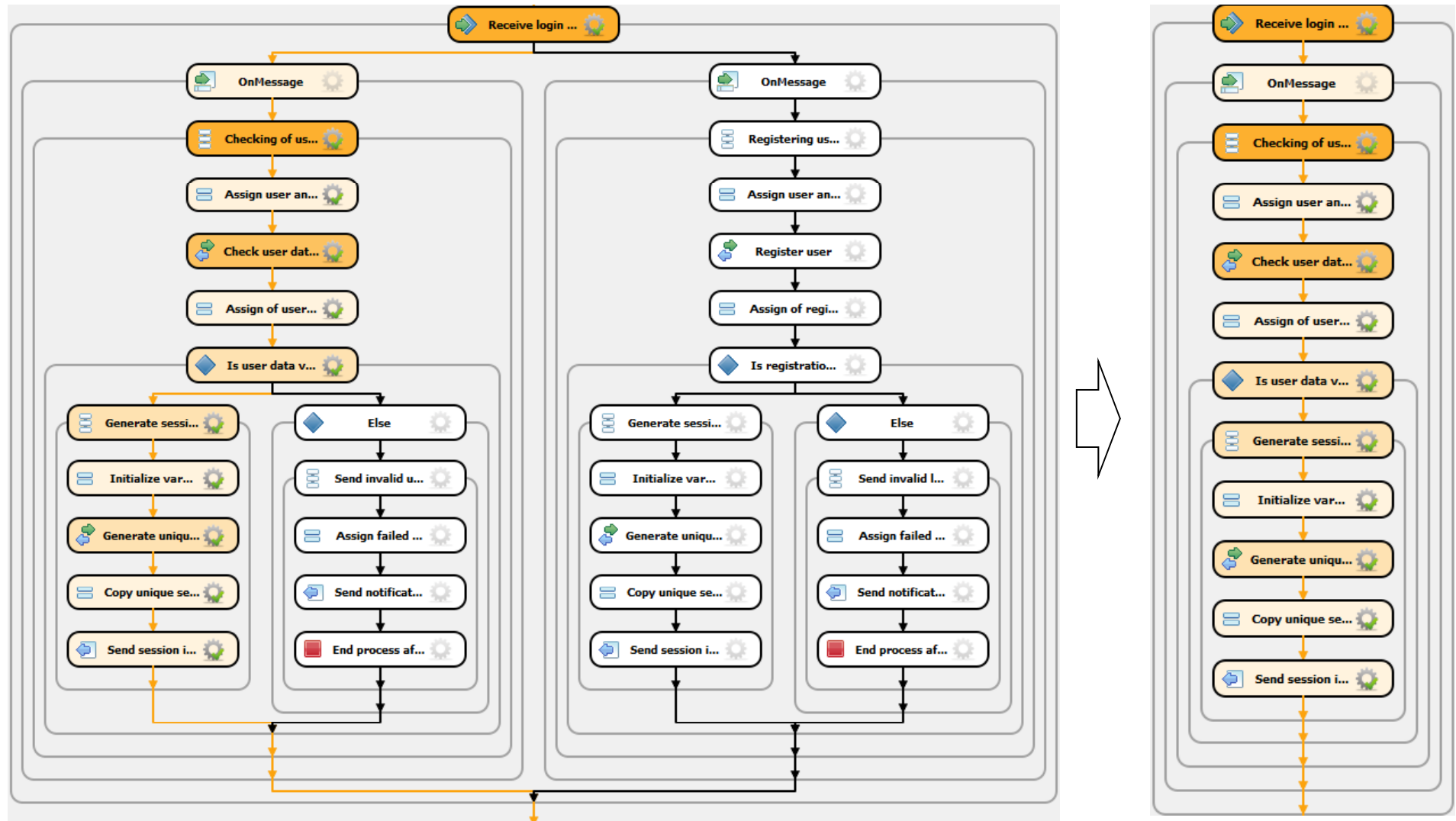
Process models have been developed in  
The COMPAS Project / [www.compas-ict.eu](http://www.compas-ict.eu)



# Visualization of Process Instance Performance



# Abstraction of a Process Instance



# Integration with WSO2 Carbon



# WSO2 From a Research Perspective

Our motivation for using WSO2 Carbon

- Open source middleware
  - Comfortable way for prototyping research
  - Make results and prototypes related to enterprise systems research accessible to a broader public
- Fast proof-of-concepts to *increase the impact* of research



# Integration with WSO2 Carbon

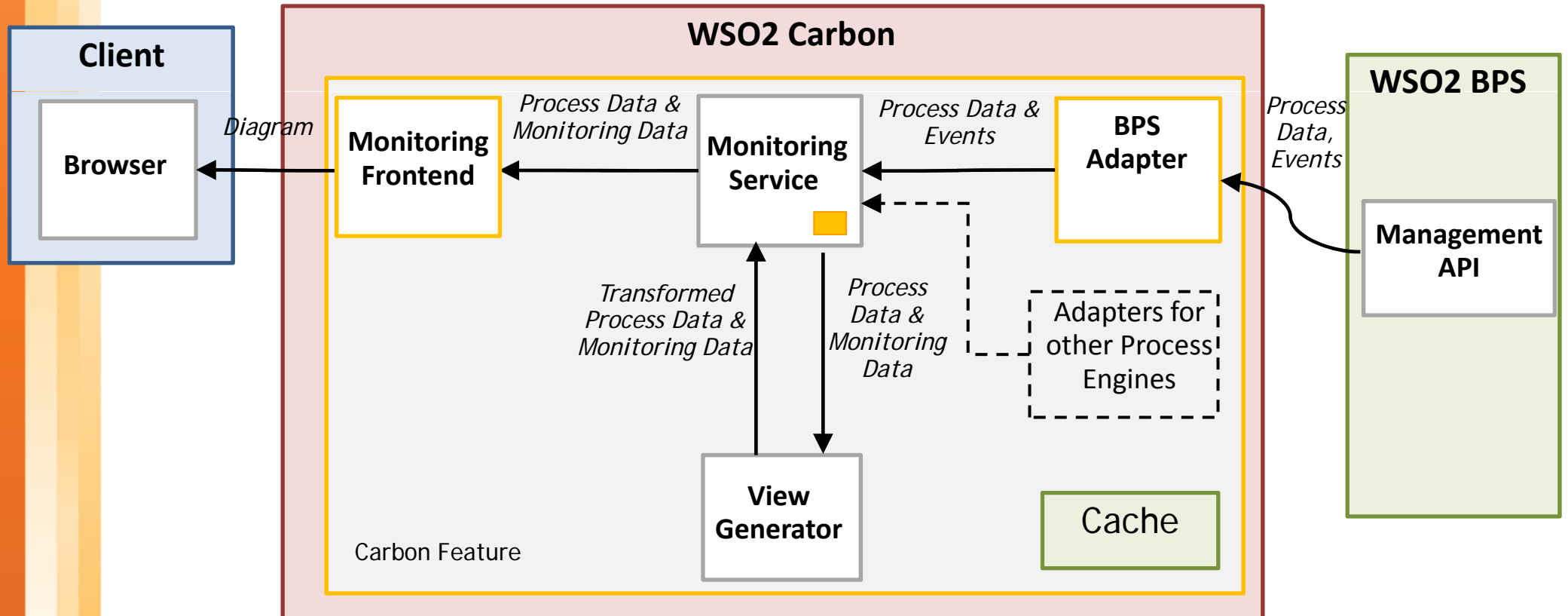
Steps of the porting included

- Code changes for deployment in an OSGi environment
- Development of an adapter for WSO2 Business Process Server (BPS) based on Web services
- Changes in the BPI frontend (removed MyFaces)
- Bundling as Carbon feature

→ Seamless integration with WSO2 Carbon web frontend



# Integration Architecture



# Process Instance Monitoring in WSO2 Carbon

The screenshot displays the WSO2 Business Process Server Management Console. The interface includes a navigation sidebar on the left with sections for Home, Manage, Monitor, Configure, Tools, and Registry. The main content area is titled "BPI - Business Process Illustrator" and shows monitoring data for a process instance. It includes summary boxes for "1-6 of 6 Process Models" and "1-4 of 4 Process Instances". Below these are controls for highlighting and omitting activities, and sliders for abstraction levels. The central part of the console features a process flow diagram with the following steps: Sequence, ReceiveGetLoan, PrepareOutPut, and InvokeClientCa...

WSO2 Business Process Server (WSO2 BP...)

Business Process Server

Management Console

Signed-in as: admin@127.0.0.1:9443 | Sign-out | Docs | About

Home

Manage

- Web Services
  - List
- Modules
  - List
  - Add
- Applications
  - List
  - Add
  - Shutdown/Restart

Business Processes

- Processes
- Instances
- Deployed Packages
- Add BPEL
- Business Process Illustrator**

Registry

- Browse
- Search
- Metadata

BPI - Business Process Illustrator

1-6 of 6 Process Models Process Models per page: 10

1-4 of 4 Process Instances Process Instances per page: 10

Graph of {http://wso2.org/bps/samples/DILoanService}DILoanService with status information of 254 Reload interval: 1 min

Highlight activities by type Highlight activities by name

Omit activities by type Omit activities by name

1. level of 7 abstraction levels of the Process Model 0. level of 3 abstraction levels of the Process Instance

Change Change

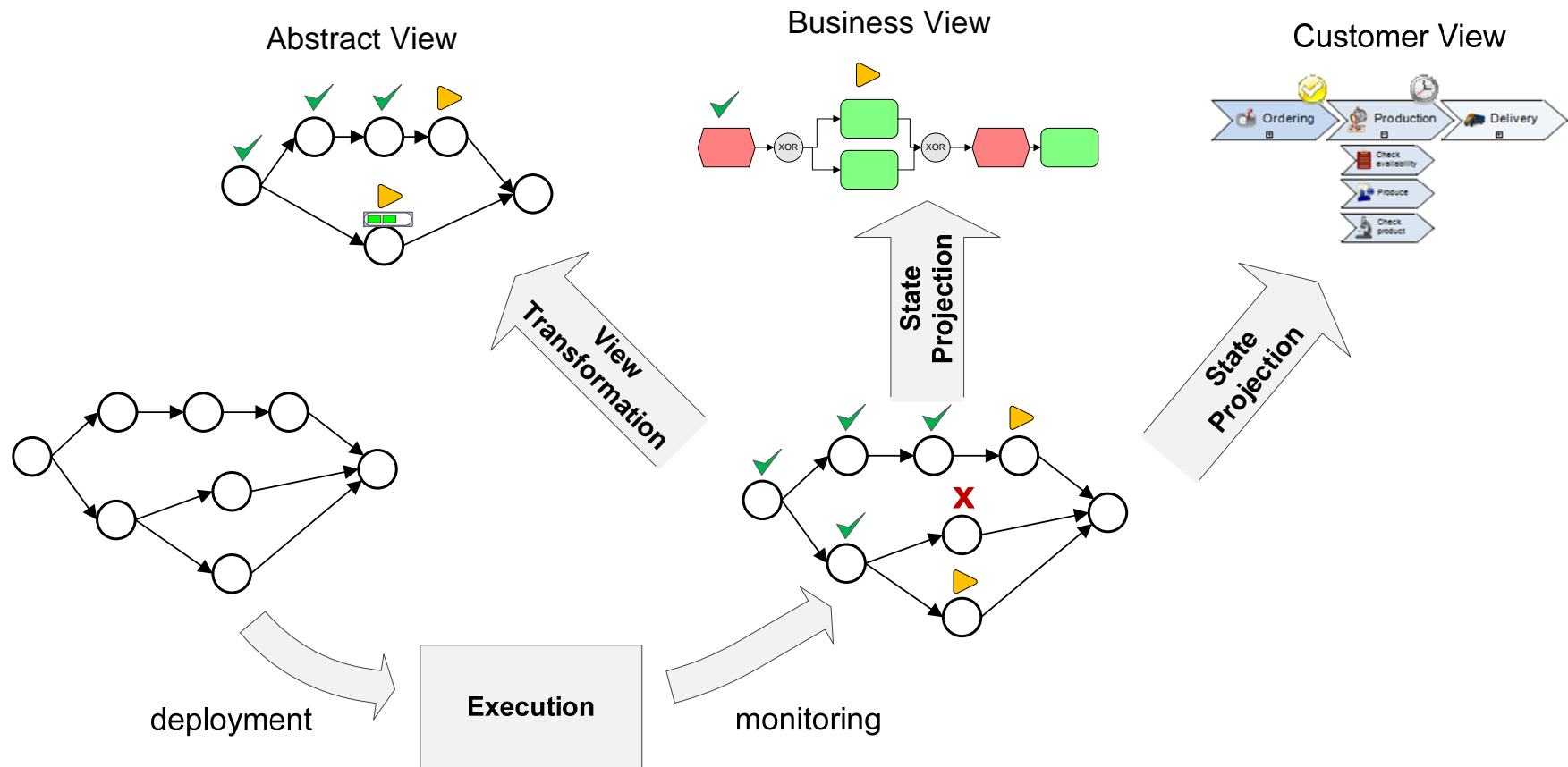
```
graph TD; Start(( )) --> Sequence[Sequence]; Sequence --> ReceiveGetLoan[ReceiveGetLoan]; ReceiveGetLoan --> PrepareOutPut[PrepareOutPut]; PrepareOutPut --> InvokeClientCa[InvokeClientCa...]; InvokeClientCa --> End(( ))
```

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# Future Perspectives

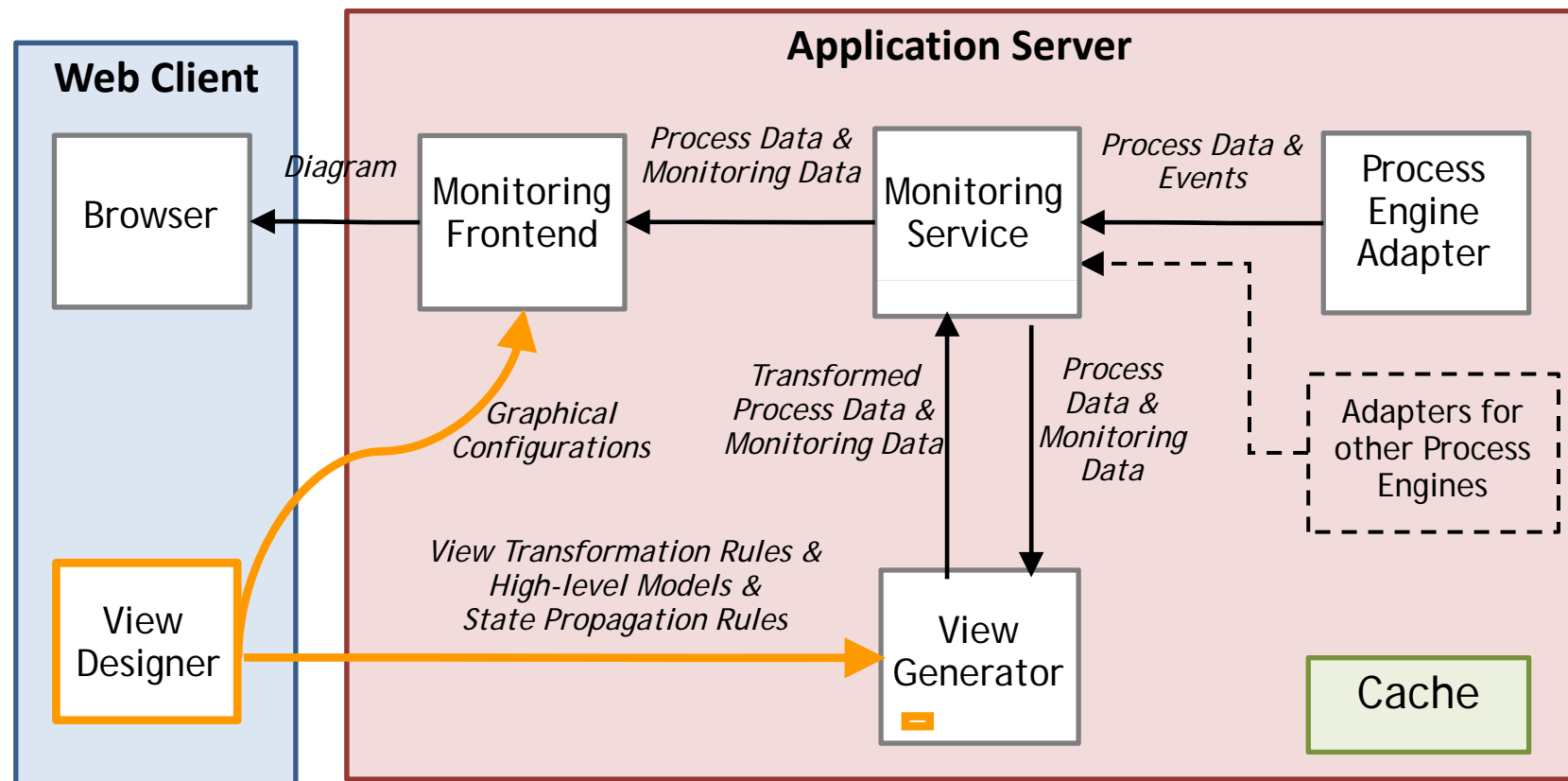
# Research on State Projections

State projections *cross the borders* of process models and languages



# Research on Graphical Configurations

*Loose coupling* of process elements, graphics, and (analytical) data



# References

The research prototype BPI has been developed by Gregor Latuske in the course of his diploma thesis. Integration of BPI with WSO2 Carbon has been carried out by Jakob Krein in the course of his student thesis. The concepts presented in this talk have been elaborated in the following scientific publications.

David Schumm, Frank Leymann, Alexander Streule: Process Views to Support Compliance Management in Business Processes. Proc. of the 11<sup>th</sup> International Conference on Electronic Commerce and Web Technologies (EC-Web'10), Springer, 2010.

David Schumm, Frank Leymann, Alexander Streule: Process Viewing Patterns. Proc. of the 14<sup>th</sup> IEEE International EDOC Conference (EDOC'10), IEEE Computer Society, 2010.

David Schumm, Gregor Latuske, Frank Leymann, Ralph Mietzner, Thorsten Scheibler: State Propagation for Business Process Monitoring on Different Levels of Abstraction. In: Proc. of the 19th European Conference on Information Systems (ECIS 2011), AIS Library, 2011.

David Schumm, Gregor Latuske, Frank Leymann: A Prototype for View-based Monitoring of BPEL Processes, Technical Report No. 2011/04, University of Stuttgart, 2011.

David Schumm, Frank Leymann, Dimka Karastoyanova: Compliance in BPM & Views on Business Processes, IBM Technology Partnership Center (ITPC), BPM Day 2011.

David Schumm: Information Design for Business Process Management, The 5<sup>th</sup> Summer School on Service Oriented Computing (Summer SOC), 2011

David Schumm, Dimka Karastoyanova, Frank Leymann, Sumadi Lie: Propagation of States from BPEL Process Instances to Chevron Models, Report 2011/06, University of Stuttgart, 2011.

Thank you for your Attention

