

# A Service-Oriented Toolchain for Model-Driven, View-Based Business Process Design and Deployment

Ta'id Holmes, Huy Tran, Uwe Zdun, Schahram Dustdar  
Distributed Systems Group, Institute of Information Systems  
Vienna University of Technology, Vienna, Austria  
{tholmes, htran, zdun, dustdar}@infosys.tuwien.ac.at

<http://www.infosys.tuwien.ac.at>  
<http://www.VitaLab.tuwien.ac.at>

# Outline

- Motivation & Introduction
- Overview of the Toolchain
- SOA for Process Deployment
- View-Based Modeling Framework (VbMF)
- Validation/Deployment/Execution Framework (VDE)
- Summary & Further Work

# Motivation:

## Interoperability and Reusability of Processes

- Why Process Description Reuse is difficult
  - *The integration of many tangled aspects hinders understandability, modularity, etc.*
    - the control flow, service interactions, message and message types, fault handling, transactions, compliances, process engine configurations, etc.
  - *Stakeholders have different point of views, abstraction levels, skill sets, needs, etc.*
    - Business or domain experts
    - IT experts: developers, administrators

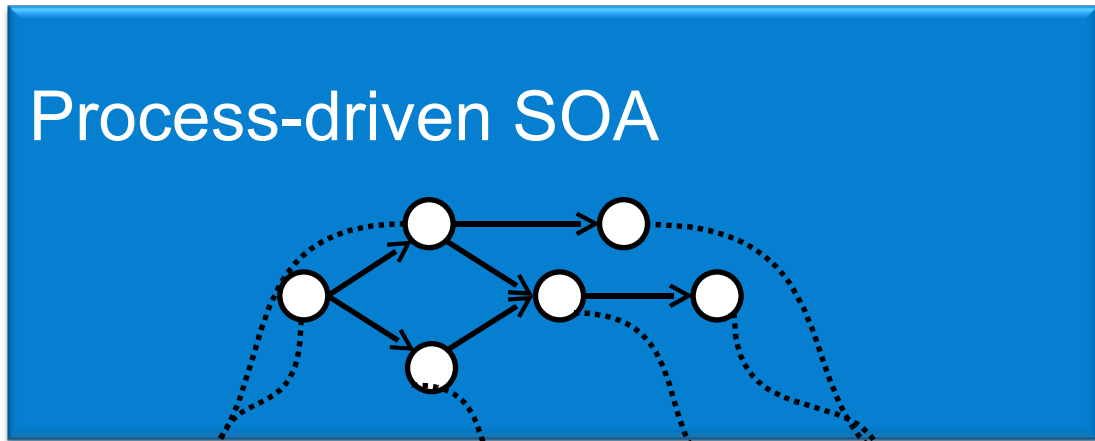
# Proposed Solution: View-Based Model-Driven Engineering

- Separation of Concern Principle
  - A realization: concept of architectural views
- Model-Driven Engineering
  - (semi)-formalization of process fragments to enhance modularity, reusability, etc.
  - separation of abstraction levels by tailored views to enhance adaptability, understandability

Separation of Concerns  
(e.g., architectural views) to  
master the complexity

VbMF

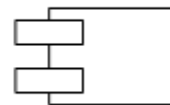
Model-Driven  
Engineering



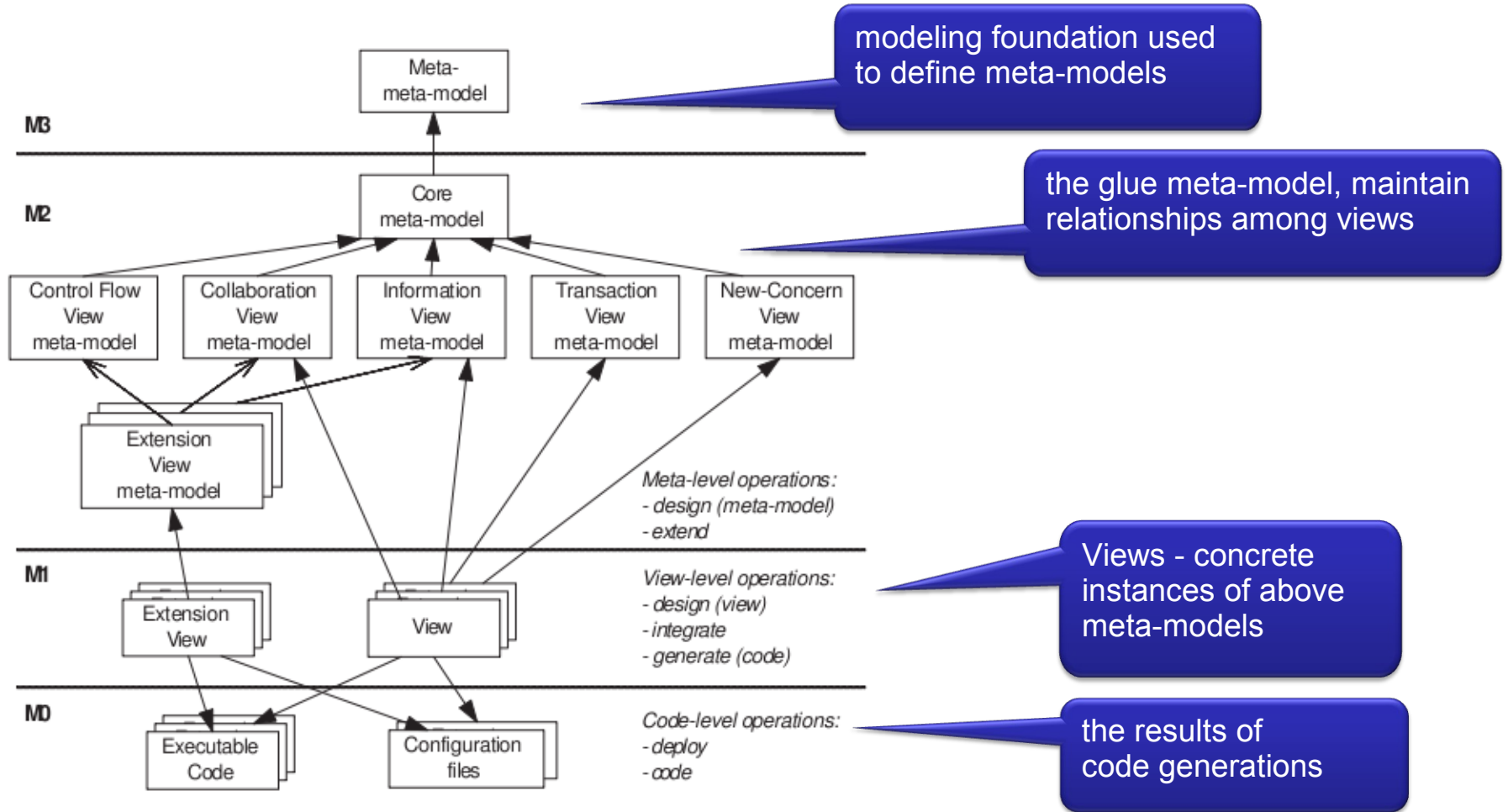
provides an efficient method for integrating business functionality



reconciles the heterogeneous nature of software systems



# View-Based Modeling Framework: Overview

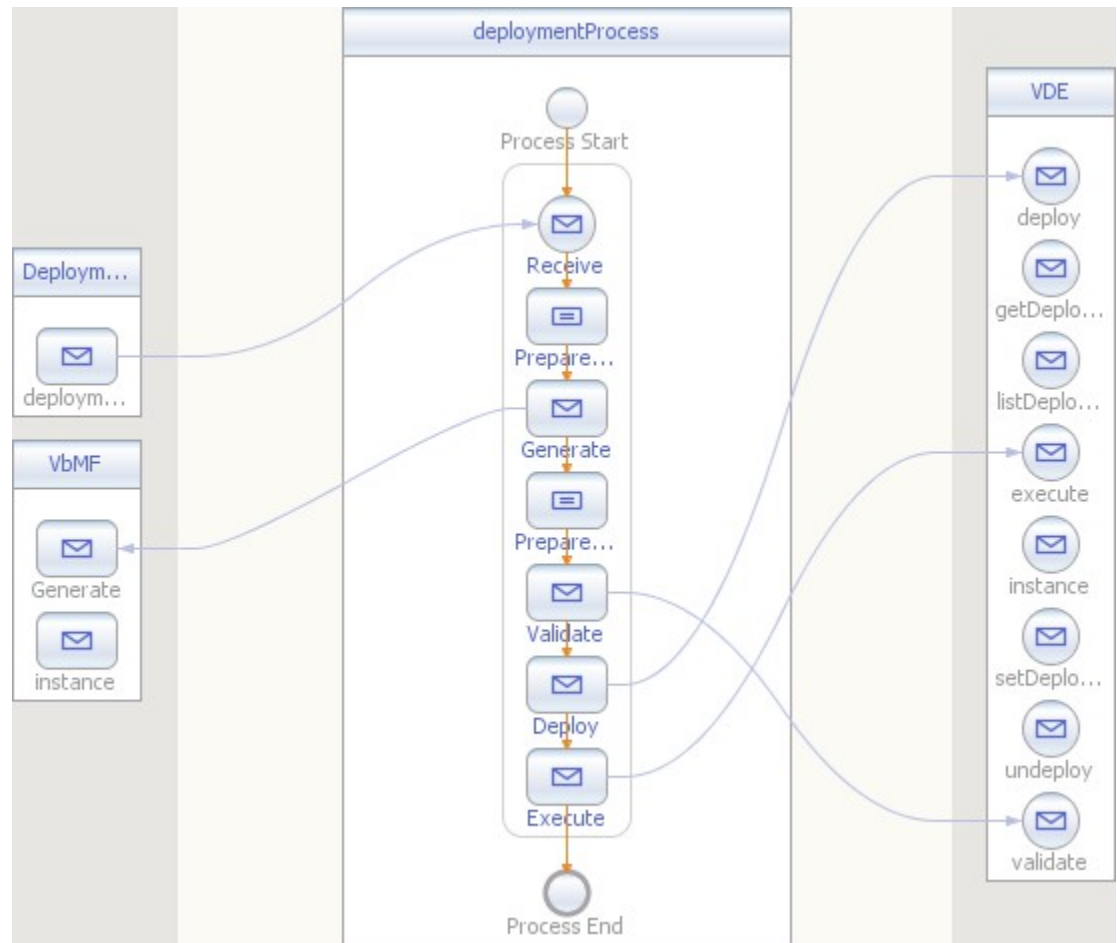


# The overall Toolchain

- Design
  - Modeling of Views within the VbMF (EMF/GMF-Editor)
- Transformation
  - Invokation of the Code Generation (oAW-Workflow)
- Validation
  - Semantic validation/optimization of a process (VDE)
- Deployment
  - Prepare and deploy process on a BPEL engine (VDE)
- Execution
  - Fire & Forget a long-running process (VDE)

# SOA for Process Deployment

- Auxiliary Deployment Process
- orchestrating
  - Model to Code Transformation
  - Validation
  - Deployment
  - Execution





# VbMF Modeling

- ▼ ◆ BPELControlflow View

- ▼ ◆ Sequence

- ◆ SimpleActivity ReceiveOrder
    - ◆ SimpleActivity PrepareVerify
    - ◆ SimpleActivity VerifyCreditCard

- ▼ ◆ Switch

- ▼ ◆ Case condition

- ▼ ◆ Sequence

- ◆ SimpleActivity PrepareCancel
        - ◆ SimpleActivity CancelOrder

- ▼ ◆ Sequence

- ▼ ◆ Flow

- ▼ ◆ Sequence

- ◆ SimpleActivity Acknowledgement
        - ◆ SimpleActivity PrepareShipping
        - ◆ SimpleActivity DoShipping

- ▼ ◆ Sequence

- ◆ SimpleActivity PrepareCharging
        - ◆ SimpleActivity DoCharging

- ◆ SimpleActivity PrepareInvoice
    - ◆ SimpleActivity SendInvoice

- ▼ ◆ BPELCollaborationView

- ▼ ◆ Receive ReceiveOrder

- ◆ Variable order\_input

- ▼ ◆ Invoke VerifyCreditCard

- ◆ Variable verify\_input
    - ◆ Variable verify\_output

- ◆ Reply CancelOrder

- ▼ ◆ Invoke DoShipping

- ◆ Variable ship\_input
    - ◆ Variable ship\_output

- ▼ ◆ Invoke DoCharging

- ◆ Variable charge\_input
    - ◆ Variable charge\_output

- ▷ ◆ Reply SendInvoice

- ▼ ◆ Invoke Acknowledgement

- ◆ Variable ack\_input
    - ◆ Variable ack\_output

- ▼ ◆ Service BankingService

- ▷ ◆ Interface CreditCard

- ▼ ◆ Service ShippingService

- ▷ ◆ Interface Shipping

- ▼ ◆ Service Shopping

- ▷ ◆ Interface Shopping

- ▼ ◆ BPELHumanView

- ◆ Role processInitiator

- ◆ Role businessAdministrators

- ◆ Role processStakeholder

- ◆ Role taskInitiator

- ◆ Role taskStakeholders

- ◆ Role potentialOwners

- ◆ Role excludedOwners

- ◆ Role notificationRecipients

- ◆ Task Acknowledgement

- ◆ PeopleLink processInitiator

- ◆ PeopleLink businessAdministrator

- ◆ PeopleLink processStakeholder

- ◆ PeopleLink taskInitiator

- ◆ PeopleLink taskStakeholders

- ◆ PeopleLink potentialOwners

- ▼ ◆ PeopleLink excludedOwners

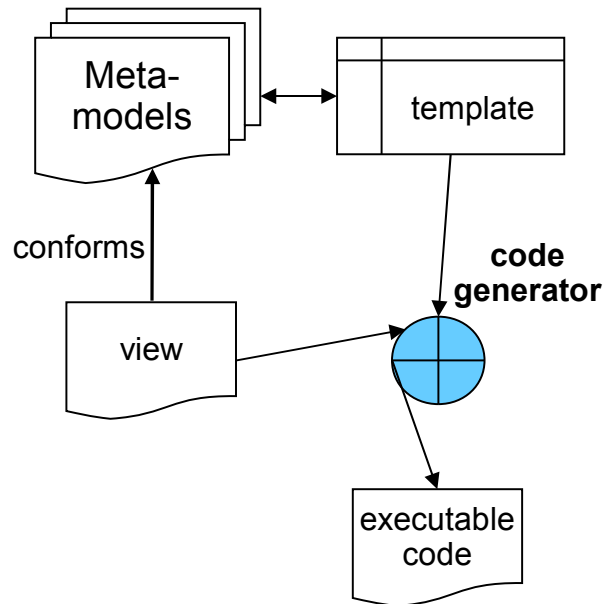
- ◆ Description descriptionEnglish

- ▼ ◆ PeopleLink notificationRecipients

- ◆ PeopleQuery /users/@notification='true'

# VbMF Transformation

templates + meta-model



```

«DEFINE Activity FOR orchestration::SimpleActivity-»
  «EXPAND SimpleActivity FOR getActivityByName(this.name)-»
«ENDDDEFINE»

«DEFINE SimpleActivity FOR bpel_collaboration::Invoke-»
  <invoke name="«name»" partnerLink="«getPartnerLink()»"
    outputVariable="«getOutput()»" inputVariable="«getInput()»"
    portType="«getInterface()»" operation="«getOperation()»"/>
«ENDDDEFINE»

«DEFINE SimpleActivity FOR bpel_collaboration::Receive-»
  <receive name="«name»"
    partnerLink="«getPartnerLink()»"
    variable="«getVariable()»" operation="«getOperation()»"
    portType="«getInterface()»"
    «IF createInstance == true»
      createInstance="yes"
    «ENDIF»/>
«ENDDDEFINE»

«DEFINE SimpleActivity FOR bpel_collaboration::Reply-»
  <reply name="«name»" partnerLink="«getPartnerLink()»"
    operation="«getOperation()»"
    variable="«getVariable()»" portType="«getInterface()»" />
«ENDDDEFINE»

«DEFINE SimpleActivity FOR bpel_information::Assign-»
  <assign name="«name»">
    ...
  </assign>
«ENDDDEFINE»
  
```

# VDE Framework

- Deployment to supported BPEL Engines
  - Active BPEL
  - ApacheODE
- Plugin Architecture for additional BPEL Engines
- Initialization of Long-Running Processes
- Unique Interface for Validation, Deployment and Execution of BPEL Processes

# Summary

- VbMF Transformation Web Service
- VDE Framework – exposes Web Services for
  - validation
  - deployment
  - execution
- Deployment Process
  - for automating the tool-chain

# Further Work

- Collaborative Model-Driven Development
  - Lightweight Collaborative Model-Driven Environment
  - Correlation of Process Stakeholders & MDD Artefacts
  - Model Repository
- Distributed Process Monitor
  - for Debugging, Logging, Monitoring, etc.
  - Publishers = Components
  - Broker Architecture
  - Distributed Subscribers

# Thanks for your attention!

Ta'id Holmes  
Distributed Systems Group,  
Institute of Information Systems,  
Vienna University of Technology, Austria

<http://www.infosys.tuwien.ac.at>  
<http://www.VitaLab.tuwien.ac.at>