

# A Visual Language and Environment for Composing Web Services



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# Project Description



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- **Composition of Web Services** a common problem - scripting languages like BPEL4WS developed
- **BPEL4WS** etc difficult to write by hand/in textual IDE
- Want **visual IDE** to build/test/deploy
- We have developed a proof-of-concept visual IDE + examples of compositions

# Motivation



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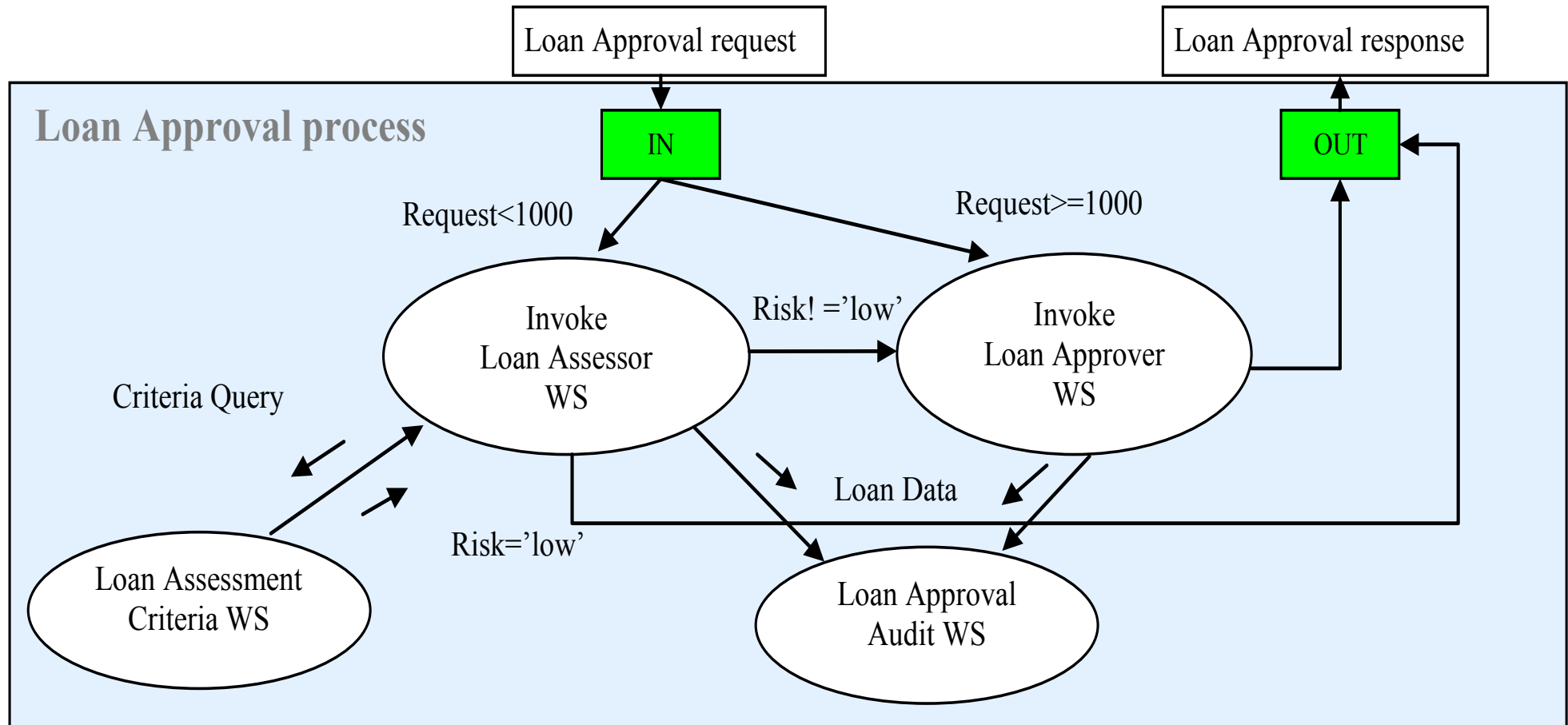
- Wanted to develop suitable **visual metaphor**, **language** and **environment** for web service composition
- Existing tools too low-level, difficult to use, address only part of problem
- Want to support web service selection, composition, BPEL4WS generation, visualisation of enactment

# Example



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# ViTABaL-WS



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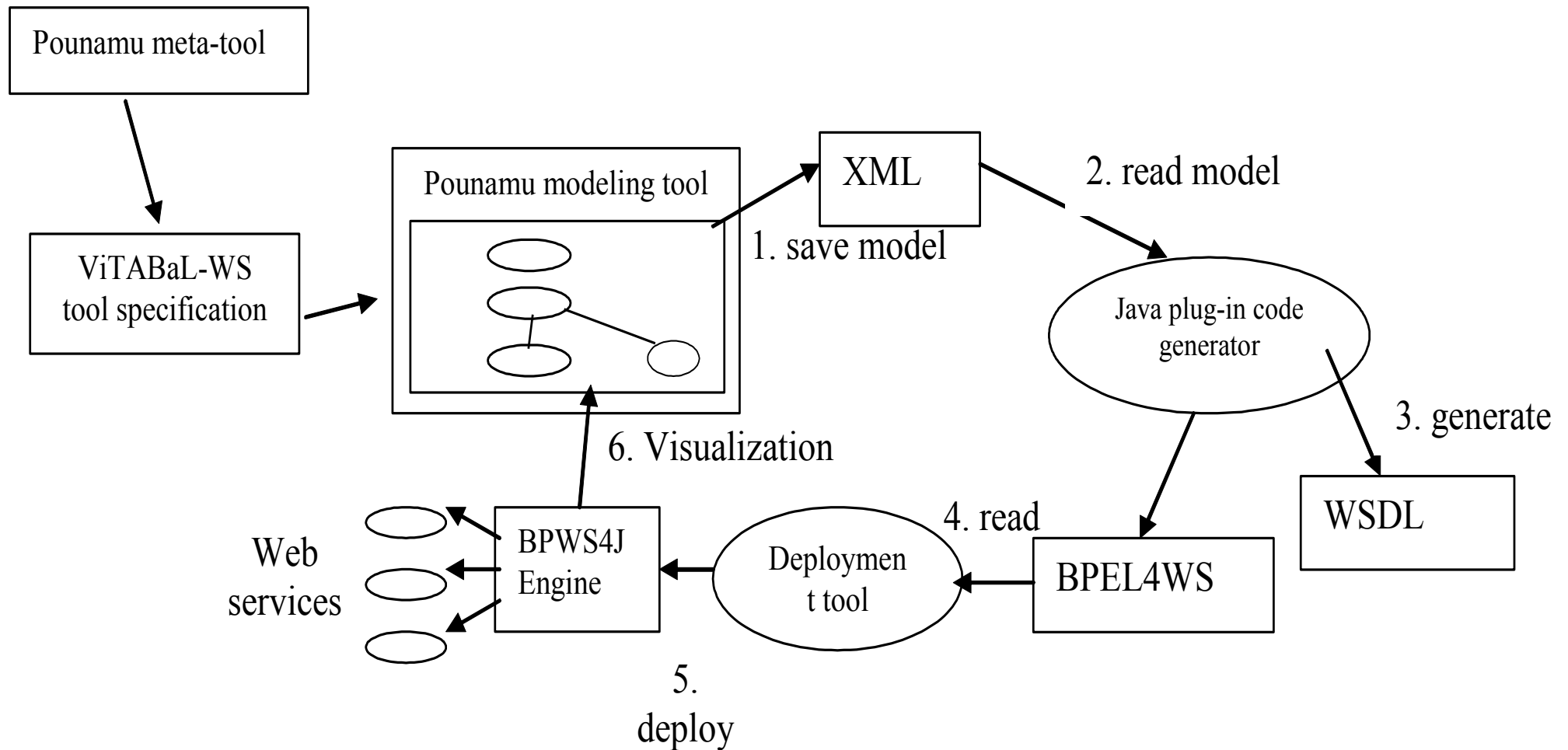
- Uses “**Tool Abstraction**” (TA) paradigm as its high level compositional metaphor
- Provides **visual language** to describe web services; control/data/event composition; synchronisation; failure handling; transactional behaviour; ...
- **Generates BPEL4WS** scripting language
- **Visualises running BPEL** in the IBM BPWS4J workflow engine using the visual TA diagrams

# Architecture

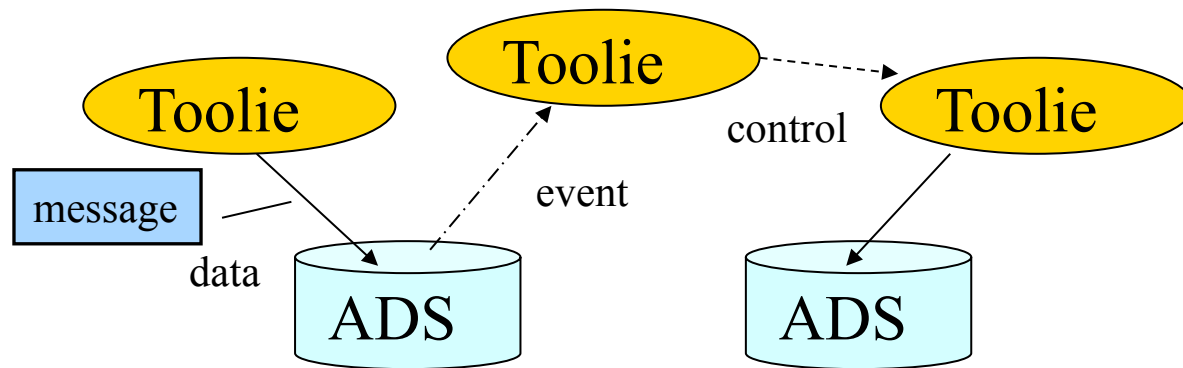


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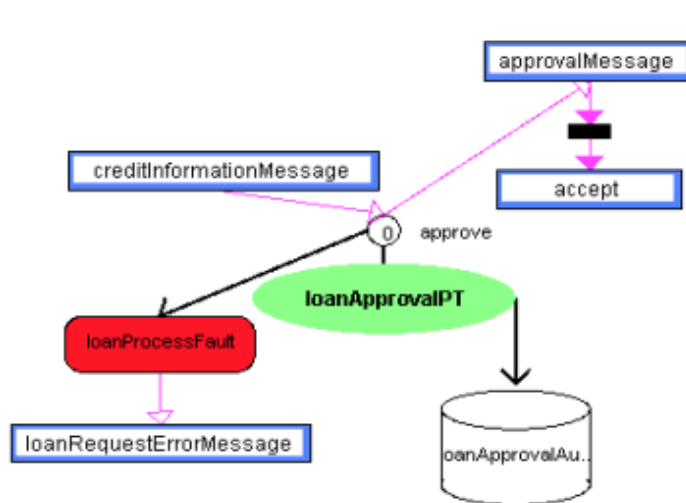
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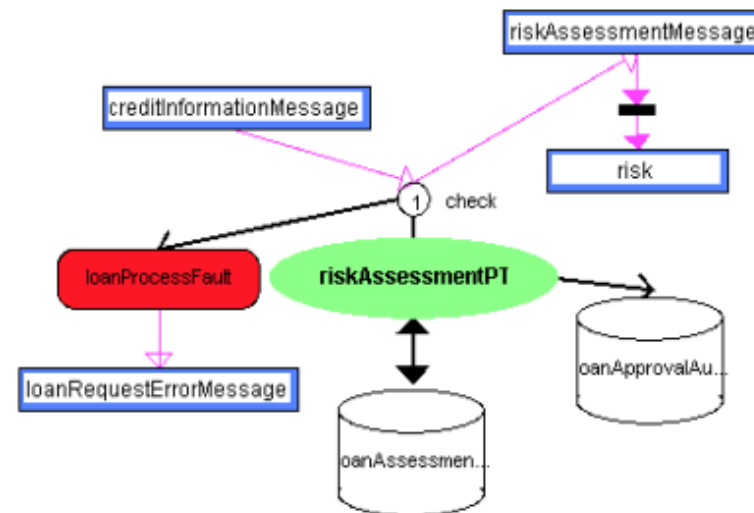
# TA Paradigm



“Toolie” = unit of processing  
 “ADS” = abstract data structure  
 Links = connection

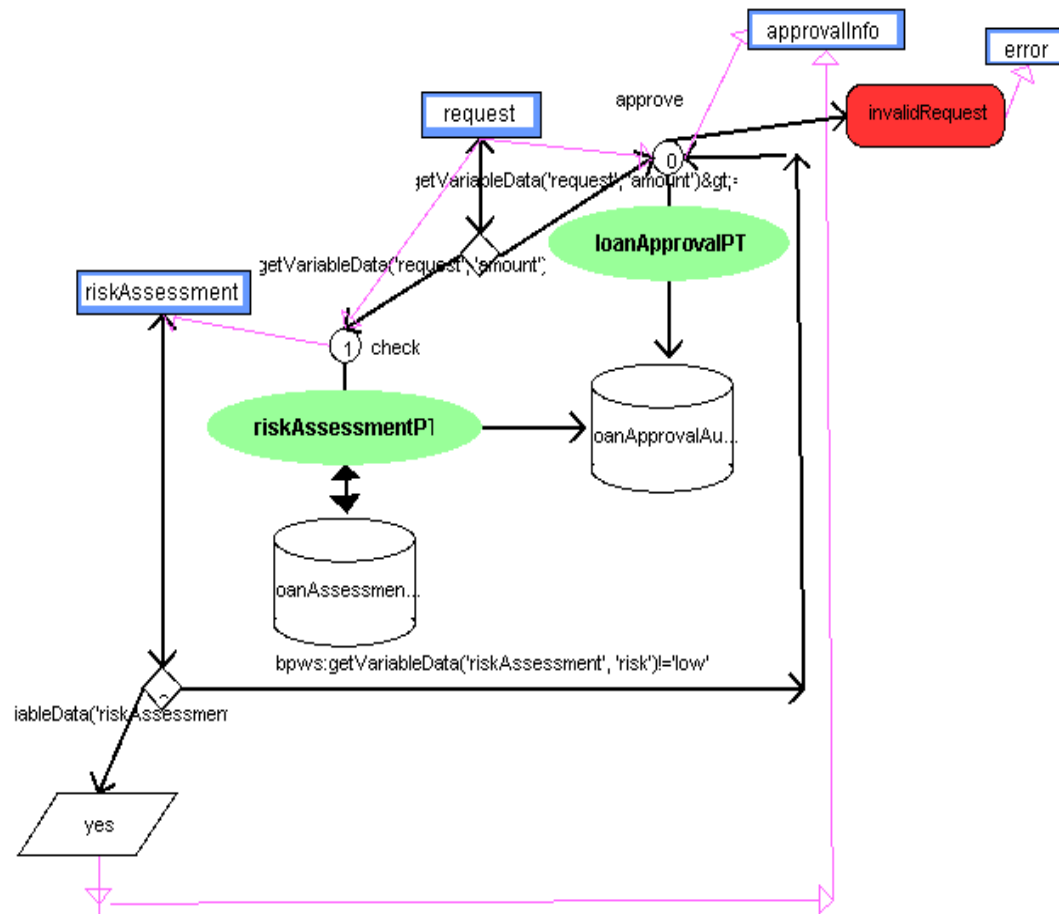


1. Web service - Loanapprover

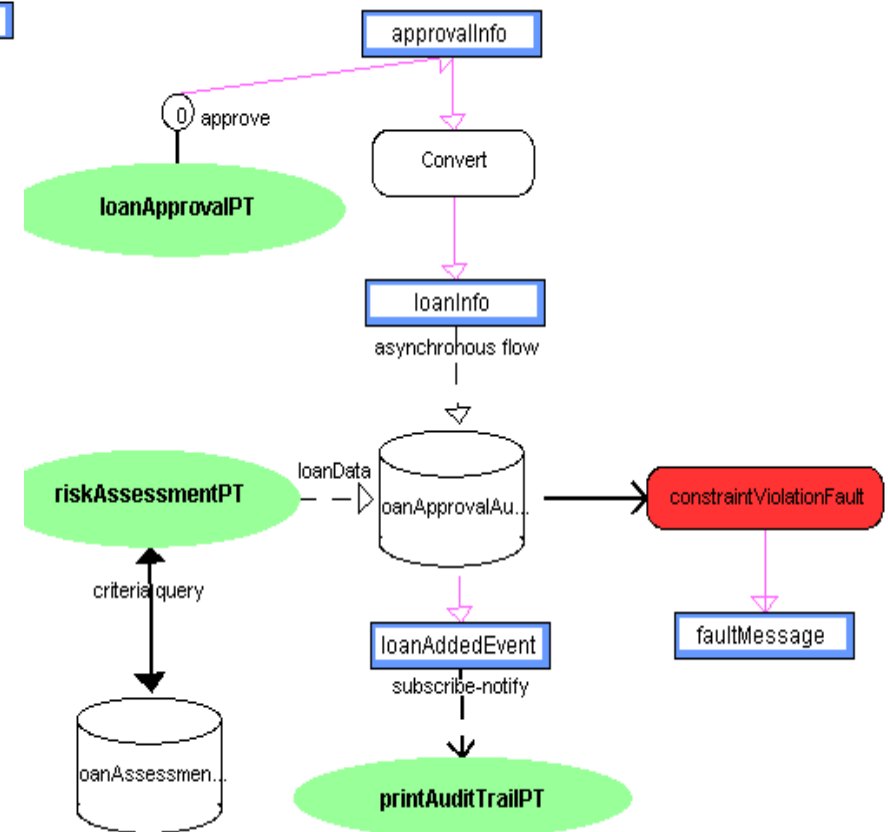


2. Web service - Loanassessor

# Loan Approval Compositions



1. Process definition -  
loanApproval



2. Alternative audit  
trail process flow

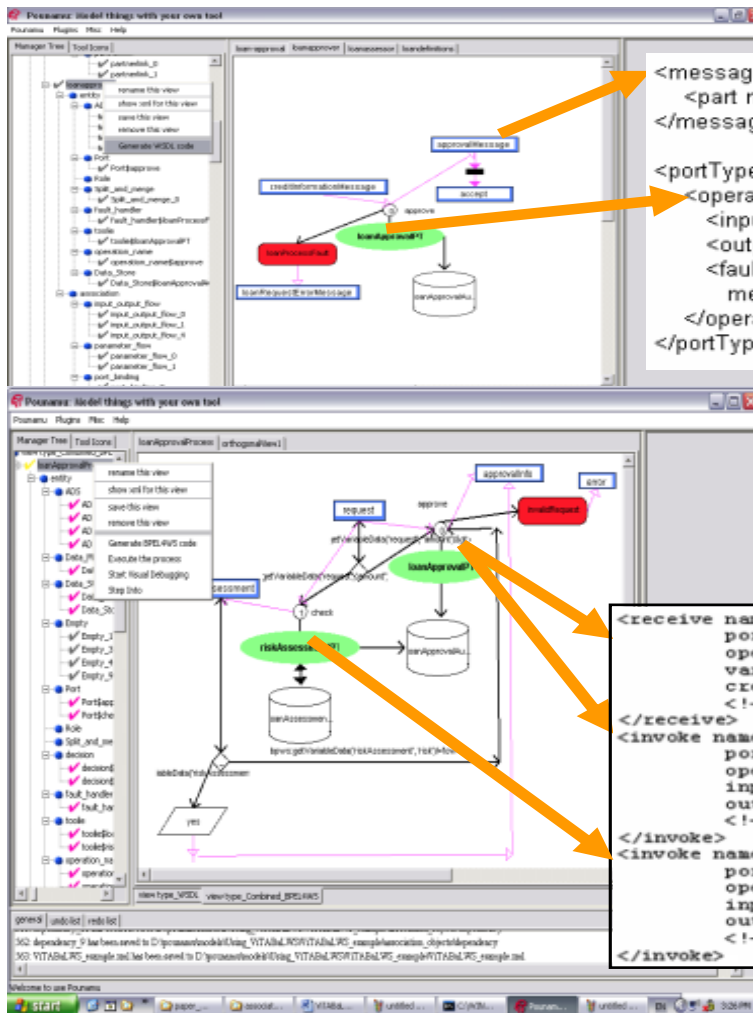


# BPEL4WS Generation



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WSDL

```
<message name="approvalMessage">
  <part name="accept" type="xsd:string"/>
</message>

<portType name="loanApprovalPT">
  <operation name="approve">
    <input message="loandef.creditInformationMessage"/>
    <output message="tns:approvalMessage"/>
    <fault name="loanProcessFault" message="loandef.loanRequestMessage"/>
  </operation>
</portType>
```

```
<receive name="receive" partnerLink="loanApprovalPT"
  portType="loanApprovalPT"
  operation="approve"
  variable="request"
  createInstance="yes">
  <!--links-->
</receive>

<invoke name="invokeapprover" partnerLink="loanApprovalPT"
  portType="loanApprovalPT"
  operation="approve"
  inputVariable="request"
  outputVariable="approvalInfo">
  <!--links-->
</invoke>

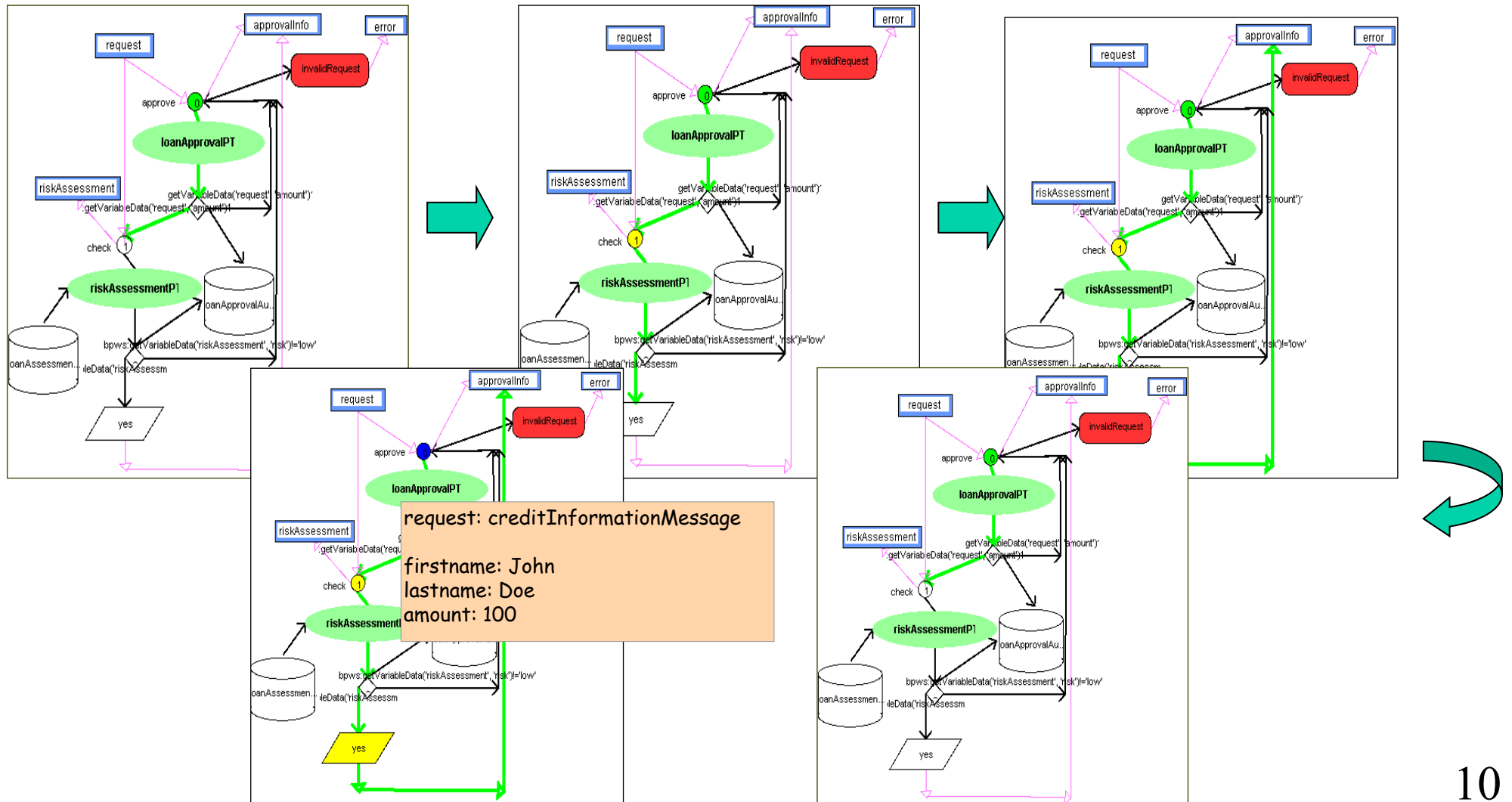
<invoke name="invokeassessor" partnerLink="assessor"
  portType="riskAssessmentPT"
  operation="check"
  inputVariable="request"
  outputVariable="riskAssessmentInfo">
  <!--links-->
</invoke>
```

BPEL4WS

The screenshot shows the 'Configure Processes' page of the BPWS 4J runtime. It lists the deployed process 'loan-approval' with its target namespace and schema information. Below the list are buttons for 'List', 'Deploy', and 'Un-deploy'.

Deployment via BPWS 4J

# Visualising Running BPEL



# Evaluation



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- **Cognitive Dimensions** evaluation of the ViTABaL-WS visual language & supporting modelling/visualisation environment
- **User evaluation** for exemplar web service composition tasks
- Results:
  - Verbose VL but good fit to composition domain; incremental evaluation; few hidden dependencies; poor viscosity and juxtaposability
  - TA metaphor OK for advanced users but difficult to understand for others
  - VL expressive but needs dynamic WS look-up & more validation/explanation

# Summary



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- Developed novel web service composition tool using TA paradigm
- Supports modelling, BPEL4WS generation, running BPEL visualisation
- Further work includes:
  - More analysis support of models
  - Porting to Eclipse (in progress)
  - Library of WS + dynamic look-up capabilities
  - Extending TA paradigm for more BPEL features
  - Drill-down to detailed BPEL4WS editing views

# References



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