WST: A Tool for Verifying Web Services systems

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1. Introduction
2. Web Services Translation tool (WST)
3. WS-CDL
4. Translation from WS-CDL to TA
5. Conclusion and Future Work
It is important to devote a great effort to analyze and verify the behavior of Web Services systems.
Introduction

A Traveler always receives his ticket and statement after performing the payment.

The TravelAgent always cancels the reservation on the traveler's demand.
Web Services: SET OF PROTOCOLS & STANDARDS

- Choreography Description Language (WS-CDL)
- Business Process Language (WS-BPEL)
- UDDI
- WSDL
- SOAP
- XML, Encodings
- HTTP, SMTP, JMS
Introduction

WS-CDL

INTERNET

Customer in Yahoo Site

Weather

Searches

Travel
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WST tool

Choreography Layer
- **WS-CDL**
  - XML

**Sequence Diagrams**

**RT-UML**
- XMI

**TIMED AUTOMATA**
- Time Restrictions
- Model Checking Engine

**Orchestration Layer**
- **WS-BPEL**
  - XML

- (Done)
- (Under development)
- (Almost done)
WST tool

- Open XMI file
- Open WS-CDL file
- Save XMI file
- Save WS-CDL
- Exit

- Save Timed Automata
- Save WS-CDL
WST tool

WS-CDL documents generation, from the initial model (RT-UML diagram).

Execute the translation process
WST tool

Execute the translation process

TA documents generation, from WS-CDL documents.
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WS-CDL
WS-CDL

- Participant, Role and Relations types.
- Information types, Variables and Tokens.
- Choreographies (life-line, Exception and Finalizer blocks).
- Channels.
- Work Units.
- Activities and Ordering Structures.
- Interaction Activity.
- Semantics.
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From WS-CDL to TA

XSLT (XML Stylesheets Language) for Transforming XML documents into other XML Documents.
## From WS-CDL to TA

<table>
<thead>
<tr>
<th>WS-CDL</th>
<th>Timed Automata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
<td>Template</td>
</tr>
<tr>
<td>Relation Type</td>
<td>Channel(^+)</td>
</tr>
<tr>
<td>Participant Type</td>
<td>Process(^+)</td>
</tr>
<tr>
<td>Channel Type</td>
<td>Channel</td>
</tr>
<tr>
<td>Variables</td>
<td>Variables</td>
</tr>
<tr>
<td>Choreography</td>
<td>Choreography(^+)</td>
</tr>
<tr>
<td>Activity</td>
<td>Work Unit</td>
</tr>
<tr>
<td>Sequence</td>
<td>Activity(^+)</td>
</tr>
<tr>
<td>Parallelism</td>
<td>Activity(^+)</td>
</tr>
<tr>
<td>Choice</td>
<td>Activity(^+)</td>
</tr>
</tbody>
</table>
From WS-CDL to TA

<roleType name="name">
</roleType>

<workunit name="ncname">
guard="xsd:x<24"?
repeat="xsd:y<7"?
block="true|false"? >
    Activity-Notation
</workunit>
<role DemandMS>
<role ProductivityMS>
<choreography>
  <variable boolean inc_demand, clock x>
  <sequence>
    <workunit>
      <guard i==0>
      <repeat clock==0>
      <interaction>
        <from: DemandMS to: ProductivityMS>
        <exchange action=request>
        <record inc_demand:=false>
        </exchange>
      </interaction>
    </workunit>
  </sequence>
</choreography>
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<interaction name="" channelVariable="tns:turbines_on-channel" operation="TurnOnTurbines" align="true" initiate="true">
  <participate relationshipType="tns:ProductivityMSWindTurbineMS" fromRole="tns:ProductivityMS" toRole="tns:WindTurbineMS"/>
  <exchange name="request"
    informationType="tns:turbineonType" action="request">
    <send variable="cdl:getVariable("tns: turbineon", "", ")">
    <receive variable="cdl:getVariable("tns:turbineon", "", "")"
      recordReference="record-the-channel-info" />
  </exchange>
  <timeout time-to-complete="cdl:minor(cdl:getVariable("tns:z", ",", ",00:04"))" />
</interaction>
Future Work

Choreography Layer

WS-CDL
XML

WS-BPEL
XML

Orchestration Layer

Sequence Diagrams
RT-UML
XMI

XSLT
(Almost Done)

EQUIVALENT to Bisimulation Relationship
Future Work

- Choreography Layer
  - **WS-CDL**
    - XML
    - (Done)
- Orchestration Layer
  - **WS-BPEL**
    - XML
    - (Almost Done)

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- **RT-UML**
  - XMI
  - (Under development)
- **TIMED AUTOMATA**
  - Time Restrictions
  - Model Checking Engine
  - XSLT

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  - XMI
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