Cost Extension

Background
As part of a collaborative research study being carried out in the area of Cost-Aware Business Process Management at Queensland University of Technology, Brisbane, Australia and Eindhoven University of Technology, the Netherlands, a proposal is put forward for cost extensions to the XES log format.

The objective of the study is to investigate, evaluate and enhance current approaches for the analysis, evaluation, treatment, and overall management of cost as it relates to business processes. There is huge potential for managing cost in a structured manner based on an explicit link with business processes, and for establishing new ways of analysing cost through exploitation of process-related data. As a first step, we propose a way to capture process-related costs in event logs.

Definition
The cost extension defines a nested element to store information about the cost associated with activities within a log. The objective of this proposed extension is to provide semantics to cost aspects that can be associated with events in a log. The proposed definition associates three data elements with a particular cost element: the amount and the currency associated with the cost element as well as the cost driver that is responsible for incurring that cost and the cost type. As it is possible for more than one cost element to be associated with an event, the cost incurred per event is summarised using the “total” attribute. The currency element is also recorded once per event. Cost information can be recorded at the trace level (for instance, to be able to say that it costs $20 when a case is started). Cost information can also be recorded at the event level (for instance, for certain event types such as complete or cancelled events) to capture the cost incurred in undertaking the activity by a resource.

The extension is defined as shown in the table below:

<table>
<thead>
<tr>
<th>Extension definition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Cost</td>
</tr>
<tr>
<td>Prefix</td>
<td>cost</td>
</tr>
<tr>
<td>Extension URI</td>
<td><a href="http://www.xes-standard.org/cost.xesext">http://www.xes-standard.org/cost.xesext</a></td>
</tr>
<tr>
<td>XML representation</td>
<td><code>&lt;extension name=&quot;Cost&quot; prefix=&quot;cost&quot; url=&quot;http://www.xes-standard.org/cost.xesext&quot;/&gt;</code></td>
</tr>
</tbody>
</table>

The extension defines the following attributes:

<table>
<thead>
<tr>
<th>No</th>
<th>XES Attribute key</th>
<th>Definition</th>
<th>XES datatype</th>
<th>Occ.</th>
<th>Allowed values, examples, other constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>total</td>
<td>Container element for cost</td>
<td>Float</td>
<td>0-1</td>
<td>It contains total cost incurred for a trace or an event. The value represents the sum of all the cost amounts within the element.</td>
</tr>
<tr>
<td>1.2</td>
<td>currency</td>
<td>The currency of the cost value</td>
<td>String</td>
<td>1</td>
<td>Any valid currency format.</td>
</tr>
<tr>
<td>1.1</td>
<td>UniqueID</td>
<td>A wrapper for multiple cost drivers and amounts</td>
<td>String</td>
<td>1-n</td>
<td>Each entry contains a unique identifier (e.g., cost driver ID) as key and the value is empty. This is to allow costs from multiple cost drivers to be summarised per (complete/cancelled) event.</td>
</tr>
<tr>
<td>1.1.1</td>
<td>amount</td>
<td>Cost amount</td>
<td>Float</td>
<td>1</td>
<td>The value contains the cost amount for a cost driver.</td>
</tr>
<tr>
<td>1.1.2</td>
<td>driver</td>
<td>Cost driver</td>
<td>String</td>
<td>1</td>
<td>The value contains the id for the cost driver used to calculate the cost.</td>
</tr>
<tr>
<td>1.1.3</td>
<td>type</td>
<td>A reference to the cost type</td>
<td>String</td>
<td>1</td>
<td>The value contains the cost type (e.g., Fixed, Overhead, Materials).</td>
</tr>
<tr>
<td>1.1.4</td>
<td>currency</td>
<td>The currency of the cost value</td>
<td>String</td>
<td>1</td>
<td>Any valid currency format.</td>
</tr>
</tbody>
</table>
XES extension

<xesextension name="Cost" prefix="cost"
url="http://www.xes-standard.org/cost.xesext">
  <trace>
    <float key="total">
      <alias mapping="EN" name="Total Cost"/>
    </float>
    <string key="currency">
      <alias mapping="EN" name="Currency of Cost"/>
    </string>
  </trace>
  <event>
    <float key="total">
      <alias mapping="EN" name="Total Cost"/>
    </float>
    <string key="currency">
      <alias mapping="EN" name="Currency of Cost"/>
    </string>
  </event>
  <meta>
    <float key="amount">
      <alias mapping="EN" name="Cost Amount"/>
    </float>
    <string type="driver">
      <alias mapping="EN" name="Cost Driver"/>
    </string>
    <string key="type">
      <alias mapping="EN" name="Cost Type"/>
    </string>
  </meta>
</xesextension>

Example

<trace>
  <string key="cost:currency" value="AUD"/>
  <float key="cost:total" value="20.00">
    <string key="xyz123" value="">
      <float key="cost:amount" value="20.00"/>
      <string key="cost:driver" value="xyz123"/>
      <string key="cost:type" value="Fixed Overhead"/>
    </string>
  </float>
</trace>
<trace>
  <string key="cost:currency" value="AUD"/>
  <float key="cost:total" value="123.50">
    <string key="d2f4ee27" value="">
      <float key="cost:amount" value="21.40"/>
      <string key="cost:driver" value="d2f4ee27"/>
      <string key="cost:type" value="Labour"/>
    </string>
    <string key="abc124" value="">
      <float key="cost:amount" value="102.10"/>
      <string key="cost:driver" value="abc124"/>
      <string key="cost:type" value="Variable Overhead"/>
    </string>
  </float>
</trace>