Elements of the Object-Process Methodology Language

<table>
<thead>
<tr>
<th>Name</th>
<th>Symbol</th>
<th>OPL</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object</strong></td>
<td></td>
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</tr>
<tr>
<td>Thing</td>
<td>B is physical. (shaded rectangle)</td>
<td>An <strong>object</strong> is a thing that exists.</td>
<td></td>
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<tr>
<td></td>
<td>C is physical and environmental. (shaded dashed rectangle)</td>
<td>A <strong>process</strong> is a thing that transforms at least one object.</td>
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<tr>
<td></td>
<td>E is physical. (shaded ellipse)</td>
<td>Transformation is object generation or consumption, or effect—a change in the state of an object.</td>
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<tr>
<td></td>
<td>F is physical and environmental. (shaded dashed ellipse)</td>
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<tr>
<td><strong>Process</strong></td>
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<tr>
<td>A is s1.</td>
<td>A <strong>state</strong> is situation an object can be at or a value it can assume.</td>
<td></td>
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<tr>
<td>B can be s1 or s2.</td>
<td>States are always within an object.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C can be s1, s2, or s3. s1 is initial. s3 is final.</td>
<td>States can be initial or final.</td>
<td></td>
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</tr>
<tr>
<td>Name</td>
<td>Symbol</td>
<td>OPL</td>
<td>Semantics</td>
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<tr>
<td>---------------------------</td>
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<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Aggregation-Participation</strong></td>
<td><img src="image" alt="Diagram" /></td>
<td>A consists of B and C.</td>
<td>A is the whole, B and C are parts.</td>
</tr>
<tr>
<td><strong>Exhibition-Characterization</strong></td>
<td><img src="image" alt="Diagram" /></td>
<td>A exhibits B, as well as C.</td>
<td>Object B is an attribute of A and process C is its operation (method).</td>
</tr>
<tr>
<td><strong>Generalization-Specialization</strong></td>
<td><img src="image" alt="Diagram" /></td>
<td>B is an A. C is an A.</td>
<td>A specializes into B and C.</td>
</tr>
<tr>
<td><strong>Classification-Instantiation</strong></td>
<td><img src="image" alt="Diagram" /></td>
<td>B is an instance of A. C is an instance of A.</td>
<td>Object A is the class, for which B and C are instances. Applicable to processes too.</td>
</tr>
<tr>
<td><strong>Unidirectional &amp; bidirectional tagged structural links</strong></td>
<td><img src="image" alt="Diagram" /></td>
<td>A relates to B. (for unidirectional)</td>
<td>A user-defined textual tag describes any structural relation between two objects or between two processes.</td>
</tr>
<tr>
<td><strong>In-zooming</strong></td>
<td><img src="image" alt="Diagram" /></td>
<td>A exhibits C. A consists of B. A zooms into B, as well as C.</td>
<td>Zooming into process A, B is its part and C is its attribute.</td>
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<td><img src="image" alt="Diagram" /></td>
<td>A exhibits C. A consists of B. A zooms into B, as well as C.</td>
<td>Zooming into object A, B is its part and C is its operation.</td>
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<td><strong>Enabling links</strong></td>
<td></td>
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<tr>
<td>Agent Link</td>
<td><img src="image" alt="Agent Link" /></td>
<td>A handles B.</td>
<td>Denotes that the object is a human operator.</td>
</tr>
<tr>
<td>Instrument Link</td>
<td><img src="image" alt="Instrument Link" /></td>
<td>B requires A.</td>
<td>&quot;Wait until&quot; semantics: Process B cannot happen if object A does not exist.</td>
</tr>
<tr>
<td>State-Specified Instrument Link</td>
<td><img src="image" alt="State-Specified Instrument Link" /></td>
<td>B requires s1 A.</td>
<td>&quot;Wait until&quot; semantics: Process B cannot happen if object A is not at state s1.</td>
</tr>
<tr>
<td><strong>Consumption link</strong></td>
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<td></td>
</tr>
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<td>Consumption Link</td>
<td><img src="image" alt="Consumption Link" /></td>
<td>B consumes A.</td>
<td>Process B consumes Object A.</td>
</tr>
<tr>
<td>State-Specified Consumption Link</td>
<td><img src="image" alt="State-Specified Consumption Link" /></td>
<td>B consumes s1 A.</td>
<td>Process B consumes Object A when it is at State s1.</td>
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<td><strong>Result link</strong></td>
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<td>Result Link</td>
<td><img src="image" alt="Result Link" /></td>
<td>B yields A.</td>
<td>Process B creates Object A.</td>
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<tr>
<td>State-Specified Result Link</td>
<td><img src="image" alt="State-Specified Result Link" /></td>
<td>B yields s1 A.</td>
<td>Process B creates Object A at State s1.</td>
</tr>
<tr>
<td><strong>Input-Output link pair</strong></td>
<td><img src="image" alt="Input-Output Link Pair" /></td>
<td>B changes A from s1 to s2.</td>
<td>Process B changes the state of Object A from State s1 to State s2.</td>
</tr>
<tr>
<td><strong>Effect link</strong></td>
<td></td>
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</tr>
<tr>
<td>Effect Link</td>
<td><img src="image" alt="Effect Link" /></td>
<td>B affects A.</td>
<td>Process B changes the state of Object A; the details of the effect may be added at a lower level.</td>
</tr>
</tbody>
</table>
## EVENT, CONDITION, AND INVOCATION PROCEDURAL LINKS

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<tr>
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<tr>
<td>Instrument Event Link</td>
<td><img src="image1.png" alt="Diagram" /></td>
<td>A triggers B. B triggers A.</td>
<td>Existence or generation of object A will attempt to trigger process B once. Execution will proceed if the triggering failed.</td>
</tr>
<tr>
<td>State-Specified Instrument Event Link</td>
<td><img src="image2.png" alt="Diagram" /></td>
<td>A triggers B. when it enters s1. B requires s1 A.</td>
<td>Entering state s1 will attempt to trigger the process once. Execution will proceed if the triggering failed.</td>
</tr>
<tr>
<td>Consumption Event Link</td>
<td><img src="image3.png" alt="Diagram" /></td>
<td>A triggers B. B consumes A.</td>
<td>Existence or generation of object A will attempt to trigger process B once. If B is triggered, it will consume A. Execution will proceed if the triggering failed.</td>
</tr>
<tr>
<td>State-Specified Consumption Event Link</td>
<td><img src="image4.png" alt="Diagram" /></td>
<td>A triggers B when it enters s2. B consumes s2 A.</td>
<td>Entering state s2 will attempt to trigger the process once. If B is triggered, it will consume A. Execution will proceed if the triggering failed.</td>
</tr>
<tr>
<td>Condition Link</td>
<td><img src="image5.png" alt="Diagram" /></td>
<td>B occurs if A exists.</td>
<td>Existence of object A is a condition to the execution of B. If object A does not exist, then process B is skipped and regular system flow continues.</td>
</tr>
<tr>
<td>State-Specified Condition Link</td>
<td><img src="image6.png" alt="Diagram" /></td>
<td>B occurs if A is s1.</td>
<td>Existence of object A at state s2 is a condition to the execution of B. If object A does not exist, then process B is skipped and regular system flow continues.</td>
</tr>
<tr>
<td>Invocation Link</td>
<td><img src="image7.png" alt="Diagram" /></td>
<td>B invokes C.</td>
<td>Execution will proceed if the triggering failed (due to failure to fulfill one or more of the conditions in the precondition set).</td>
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