Information Leaks and Privacy in Web Services Computing

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Web Services Interactions

<table>
<thead>
<tr>
<th>Party</th>
<th>Return Type</th>
<th>Method</th>
<th>Parameter Type(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>void</td>
<td>callback</td>
<td>ObjType3</td>
</tr>
<tr>
<td>P2</td>
<td>ObjType2</td>
<td>method</td>
<td>ObjType2</td>
</tr>
<tr>
<td>P3</td>
<td>ObjType3</td>
<td>method</td>
<td>ObjType3, SubObjType1</td>
</tr>
<tr>
<td>P4</td>
<td>ObjType3</td>
<td>method</td>
<td>ObjType3</td>
</tr>
</tbody>
</table>

Type Hierarchy

Privacy-Safe Web Services

A web service is privacy-safe if it satisfies

- **Leak-Source Property**: the party is not a source for any information leak
- **Leak-Exploitation Property**: the party and its execution environment do not exploit any information leak.

Local Leak-Source Property

Development Guideline: Strong type matching.

Leak-Exploitation & KLIC

Leak-Exploitation Property

- Certification of Web Services
- Versioning of Web Services
- Static Program Analysis
- Type Deception Tracking

Cost of Information Leaks (KLIC)

- Naive: \( KLIC = \sum_{\text{sources}} \sum_{\text{variables}} \text{size}(O_v) \times \text{size}(O_a) \times \text{size}(O_w) \)
- Weighted: \( KLIC = \sum_{\text{sources}} \sum_{\text{variables}} (O_v + O_a + O_w) \times W_k \)

References