Challenges to OSLC Link Management in Safety Audited Industries

Conference Impulse

The research leading to these results has received funding from the European Union’s Seventh Framework Programme (FP7/2007-2013) for CRYS TAL – Critical System Engineering Acceleration Joint Undertaking under grant agreement n° 332830 and from specific national programs and / or funding authorities (BMBF 01IS13001E).
Why do we use links?

- Applicable standards
  - IEC 61508, ISO 26262, ISO 14971, DO-178B/C
- demand sound development process (quality + reliability)
- and credible proof of the process
- and credible proof of dealing with all safety concerns

- **Main problem: homo sapiens**
  - Humans perform complex transformations in development processes and those are neither reliable nor easy to document
  - Resulting items often stand in no easy relationship to each other

- One proof contribution: document the development activity (input, function, output) → this is the „link“ or „trace“
What is the Link?

- Links express an (possibly directed) explicit relationship
- You know from what to what the relationship exists
- You can separate it from other relationships having the same source and target or just opposite direction
- One endpoint alone is not a link (and two not necessarily)
Links must withstand forces of change

- Links are affected by various layers of toolchain
- Imagine activities as „shearing forces“ on „rope“
- In some cases links must break by guarantee!
<table>
<thead>
<tr>
<th>Data</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport between tools</td>
<td>Mesh-up of baselines</td>
</tr>
<tr>
<td>Reorganization of data</td>
<td>New variants</td>
</tr>
<tr>
<td>Synchronization of data</td>
<td>Reuse</td>
</tr>
<tr>
<td>Concurrent editing</td>
<td>Changing traceability demand</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tool</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes of technical representation</td>
<td>Changes to network topology</td>
</tr>
<tr>
<td>Different attributes</td>
<td>Changes to number and role of servers</td>
</tr>
<tr>
<td>Data distribution concept</td>
<td>Developing Security</td>
</tr>
<tr>
<td>Semantic Interpreation</td>
<td>Alternative Transport Layers</td>
</tr>
</tbody>
</table>
Very often people ask about linking:
- How do I add a link?
- How do I navigate over a link?

But equally important questions are:
- How do I remove links?
- How do I redirect links?
- How do I recognize link integrity?
- How can I point to a placeholder?
- How can I reproduce complex link structures?
- Access rights to links?
- How do I implement various instances of a link?
- How do I make sure that links of certain types will only point to resources of certain types?
- How do I make sure that links will not navigate across configurations?
- How do I make sure that links will not navigate across baselines?
- ...
What is the OSLC Link?

- OSLC involves two kinds of "links":
  - Universal Resource IDs (URIs)
  - RDF links (in data packets)

- OSLC intends to provide a "weak" form of link over the boundary of ALM/PLM supervision

- OSLC claims only to provide "lose coupling"

- The "lose" quality is crucial in deciding whether your projects must implement certain links on a firm platform or may implement them as OSLC links

- Note: you can have "link redundancy"
  - Firm links for auditing
  - Lose Links for daily work

- With OSLC you can often link with great precision to items
Knowing a URI does not mean you can know what is related to it and why? → Where to query them all?
• OSLC URIs are „absolute” by very nature
• Combination of techniques required in order to live with it
Storage matters

- URIs can be put in places where it is difficult to manage them

How to perform audit of older revisions?

resource $a$ has been just moved to a new place

Version Control System
Without contextual link resolution (get me the right link in this configuration, variant, baseline) you will observe various link integrity problems with distributed link storage.

Think of this: You never audit head revisions!
Conclusion

- OSLC is using technology of the web in order to
  - document relationships between artifacts.
  - quickly navigate to those items using universally available browsers.
  - uses most generic URIs as link endpoints.

- For Critical System Projects this means:
  - Linking within ALM (or comparable products) should be preferred
  - OSLC links are not naturally suitable for long term projects / products
  - Experience is showing that OSLC links do not withstand various types of „stress“ → careful application of them is mandatory

- Outlook
  - We will see more features in OSLC4J and OSLC specifications in order to simplify some link management in the future (e.g. OSLC CCM 3.0)
Thank you for your attention!

M.Sc. Aleksander Lodwich
Software Engineer at ITK Engineering AG
aleksander.lodwich@itk-engineering.de
+49 711 933157-393