# HOL-OCL

## Tool Demonstration

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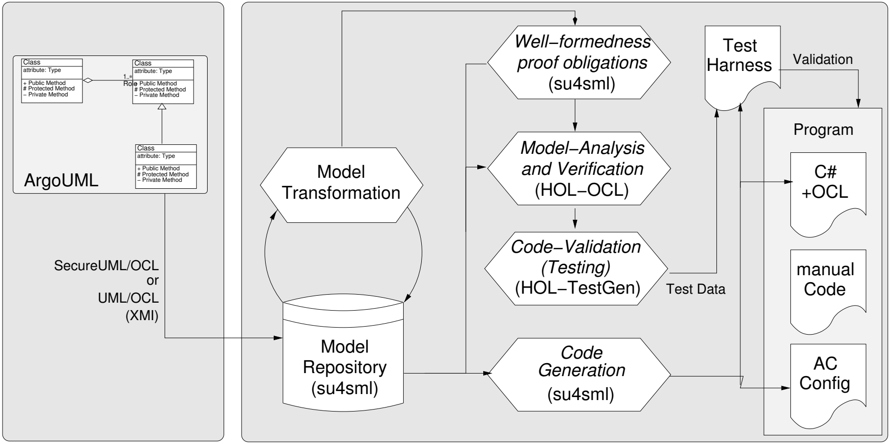
# The HOL-OCL Vision:

## A Tool Supported Formal Model-driven Engineering Process with Tool-support



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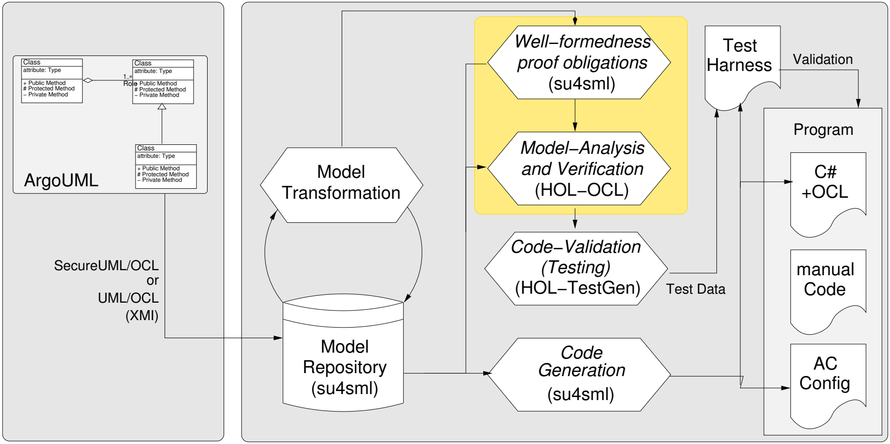
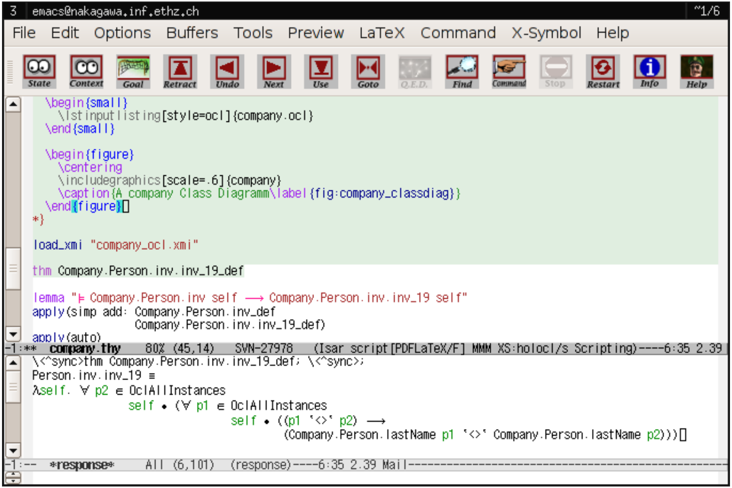


# Tool-Demo


emacs@nakagawa.inf.ethz.ch
File Edit Options Buffers Tools Preview LaTeX Command X-Symbol Help
State Context Goal Retract Undo Next Use Goto Q.E.D. Find Command Stop Restart Info Help
\begin{small}
\lstinputlisting[style=ocl]{company.ocl}
\end{small}
\begin{figure}
\centering
\includegraphics[scale=.6]{company}
\caption{A company Class Diagramm\label{fig:company_classdiag}}
\end{figure}
*}
load_xmi "company_ocl.xmi"
thm Company.Person.inv.inv_19_def
lemma "⊨ Company.Person.inv self ⟶ Company.Person.inv.inv_19 self"
apply(simp add: Company.Person.inv_def
Company.Person.inv.inv_19_def)
apply(auto)
-1:** company.thy 80% (45,14) SVN-27978 (Isar script [PDFLaTeX/F] MMM XS:holocl/s Scripting)----6:35 2.39
\<^sync>thm Company.Person.inv.inv_19_def; \<^sync>;
Person.inv.inv_19 ≡
λself. ∀ p2 ∈ OclAllInstances
self • (∀ p1 ∈ OclAllInstances
self • ((p1 ‘<>’ p2) ⟶
(Company.Person.lastName p1 ‘<>’ Company.Person.lastName p2)))
-1:-- *response* All (6,101) (response)----6:35 2.39 Mail

# Proof Obligations: Liskov's Substitution Principle

## Liskov substitution principle

Let $q(x)$ be a property provable about objects x of type $T$. Then $q(y)$ should be true for objects $y$ of type $S$ where $S$ is a subtype of $T$.

For constraint languages, like OO, this boils down to:

- *pre-conditions* of overridden methods must be *weaker*.
- *post-conditions* of overridden methods must be *stronger*.

Which can formally expressed as implication:

- Weakening the pre-condition:

$$op_{\text{pre}} \to op_{\text{pre}}^{\text{sub}}$$

- Weakening the pre-condition:

$$op_{\text{post}}^{\text{sub}} \to op_{\text{post}}$$

# Methodology

A tool-supported methodology should

- integrate into existing toolchains and processes,
- provide a unified approach, integrating ,
  - syntactic requirements (well-formedness checks),
  - generation of semantics requirements (proof obligations),
  - means for **verification** (proving) or **validation**, and of course
- all phases should be supported by tools.

**Example**

A package-based object-oriented refinement methodology.

# Conclusion

- We presented HOL-OCL providing:
  - a formal, machine-checked semantics for OO specifications,
  - an interactive proof environment for OO specifications,
  - publicly available: `http://www.brucker.ch/projects/hol-ocl/`,
  - next (major) release planned in November 2008.
- HOL-OCL is integrated into a toolchain providing:
  - code generators,
  - a transformation framework (including PO generation),
  - support for SecureUML via model transformations.

# Ongoing and Future Work

- Ongoing work includes the development of support for:
  - well-formedness-checking,
  - proof-obligation generation (Liskov, Refinement, ),
  - consistency checking,
  - Hoare-style program verification,
  - better proof automation.
- Future works could include the development for
  - integrating OCL validation tools, e.g., USE,
  - test-case generation (i.e., integrating HOL-TestGen),
  - supporting SecureUML natively.
  - ....

# The next Challenge for OCL Tools

- **State of the art:**
  - There are a lot of good OCL tools, which work in isolation.
  - There is no "one sizes fits all" OCL tool.
  - There is no (integrated) development process supporting.
- **Observation:** Successful specification languages comprise:
  - tools that work together.
  - one or more development processes that are well supported by tools.
- **Conclusion:** We, as the OCL Community, should
  - combining the strenghs of different OCL tools.
  - provide methodologies (development processes) on top of OCL.