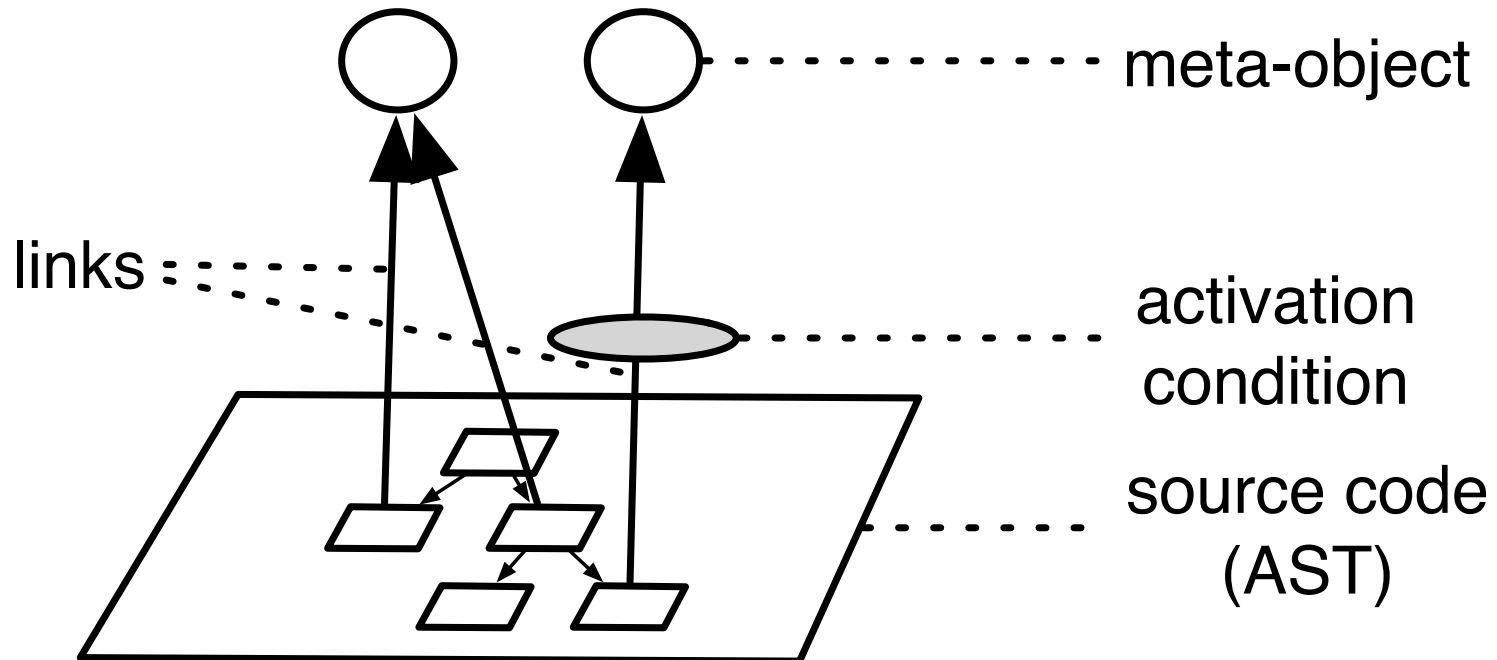


The Meta in Meta-Object Architectures

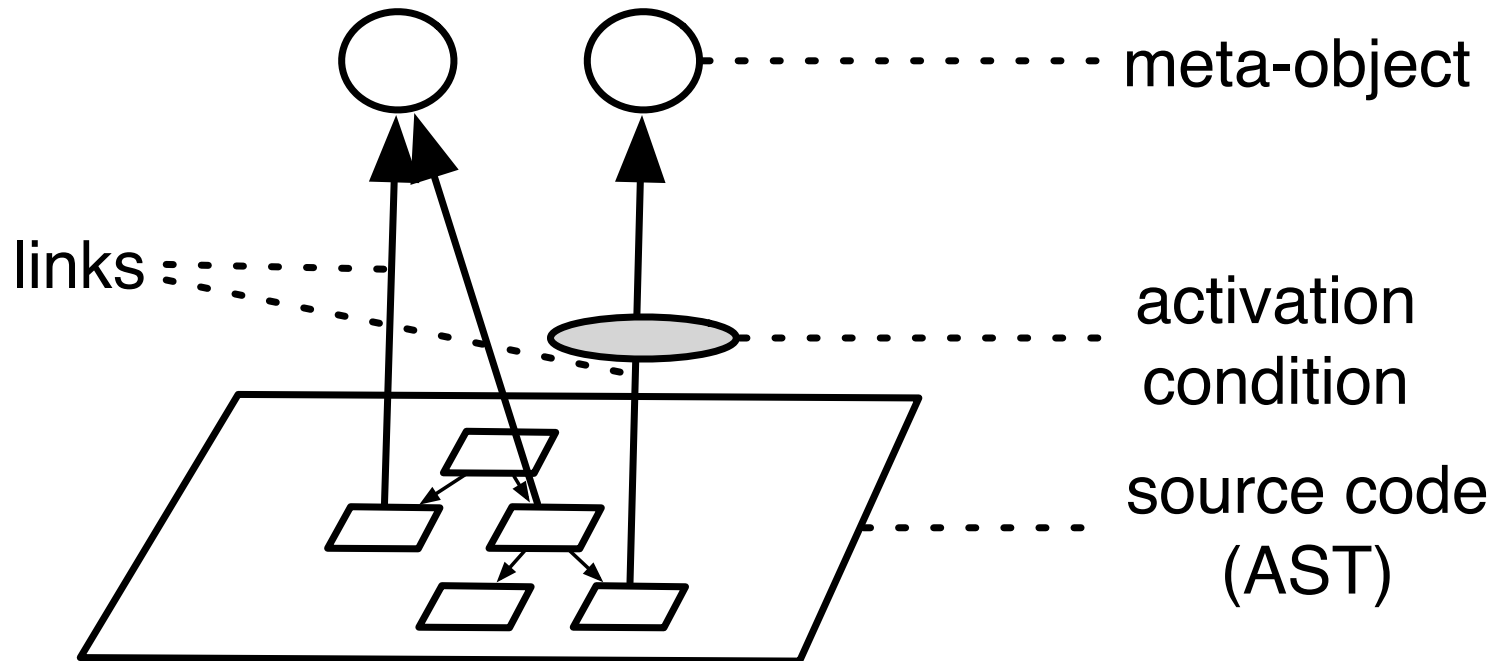
Marcus Denker, University of Bern
Mathieu Suen, INRIA
Stéphane Ducasse, INRIA

Partial Behavioral Reflection



Tanter, OOPSLA 2003

Partial Behavioral Reflection

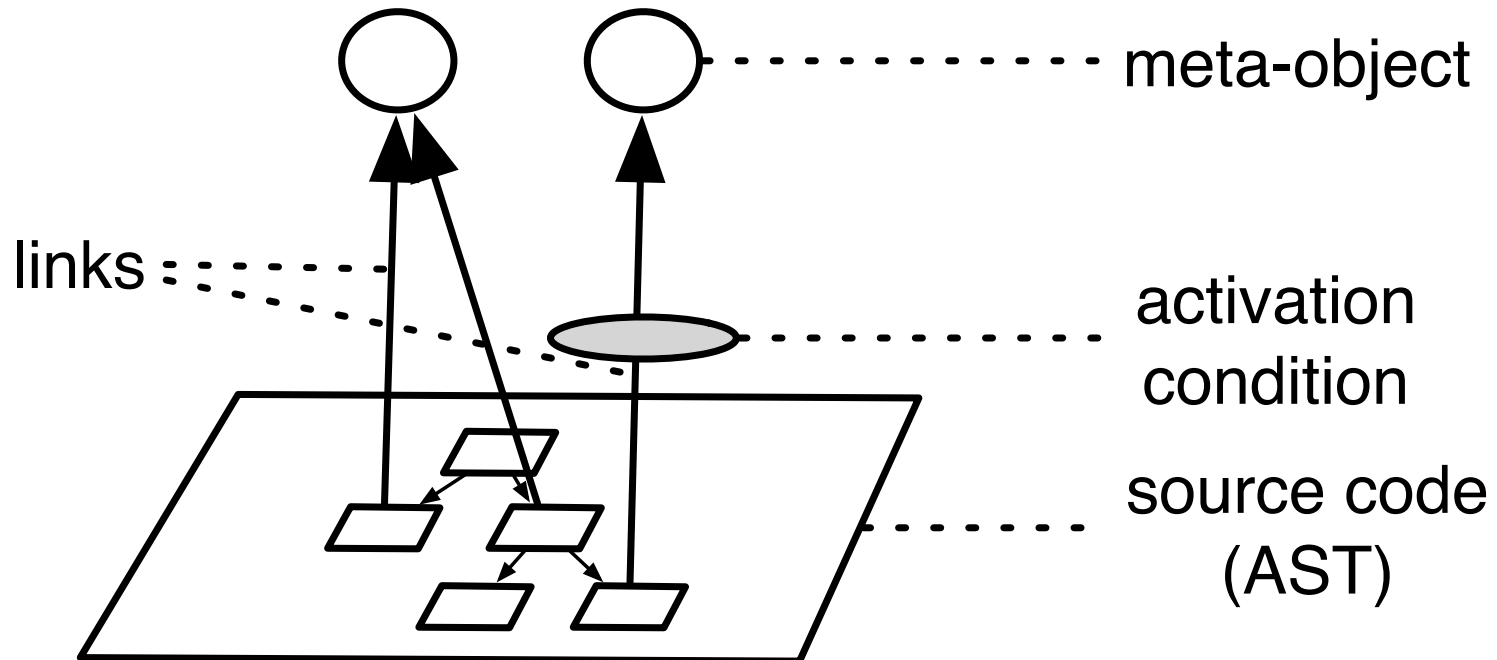


Dynamic
(Smalltalk)

David Röthlisberger, Marcus Denker and Éric Tanter:
**Unanticipated Partial Behavioral Reflection:
Adapting Applications at Runtime**

Journal of Computer Languages, Systems and Structures, vol.
34, no. 2-3, July 2008, pp. 46-65.

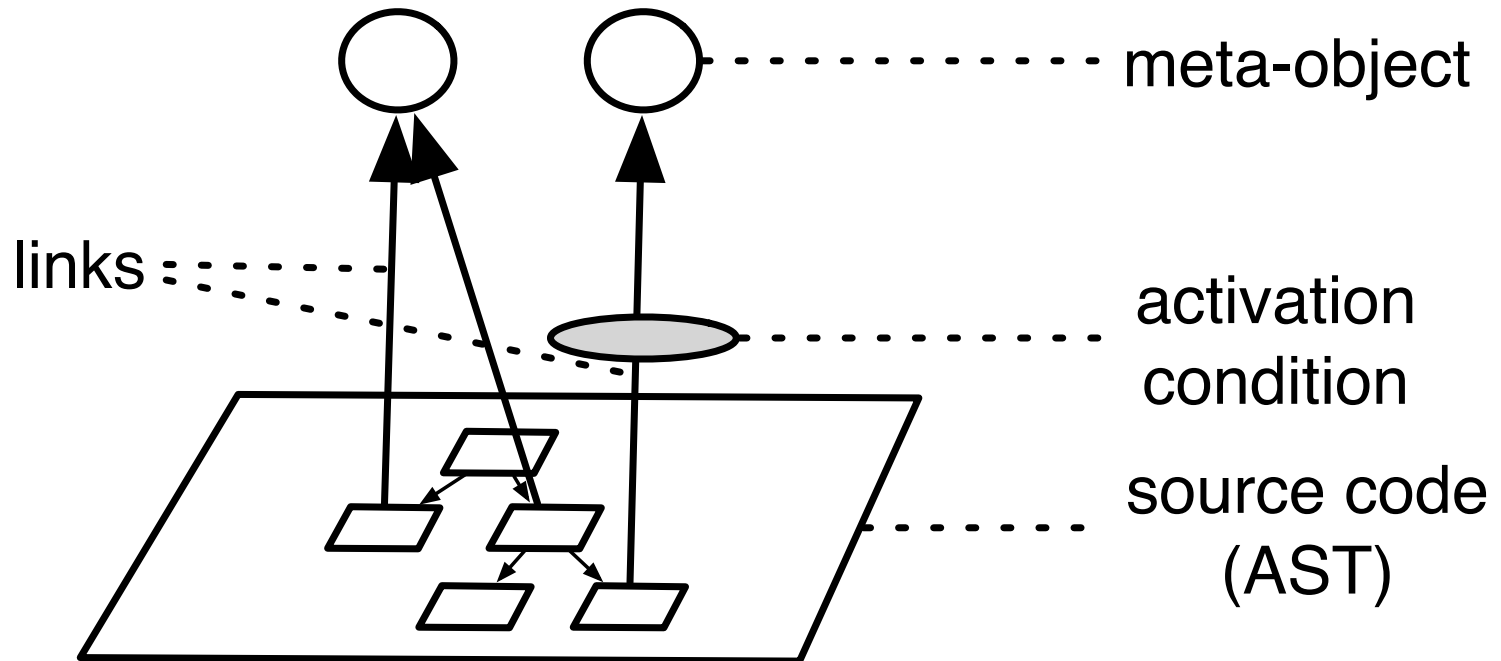
Partial Behavioral Reflection



AST

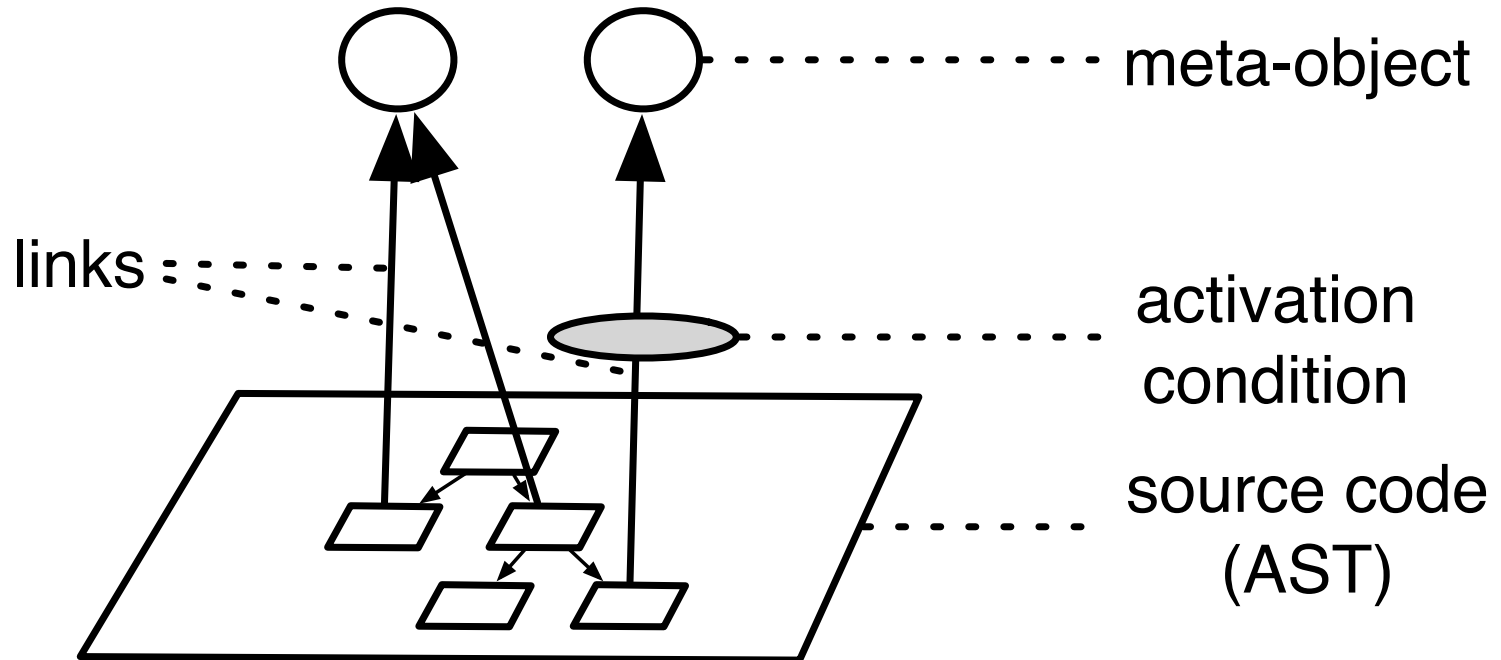
Marcus Denker, Stéphane Ducasse, Adrian Lienhard
Philippe Marschall: **Sub-Method Reflection**
Journal of Object Technology, vol. 6, no. 9,

Behavioral Reflection: Flexible



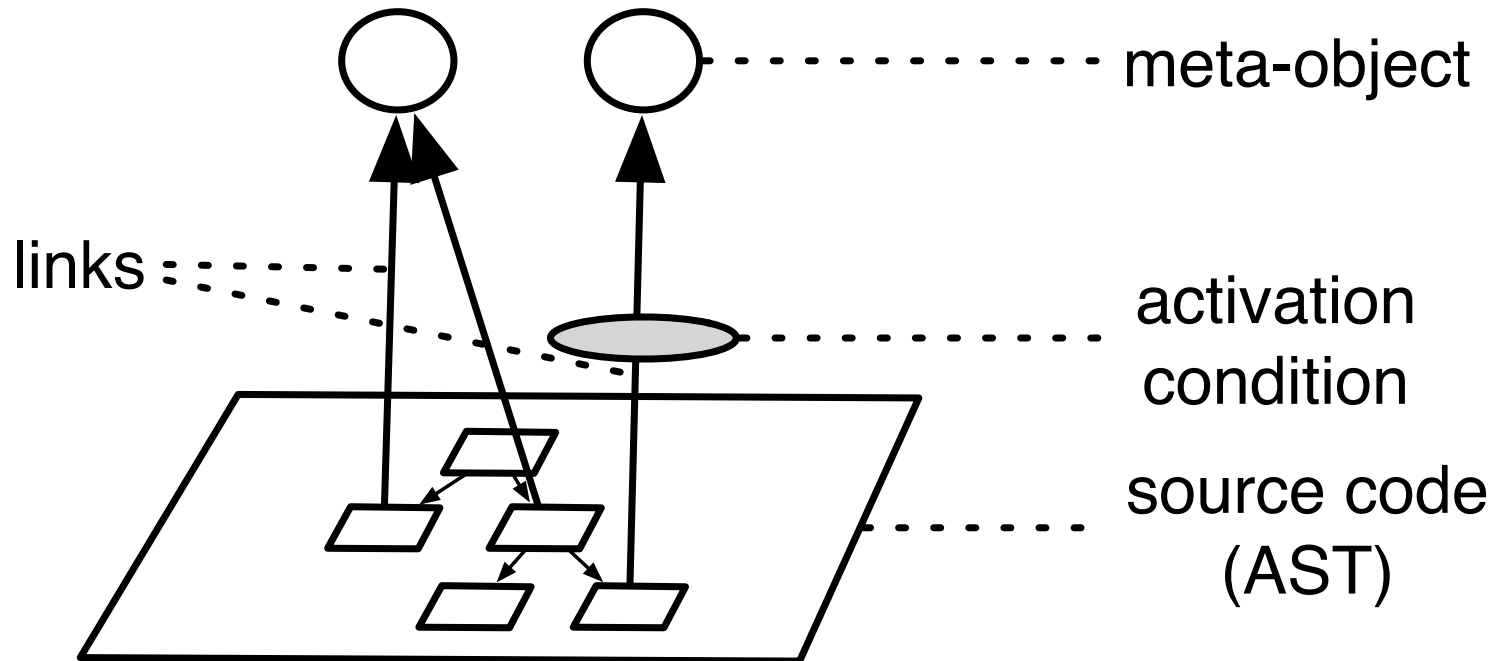
> Very Flexible

Behavioral Reflection: CLOS



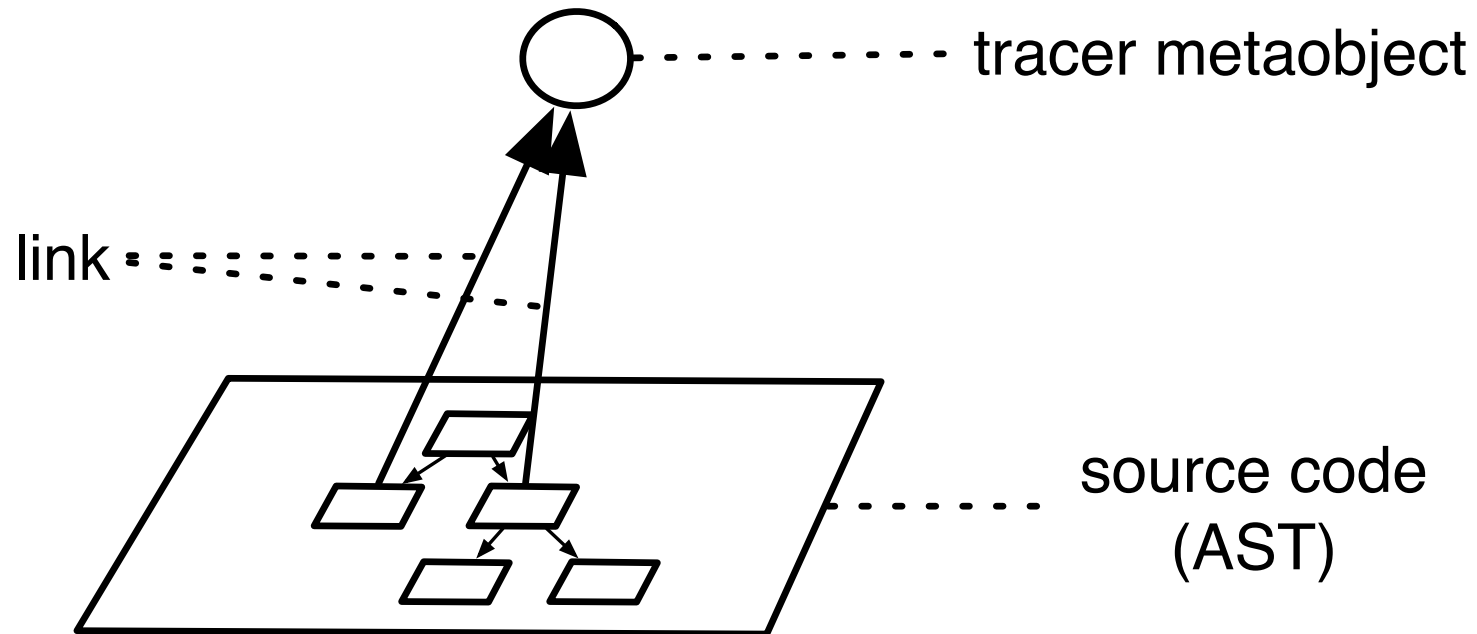
> Meta-class MOP (CLOS)

Behavioral Reflection: AOP



> Aspects

Behavioral Reflection: Tracer



> Tracer

Problem: Recursion

- > Behavioral reflection cannot be applied to the whole system
 - System classes
 - Meta-objects

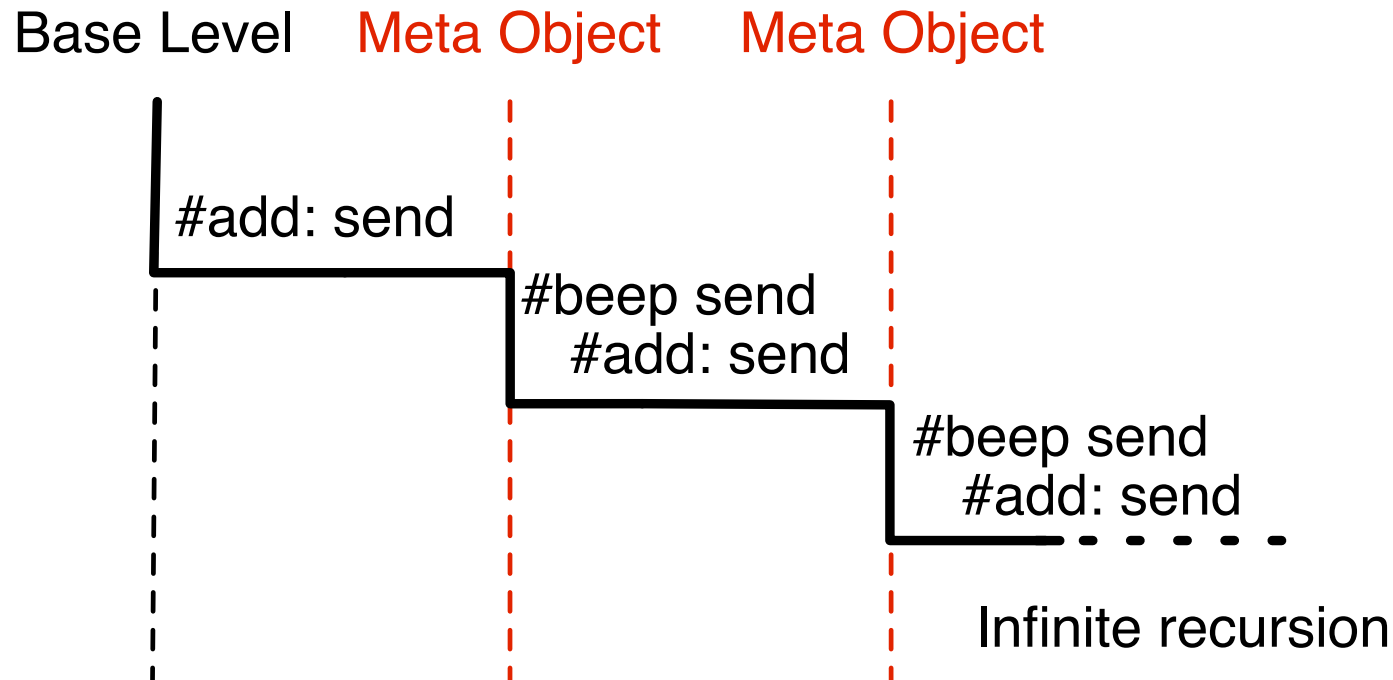
Example: Beeper

> Call the Beeper from `OrderedCollection>>#add`

```
beepLink := Link new metaObject: Beeper.  
beepLink selector: #beep.
```

```
(OrderedCollection>>#add:) methodNode link: beepLink.
```

Meta-object Call Recursion

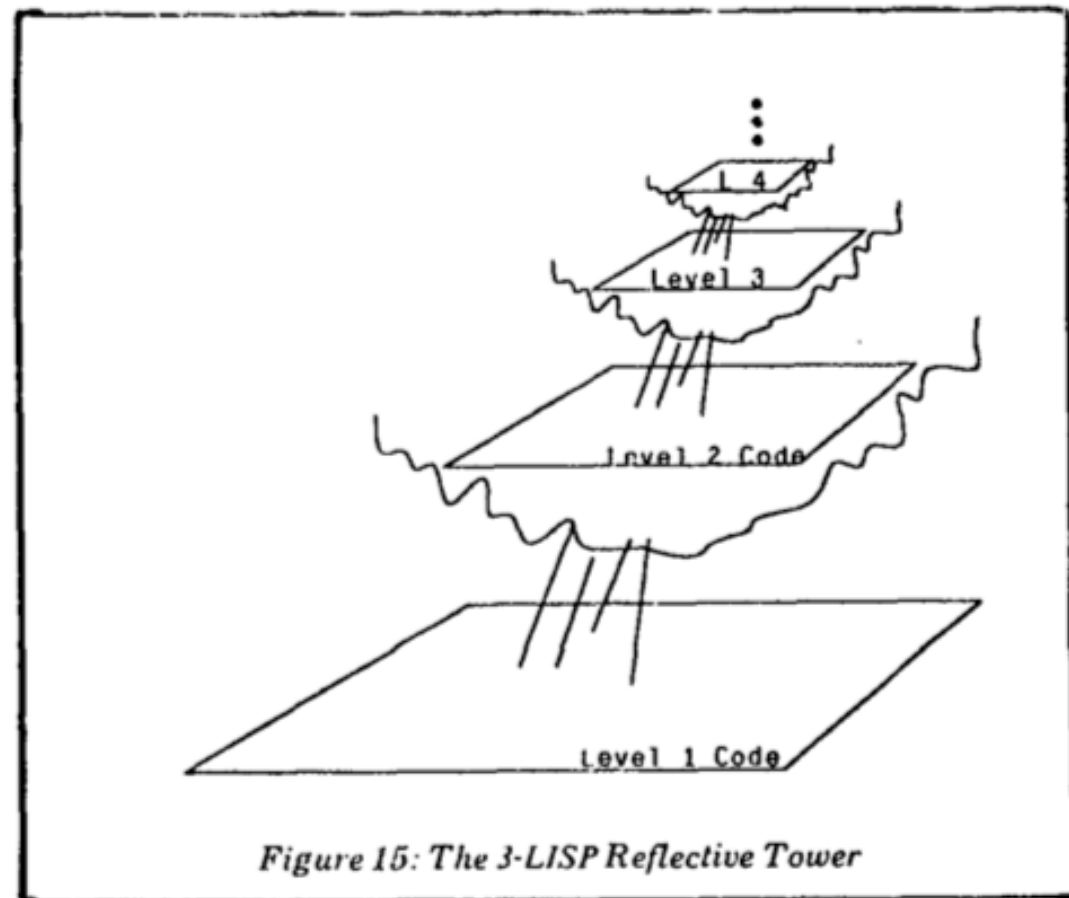


Ad-hoc Solutions

- > Code duplication
- > Adding special tests

Tower of Interpreters

> Smith, 1982

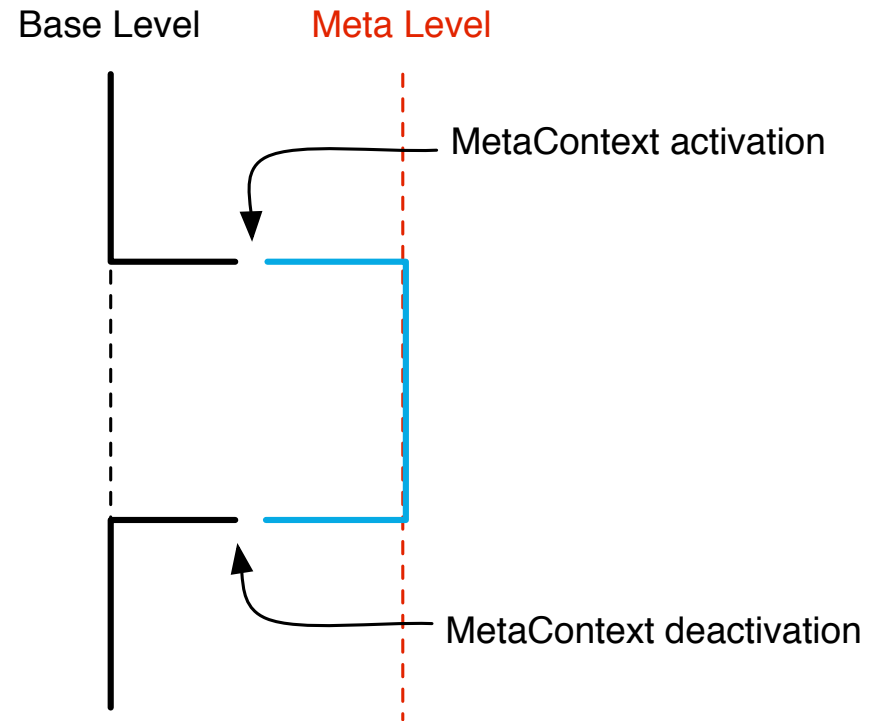


The Real Problem

Representing Meta-Level Execution

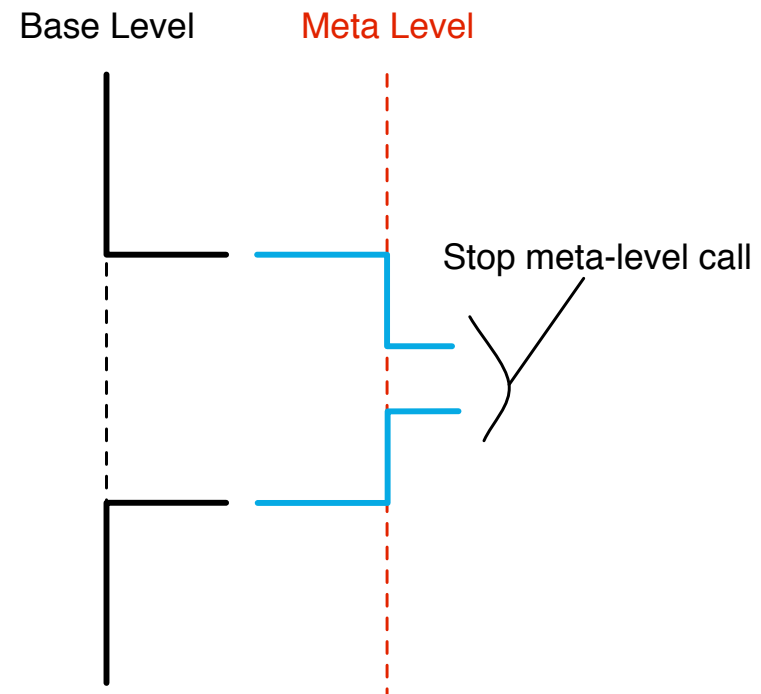
The Meta-Context

- > Link enables **MetaContext**



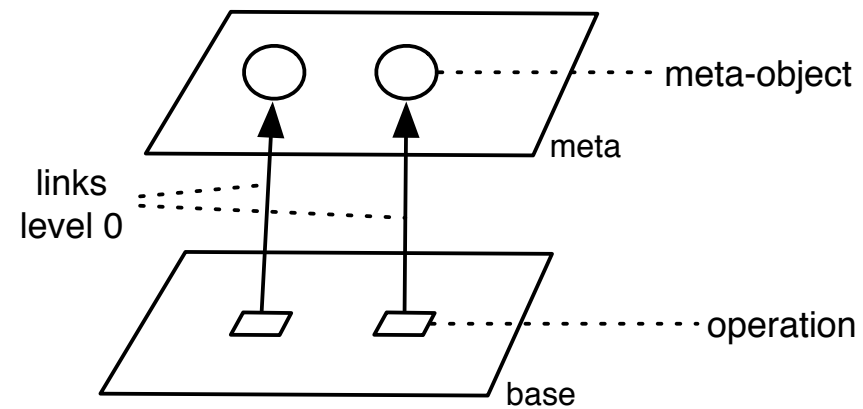
Context-aware Links

- > Disable call when already on the meta-level



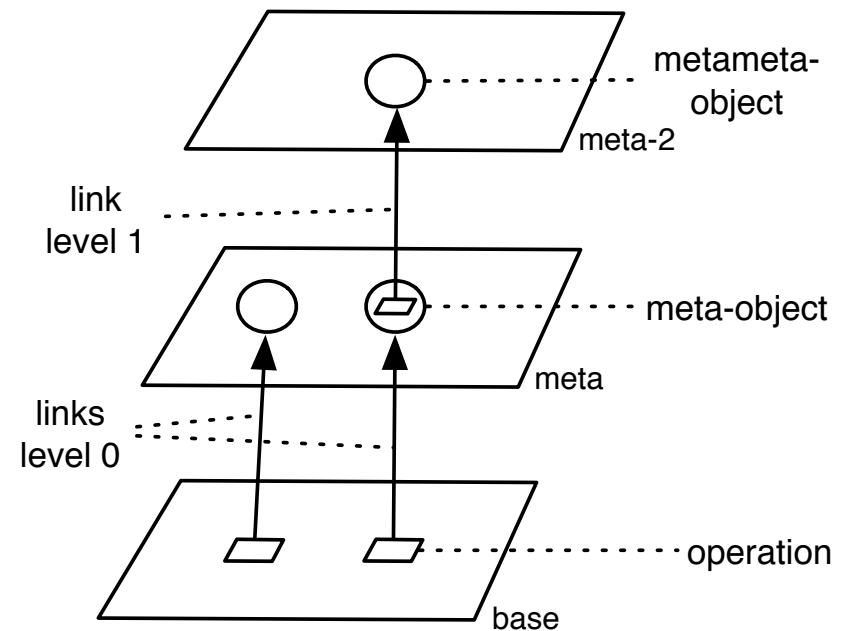
MetaContext

> Recursion problem solved



MetaContext

- > Meta-level analysis:
 - Trace the tracer



Future Work

- > Generalize context model:
 - Beyond the meta-context

- > Virtual machine support

- > Context-aware language kernel

Conclusion

- > Recursion problem
- > Missing representation of meta-level execution
- > Meta-context
 - Solves the recursion problem
 - Enables *meta-level analysis*

Conclusion

- > Recursion problem
- > Missing representation of meta-level execution
- > Meta-context
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Questions?