Metadata and aspect evolution

Experiences in Aspicere

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Aspicere

- What's in a name?
  - aspicere ≡ "to look at" (Latin)
  - Here: aspect language for C
- Characteristics:
  - Prolog-based pointcut language
  - Source code weaver
  - Currently only statically determinable joinpoints
  - Likewise no weaving within advices
- Future:
  - Merging into GCC 4.0 ("heterogeneous AOP")
  - cflow, sequence, ...
  - Weaving inside advices

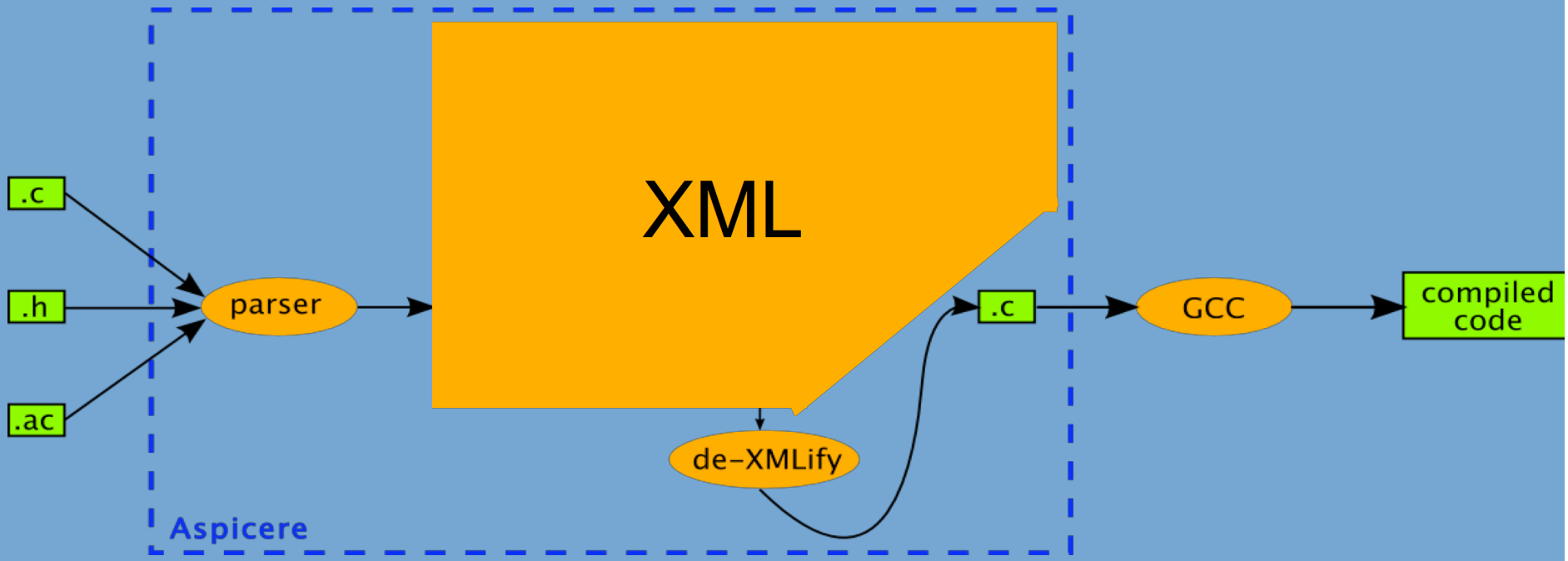
Outline

1. Aspicere, a short introduction
2. Metadata
3. Demonstration

Outline

1. Aspicere, a short introduction

General architecture



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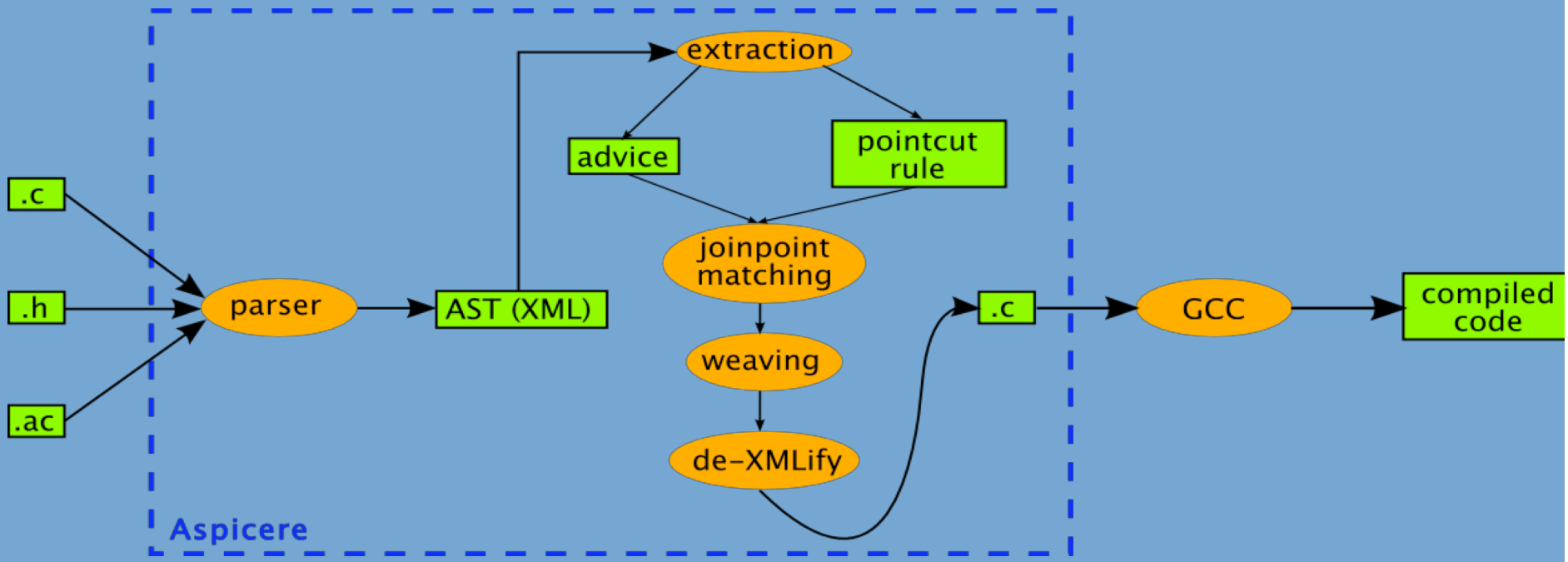

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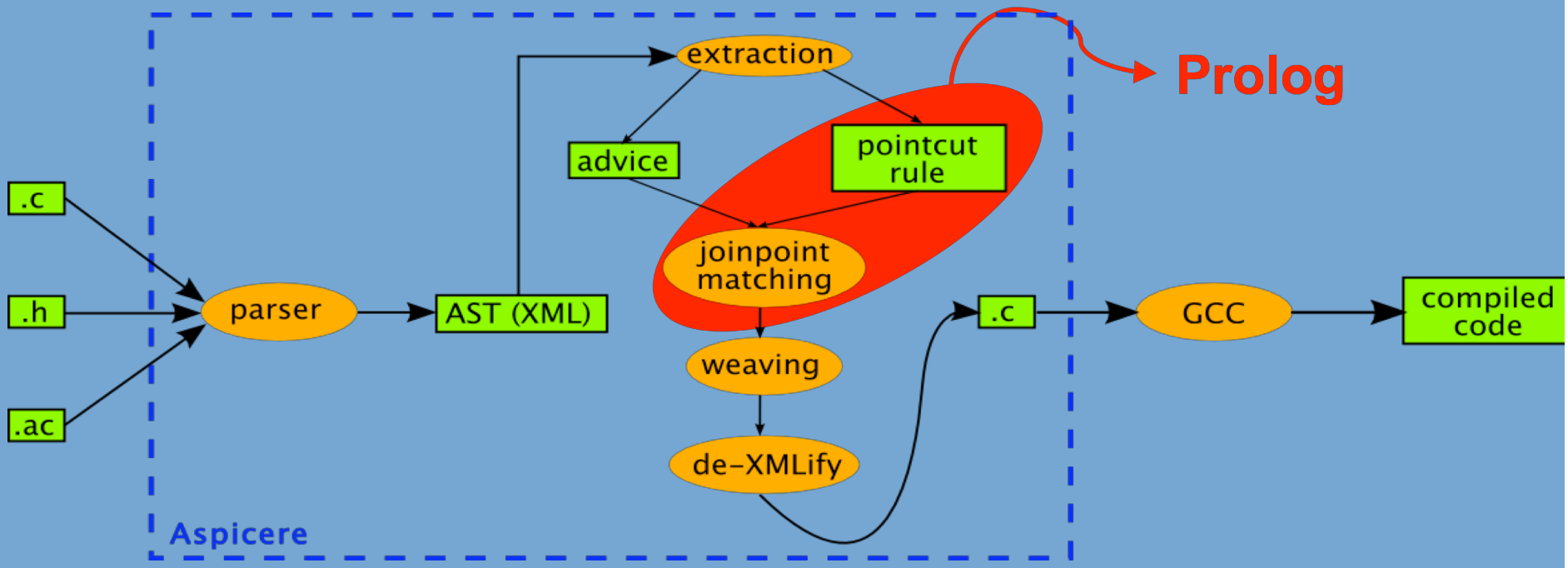

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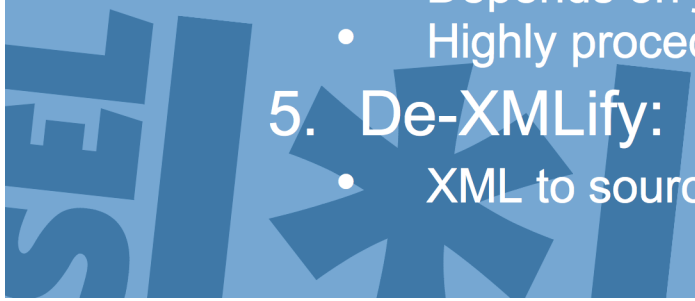
  ≡ preprocessor for GCC

More details

1. Parser:
   - btyacc (backtracking): slowwwwwww ...
   - Antlr: very fast + type-checking
2. Extraction:
   - XSLT + XPath (cached)
3. Joinpoint matching (Prolog):
   - Backward chaining
   - Instantiate joinpoints as needed
   - **Bind** weave-time properties
4. Weaving:
   - Depends on joinpoint type
   - Highly procedural
5. De-XMLify:
   - XML to source code



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} WHY?

Even more details ...

source code

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int main(void){
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}
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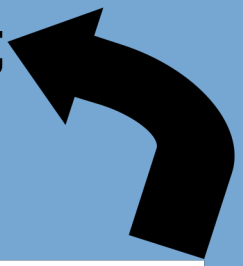

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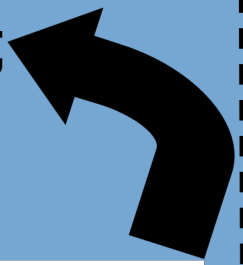

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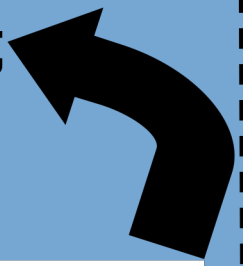

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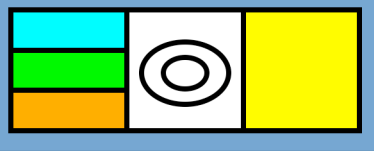

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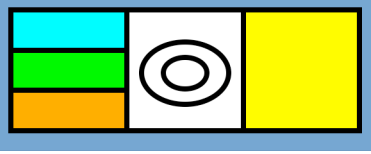

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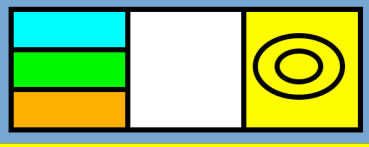

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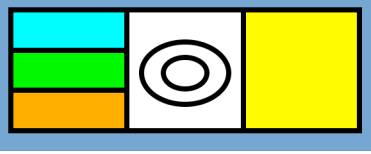

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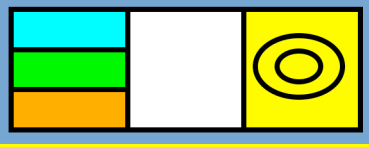

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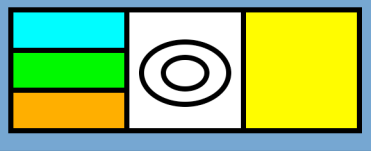

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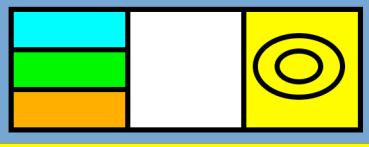

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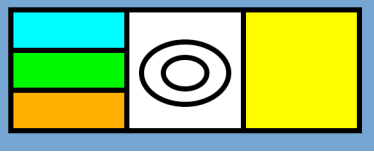

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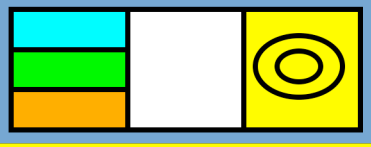

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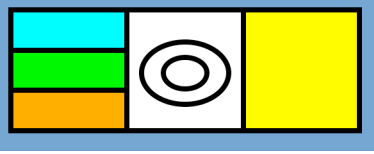

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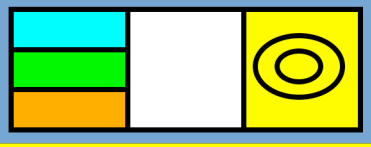

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Example

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ReturnType advice tracing_nonvoid(ReturnType) on (Jp):
  call(Jp,_)
  && type(Jp,ReturnType)
  && !str_matches("void",ReturnType)
    {
    ReturnType i;
    /* Tracing code */
    i = proceed ();
    /* Tracing code */
    return i;
    }
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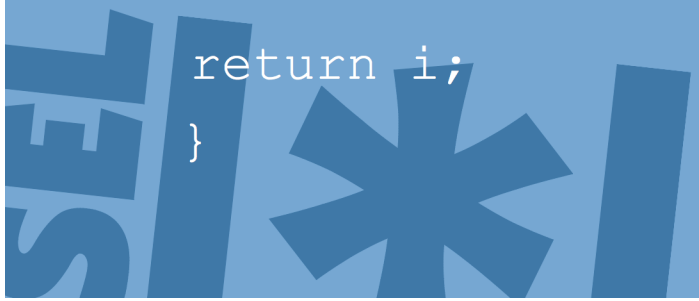

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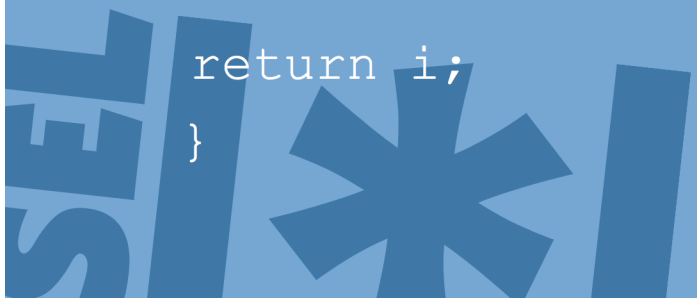
Prolog predicates



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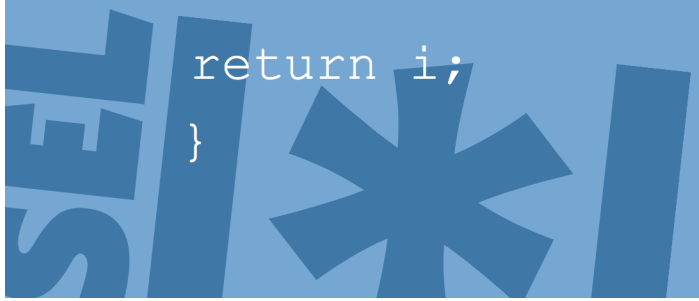
Prolog predicates

"Templatized" C



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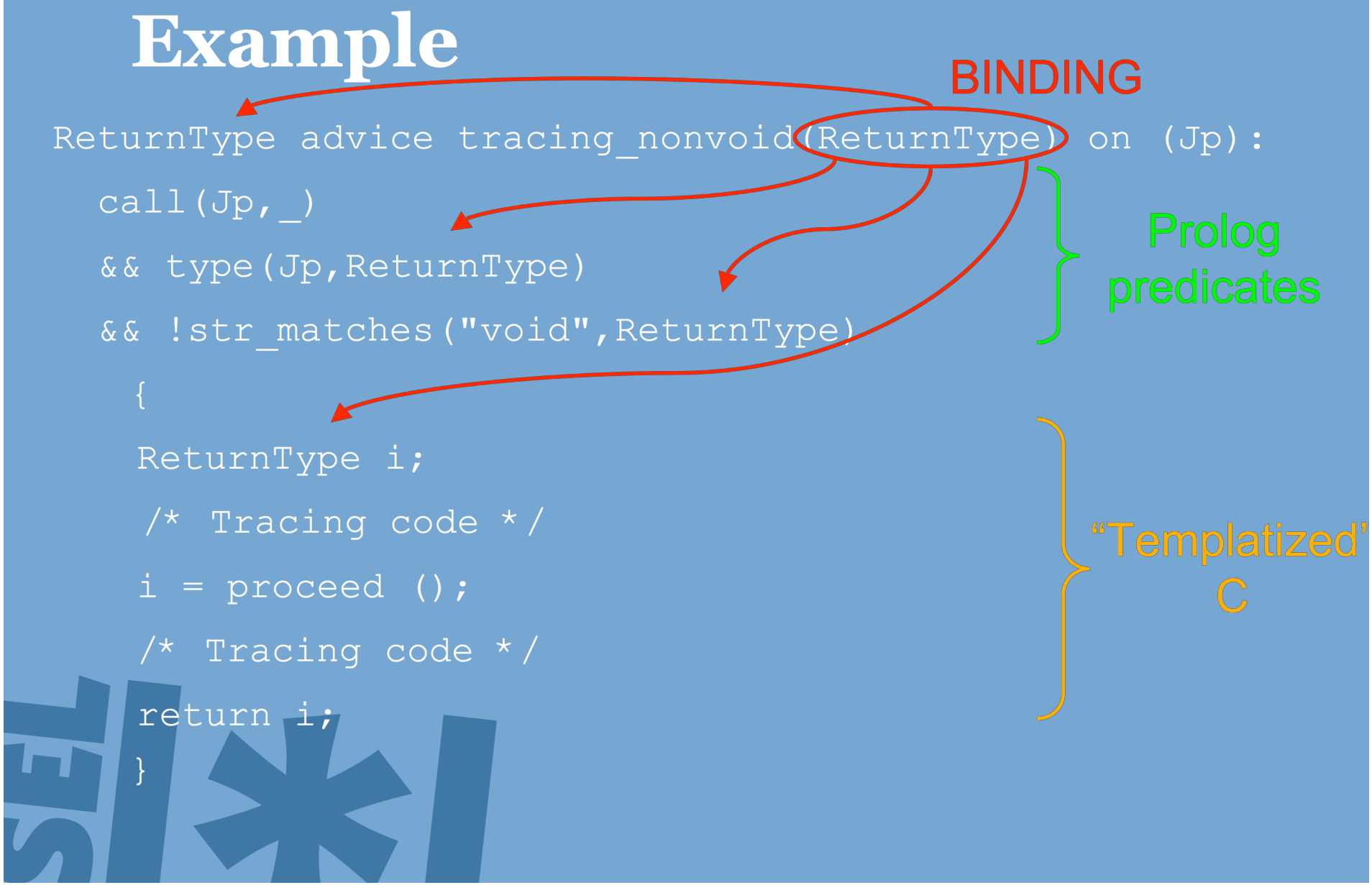
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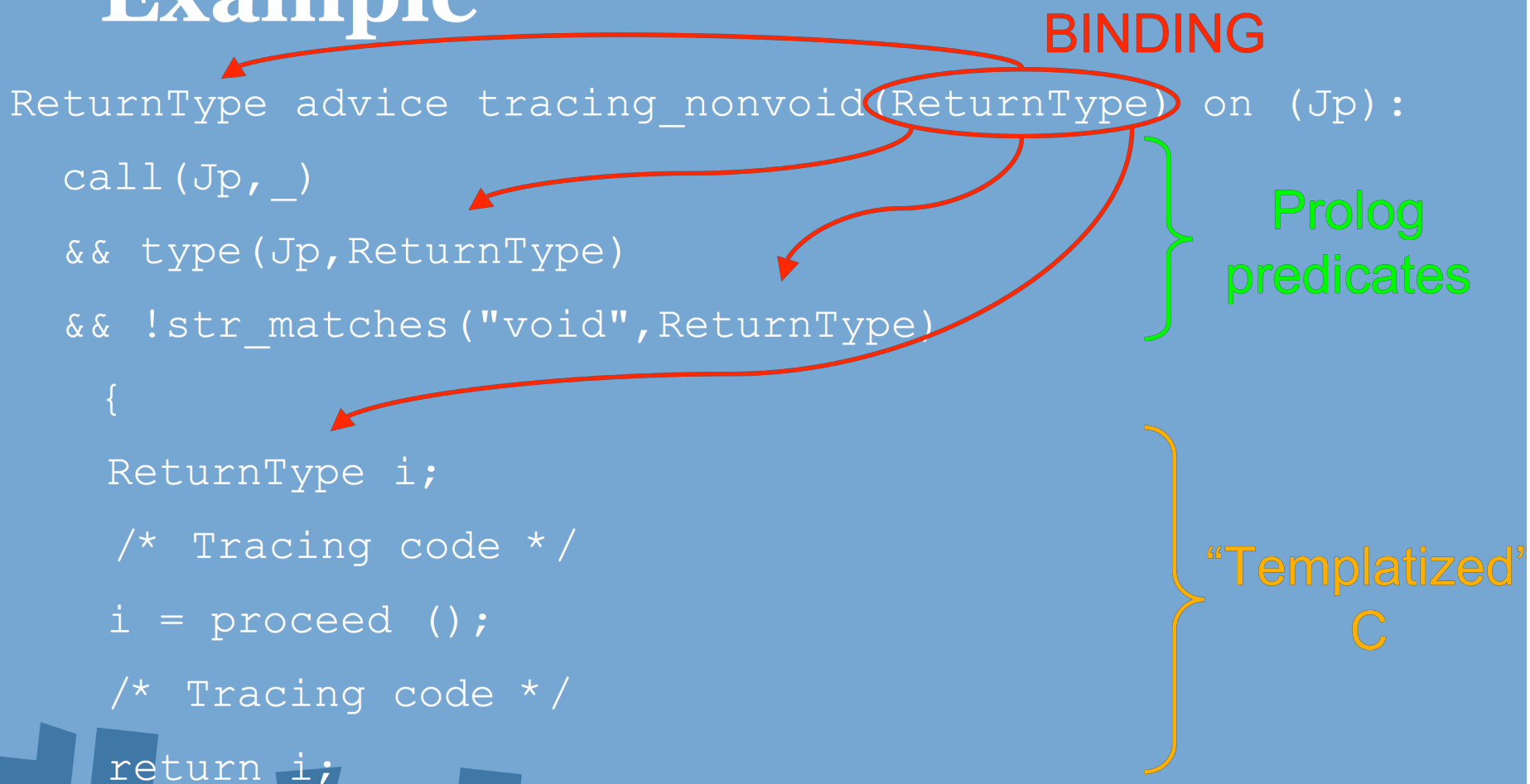

➡ Aspect ≡ normal compilation unit enhanced with advice

Bindings

- What?
  - Logic variables which are bound and can be used freely throughout advice code
  - ≈ C++ template parameter
  - cf. Kris Gybels' and Johan Brichau's work, Cobble, LogicAJ, ...
- How?
  - Consider tuple of bindings $L=(L_1,...,L_n)$
  - Instantiate advice once for all solutions for L
- Why?
  - Leverage power of Prolog ➔ reusable, robust pointcuts
  - NECESSITY ➔ no Object-class, nor template parameters

generic aspect language

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2. Metadata

Metadata

- What?
  - "data about data": semantics, design decisions, conventions, ...
- Why?
  - automated (aspectized) evolution, aspect mining, ...
- How?
  - Documentation ➔ Javadoc, Doxygen, ...
  - Separate file ➔ property files, ...
  - Language support ➔ Java 5 annotations, C# custom attributes
  - AOP introduction ➔ AspectJ 5
- In Aspicere:
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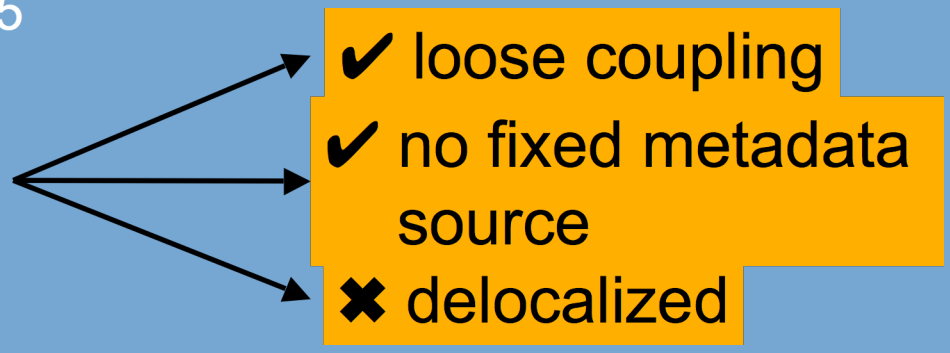
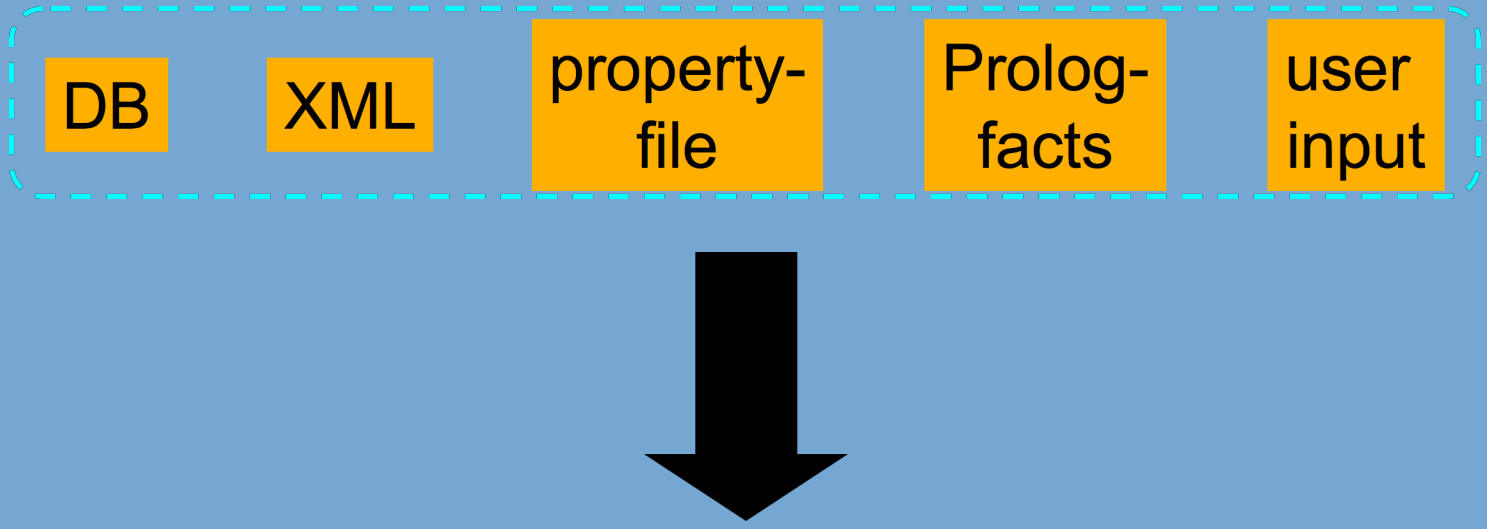


Metadata supply and consumption

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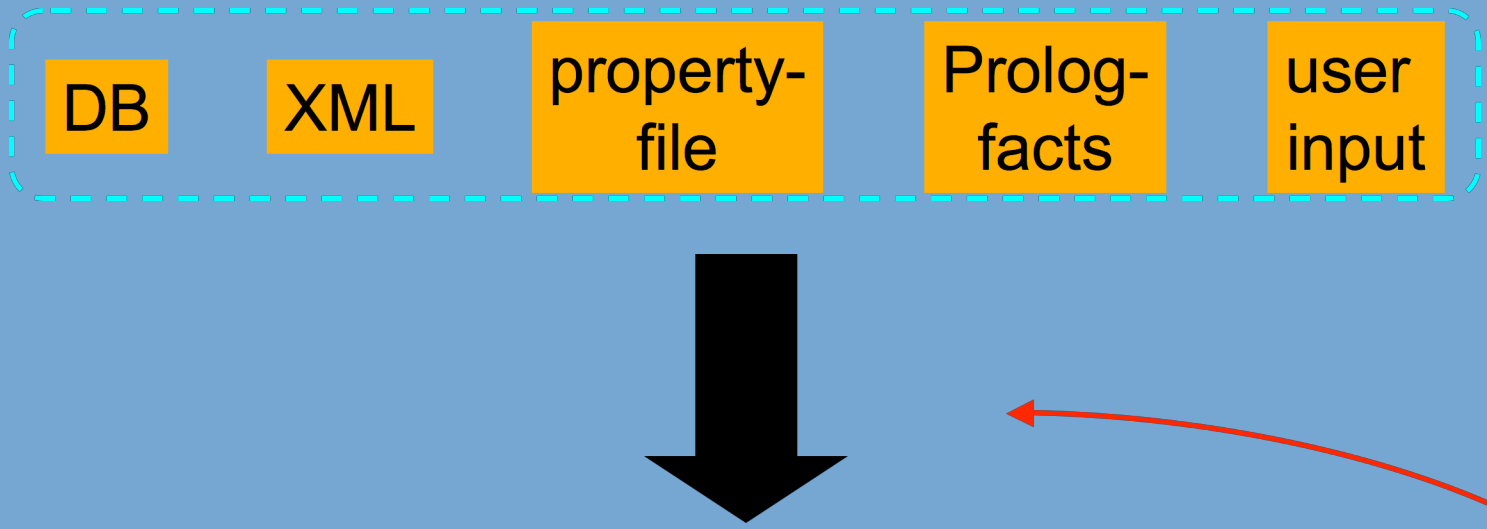


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metadata

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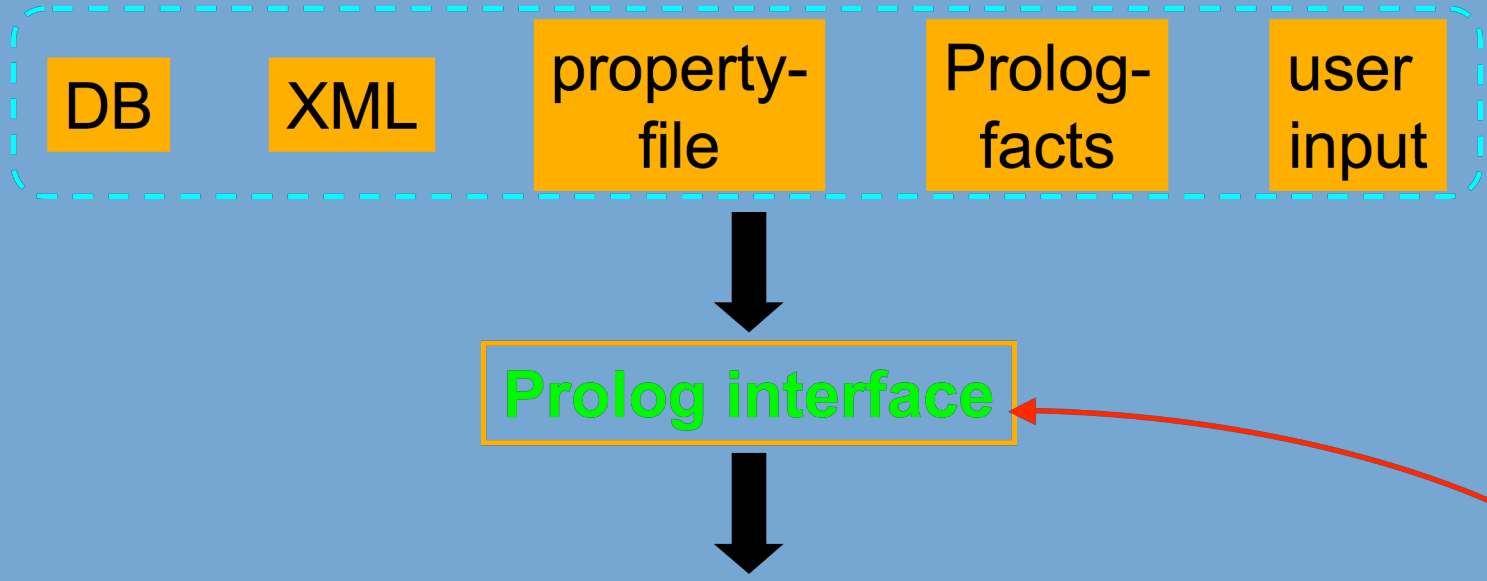


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Conclusion and questions

- Conclusion:
  - Prolog facts and rules enable transparent storing of metadata
  - Aspicere's use of Prolog-like pointcuts allows easy exploitation of metadata
- Questions:
  - Does direct language support for metadata (a.k.a. annotations) yield better evolution opportunities than other mechanisms?
  - What about availability of metadata?

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