XCore: Support for Developing Program Analysis Tools

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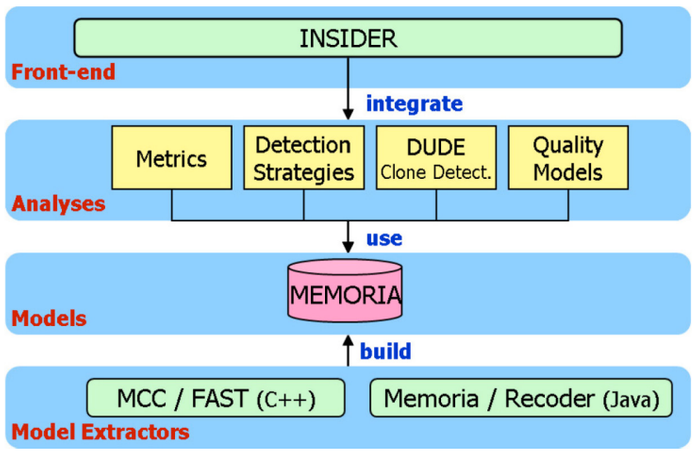
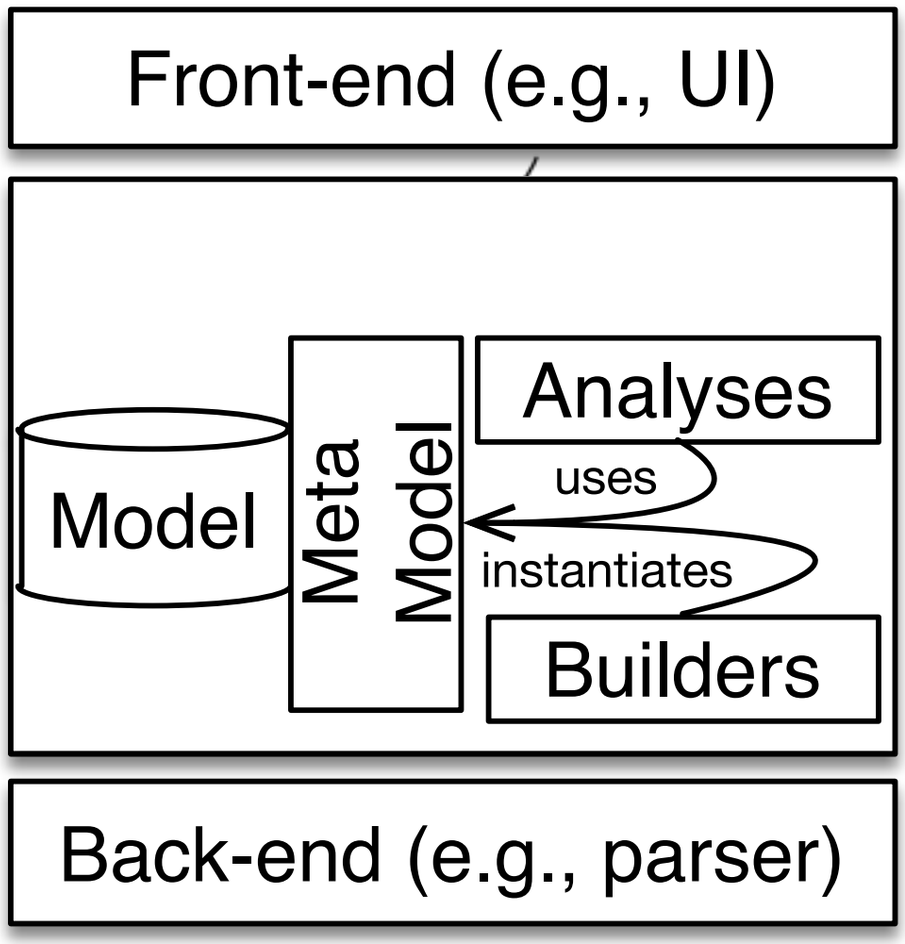
Analysis tools
generic architecture



iPlasma / Mcc



TEDi

developed

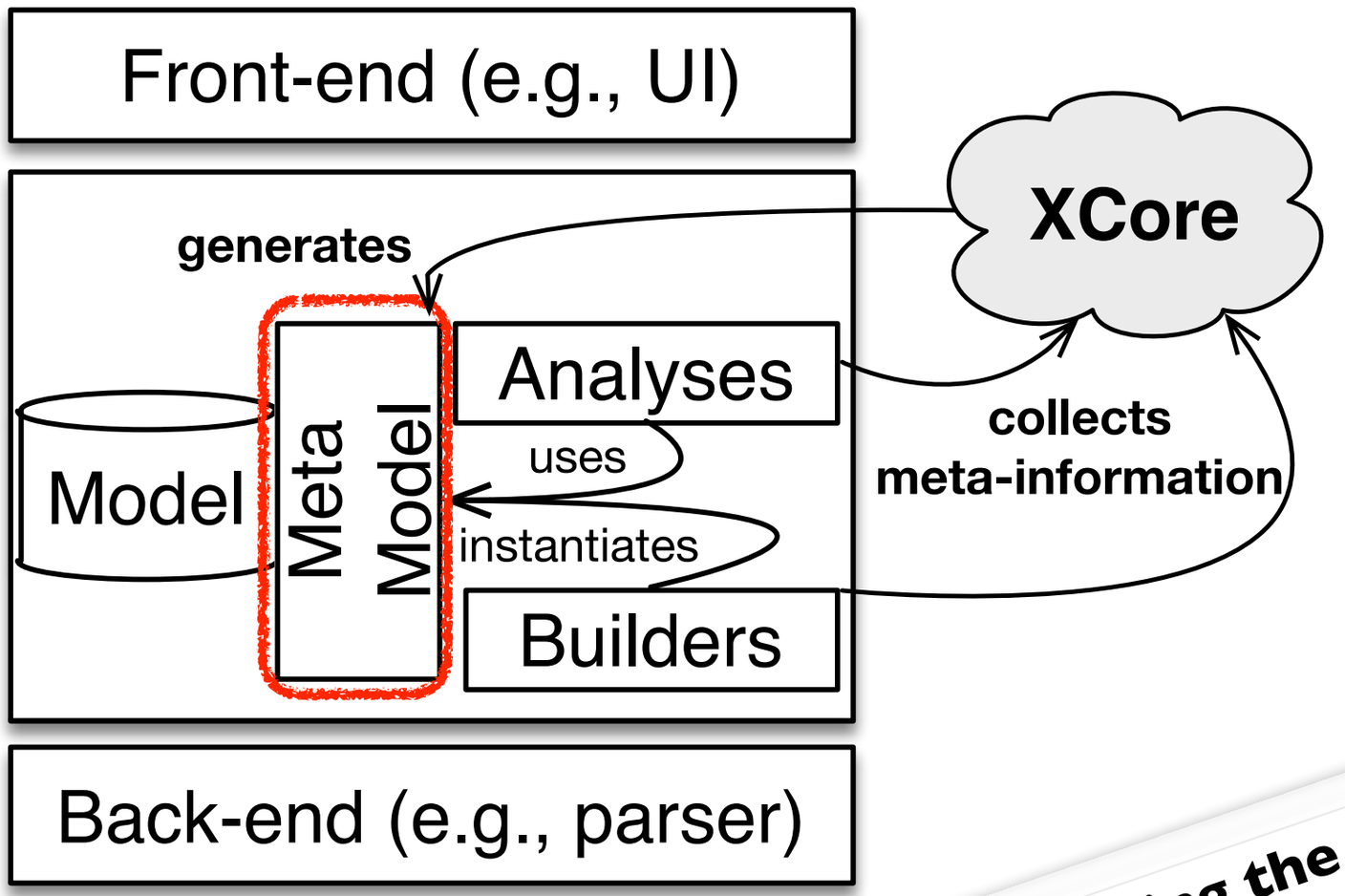
Randoop

WALA

T. J. WATSON LIBRARIES FOR

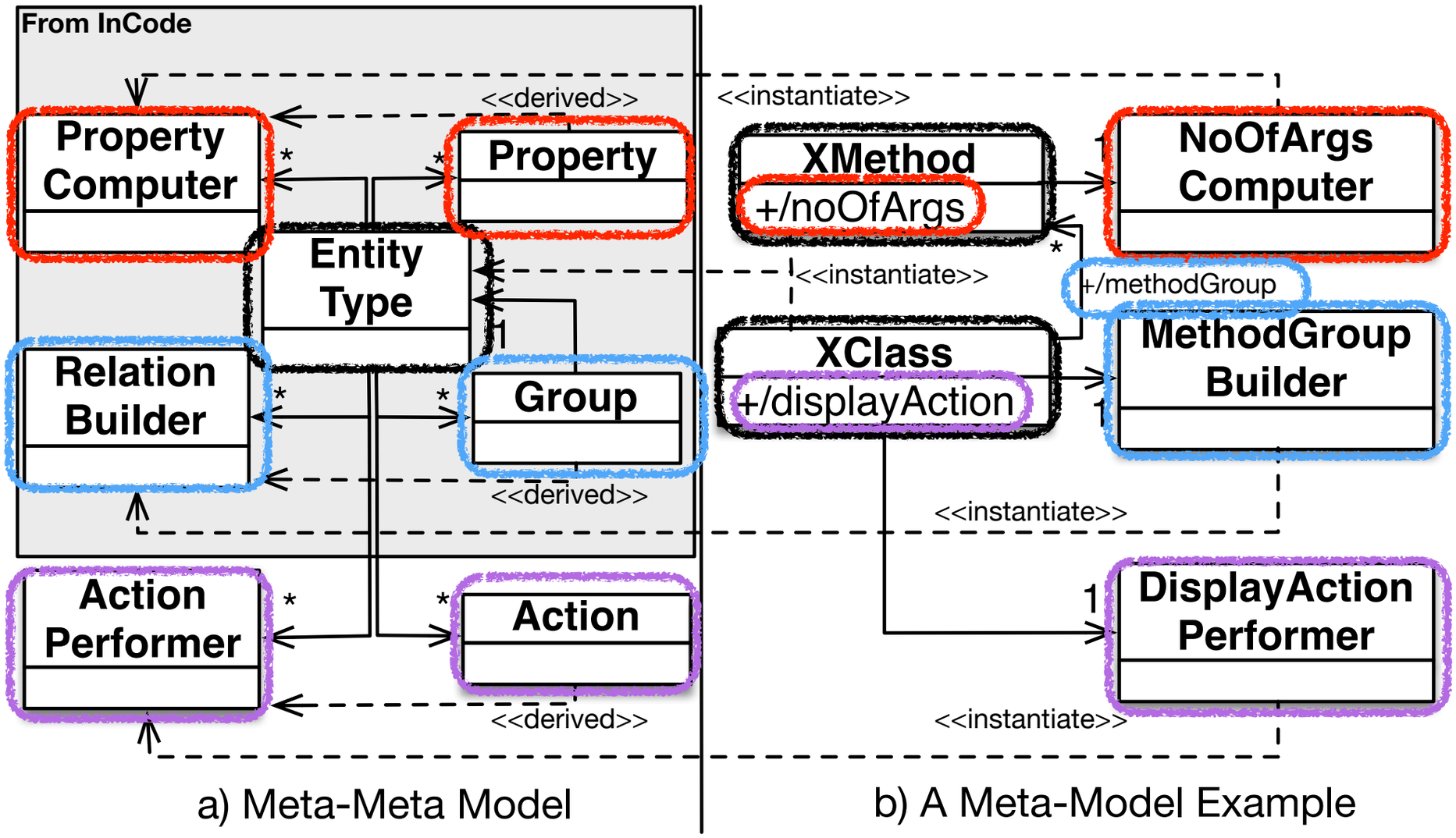
used

Why XCore?



Implementing the model representation (and its related mechanisms) is a recurring task

Describing the model



Based on Ganea et. al.
***Continuous Quality Assessment with inCode*, 2017**

XCore - Eclipse plugin

The Eclipse Project of the Tool

```
/ **
  * Documentation
  */
@PropertyComputer
class NoOfArgs implements
IPropertyComputer<Integer,XMethod>
{
    public Integer compute() {…}
}
```

```
//Generated by XCore
interface XMethod {
    /**
     * Documentation
     */
    public Integer noOfArgs();
}
class XMethodImpl implements XMethod
{
    …
}
```

Eclipse IDE

build time

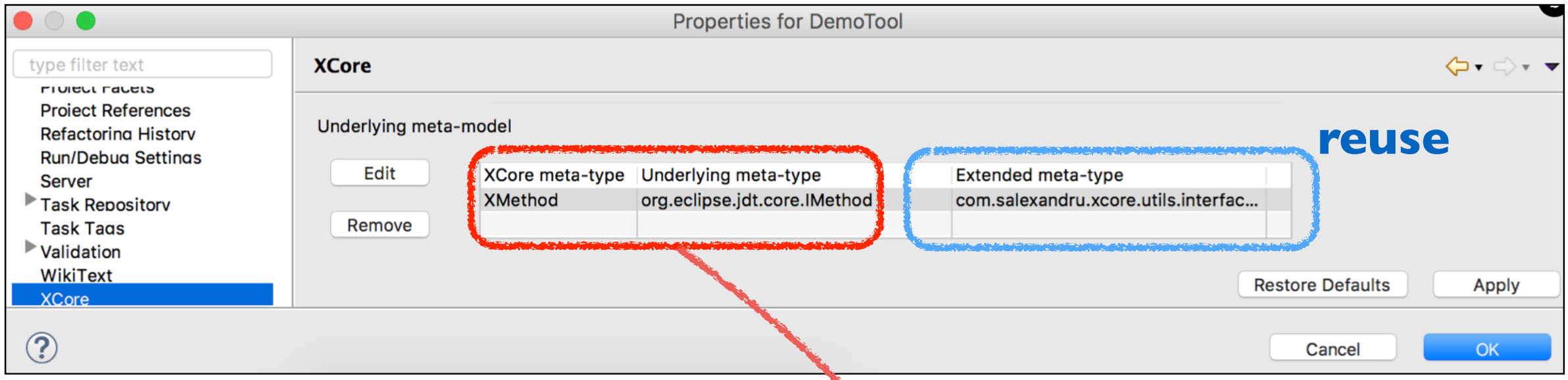
generates

XCore

Annotation Processor

@PropertyComputer
@RelationBuilder
@ActionPerformer

Additional features



available

```
@PropertyComputer
public class NoOfArguments
    implements IPropertyComputer<Integer, XMethod> {

    @Override
    public Integer compute(XMethod entity) {
        IMethod tmp = entity.getUnderlyingObject();
        return tmp.getNumberOfParameters();
    }

}
```

set

```
@RelationBuilder
public class MethodGroup implements
  IRelationBuilder <XMethod, XClass> {

  @Override
  public Group<XMethod> buildGroup(XClass
    IType tmp = entity.getUnderlyingObject
    Group<XMethod> res = new Group<>();
    try {
      for(IMethod aMet : tmp.getMethods())
        {
          XMethod m =
          Factory.getInstance()
            .createXMethod(aMet);
          res.add(m);
        }
    } catch (JavaModelException e) {}
    return res;
  }
```

Additional features

Underlying meta-model

XCore meta-type	Underlying meta-type	Extended meta-type
XMethod	org.eclipse.jdt.core.IMethod	com.salexandru.xcore.utils.interfac...

Edit

Remove

Extra Underlying meta-models

XCore meta-type	New Underlying meta-type	Transformer
XMethod	com.ibm.wala.types.MethodReference	xcoreview.transformations.JdtMeth...

Add New Meta-Model Type

Edit

Remove

original binding

Extra-binding

```
@PropertyComputer
public class NumberOfCalls implements IPropertyComputer<Integer, XMethod> {

    @Override
    public Integer compute(XMethod entity) {
        IJavaProject p = entity.getUnderlyingObject().getJavaProject();

            return cg.getNodes(entity.asMethodReference()).size();

    }

}
```

Pros & Cons

Generate the meta-model source code

Reuse an XCore-based tool

- specialise the meta-model of another tool

Easy to extend

- just add annotated classes

Problems with incremental compilation

- all annotated classes are needed

Future Work

“Merge Tool Into ...“ feature

combine two XCore-based tools

Associate to multiple back-ends

combine different tools

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https://github.com/SAlexandru/XCore

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