Journée RIS
19 Octobre 2001
« Usages et perspectives pour la production de logiciel sûr »

Définition d'une stratégie de Test d'un protocole à méta-objets

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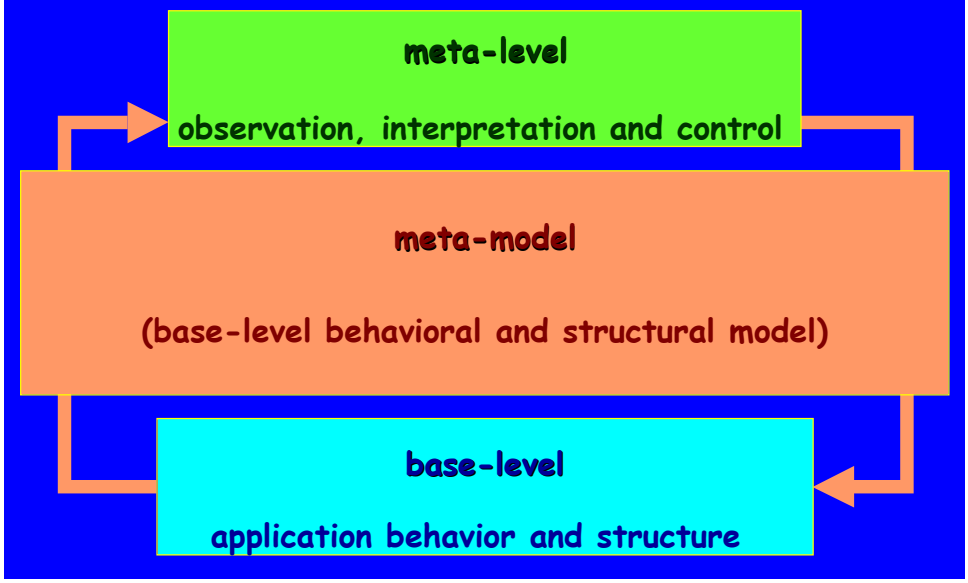
Outline

- Reflective architectures and MOPs
- A strategy for testing MOPs
- Case study: the FRIENDS MOP
- Test Experiments
- Conclusions and Perspectives

Reflective Architectures



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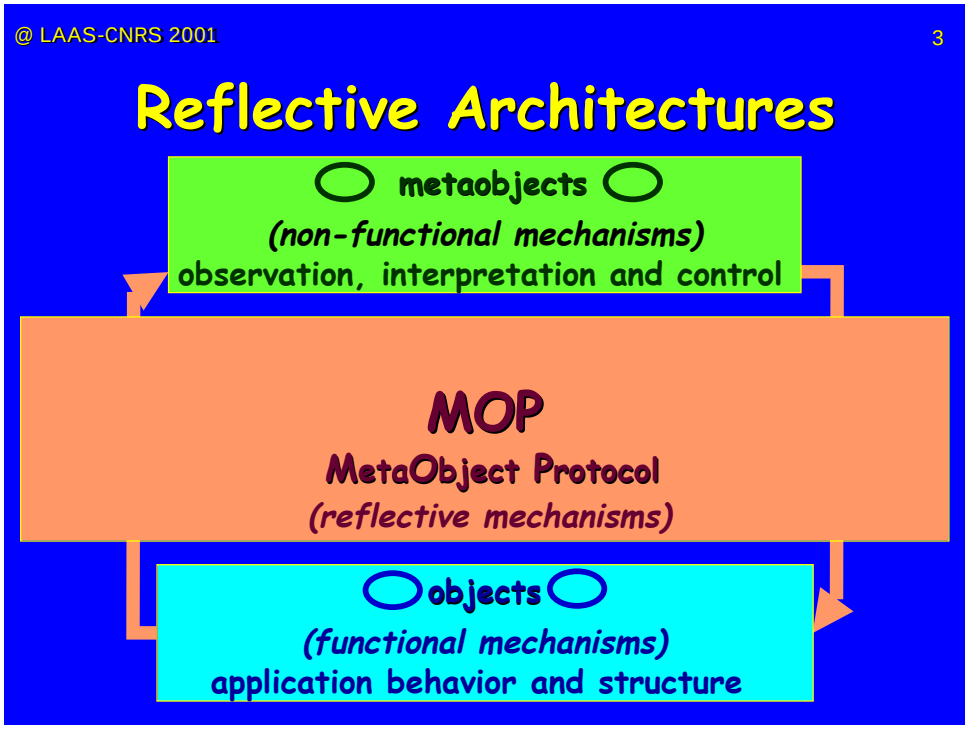
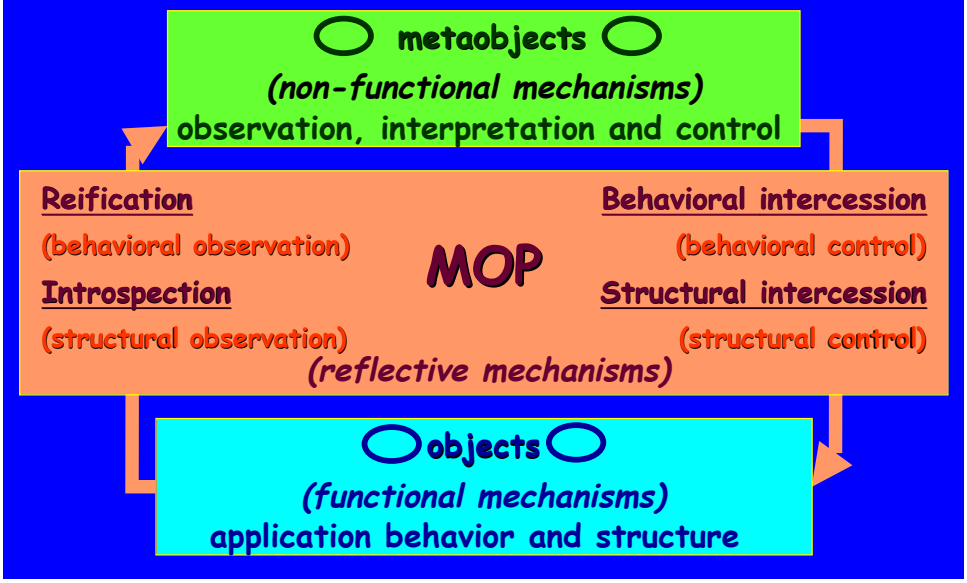
Reflective Architectures



Reflective Architectures



Strategy for testing MOPs

(Major issues covered by the strategy)

1. Test order definition
2. Test objectives for each testing level
3. Conformance checks for each testing level
4. Test environments

Incremental Test Order

- *TL0.* Testing preceding the MOP activation
- *TL1.* Reification mechanisms
- *TL2.* Behavioral intercession mechanisms
- *TL3.* Introspection mechanisms
- *TL4.* Structural intercession mechanisms

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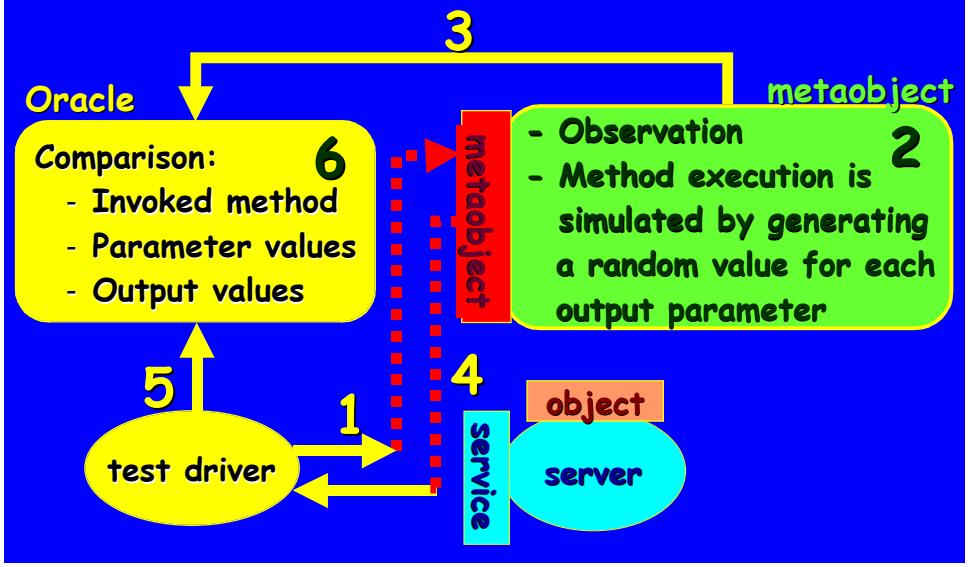
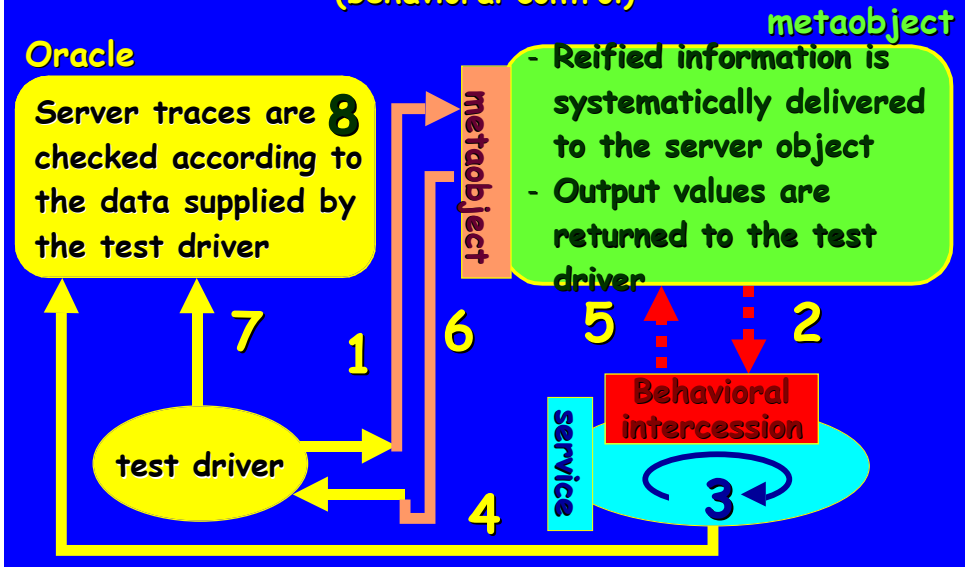
Incremental Test Order

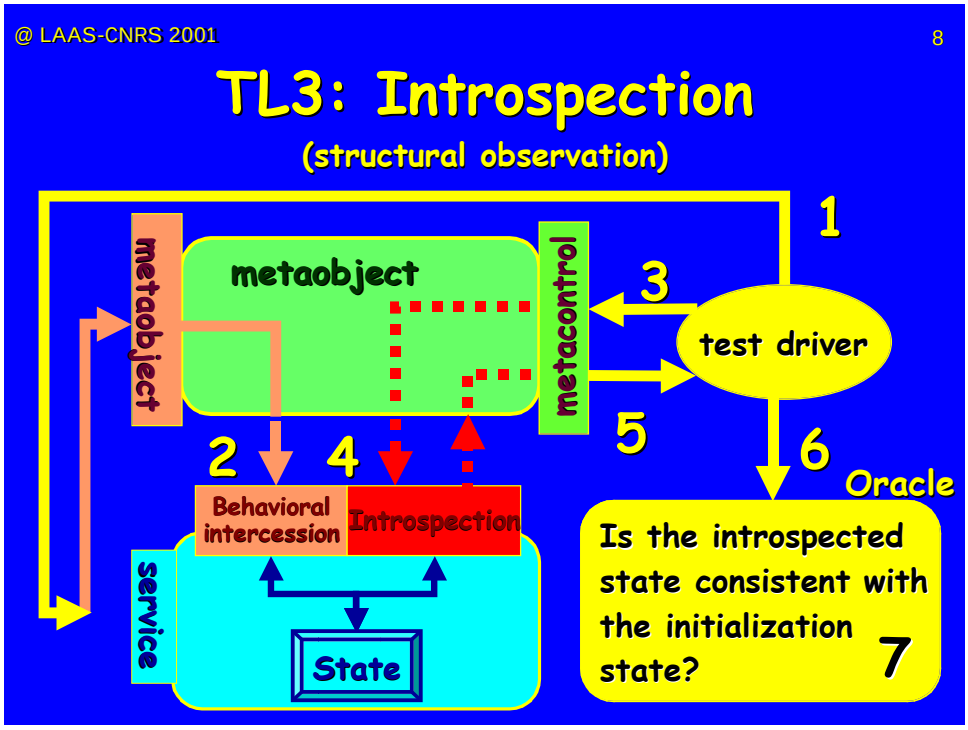
- *TL0.* *implementation dependent*
- *TL1.* Reification mechanisms
- *TL2.* Behavioral intercession mechanisms
- *TL3.* Introspection mechanisms
- *TL4.* Structural intercession mechanisms

TL1: Reification
(behavioral observation)



TL2: Behavioral intercession
(behavioral control)

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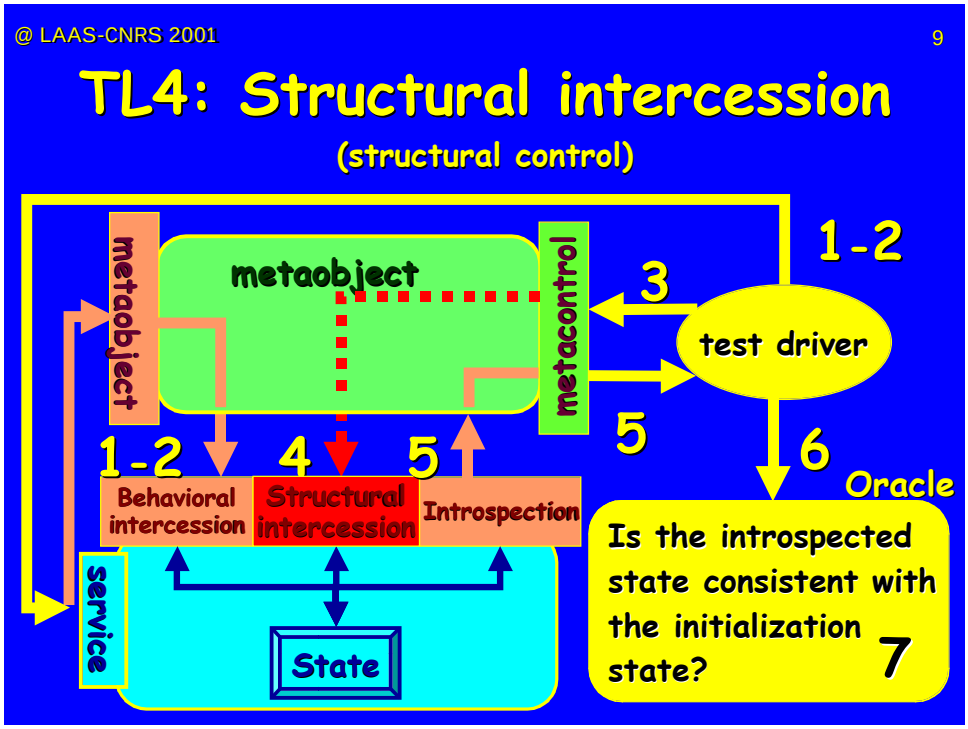
TL3: Introspection
(structural observation)
metaobject
metaobject
metacontrol
1
3
test driver
5
6
Oracle
2
4
Behavioral intercession
Introspection
service
State
Is the introspected state consistent with the initialization state?
7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TL4: Structural intercession
(structural control)
metaobject
metaobject
metacontrol
1-2
3
test driver
5
6
Oracle
1-2
4
5
Behavioral intercession
Structural intercession
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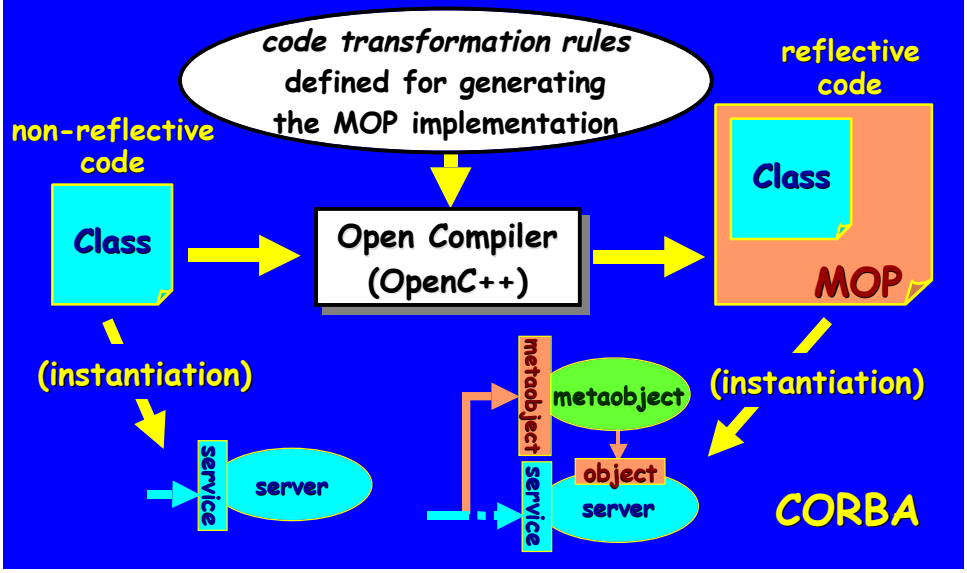
Incremental Test Order

- *TL0. implementation dependent*
- *TL1.* Reification mechanisms
- *TL2.* Behavioral intercession mechanisms
- *TL3.* Introspection mechanisms
- *TL4.* Structural intercession mechanisms

The FRIENDS MOP

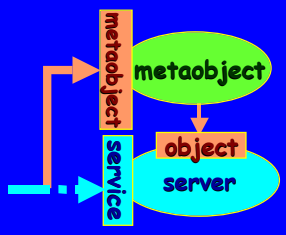


Test Experiments (I)

(Service interfaces)

```
interface shortTypeParameters{
   short ReturnValue ();
   void InValue (in short v);
   void OutValue (out short v);
   void InOutValue (inout short v);
   short All ( in short v1,
               out short v2,
               inout short v3);
};
```

Reification & Behavioral Intercession



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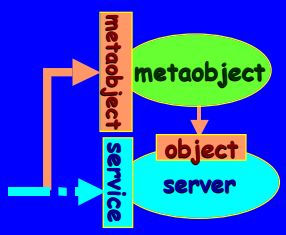

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```

Reification & Behavioral Intercession

Introspection & Structural Intercession

```
interface shortTypeAttributes{
   attribute short ReadWriteValue ;
   attribute readonly short ReadValue ;
};
```

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Test Experiments (I)

(Service interfaces)

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Reification & Behavioral Intercession

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   short All ( in short v1,
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};
```

Reification & Behavioral Intercession

Built-in types,
Strings,
Class types,
Structures and Arrays

Introspection & Structural Intercession

```
interface shortTypeAttributes{
   attribute short ReadWriteValue ;
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```
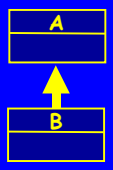


Test Experiments (II)

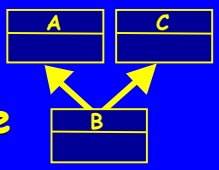
(object-oriented properties considered)

- Inheritance:

simple



multiple

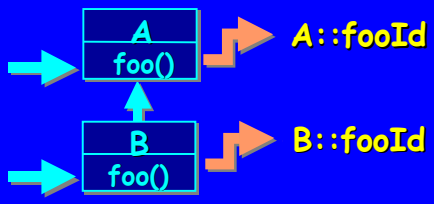


- Encapsulation (methods and attributes):

public / protected / private

Experimental results

- Reification / Behavioral intercession
  - Method invocations were incorrectly handled when using inheritance



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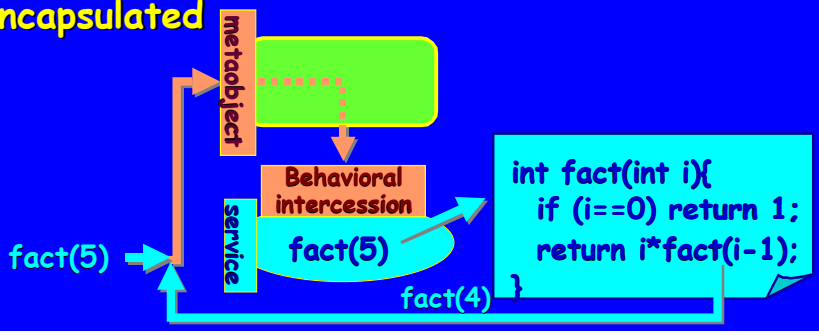
  - Internal object activity was incorrectly encapsulated



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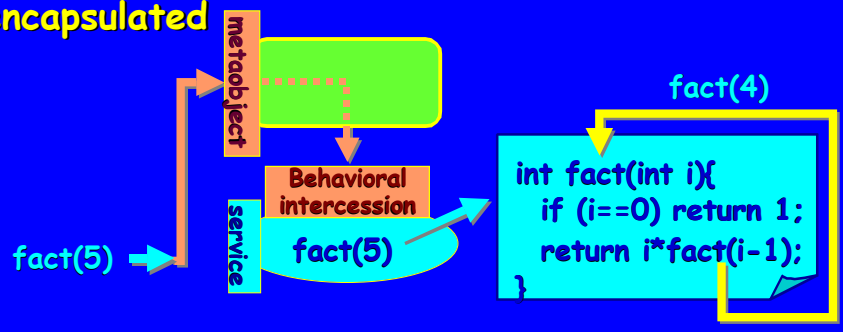

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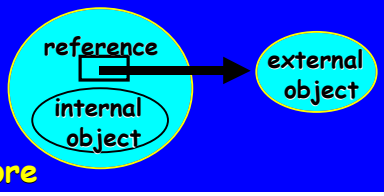
Experimental results

- Reification / Behavioral intercession
  - Method invocations were incorrectly handled when using inheritance
  - Internal object activity was incorrectly encapsulated
- Introspection / Structural intercession
  - Object composition
    vs
    Object references

deep copy/restore



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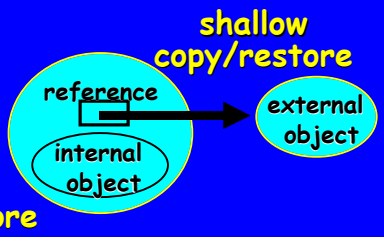

Conclusion

- Step forward in the definition of a global test strategy for reflective systems
- General and incremental strategy enabling the reuse of those mechanisms already tested for testing the remaining ones.
- Case Study: feasibility and effectiveness of the proposed approach

Ongoing work

- Definition of rigourous test criteria for to guide the automatic generation of test case input values