EURESCOM

UML Profile for DCL

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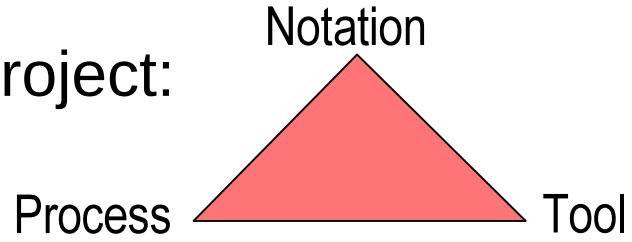
Agenda

- Motivation
- Technology used for graphical support of DCL: UML profile
  - UML semantics
  - Definition of the UML profile
  - Extension mechanisms
- The profile for DCL
  - Stereotypes and notation
  - Automatic generation of XML descriptors with a UML tool
- Conclusion

Motivation

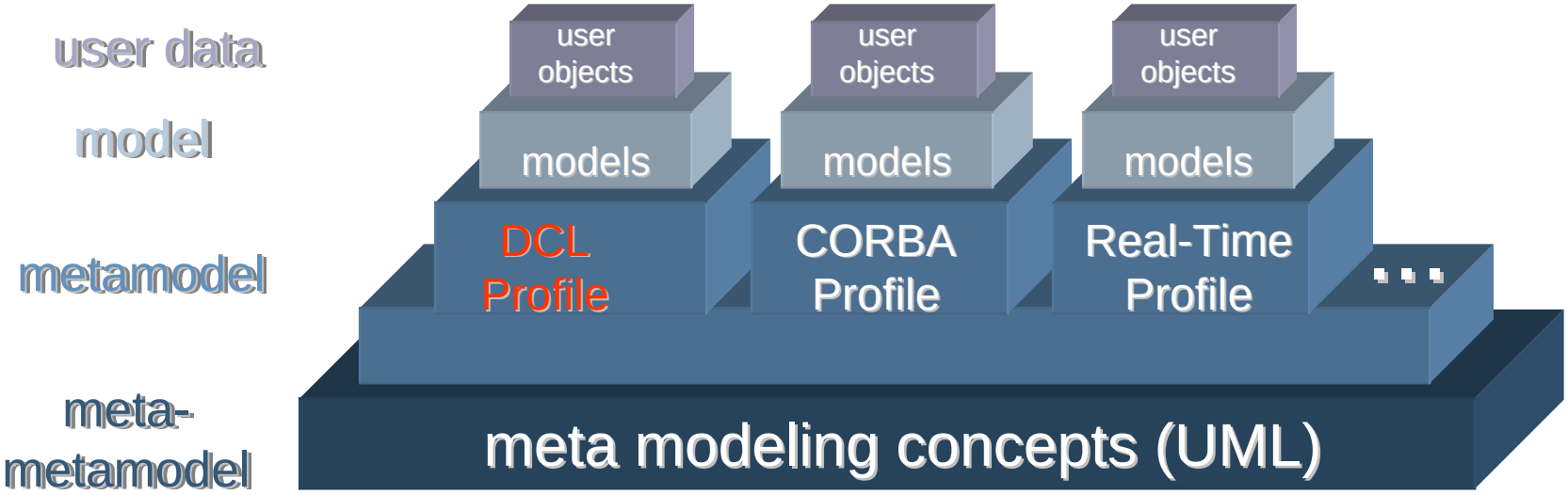
- The triangle for a successful software project:



- Why a graphical support for Deployment and Configuration Language (DCL)?
- Why Unified Modeling Language (UML)?
- Goal
  - Extend design phase to the distributed specification.
  - Connection between software development and deployment process.
  - One model contains all relevant information.

UML Semantics

- All-purpose language
- Specialization and restrictions for DCL are needed !
- UML profile – domain specific library of UML „macros“
- Four layer meta-modeling architecture:



UML Profile

- Is a predefined set of stereotypes, tagged values, constraints (extension mechanisms)
- Extension mechanisms collectively specialize and tailor UML for a specific domain or process
- Provides conventions for applying and specializing standard UML to a particular environment or domain
- Does not extend UML by adding any new basic concepts

UML Extension mechanisms

- Stereotypes:
  - Sub-classification of an existing UML element
  - The new element has its own special properties (expressed as tagged values), semantics and notation
- Tagged Values:
  - New information about model elements and presentation elements (new properties)
- Constraints:
  - Conditions and restrictions, that apply to model elements

UML Profile for DCL

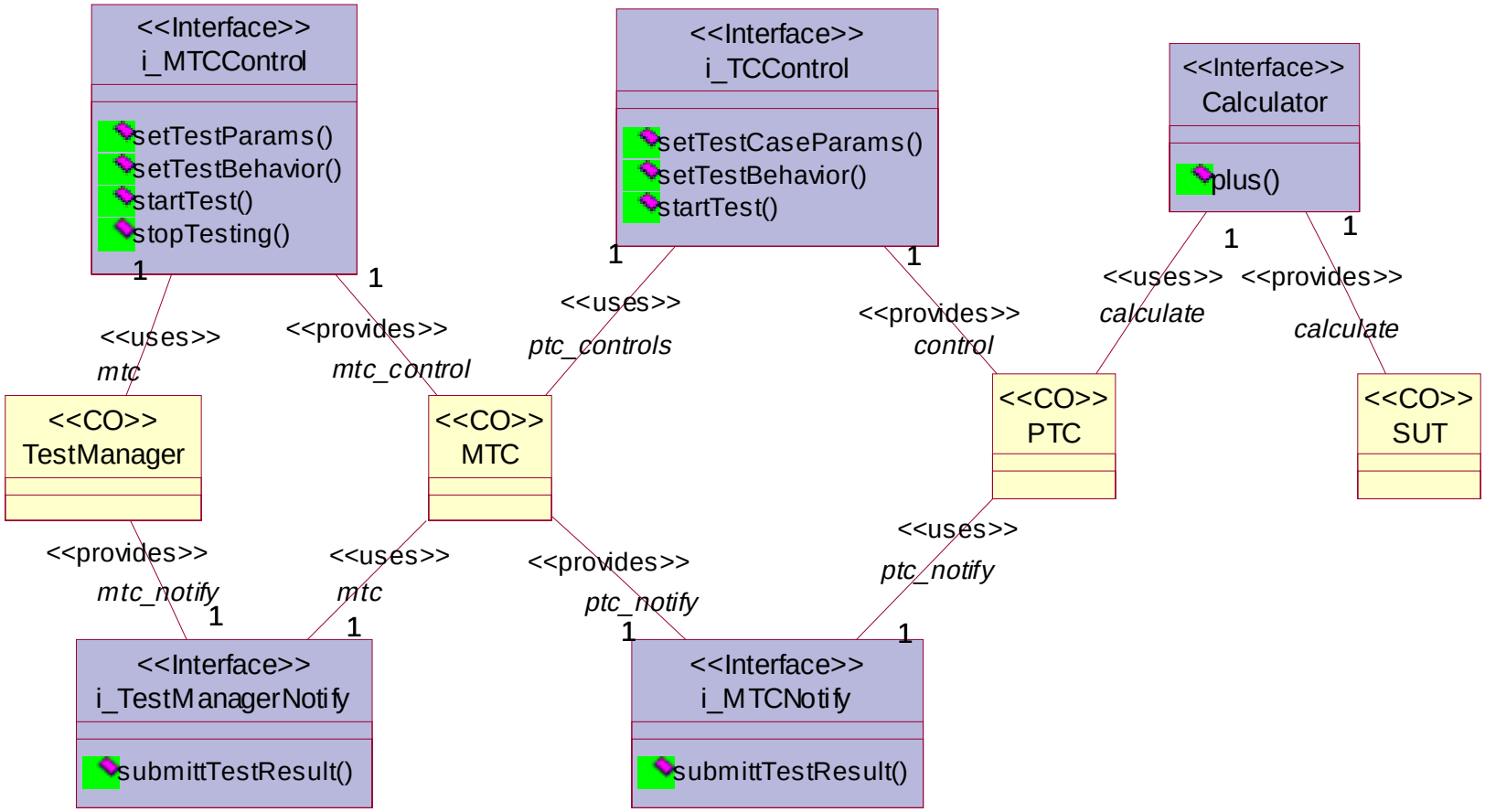
- Provides conventions for applying and specializing standard UML to the graphical notation for DCL
- Specializes the UML metamodel for DCL
- Bridges the gap between design and deployment phase of distributed applications
- Realisation of this profile with existing UML tools is possible (e.g. Rational Rose)
- Interchange format between tools and programs: XML (deployment phase)

Diagrams and Stereotypes

- Class diagram : Computational Object Types (CO Types) and their interfaces
- Collaboration diagram: Initial configuration of COs and their factories
- Component diagram: implementation components
- Stereotypes:

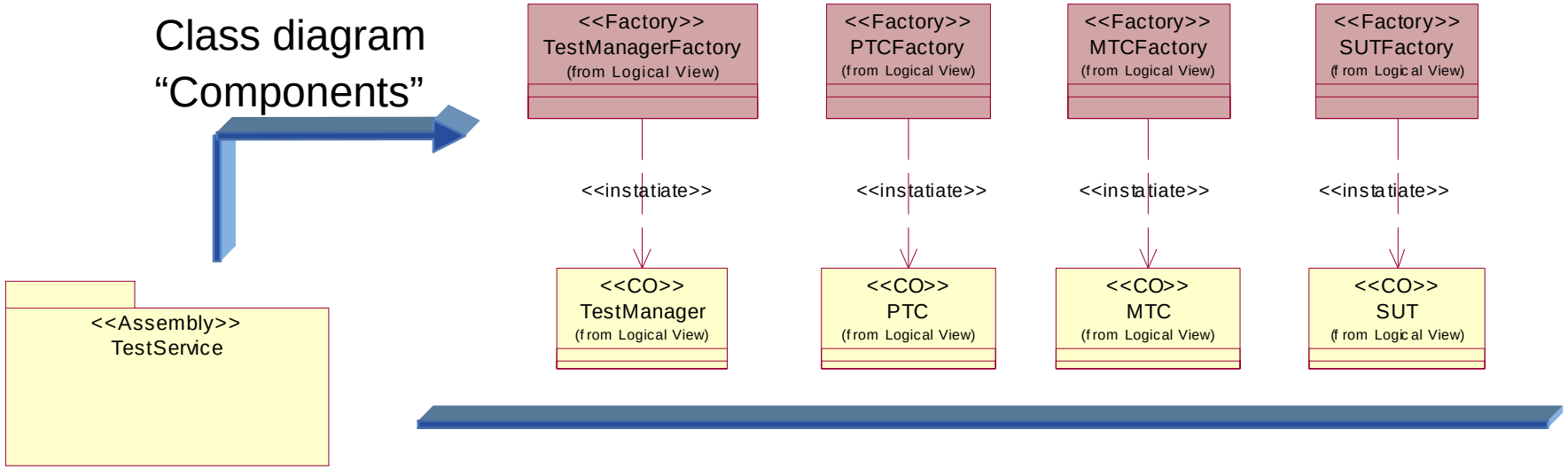
UML-Metamodel element	Stereotype
Class	<<CO>>
Class	<<Factory>>
Class	<<Interface>>
Component	<<implementation>>
Package	<<assembly>>
Association	<<uses>>
Association	<<provides>>
Dependency	<<instantiate>>

Class diagram: CO Types and interfaces

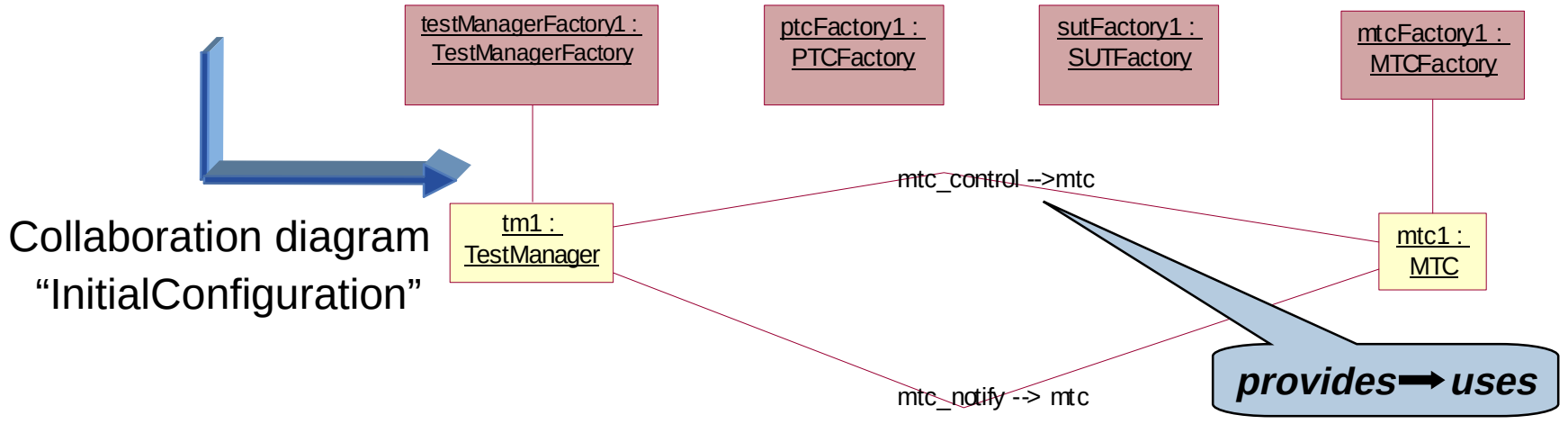


Initial Configuration

Class diagram
"Components"



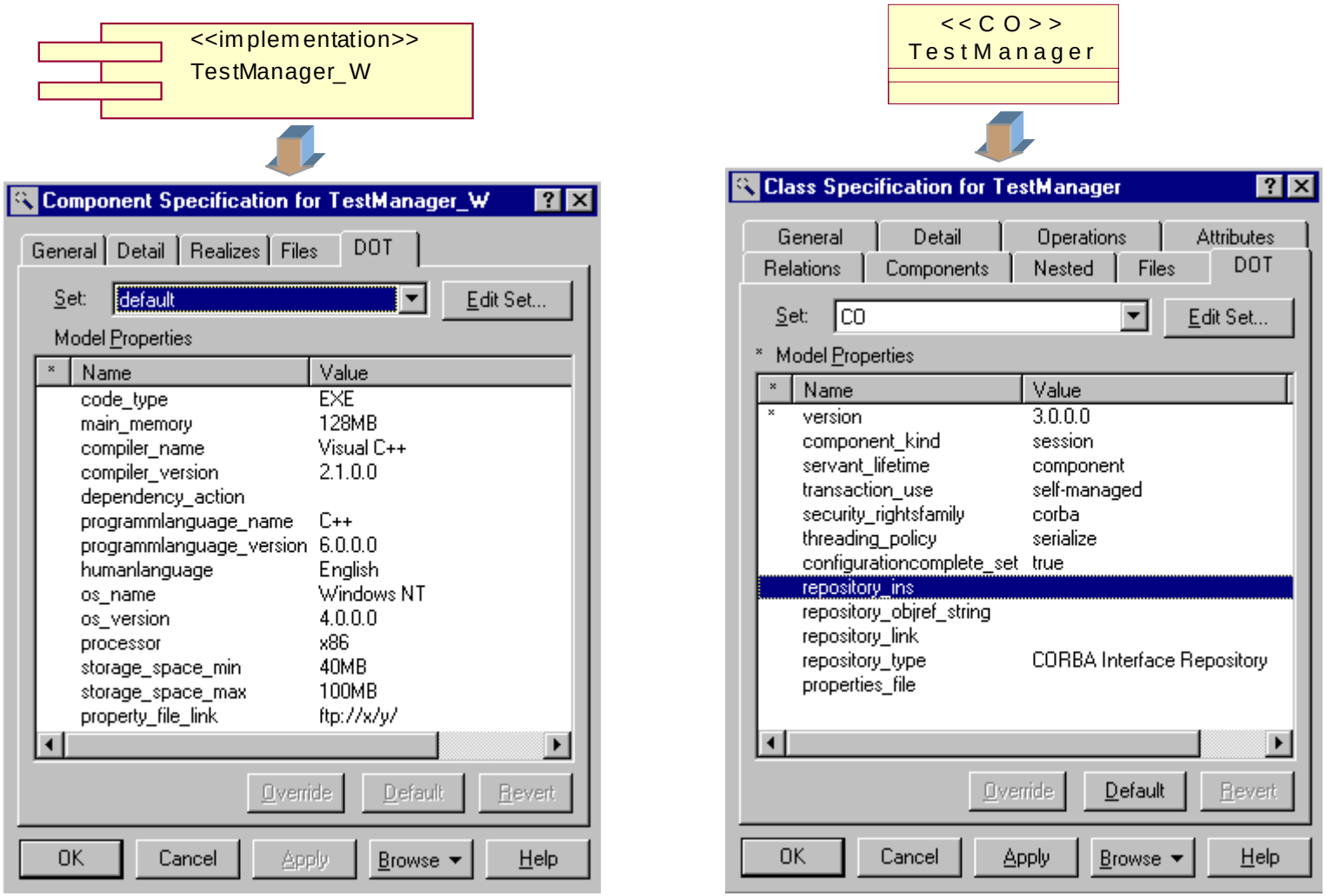
Collaboration diagram
"InitialConfiguration"



Tagged Values (1)

- DCL specific keyword pairs: property name and value
- For stereotypes <<CO>> and <<Implementation>> tagged values are defined in the profile
- Source: CCM Descriptors
  - Software Package
  - CORBA Component
  - Component Assembly

Tagged Values (2)



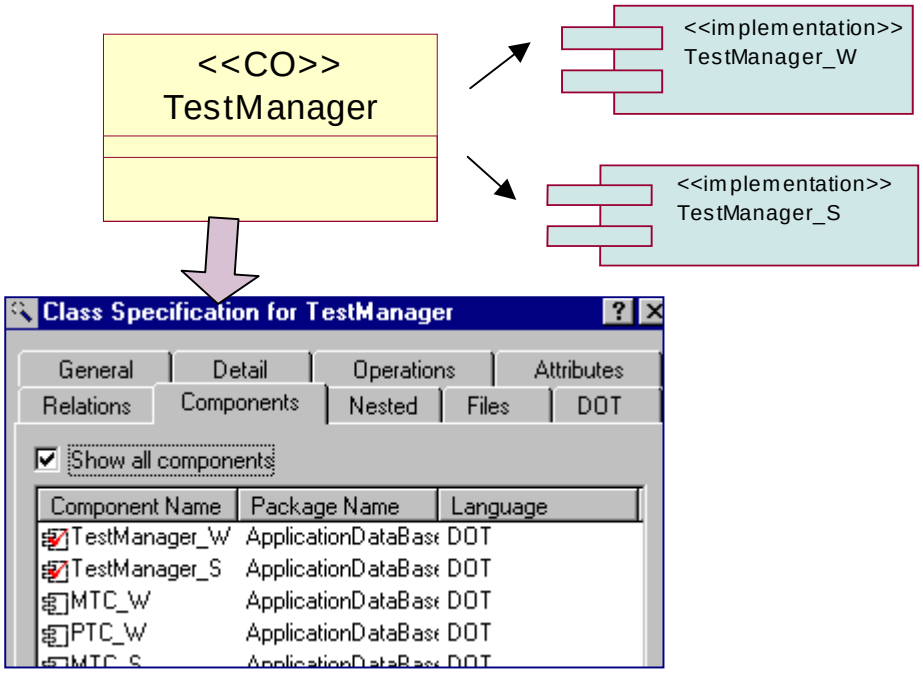
Constraints

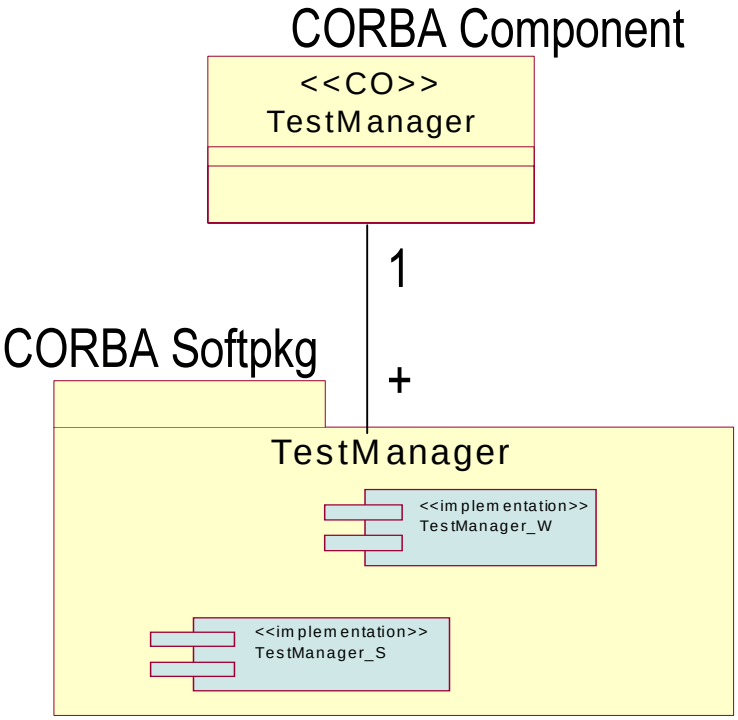
- <<assembly>> must have two diagrams: “Components” and “InitialConfiguration” diagram
- a class diagram of <<assembly>> package contains only classes with <<CO>> and <<Factory>>
- Generalisation: all elements of the same stereotype (e.g. <<CO>>)
- Valid association stereotype combinations:

From: \ To:	<<CO>>	<<Factory>>	<<Interface>>
<<CO>>			<<uses>> <<provides>>
<<Factory>>	<<instantiate>>		
<<Interface>>			

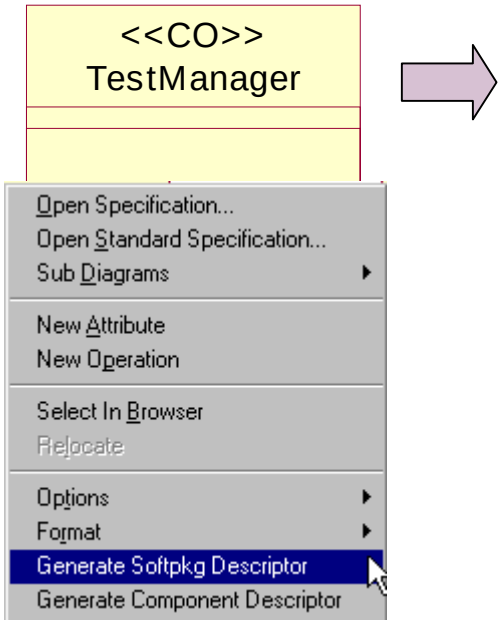
Realization with UML tool Rational Rose

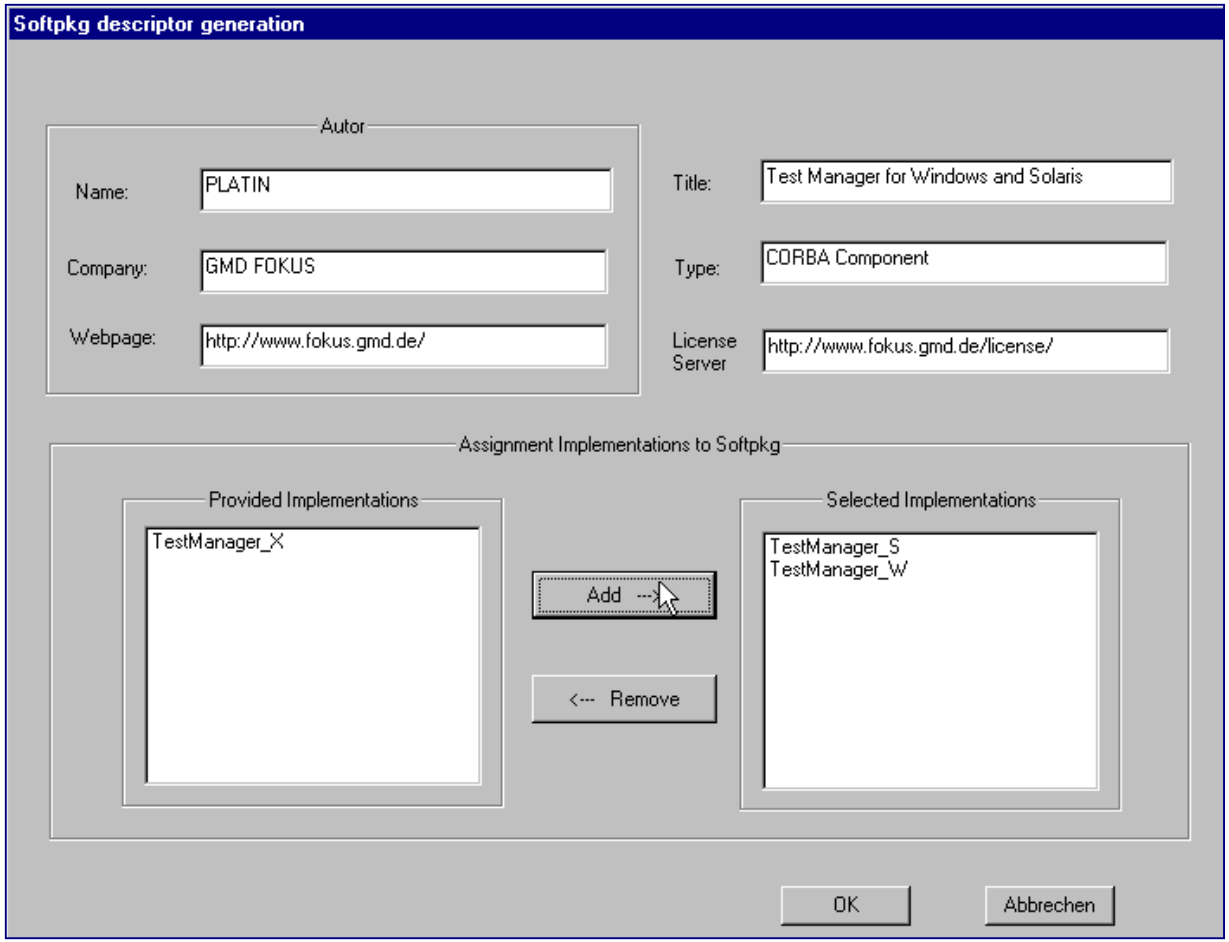
- Rational Rose provides
  - graphical support for UML
  - automatic generation of XML-Descriptors using Rose Extensibility Interface (REI)



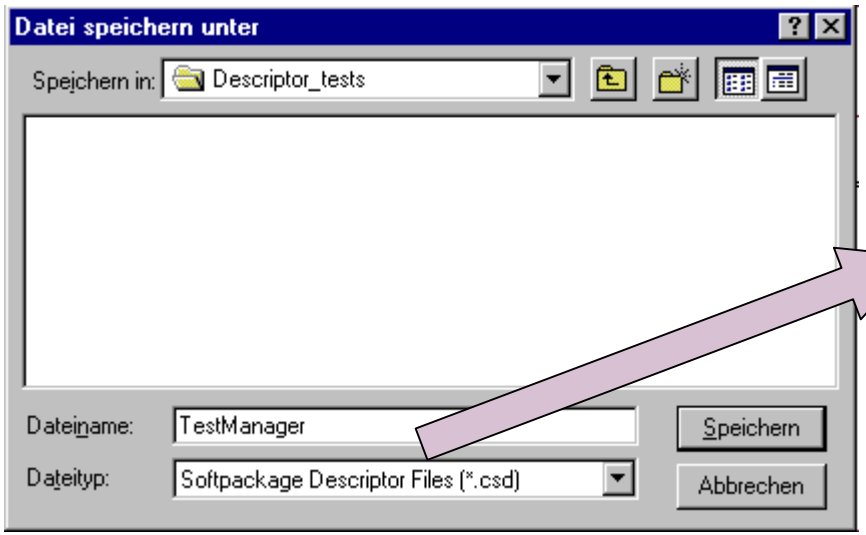


Generation of softpkg descriptor (1)





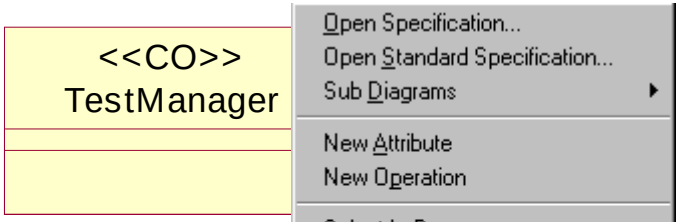
Generation of softpkg descriptor (2)

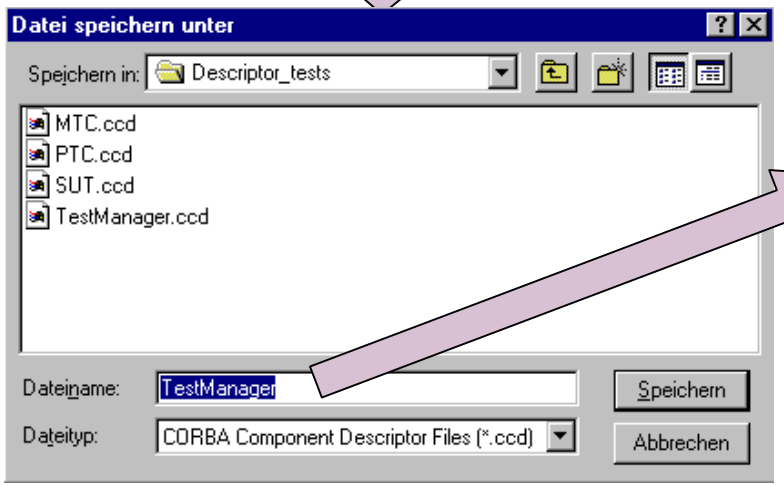



```
<?xml version="1.0" ?>
<!DOCTYPE softpkg SYSTEM "softpkg.dtd">

<softpkg name="TestManager">
        <idl id="IDL:M1/TestManager:1.0"/>
        <author>
                <company>GMD FOKUS</company>
                <name>PLATIN</name>
                <webpage href="http://www.fokus.gmd.de/"/>
        </author>
        <license href="http://www.fokus.gmd.de/license/"/>
        <title>Test Manager for Windows and Solaris</title>
        <pkgtype>CORBA Component</pkgtype>
        <implementation id="DCE:TestManager_W">
                <description>This is an implementation for  Windows operation system </description>
                <descriptor>
                        <fileinarchive> TestManager.ccd </fileinarchive>
                </descriptor>
                <mainmemory size="128MB"/>
                <compiler name="Visual C++"  version="2.1.0.0"/>
                <programminglanguage name="C++"  version="6.0.0.0"/>
                <os name="Windows NT" version="4.0.0.0"/>
                <processor name="x86"/>
                <storage>
                        <space min="40MB"  max="100MB"/>
                </storage>
                <propertyfile>
                        <fileinarchive name="TestManager_W.cpf"/>
                        <link href="ftp://x/y/"/>
                </propertyfile>
                <code type="EXE">
                        <fileinarchive name="TestManager_W.EXE"/>
                </code>
        </implementation>
        <implementation id="DCE:TestManager_S">
                <description>This is an implementation for  UNIX operation system </description>
                <descriptor>
                        <fileinarchive> TestManager.ccd </fileinarchive>
                </descriptor>
                <code type="DLL">
                        <fileinarchive name="TestManager_S.DLL"/>
                </code>
        </implementation>
</softpkg>
```

Generation of CORBA component descriptor

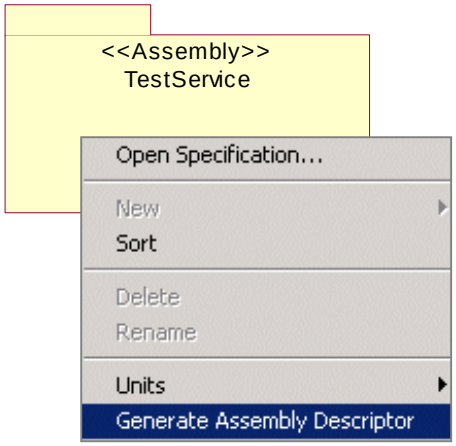


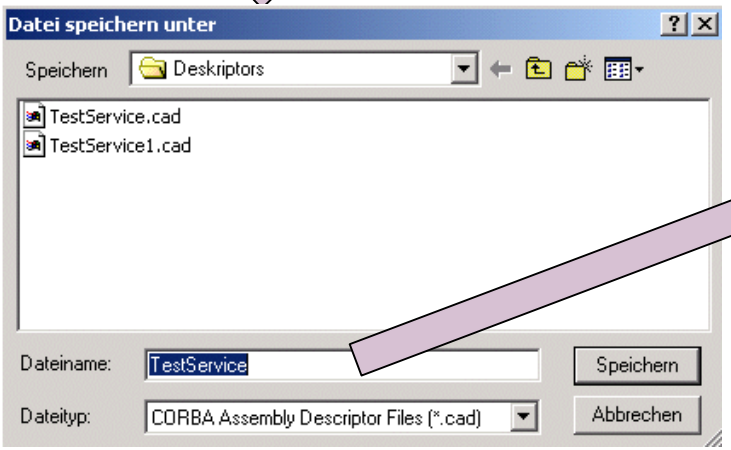



```
<?xml version="1.0" ?>
<!DOCTYPE corbacomponent SYSTEM "corbacomponent.dtd">

<corbacomponent>
        <componentrepid repid="IDL:TestManager:1.0">
        <corbaversion>3.0</corbaversion>
        <componentkind>
                <session>
                        <servant lifetime="component"/>
                </session>
        </componentkind>
        <transaction use="self-managed"/>
        <security rightsfamily="corba"/>
        <threading policy="serialize"/>
        <repository type="CORBA Interface Repository"/>
        <componentfeatures name="TestManager" repid="IDL:TestManager">
                <ports>
                        <provides
                                providesname="mtc_notify"
                                repid="IDL:i_TestManagerNotify:1.0">
                                        <operationpolicies>
                                                <operation name="submittTestResult">
                                                        <transaction use="required"/>
                                                        <requiredrights>
                                                                <right name="submitt"/>
                                                        </requiredrights>
                                                </operation>
                                        </operationpolicies>
                        </provides>
                        <uses
                                usesname="mtc"
                                repid="IDL:i_MTCControl:1.0"/>
                </ports>
        </componentfeatures>
        <interface name="i_TestManagerNotify"  repid="IDL:i_TestManagerNotify:1.0">
                <operationpolicies>
                        <operation name="submittTestResult">
                                <transaction use="required"/>
                                <requiredrights>
                                        <right name="submitt"/>
                                </requiredrights>
                        </operation>
                </operationpolicies>
        </interface>
</corbacomponent>
```

Generation of CORBA assembly descriptor






```
<!DOCTYPE componentassembly SYSTEM  "componentassembly.dtd">
<componentassembly id="TestService">
      <description>Example TestManager</description>
      <componentfiles>
            <componentfile id="TestManager">
                  <fileinarchive name="TestManager.ccd"/>
            </componentfile>
            <componentfile id="PTC">
                  <fileinarchive name="PTC.ccd"/>
            </componentfile>
            <componentfile id="MTC">
                  <fileinarchive name="MTC.ccd"/>
            </componentfile>
            <componentfile id="SUT">
                  <fileinarchive name="SUT.ccd"/>
            </componentfile>
      </componentfiles>
      <partitioning>
            <homeplacement id="testManagerFactory1"  type="TestManagerFactory">
                  <componentfileref idref="TestManager"/>
                  <componentinstantiation id="tml"/>
                  <componentinstantiation id="tm2"/>
            </homeplacement>
            <homeplacement id="ptcFactory1"  type="PTCFactory">
                  <componentfileref idref="PTC"/>
            </homeplacement>
            <homeplacement id="sutFactory1"  type="SUTFactory">
                  <componentfileref idref="SUT"/>
            </homeplacement>
            <homeplacement id="mtcFactory1"  type="MTCFactory">
                  <componentfileref idref="MTC"/>
                  <componentinstantiation id="mtc1"/>
            </homeplacement>
      </partitioning>
      <connections>
            <connectinterface id="i_TestManagerNotify">
                  <usesport>
                        <usesidentifier>mtc</usesidentifier>
                        <componentinstantiationref idref="mtc1"/>
                  </usesport>
                  <providesport>
                        <providesidentifier>mtc_notify</providesidentifier>
                        <componentinstantiationref idref="tml"/>
                  </providesport>
            </connectinterface>
            <connectinterface id="i_MTCControl">
                  <usesport>
                        <usesidentifier>mtc</usesidentifier>
                        <componentinstantiationref idref="tml"/>
                  </usesport>
                  <providesport>
                        <providesidentifier>mtc_control</providesidentifier>
                        <componentinstantiationref idref="mtc1"/>
                  </providesport>
            </connectinterface>
      </connections>
</componentassembly>
```

Conclusion

- Graphical support for DCL
  - Specification of all CO Types, their interfaces and properties
  - Specification of Initial Configuration
  - Automatic generation of XML-Descriptors for the Assignment Tool
- In process:
  - Constraints for Run-time Configuration
  - Design of run-time configuration for a hardware system (which component on which node?)
- Demo follows …

Thank you!