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Softwaremodellierung mit dem Enterprise Architect

Resources

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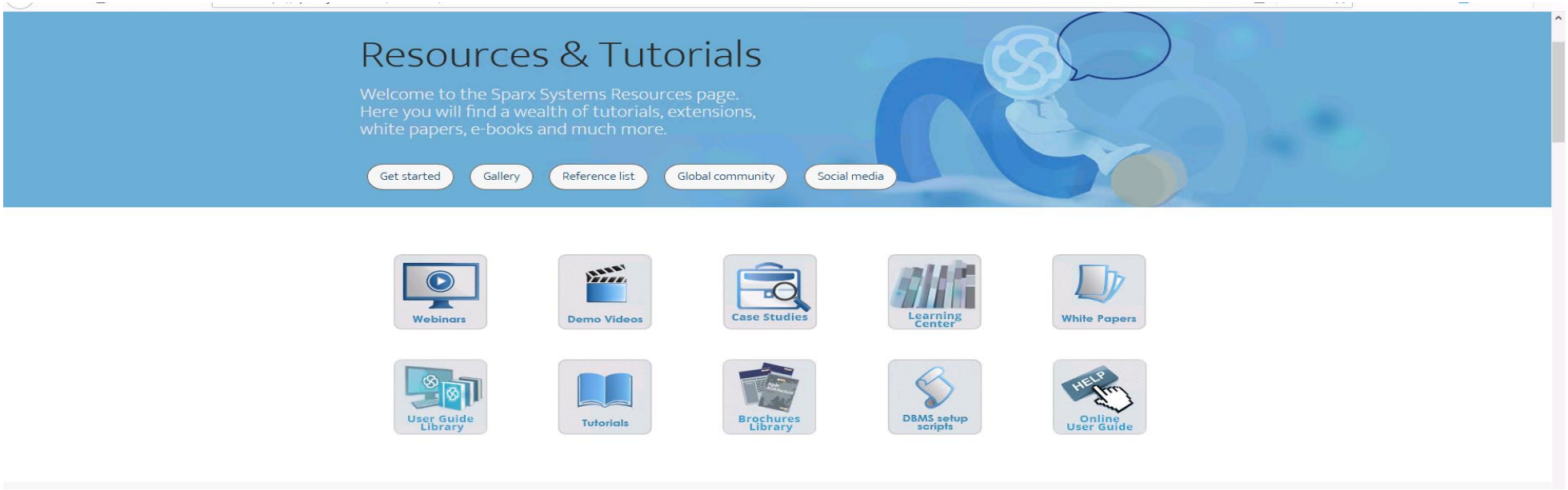

Hinweise

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- Alle Beispiele können im Nachgang des Kurses frei verwendet werden
  - Ablage in einem Git-Repository
- UML-Kenntnisse sind hier vorausgesetzt
- Screenshots und Befehle stammen aus der Enterprise Architect Version 13
  - Aktuelle Version 14.x ist in der Benutzerführung deutlich verbessert

Copyright and Impressum

Javacream

Dr. Rainer Sawitzki

Alois-Gilg-Weg 6
81373 München

Table of Contents

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1

GRUNDLAGEN

1.1

ÜBERSICHT

Enterprise Architect von Sparx Systems

- UML Werkzeug

Eigenschaften vom Enterprise Architect

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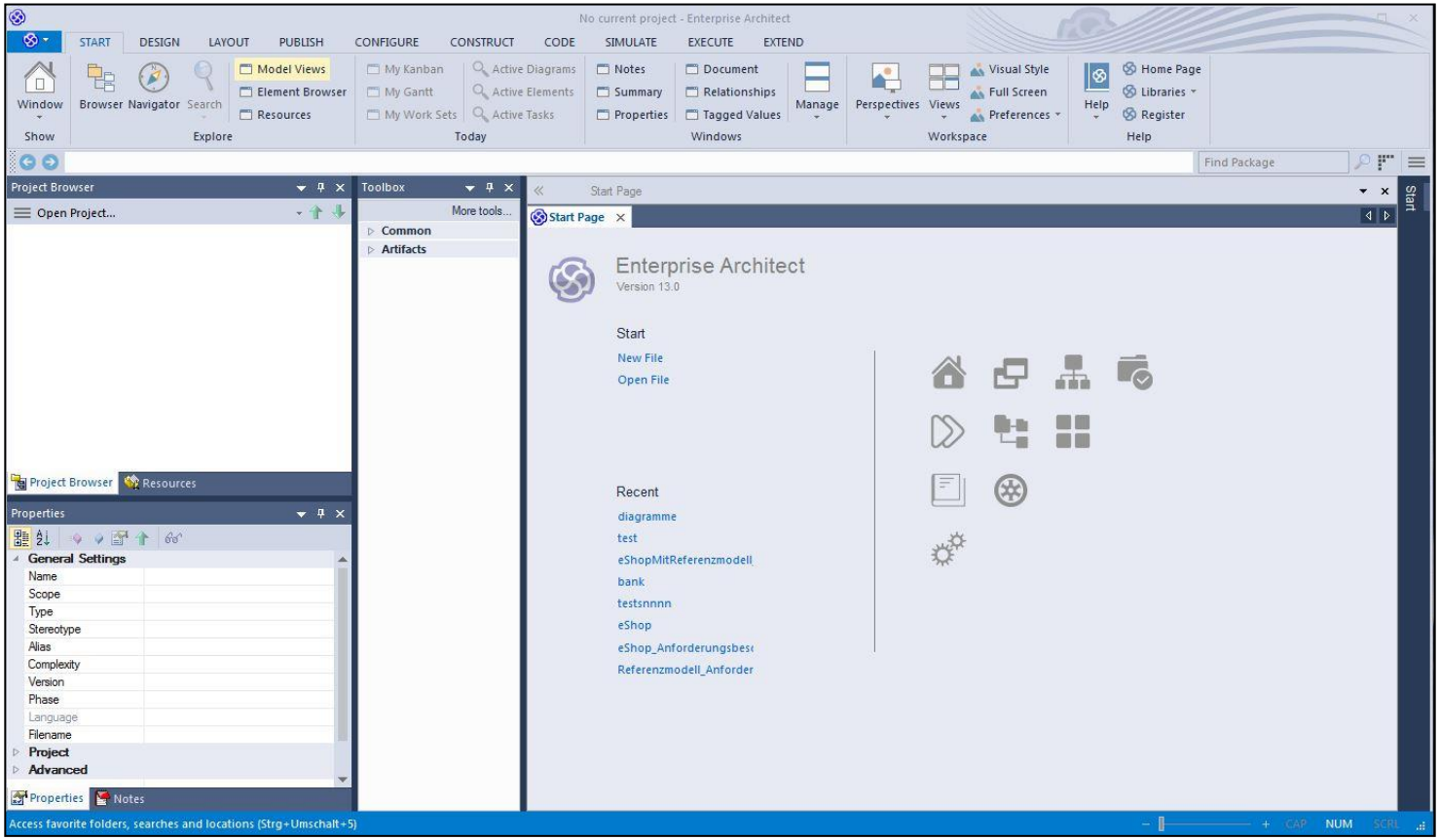
- UML Werkzeug mit Erweiterungen
  - Alle UML Diagramme nutzbar
  - Toolspezifische Ergänzungen und Erweiterungen
    - BPMN
    - Requirement Modeling
    - Seit Version 11, verschiedene „Themes“ für UML
    - Seit Version 12 anderes Look and Feel
    - Seit Version 13 neues „MS“ Office Look and Feel
- Komplettes Werkzeug mit den folgenden Eigenschaften
  - UML 2.x basiert
  - Projekt-Management Ergänzungen
  - Dokumentationserstellung
  - Preis-Leistungsverhältnis
  - Große Akzeptanz und Verbreitung

1.2

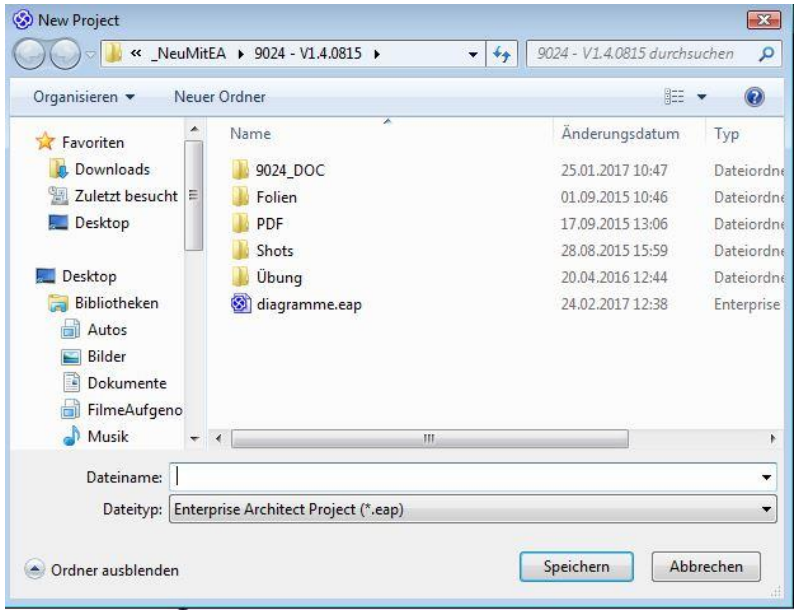
ERSTES ARBEITEN

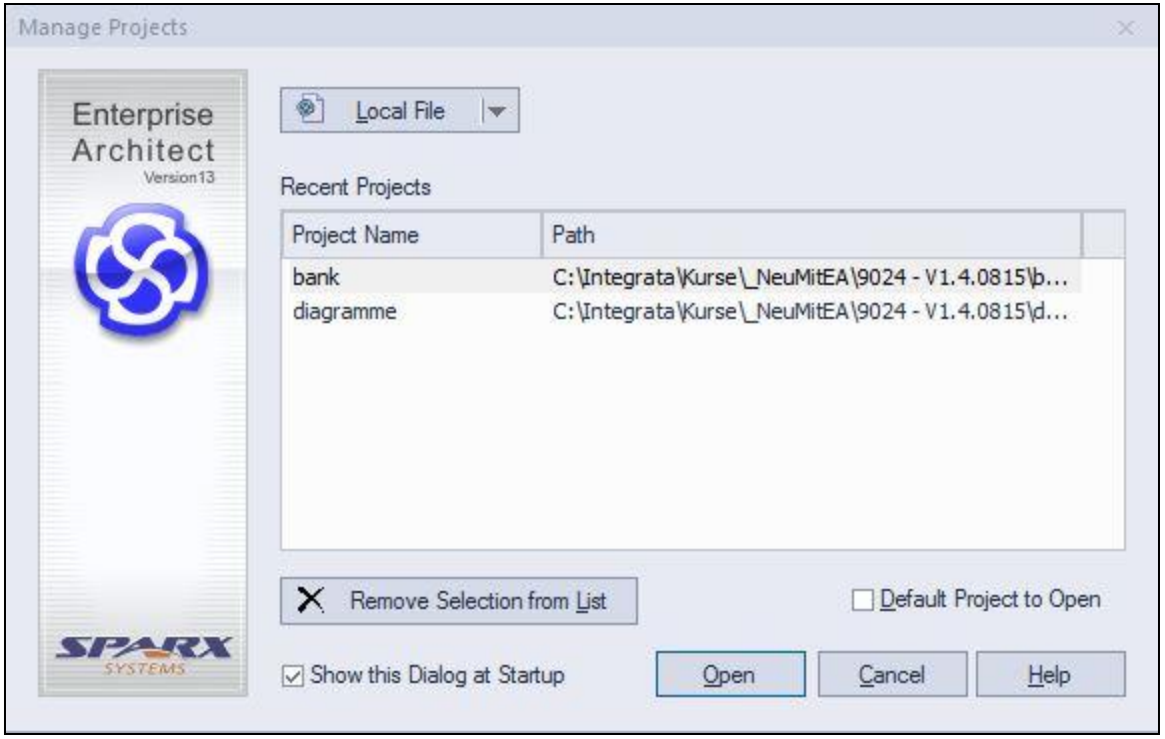
Starten vom EA



- Manage Projects
  - Open
  - Create
  - Copy
- Recent Liste kann nur über File -> Open Project geändert werden

Anlegen von Projekten





Aufbau der Oberfläche

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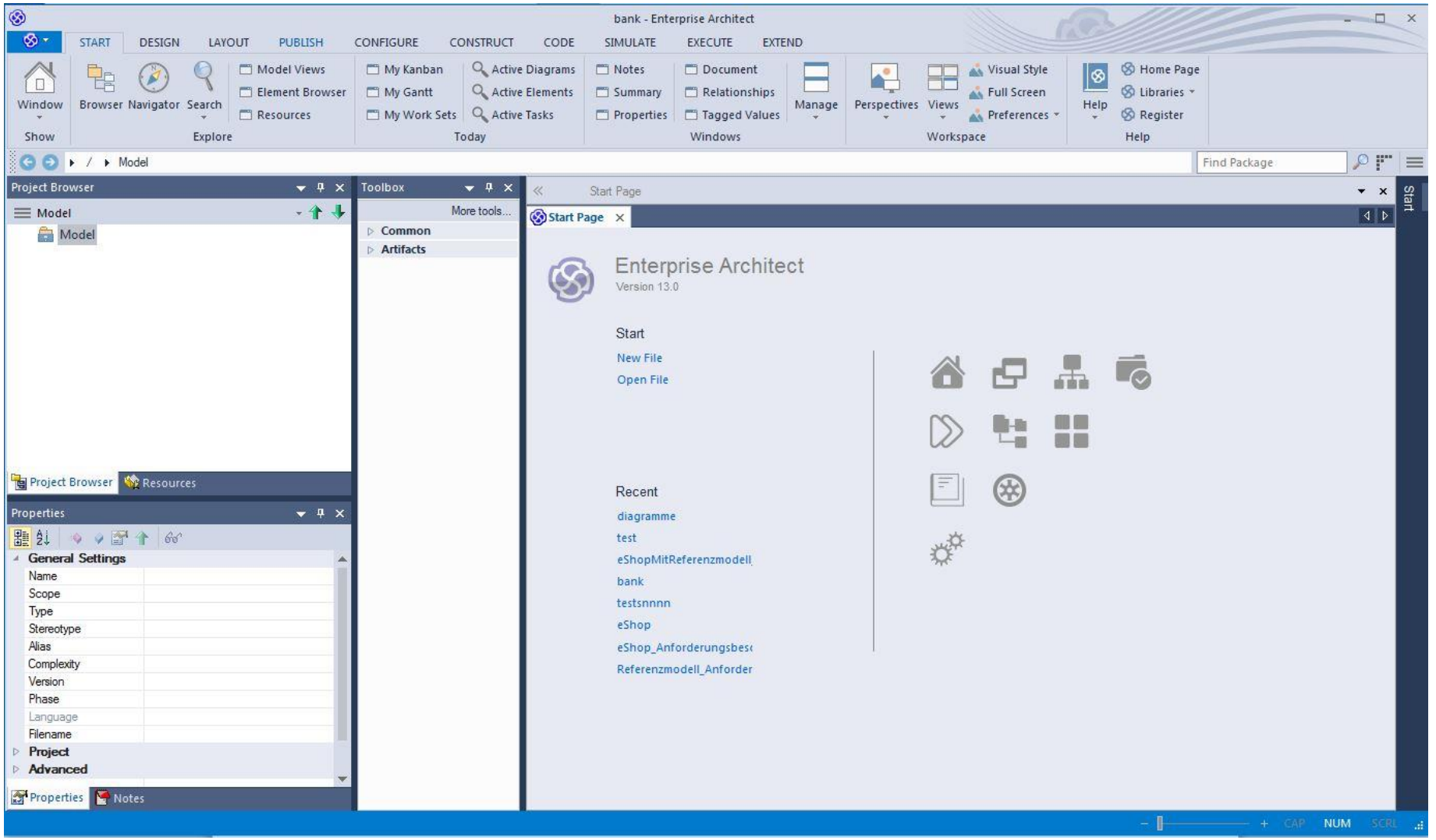
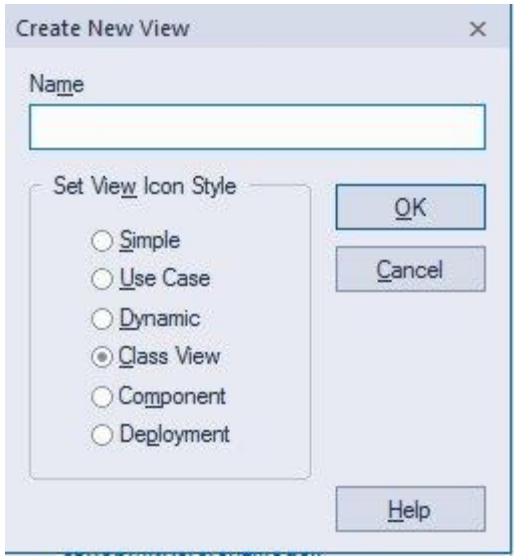
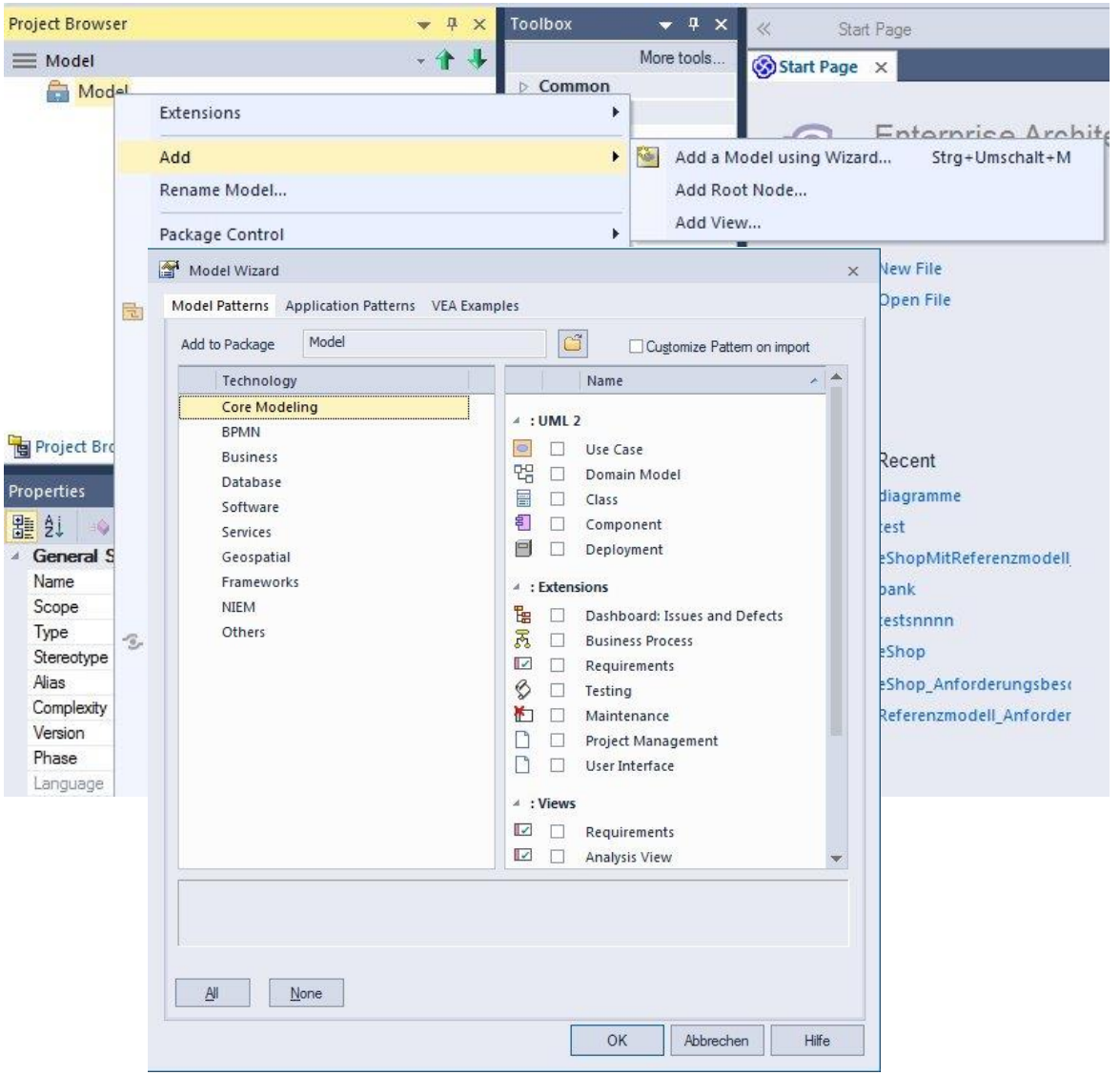


Anlegen von Strukturen



- Im Project Browser muss vor Beginn eine „ordentliche“ Struktur definiert werden
- Zwei Möglichkeiten
  - Wizard
  - Über Views manuell



Voreinstellungen

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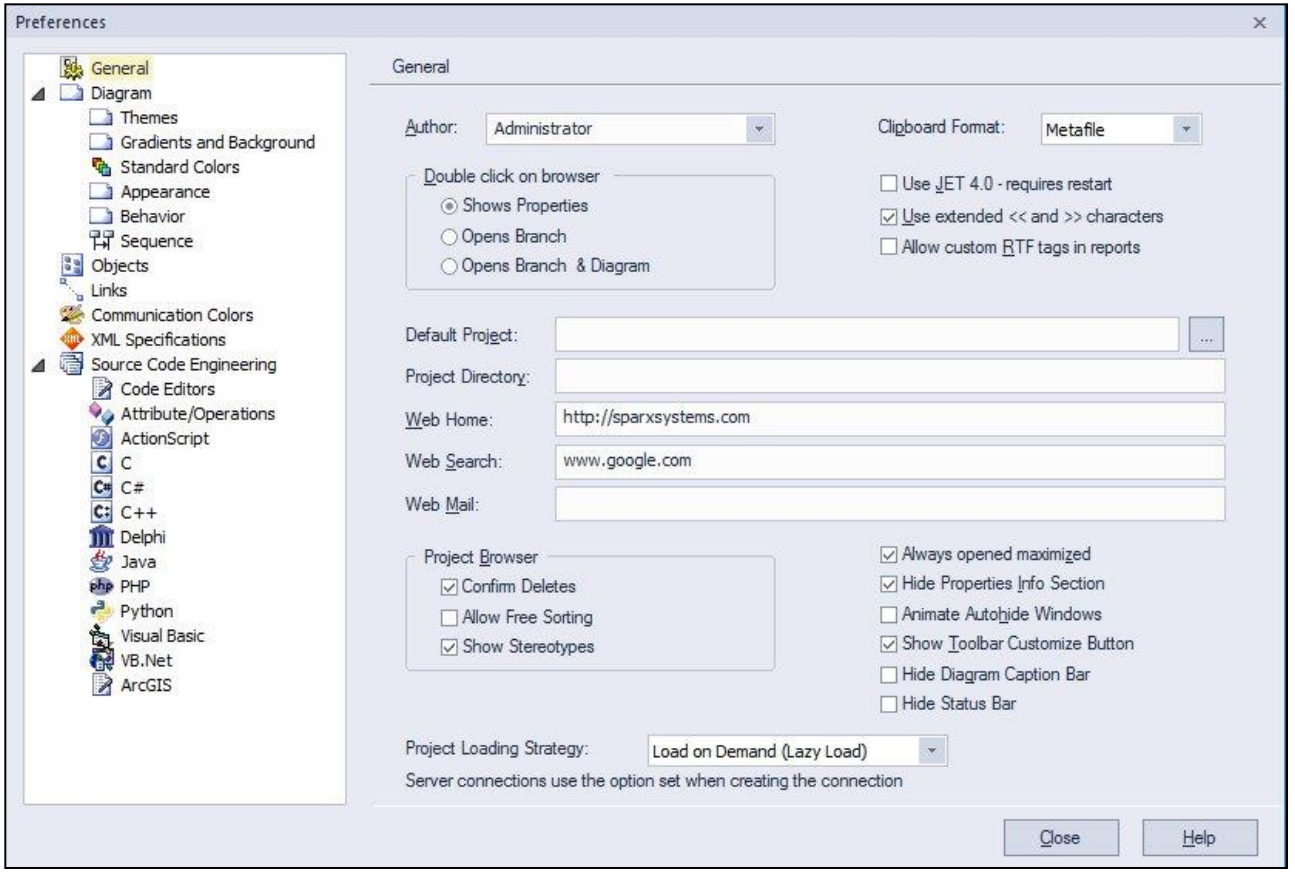
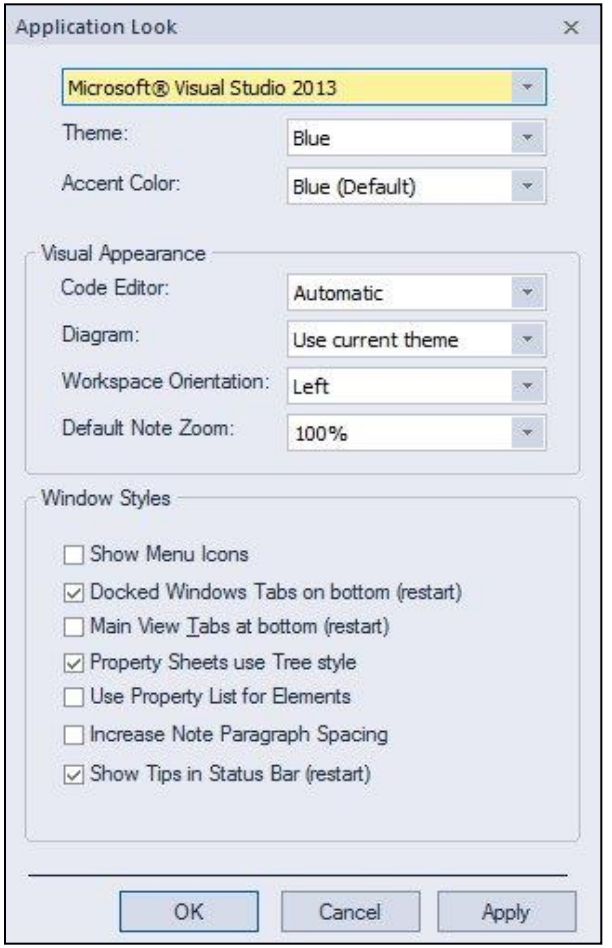
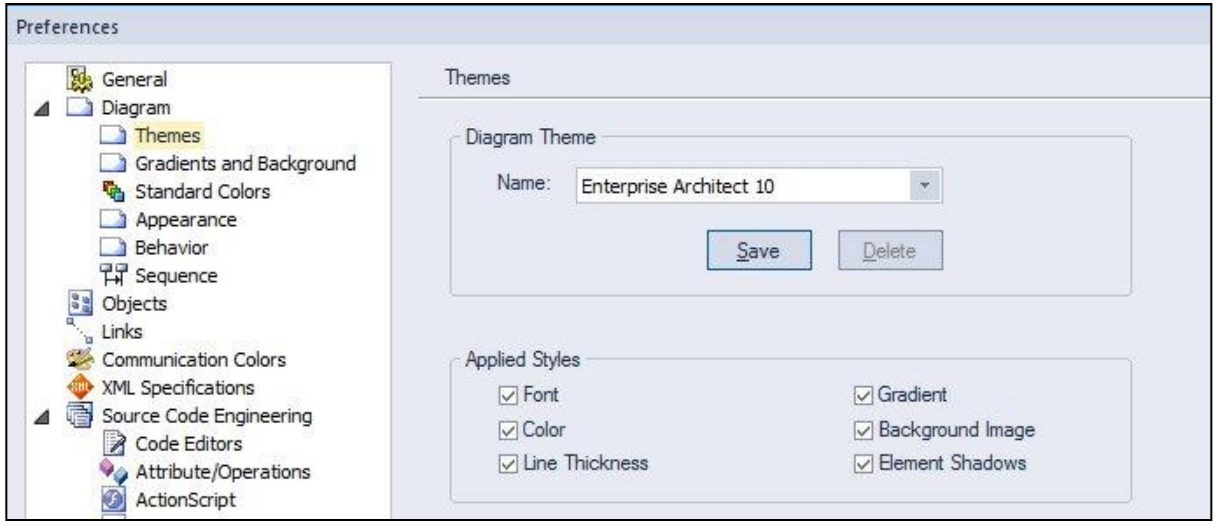


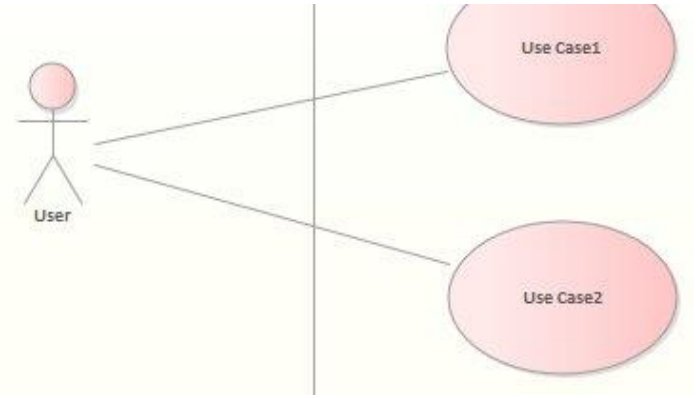


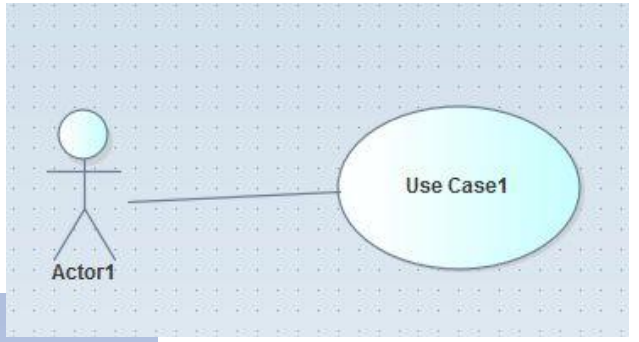
Voreinstellungen für EA über Start Register -> Visual Style bzw. Preferences

Voreinstellungen Themes



- Seit EA 11 möglich
  - Beispiele:
    - EA11
    - EA10
    - Ocean Breeze





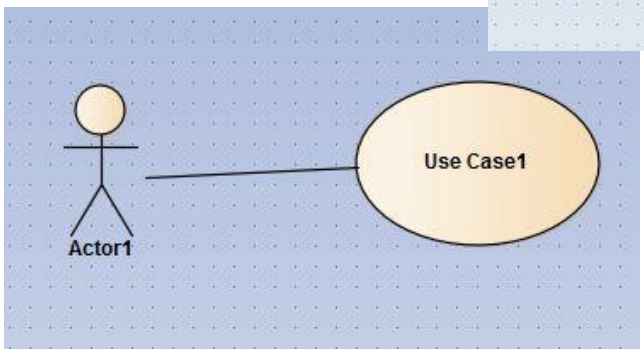
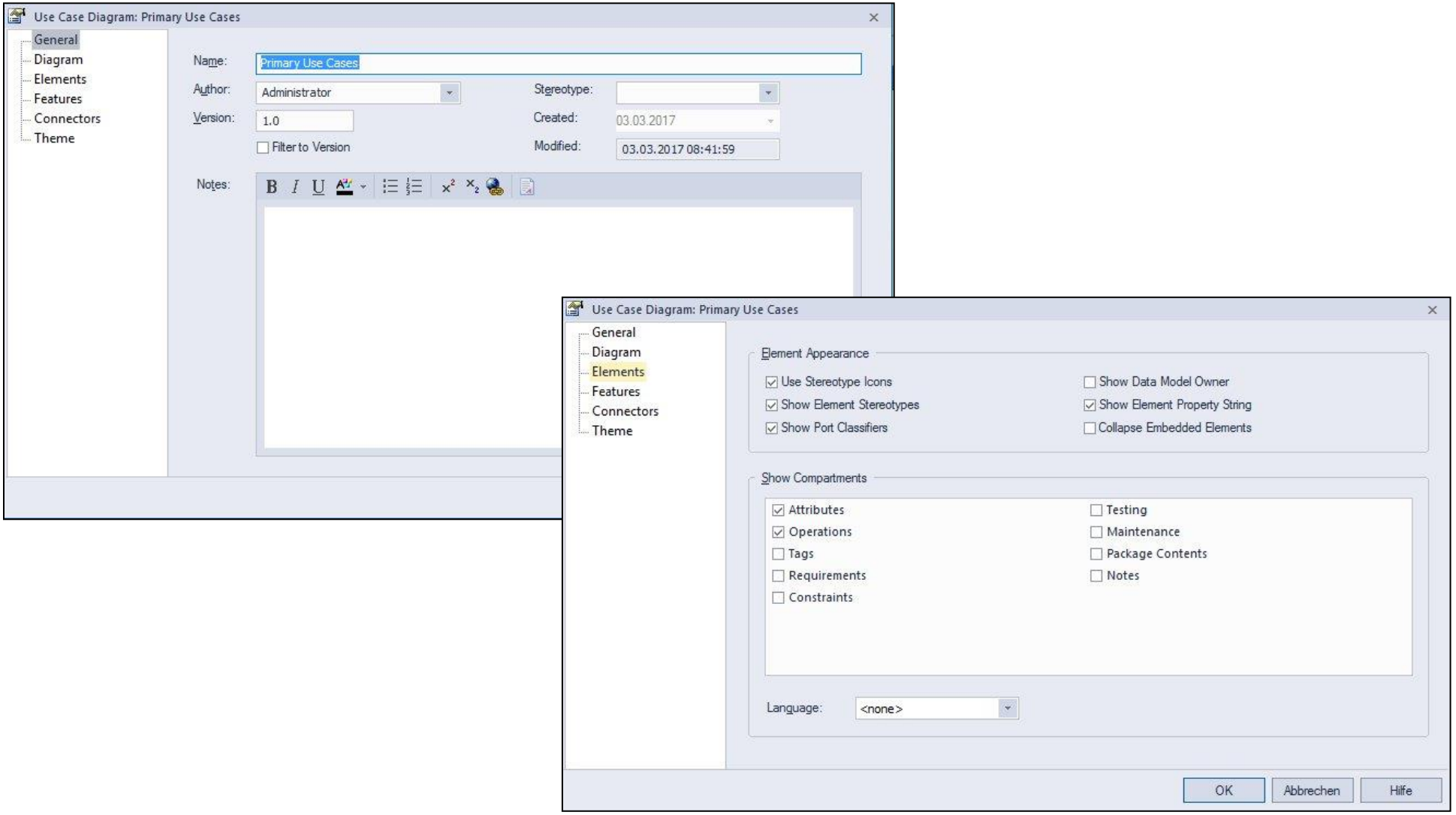
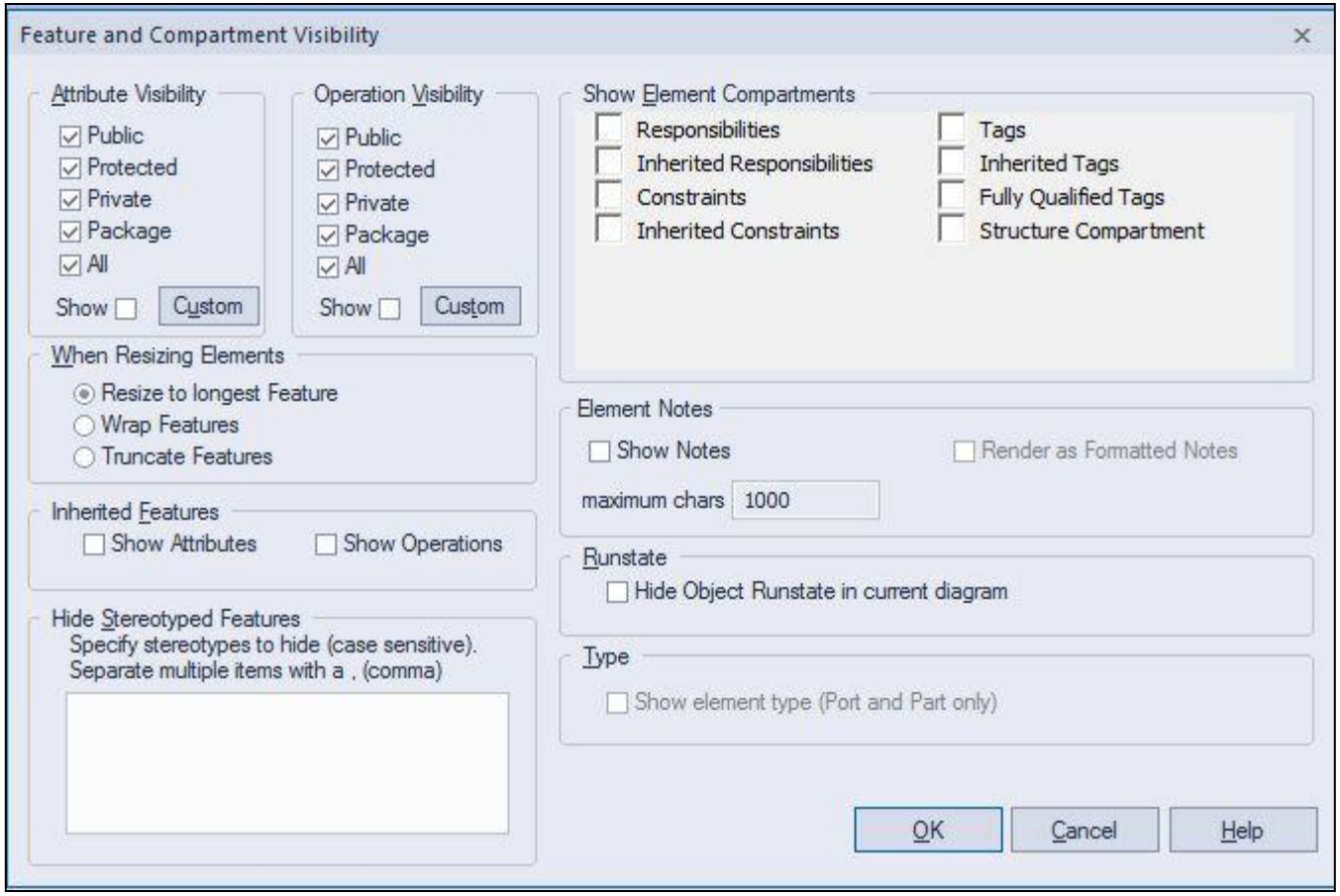


Diagramm Einstellungen



Element Einstellungen

- Diagramm und Element Einstellungen können sich überlagern



UML Standard und Funktionen des Werkzeugs

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- UML Werkzeuge (hier EA) können meist mehr als der UML-Standard
  - UML ist OMG Standard (Siehe www.omg.org)
- Nicht alle Elemente in einer Toolbox sind UML-Elemente
- Teilweise sinnvolle Ergänzungen
- Teilweise nicht so sinnvolle Ergänzungen
- Ergänzungen benötigen immer eine Erklärung (Interpretation)
- Vorgehensweise:
  - Erst UML lernen
  - Dann UML Elemente mit dem Werkzeug umsetzen

2

ANFORDERUNGSANALYSE

2.1

USE CASES

Anlegen einer Struktur für ein Use Case Modell

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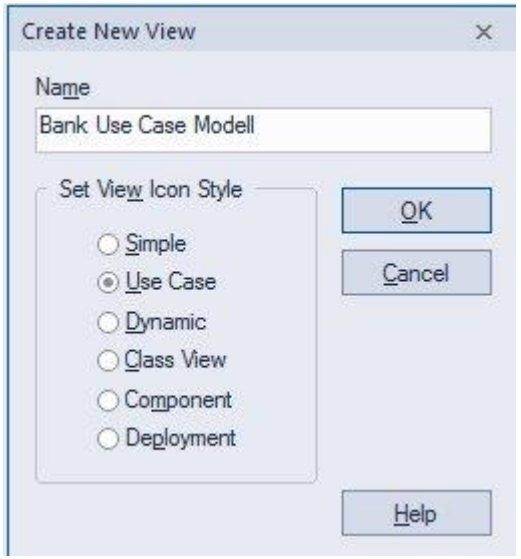


- Strukturen anlegen:
  - manuell
  - Wizard

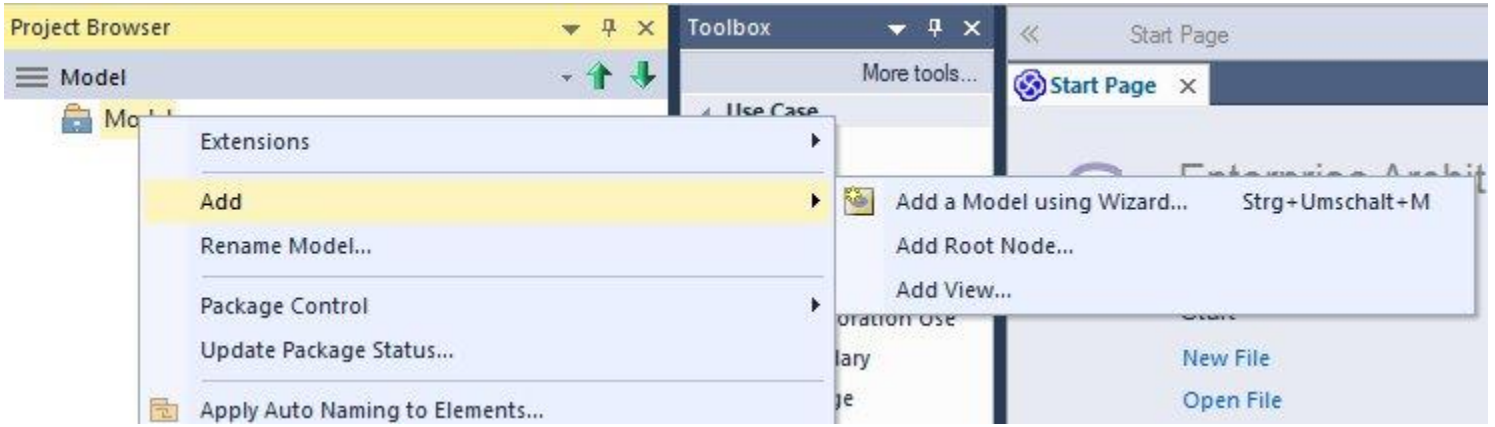
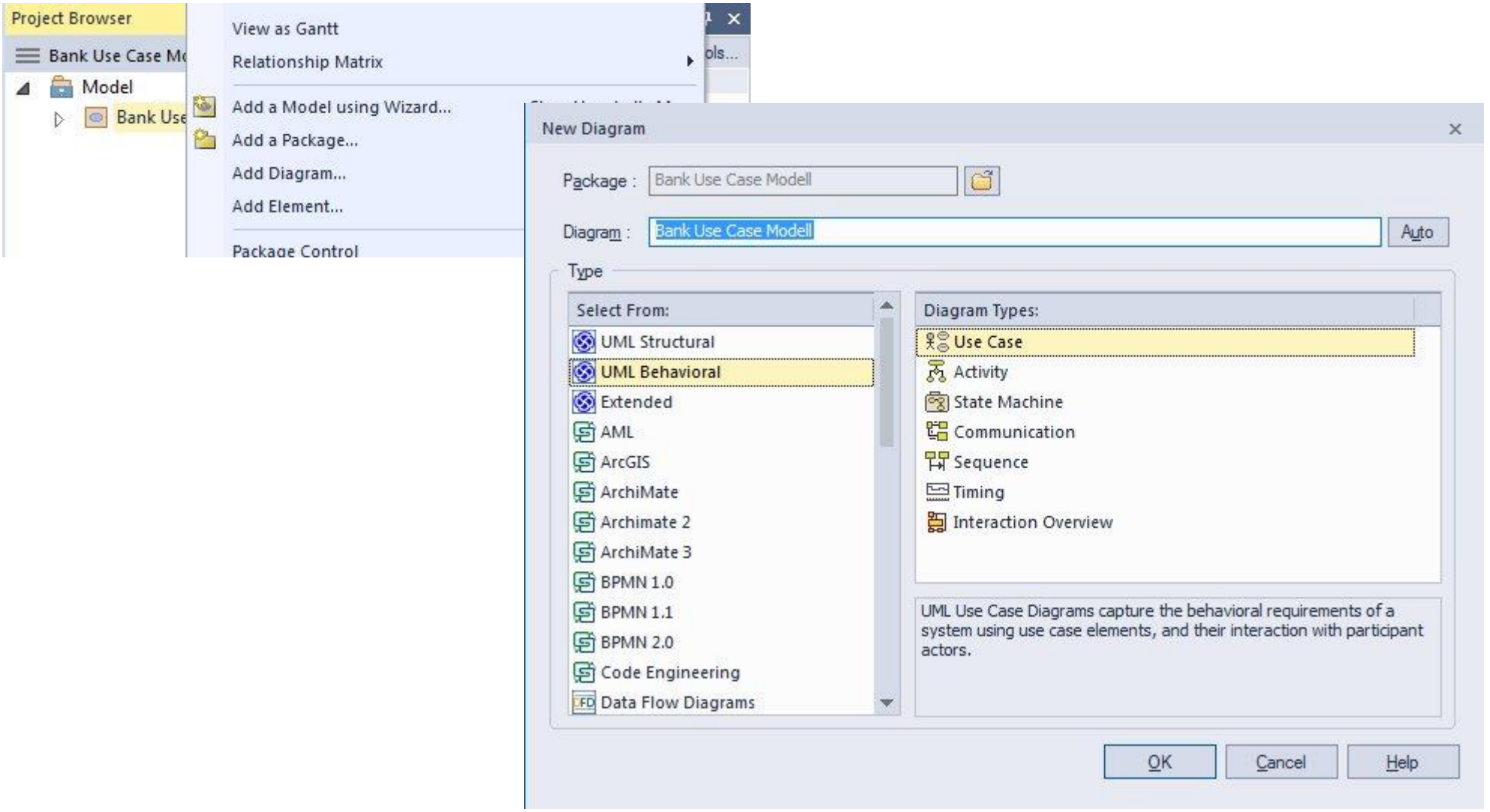
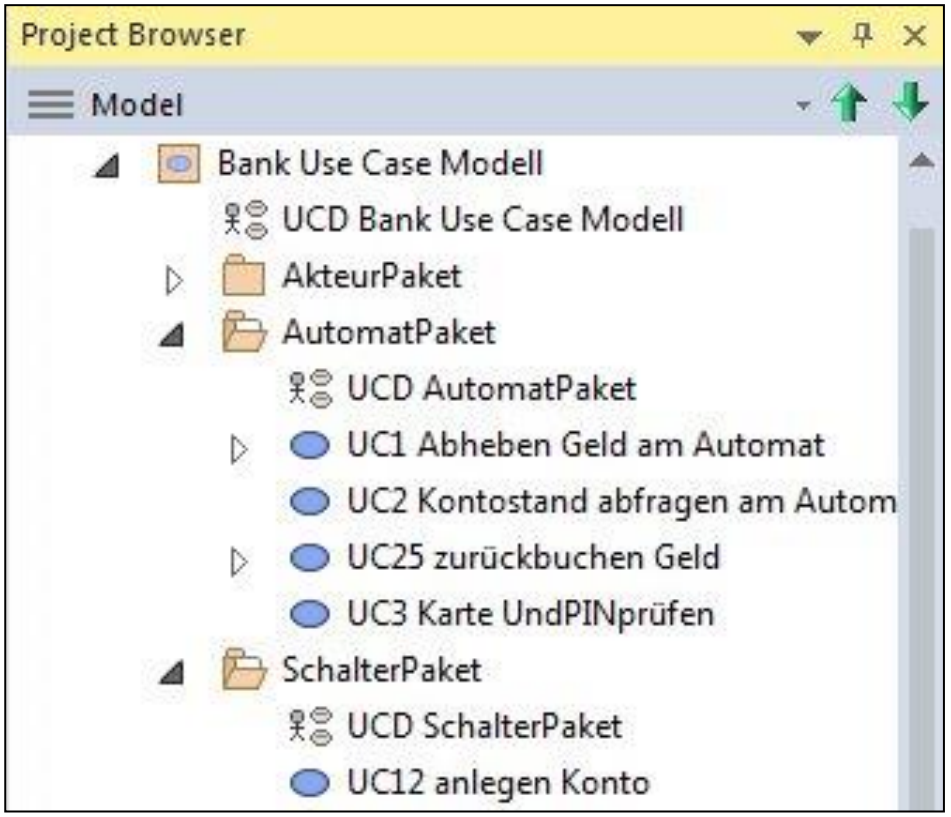


Diagramme zum Modell hinzufügen

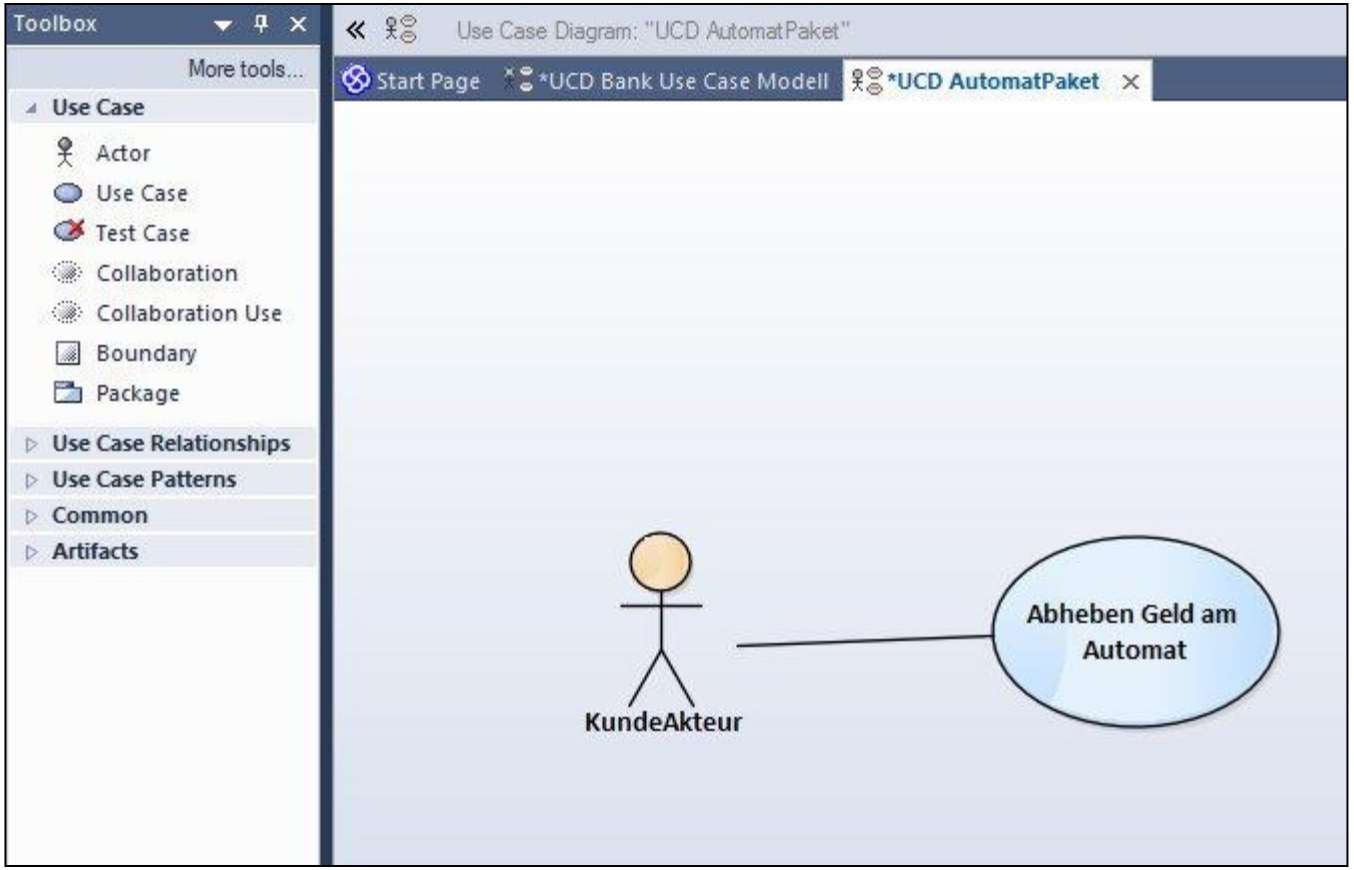


Mögliche fertige Grund-Struktur im Project Browser



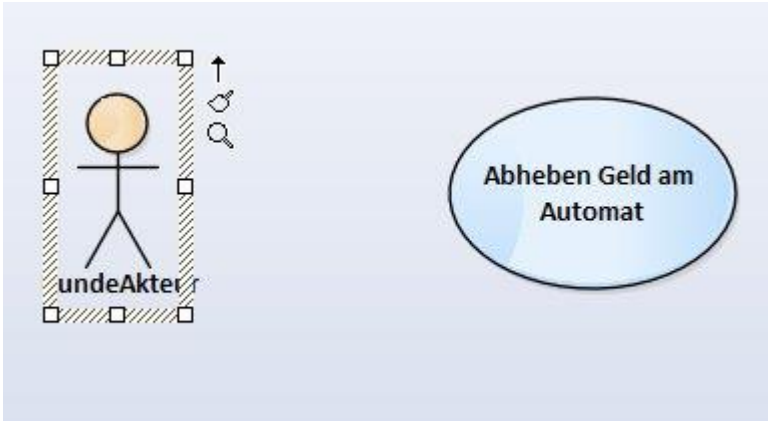
- Die Strukturen müssen vor der Modellierung erstellt werden bzw. können auch nachträglich angepasst werden
- Erste, einfache Struktur ist ohne Pakete
- Pakete sollten auf Dauer hinzugefügt werden

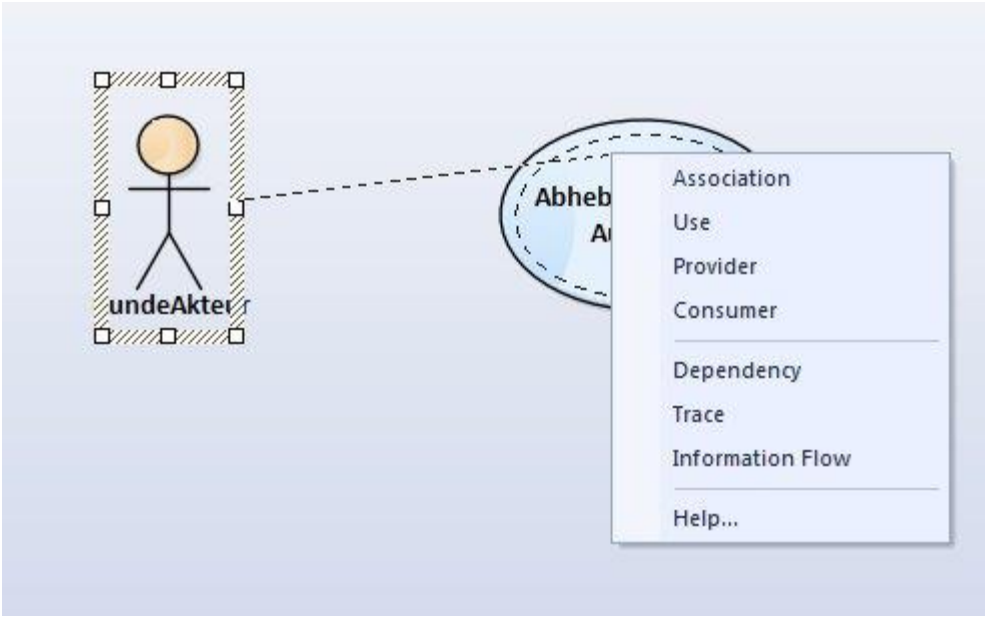
Erstellen des Use Case Diagramms (1)

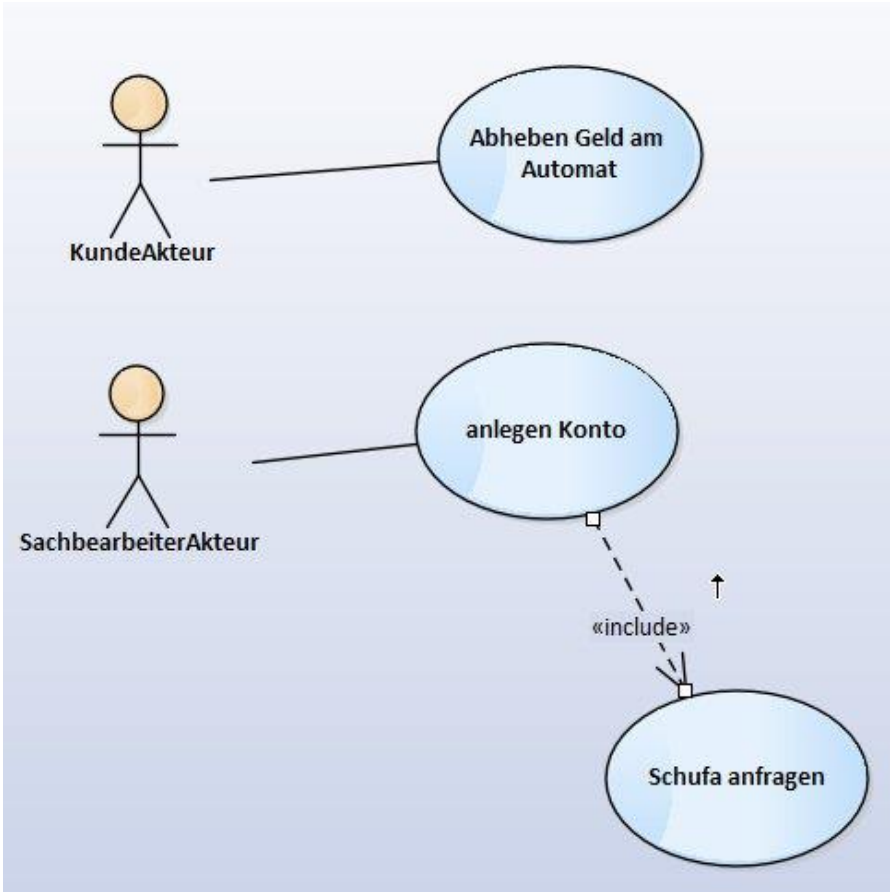


- Use Case Diagramme lassen sich auf verschiedene Art an legen
- Toolbox
- Werkzeugleiste
- Aufs Element klicken

Erstellen des Use Case Diagramms (2)







Beschreibung des Use Cases

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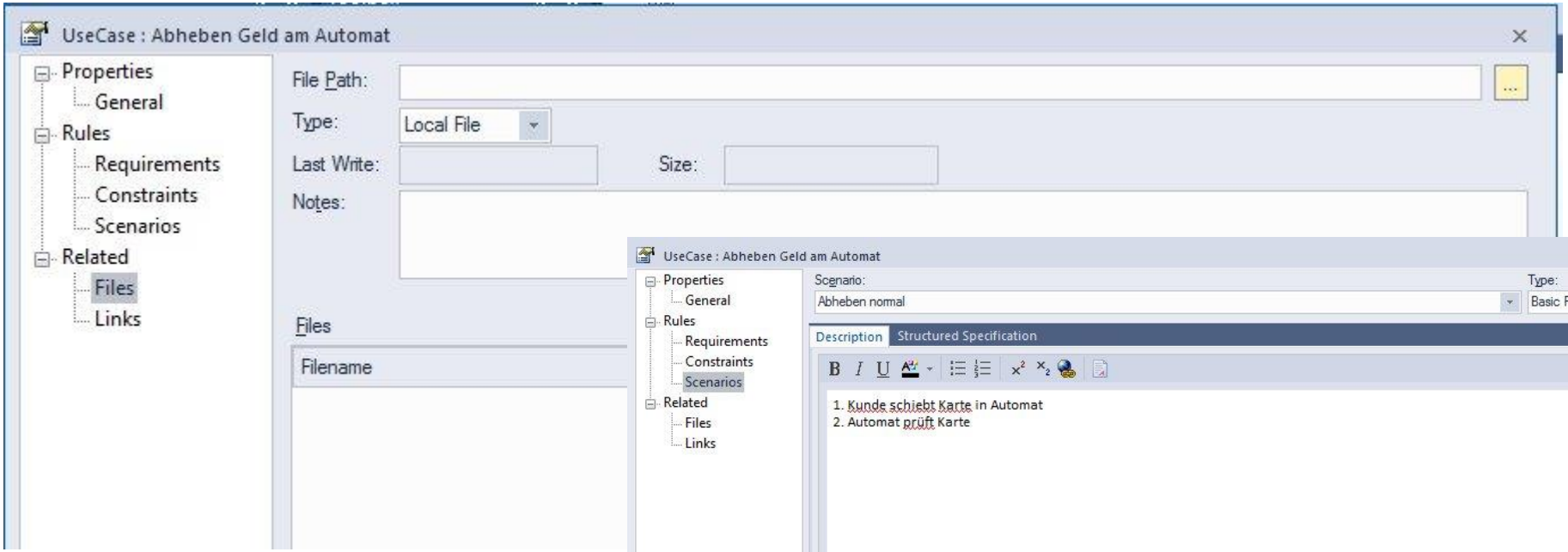
- Die Beschreibung des Use Cases kann auf verschiedene Arten und Weisen erfolgen:
  - Textform
    - Prosa
    - Schablone
    - EA
  - Ergänzend können folgende Diagramme verwendet werden:
    - Aktivitätsdiagramm
    - Sequenzdiagramm

    (Beide Diagramme beschreiben hier nur die Interaktion des Akteurs mit dem System)

Beschreibung der Use Cases in Textform



- Externe Beschreibungen können über den Tab Files der Properties angehängt werden
- Abläufe können auch direkt im EA beschrieben werden

Strukturierte Beschreibung der Use Cases mit Generierung von Diagrammen

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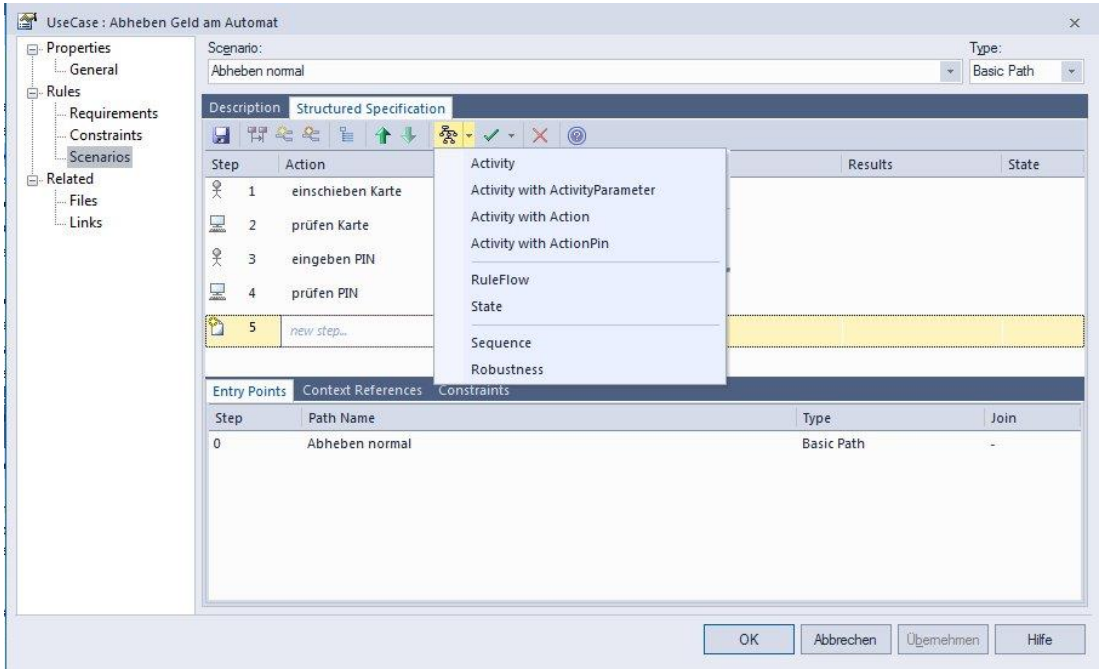
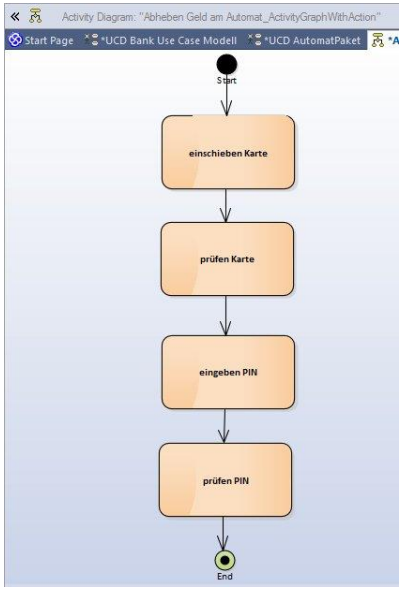


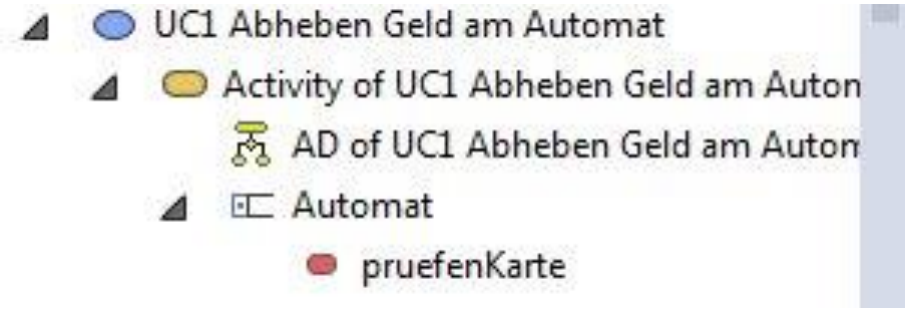
- Abläufe können strukturiert beschrieben werden
- Daraus lassen sich Diagramme generieren
  - Aktivitäts-Diagramme
  - Sequenz-Diagramme
  - Robustness-Diagramme



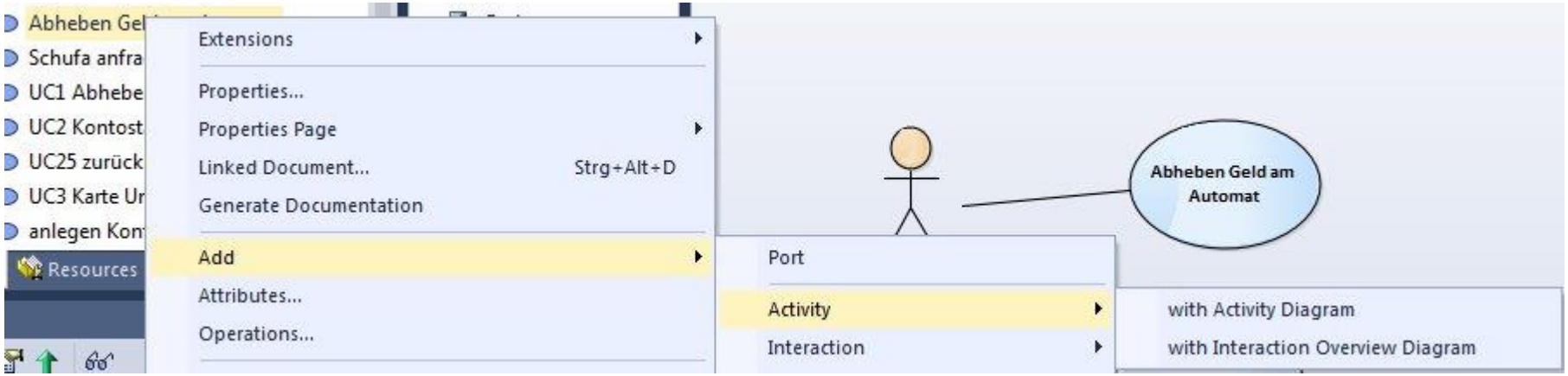
2.2

ACTIVITY

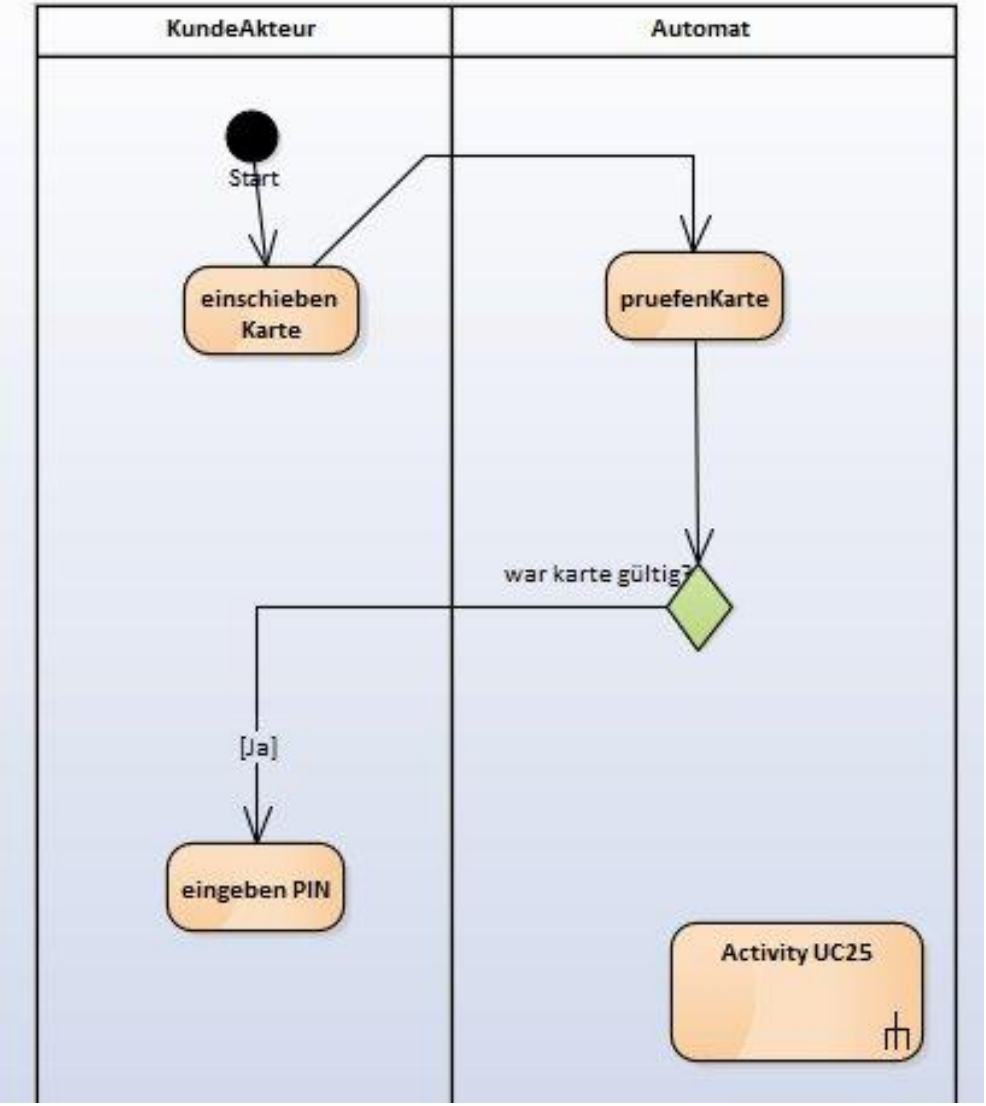
Aktivitäts-Diagramme (1)



- Anlegen über rechte Maustaste -> New Child Diagram -> Activity
- Die grundlegende Struktur ist wichtig
- Partitions können verwendet werden



Aktivitäts-Diagramme (2)



Weitere Mögliche Modelle (Views) in der Anforderungsanalyse

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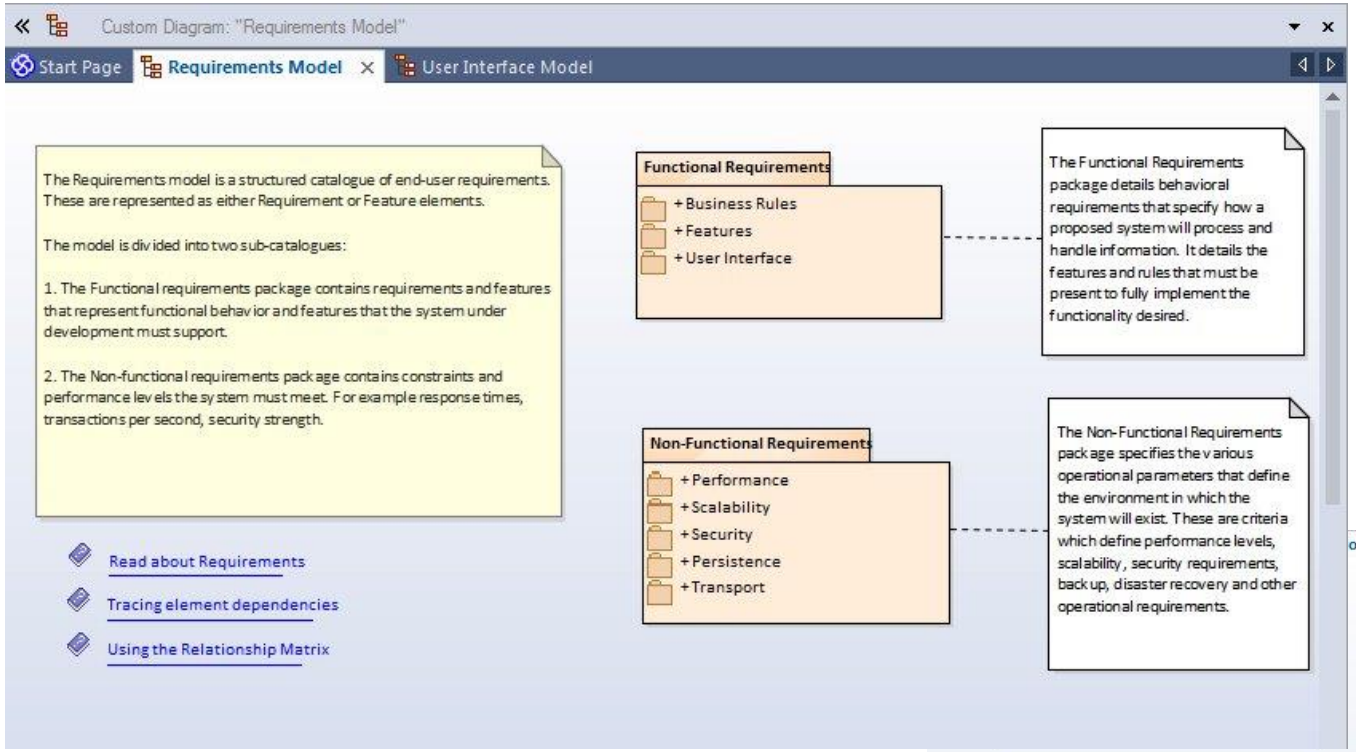

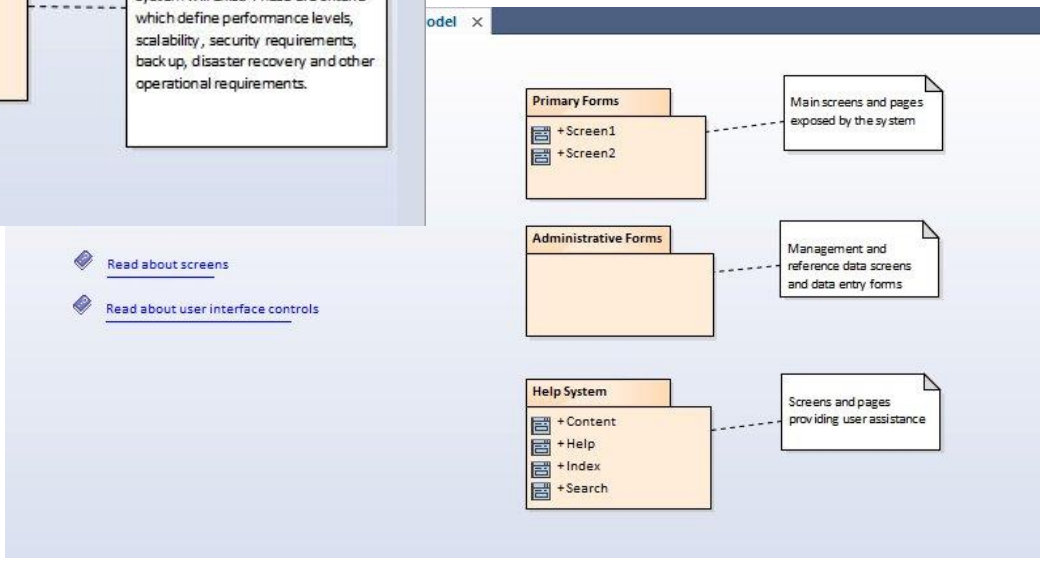

- User Interface Model
- Requirements Model

3

DAS FACHLICHE MODELL

3.1

STRUKTUR

Fachliches Modell

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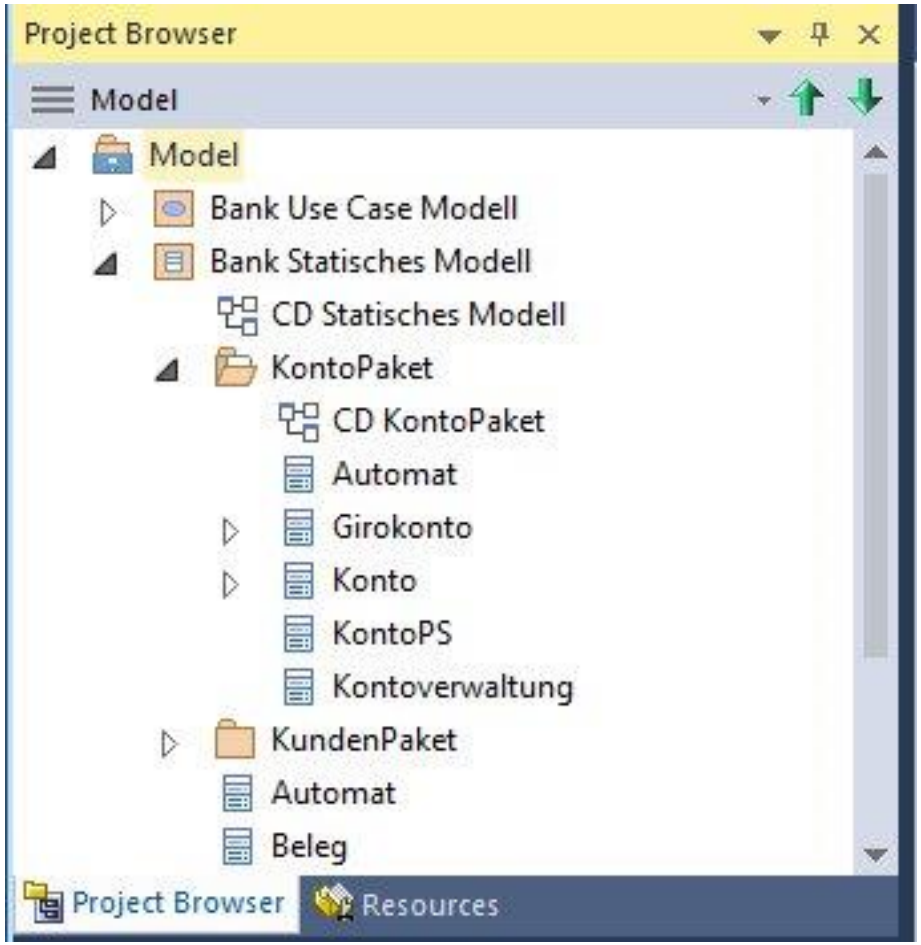
- Beschreibt die fachlichen Zusammenhänge hinter Systemgrenze
- Keine (wenig) technische Details
- Besteht aus statischem und dynamischem Modell
- Statisches Modell
  - Klassen-Diagramm bzw. Abwandlungen (Pakete / Interfaces)
- Dynamisches Modell
  - Interaktions-Diagramme
    - Sequenz-Diagramm
    - Kommunikations-Diagramm
    - (Aktivitäts-Diagramm)
  - Zustands-Diagramm
  - weitere

Erstellen einer Struktur für ein fachliches Modell

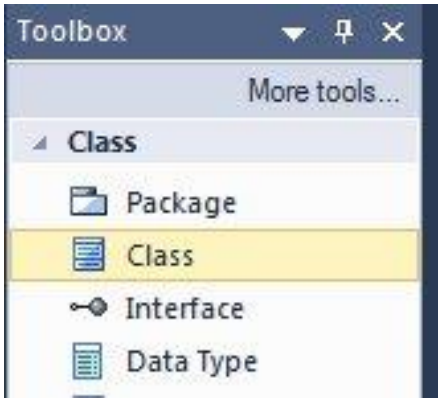


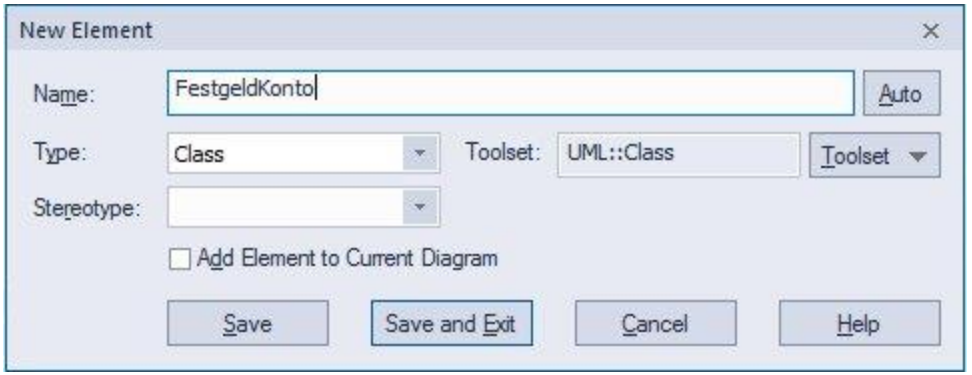
- Unterschiedliche Strukturen sind möglich

3.2

KLASSENDIAGRAMM

Klassen erzeugen

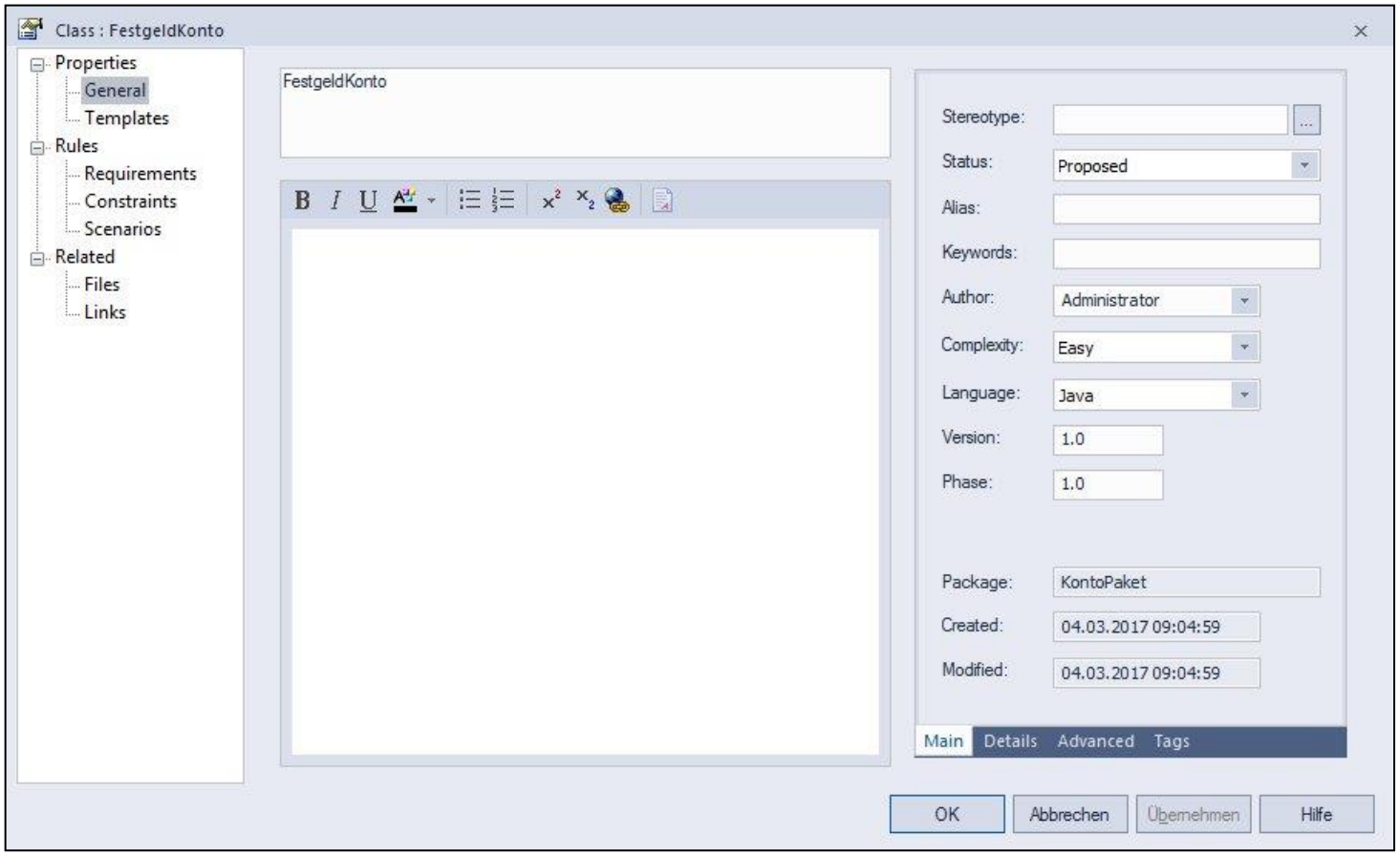




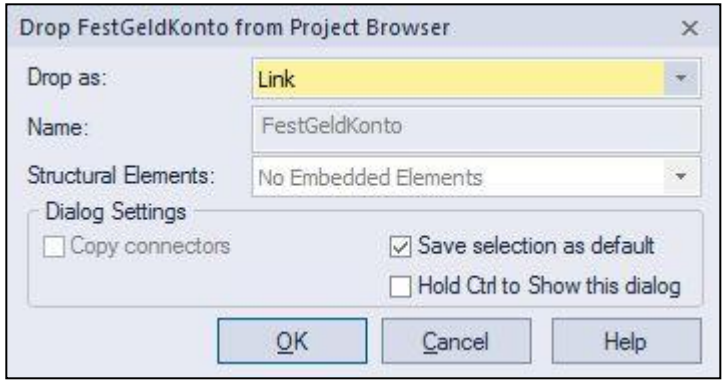
- Das Erzeugen von Klassen kann auf verschiedene Arten und Weisen erfolgen:
  - Toolbox
  - Über die Struktur
    - Toolset auswählen

Klassen detaillieren

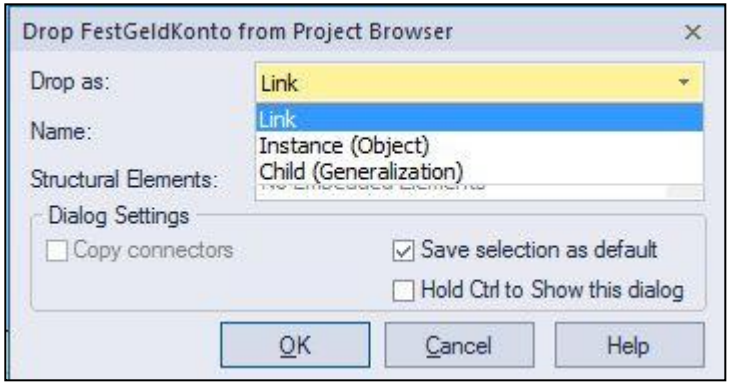
- Jede Klasse kann über die Properties und den einzelnen Tabs weiter detailliert werden



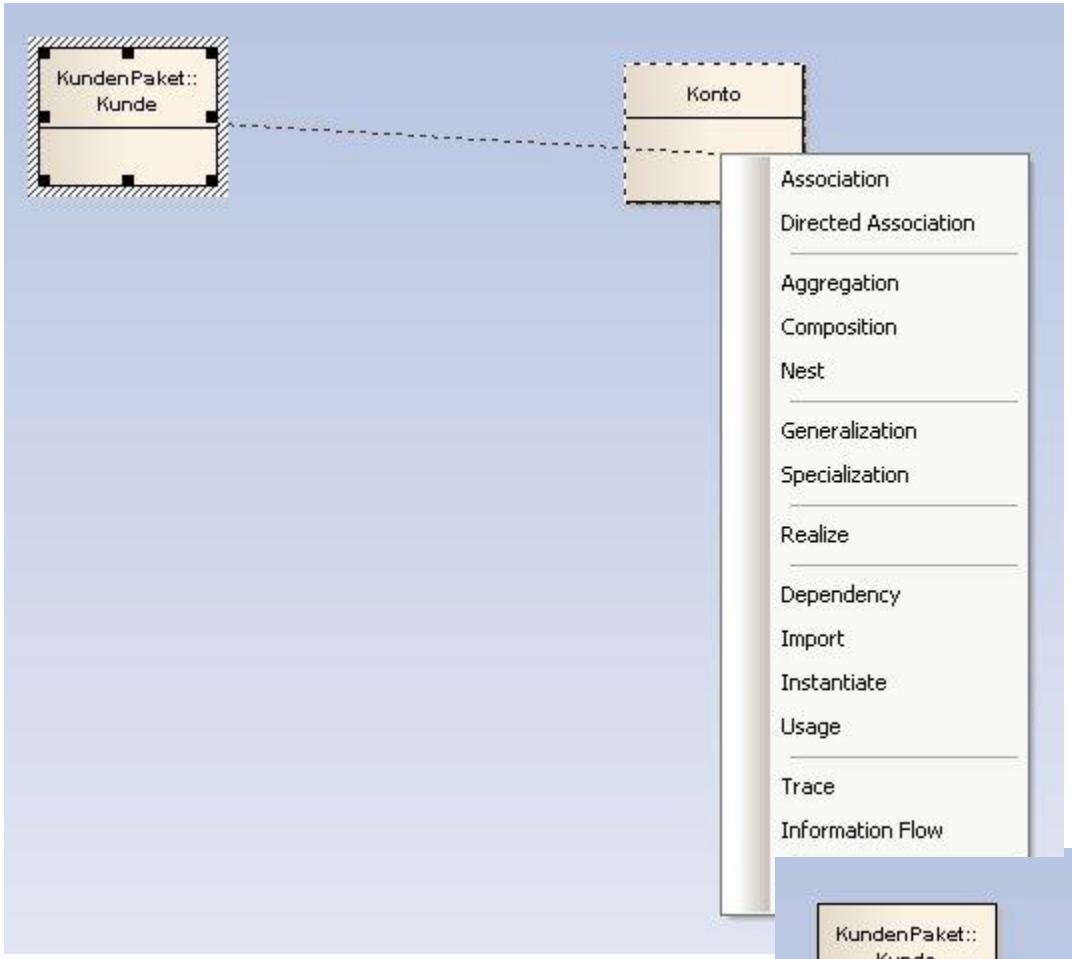
Elemente aus der Struktur ins Diagramm ziehen



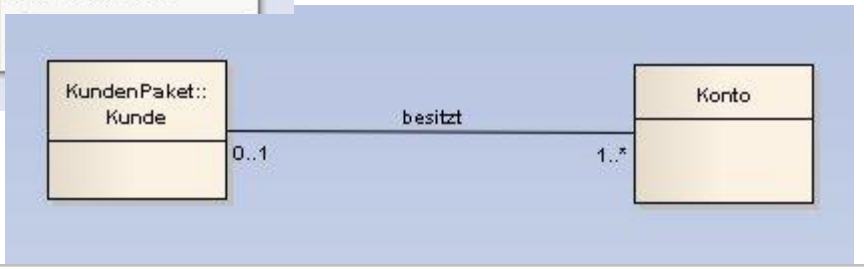
- Elemente (Klassen, Use Cases, Akteure etc. lassen sich aus dem Project Browser in das entsprechende Diagramm ziehen
- Verschiedene Optionen sind beim Ziehen möglich



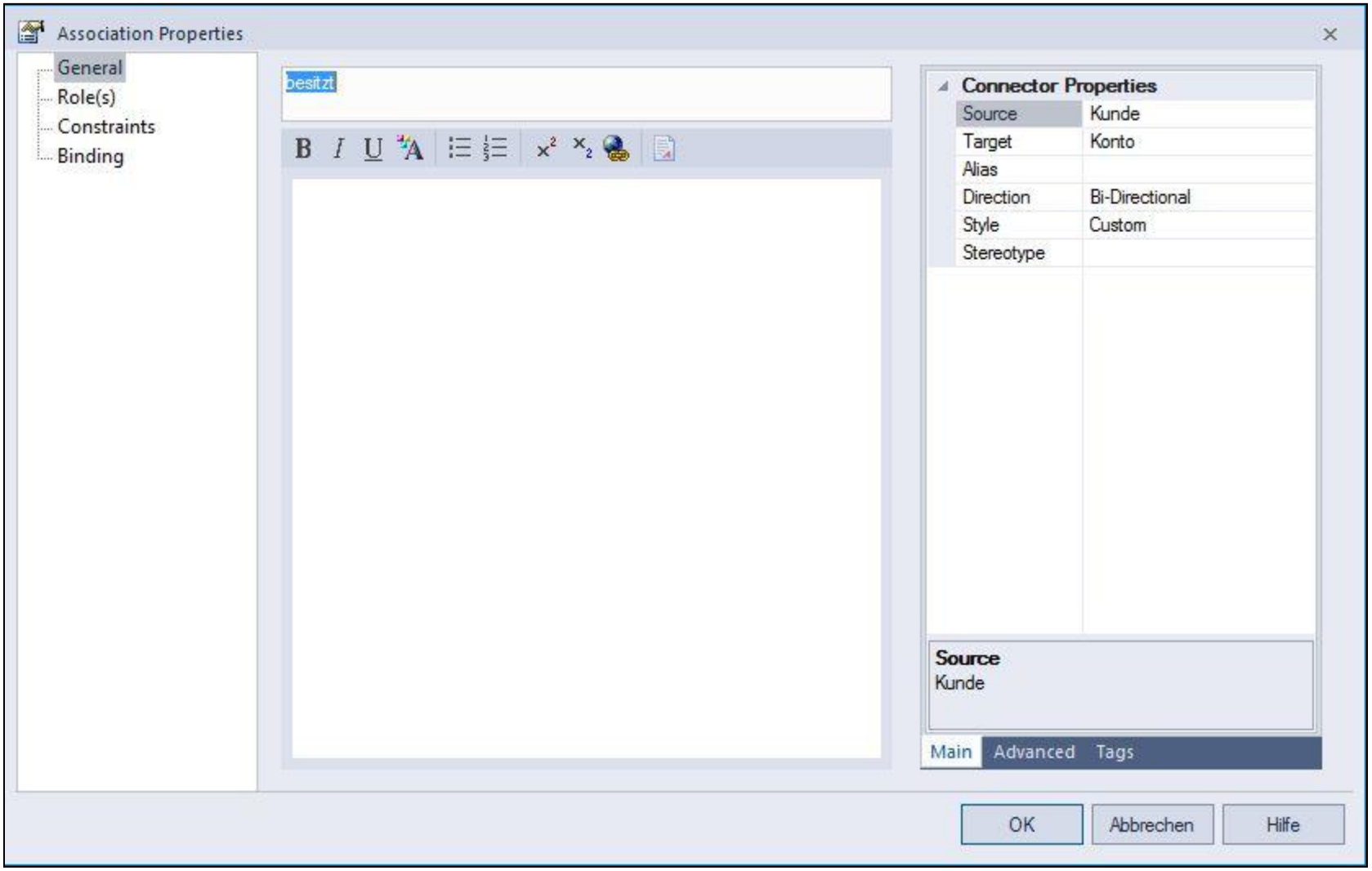
Anlegen von Beziehungen im Klassen-Diagramm



- Über die Eigenschaften (Properties) können die Beziehungen weiter detailliert werden



Attribute für die Instanzen festlegen



Operationen und Parameter festlegen

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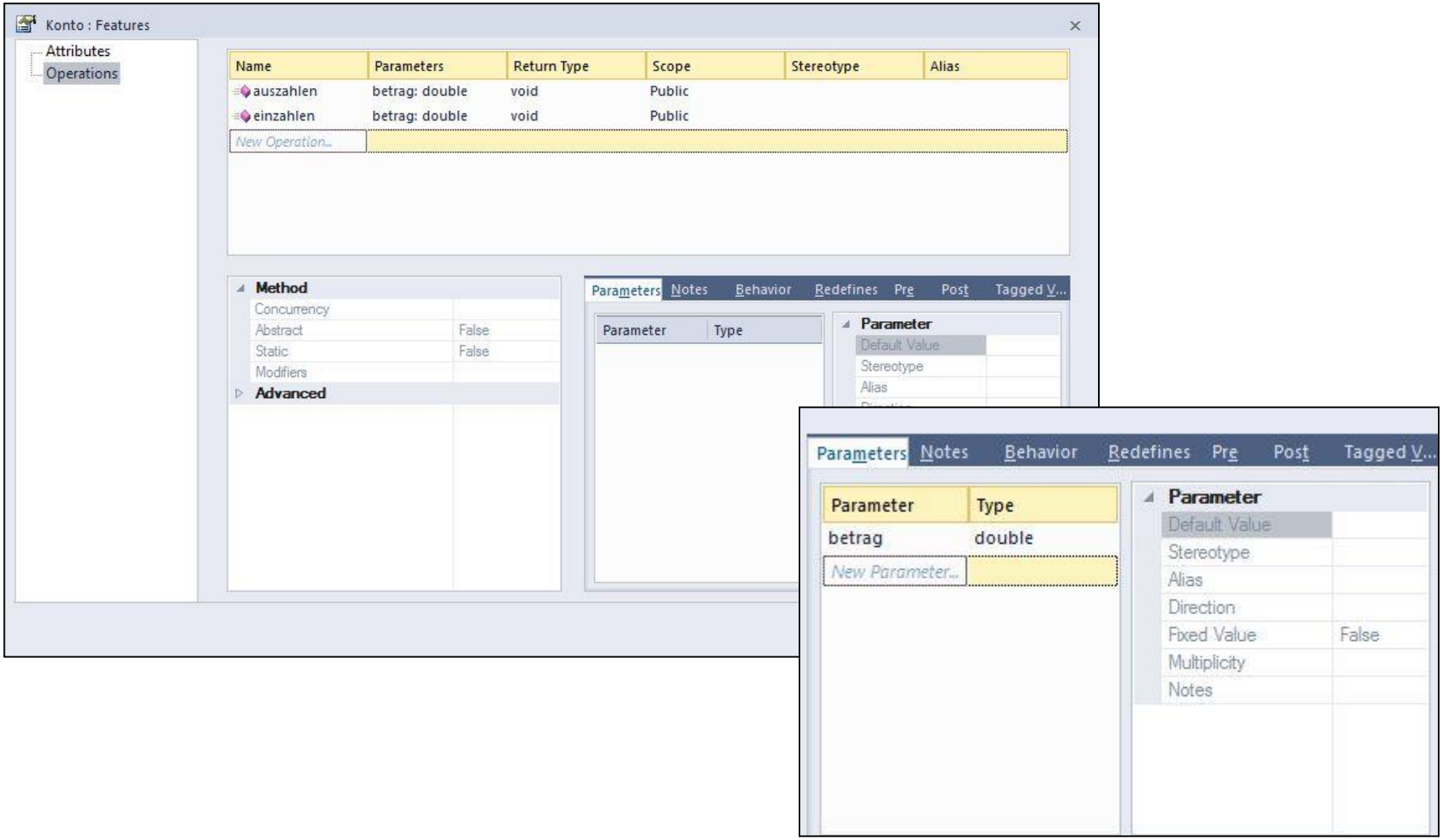
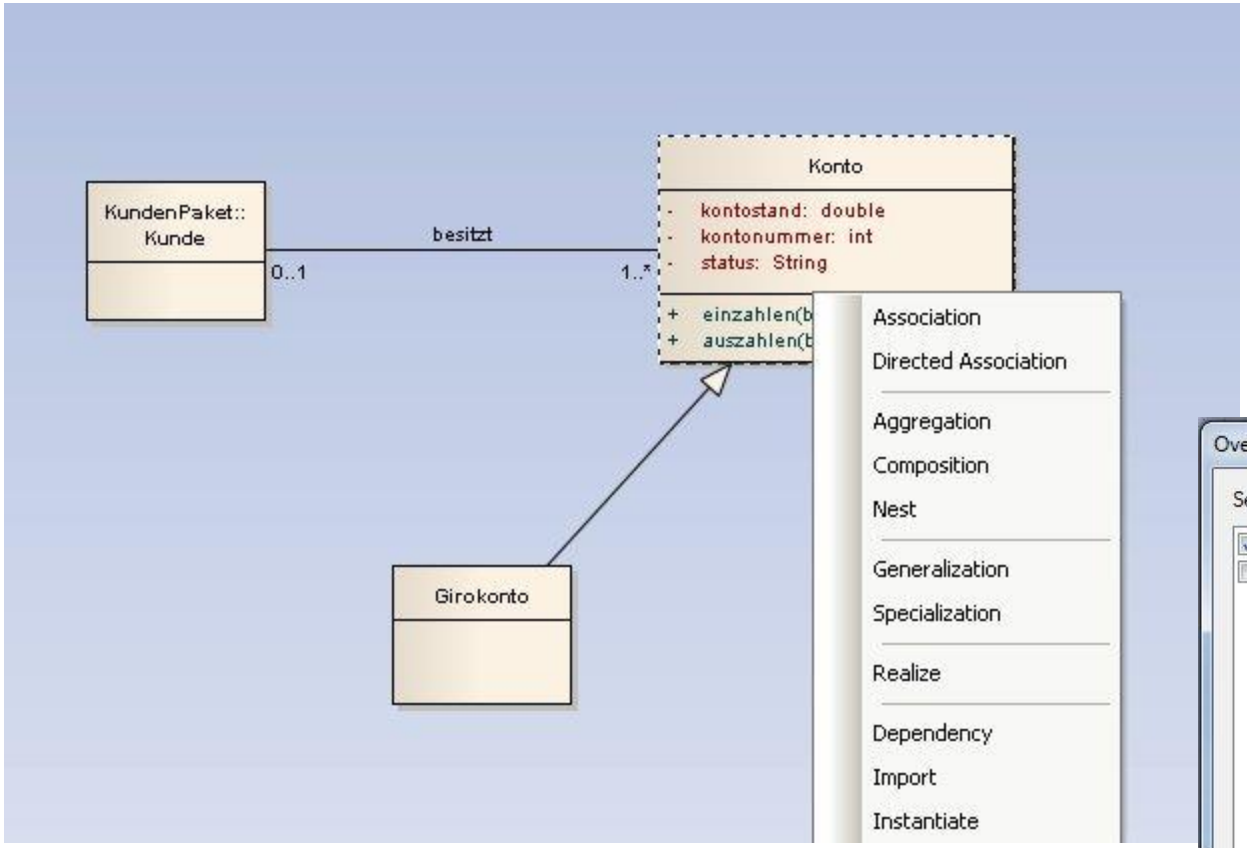
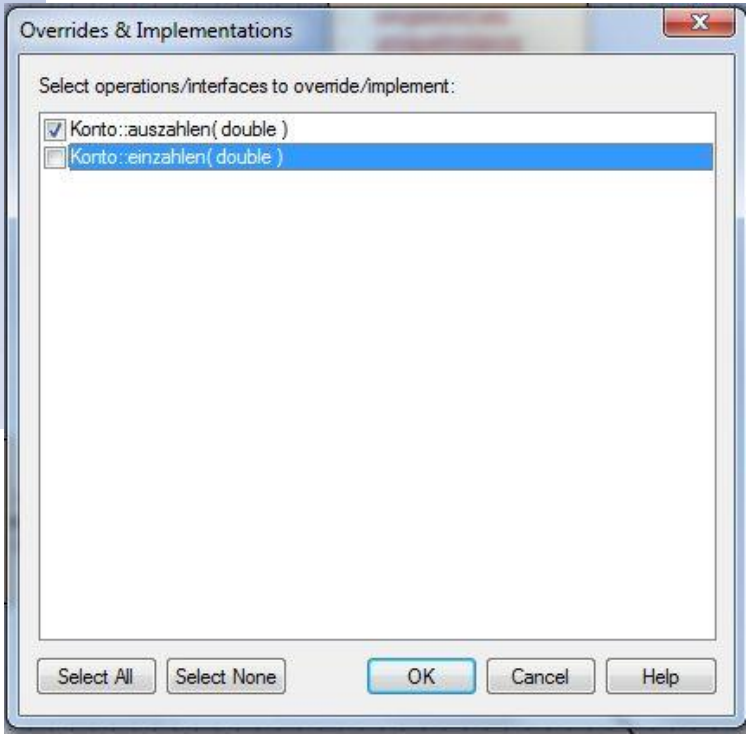


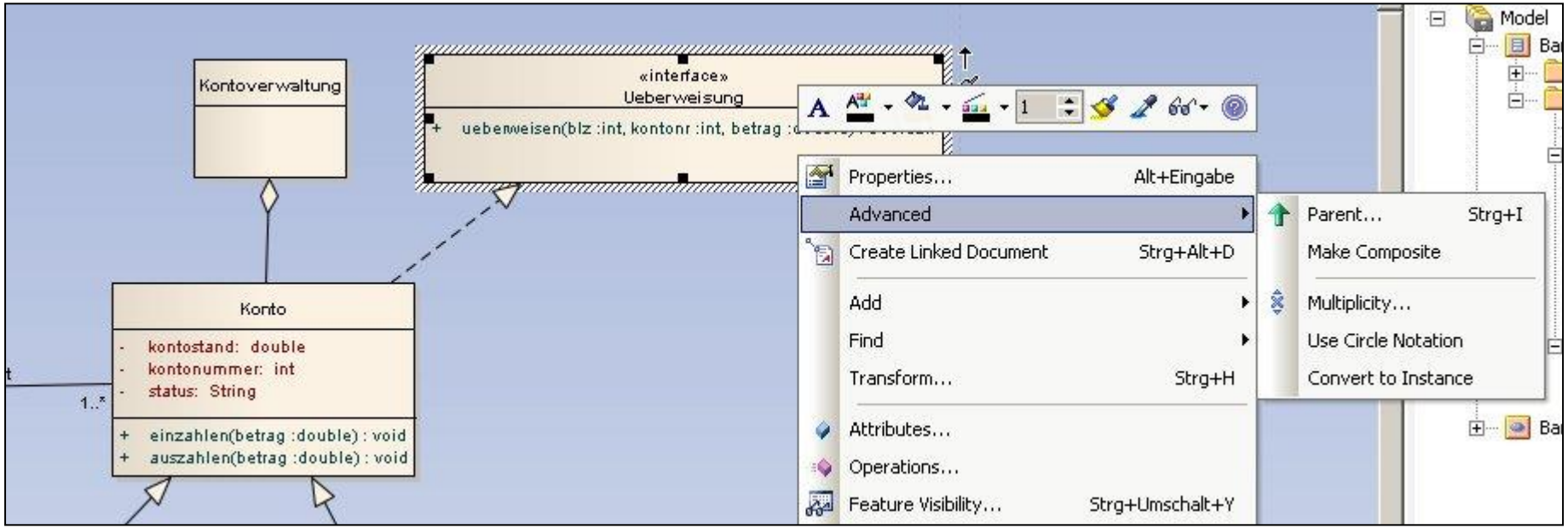
Vererbung



- Bei der Vererbung können die Operationen, die Überladen oder Überschrieben werden sollen, ausgewählt werden



Interfaces und Aggregationen

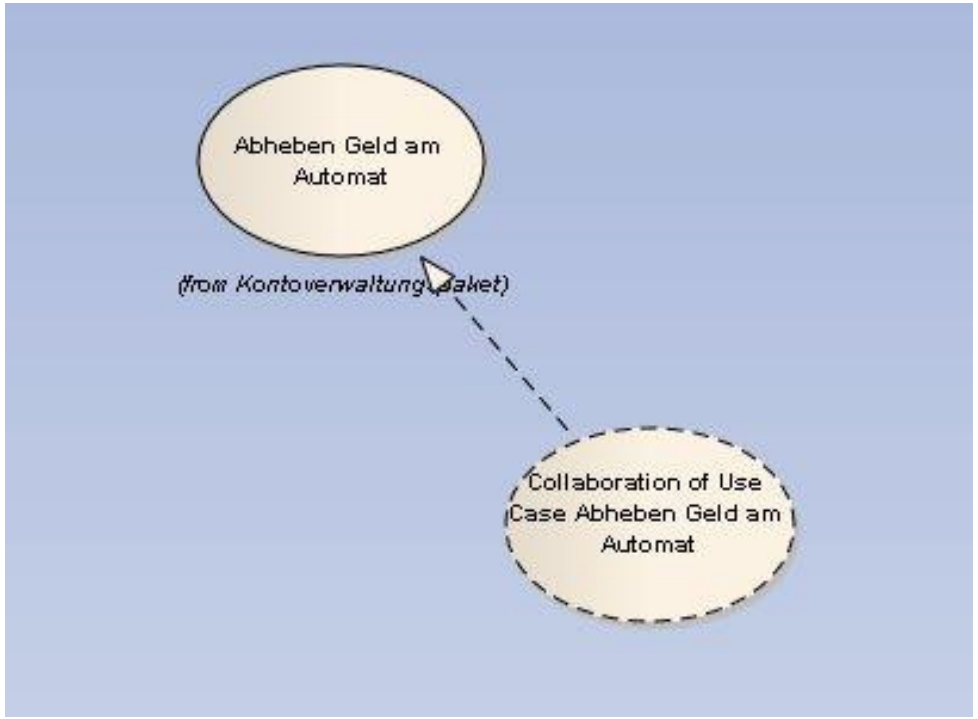


- Neben den Assoziationen lassen sich auch Interfaces mit Realize verbinden
- Aggregationen und Kompositionen können direkt oder über die Properties der Assoziation geändert werden

3.3

INTERAKTIONEN

Die Planung der Interaktions-Modellierung



- Bei sauberer Planung können die Interaktionen über eine Collaboration realisiert
- Eine geeignete Struktur muss vorher angelegt werden

Die verschiedenen Diagramme zur Interaktions-Modellierung

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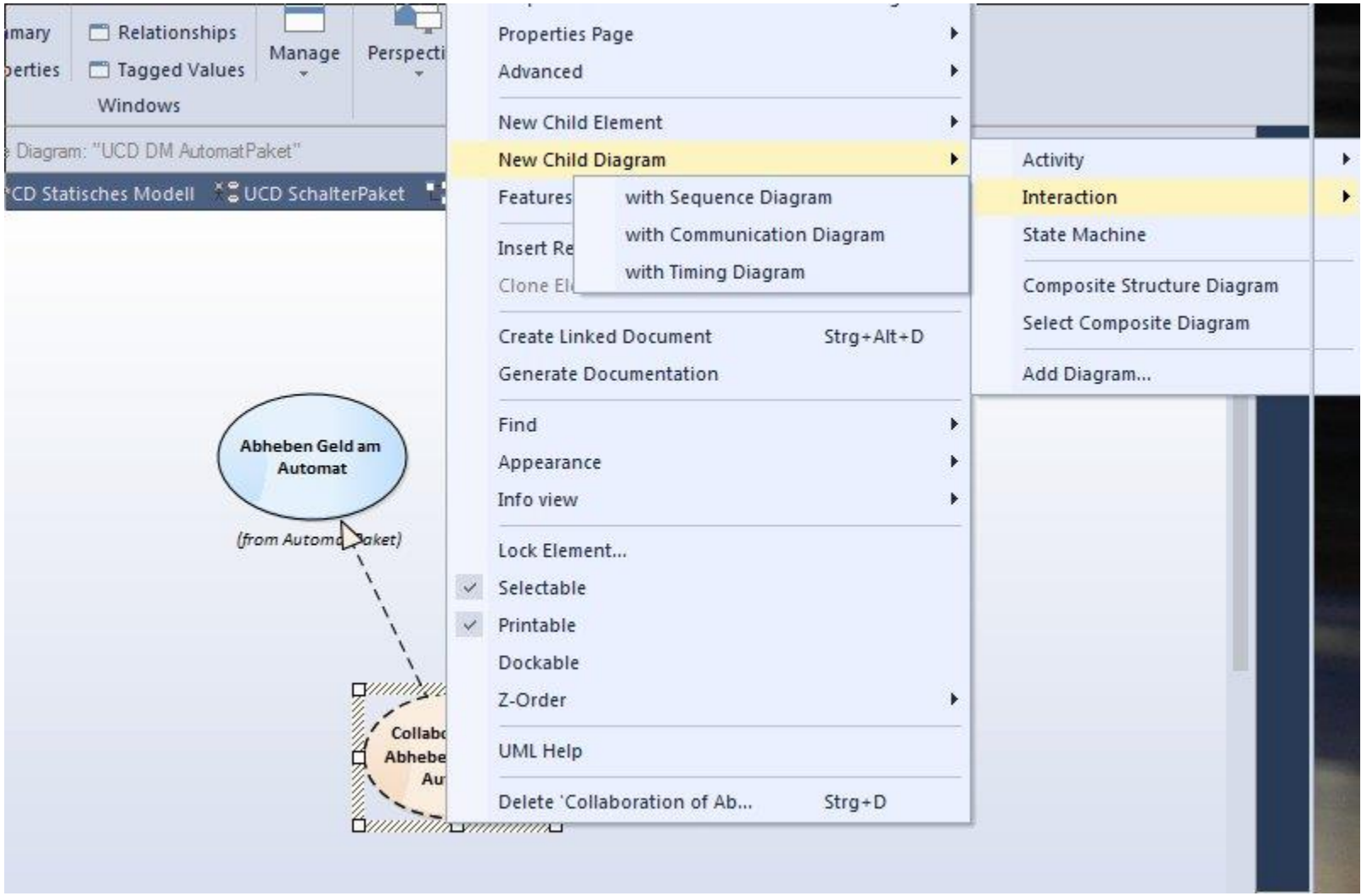

Sequenz-Diagramm: Struktur und erste Elemente

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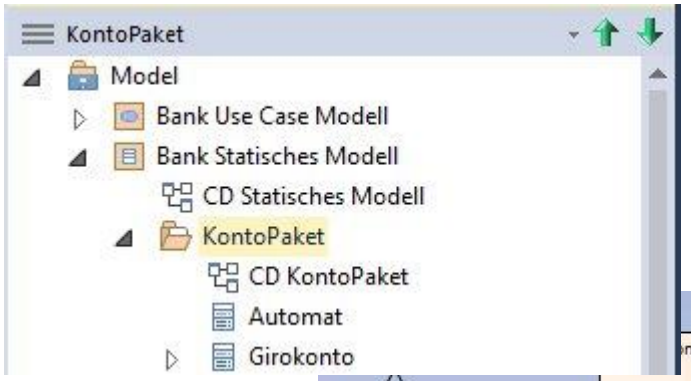
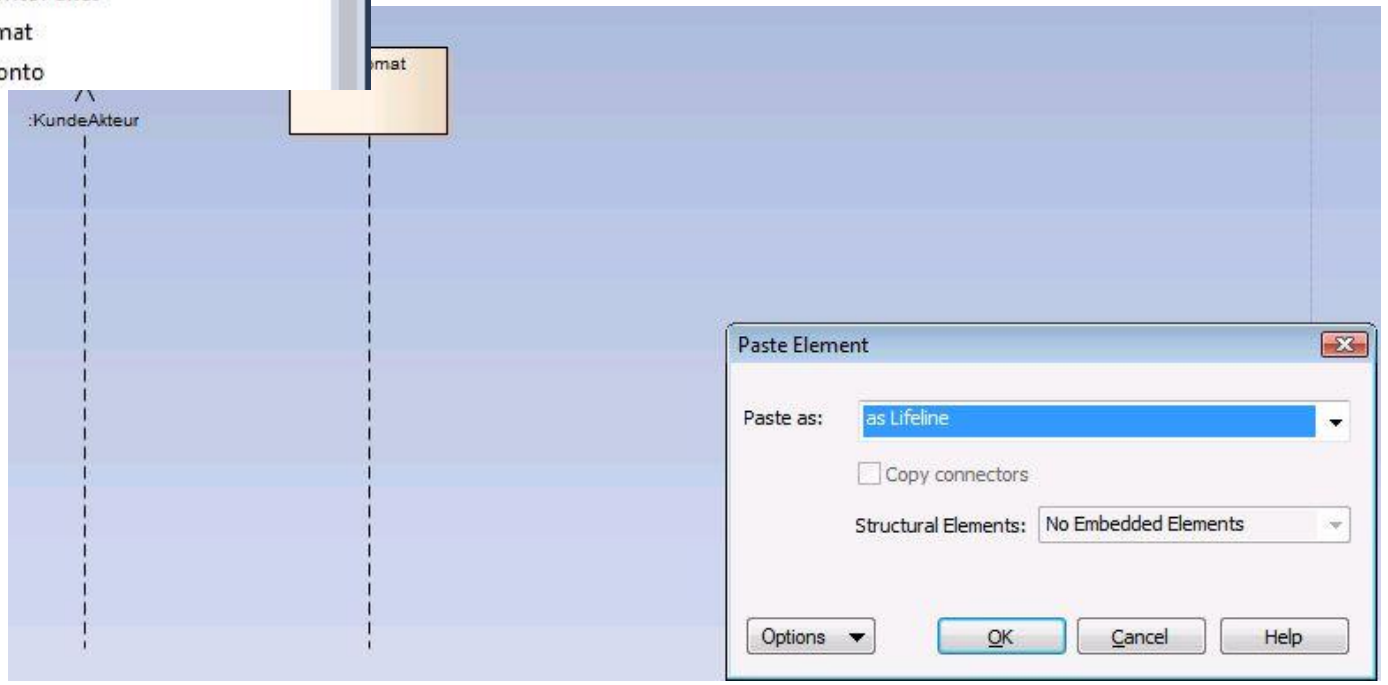


- Bei Drag and Drop der Elemente muss teilweise as Lifeline verwendet werden



Sequenz-Diagramm Toolbox und Nachrichten Einstellungen

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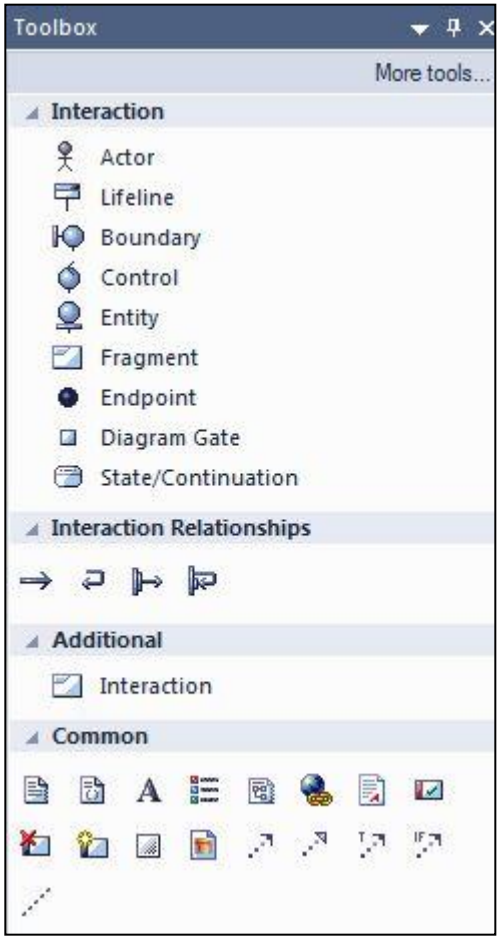

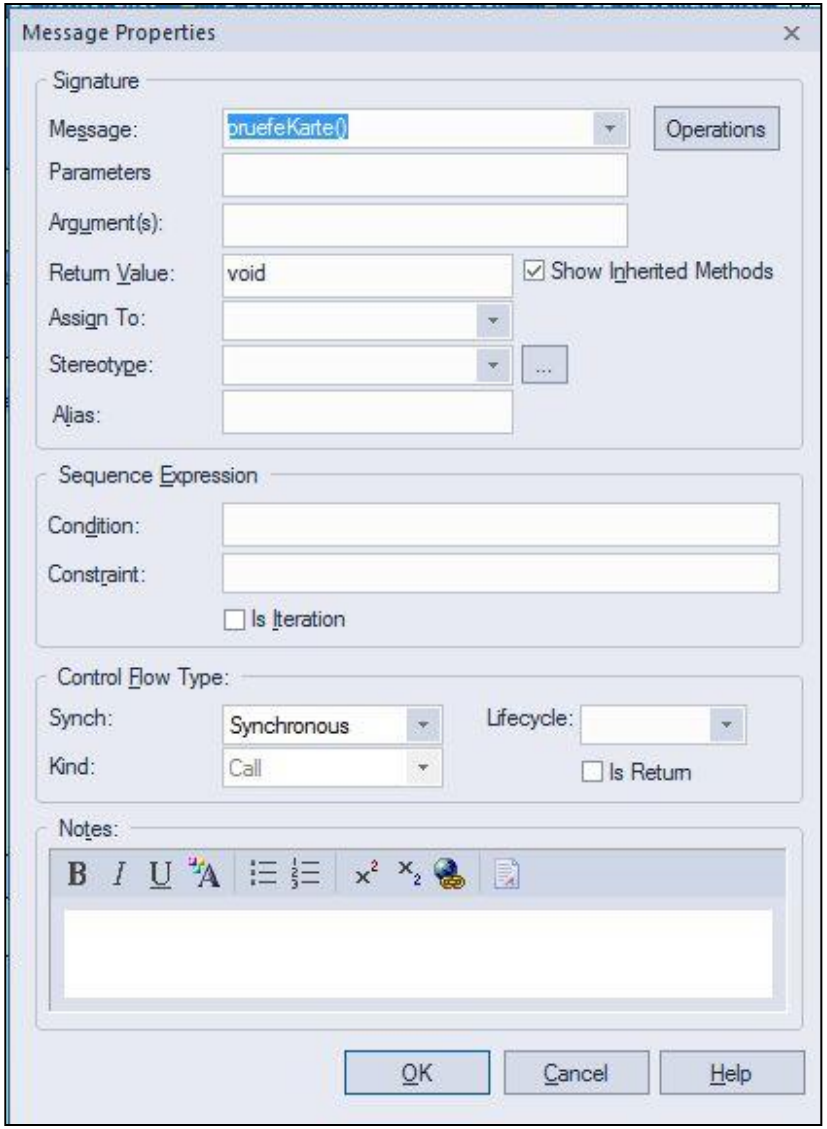

Message Properties vs. Operations

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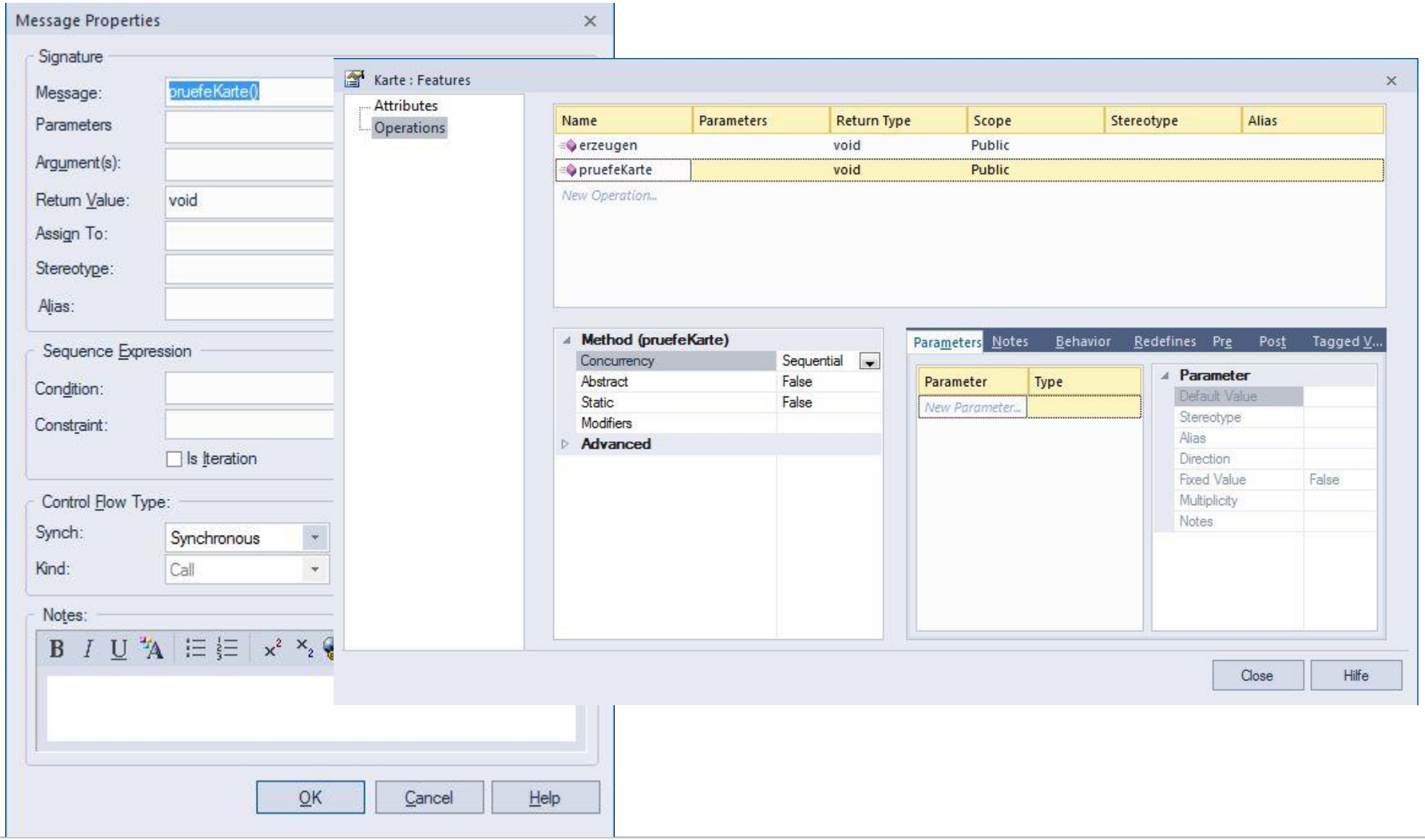
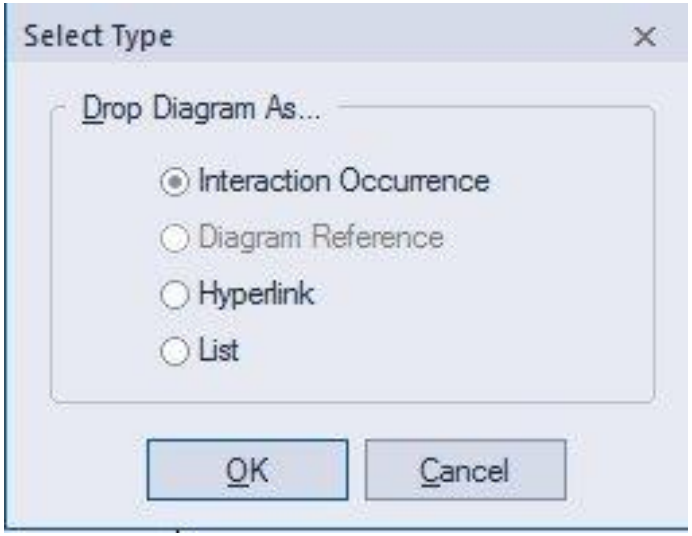
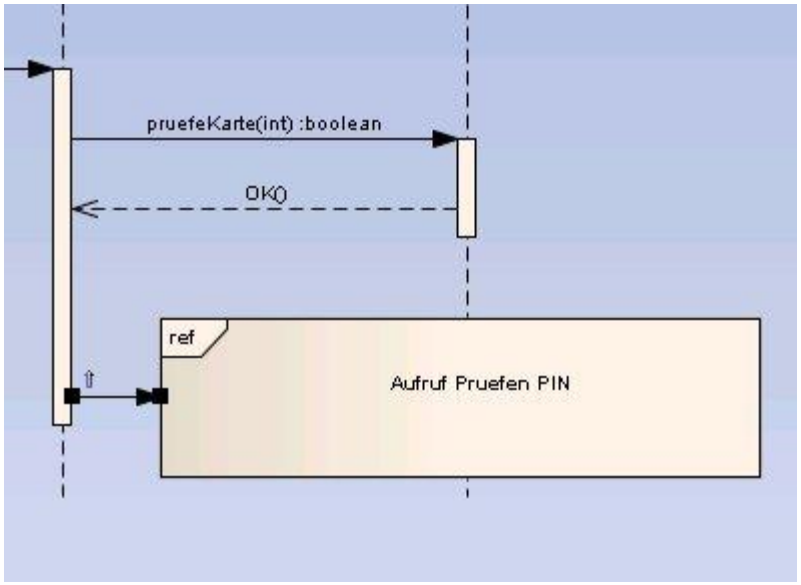


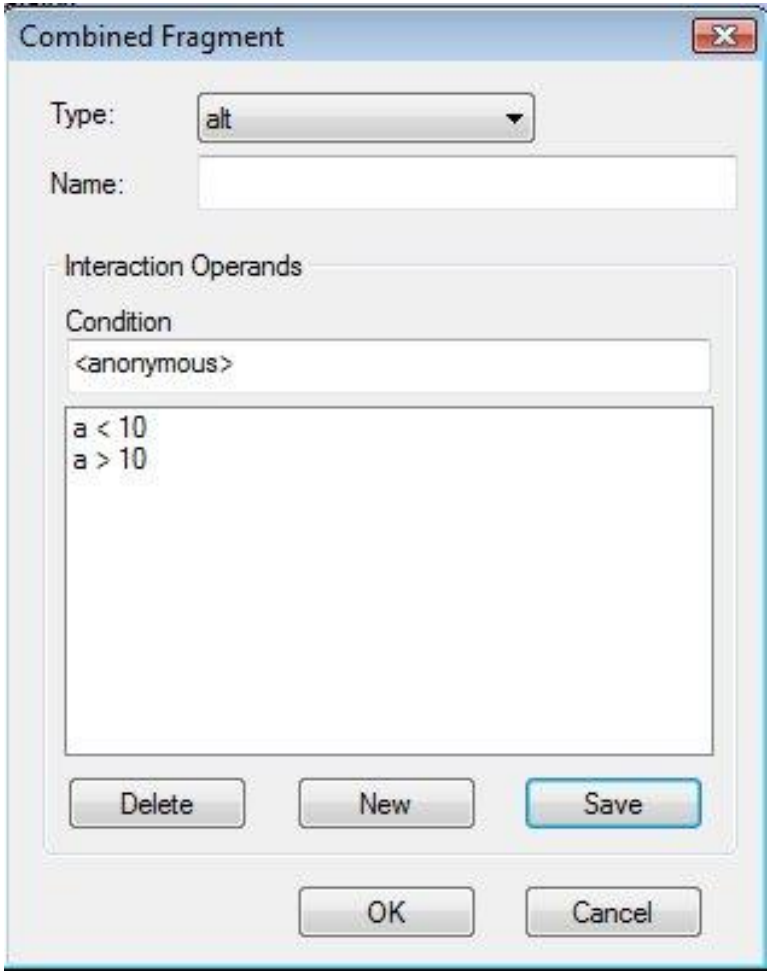
Der Aufruf von weiteren Sequenz-Diagrammen

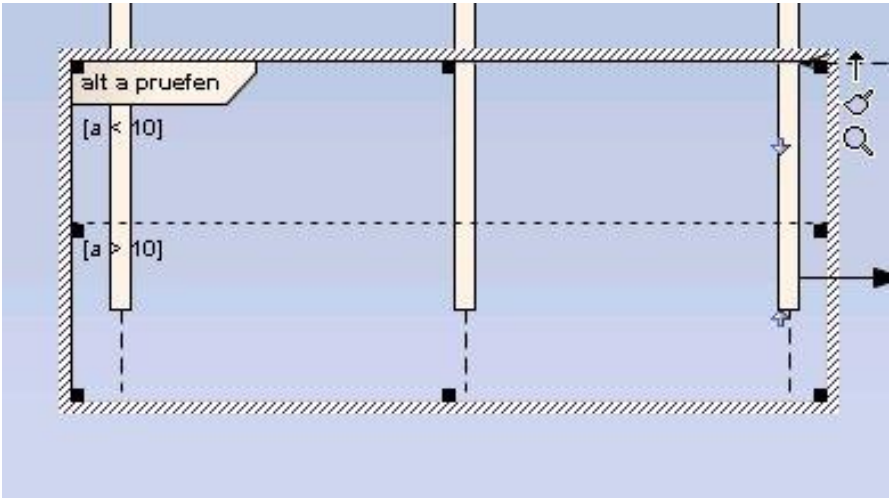
- Ein Sequenz-Diagramm kann ein anderes aufrufen. Diese ref kann durch ziehen des vorhandenen Diagramms erzeugt werden.



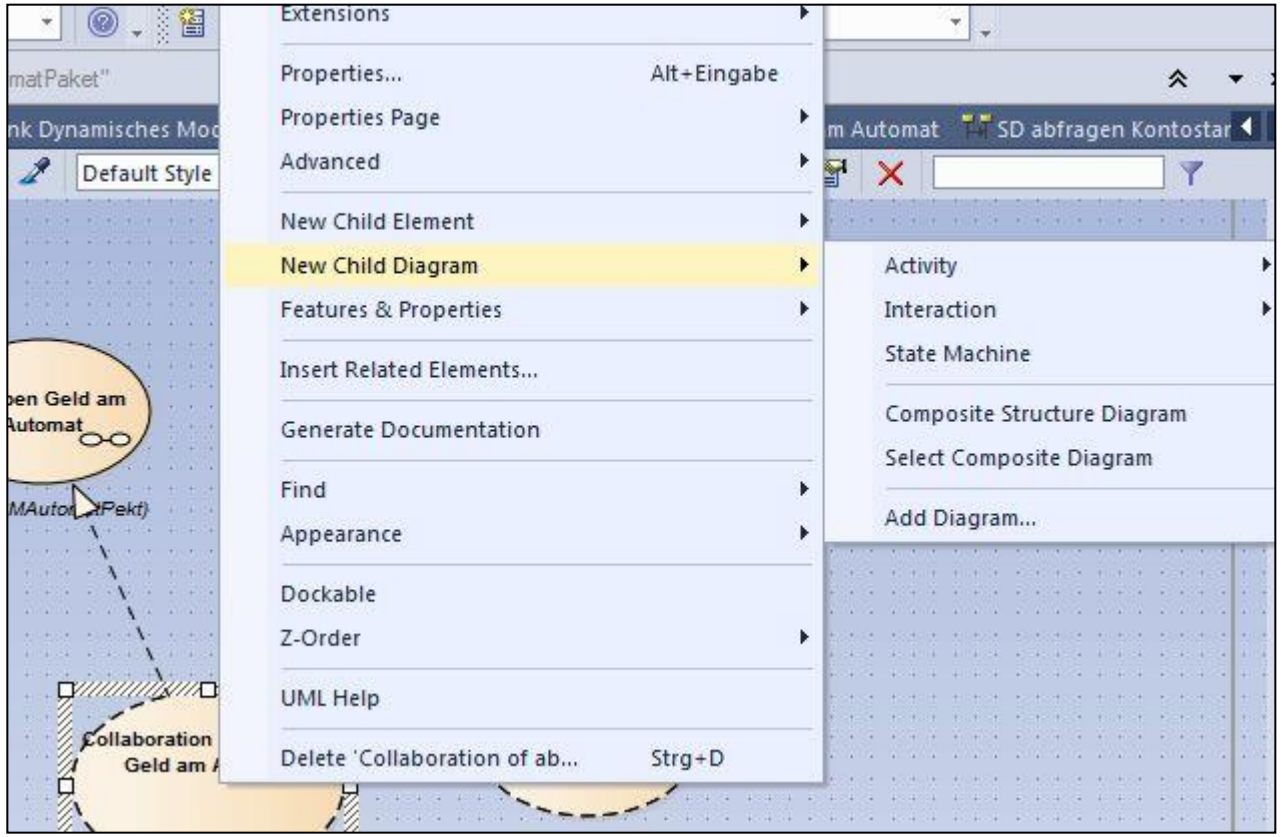


Kontrollstrukturen im Sequenz-Diagramm



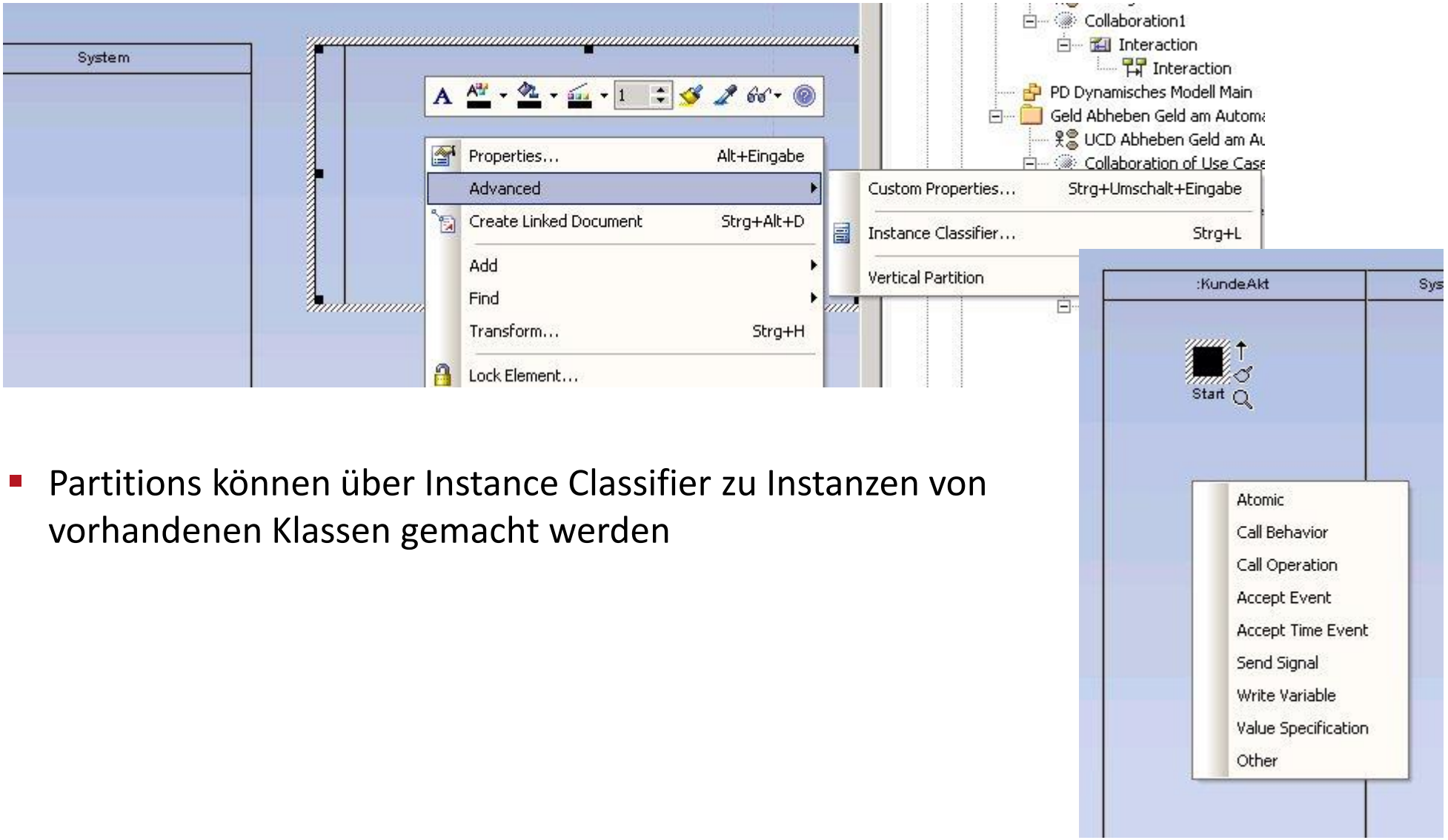


Link auf vorhandene Diagramme



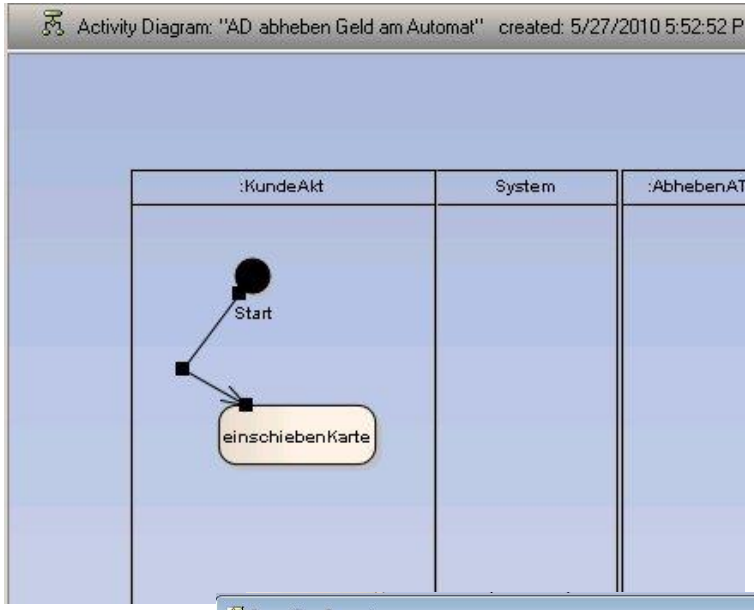
- Falls erforderlich lässt sich das System so konfigurieren, dass untergeordnete Diagramme über einen Doppelklick aufrufbar sind
- über *New Chlid Diagram -> Select Composite Diagram auf dem Element (hier Collaboration)*
- Auswahl des Diagramms

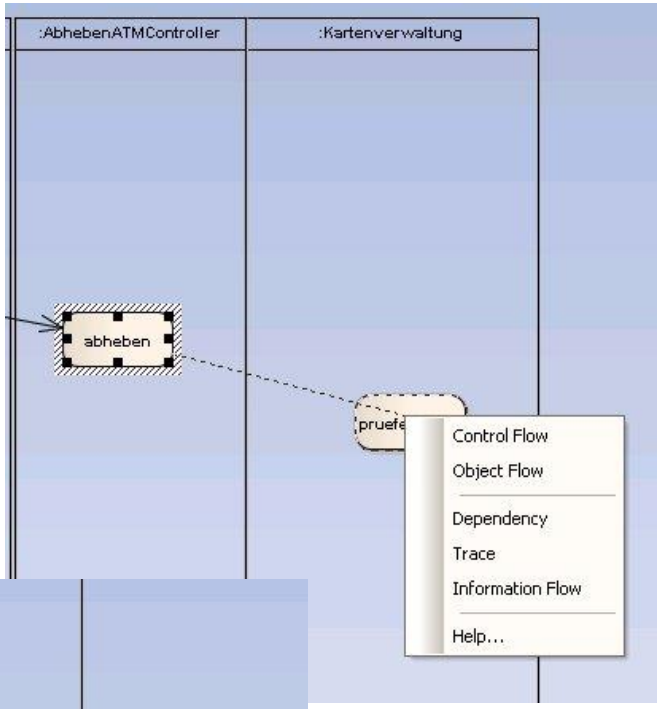
Aktivitäts-Diagramme zur Interaktions-Modellierung

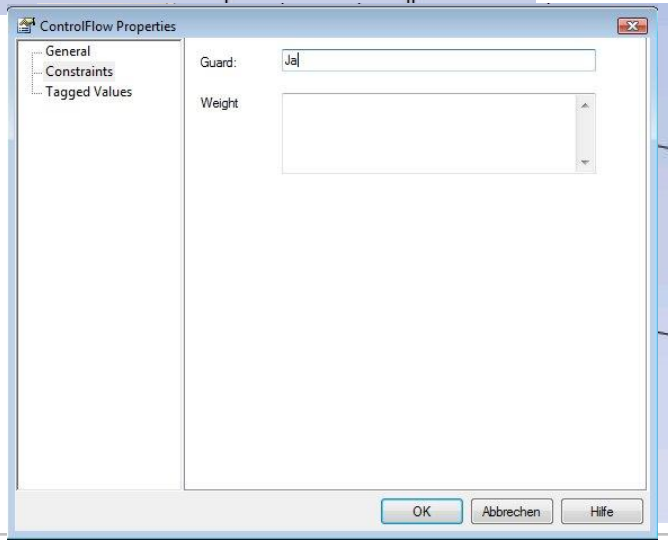


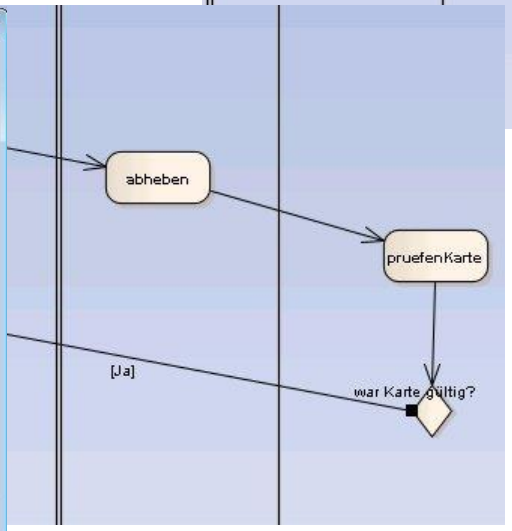
- Partitions können über Instance Classifier zu Instanzen von vorhandenen Klassen gemacht werden

Details zum Aktivitäts-Diagramm

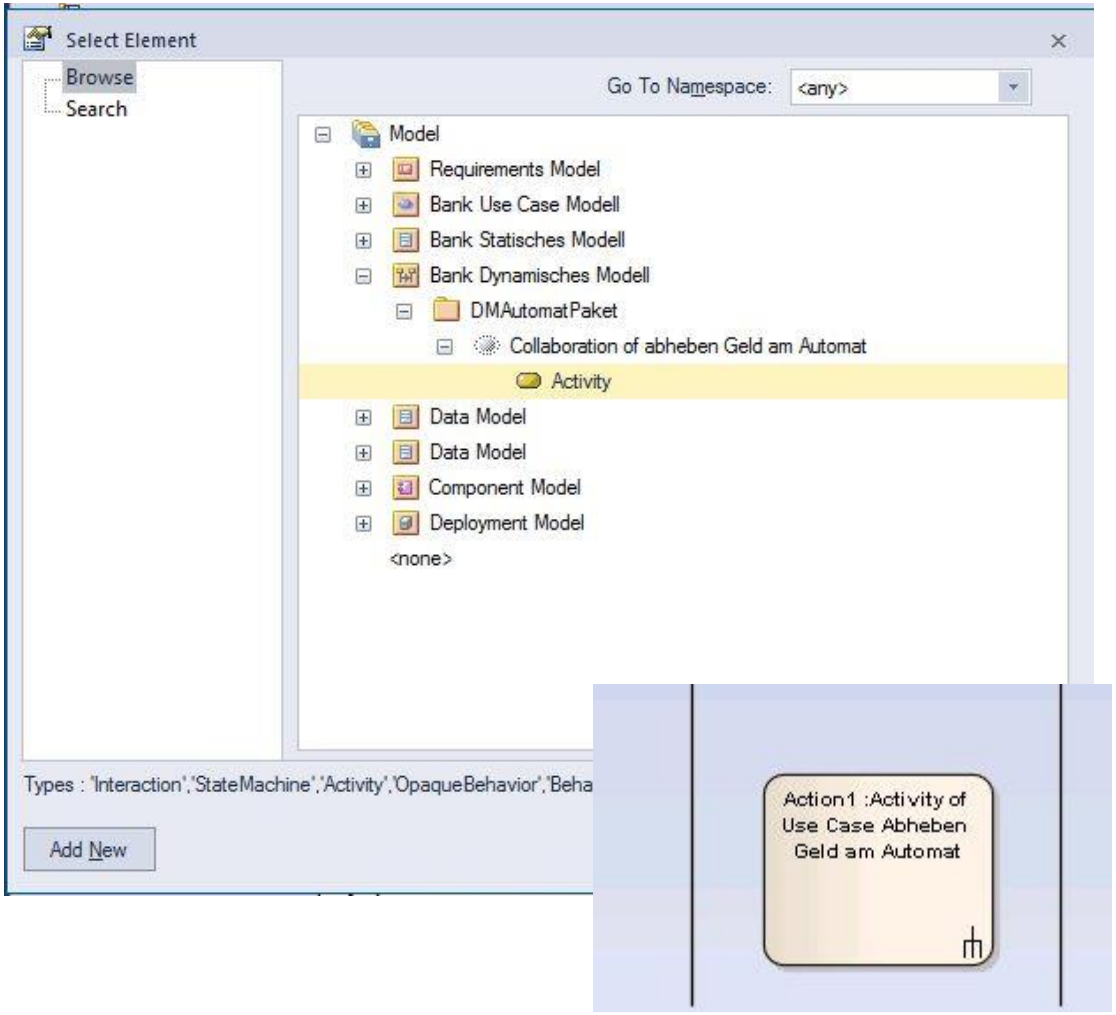




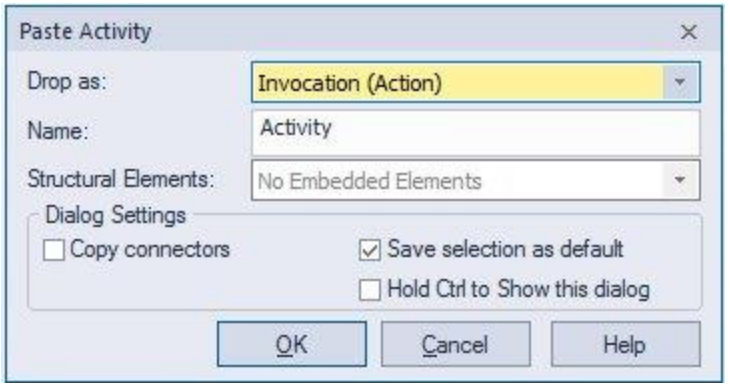




Call Behavior Action



- Activity ins Diagramm ziehen
- Auswahl Drop as *Invocation (Action)*



Weitere Diagramme: Timing Diagramm

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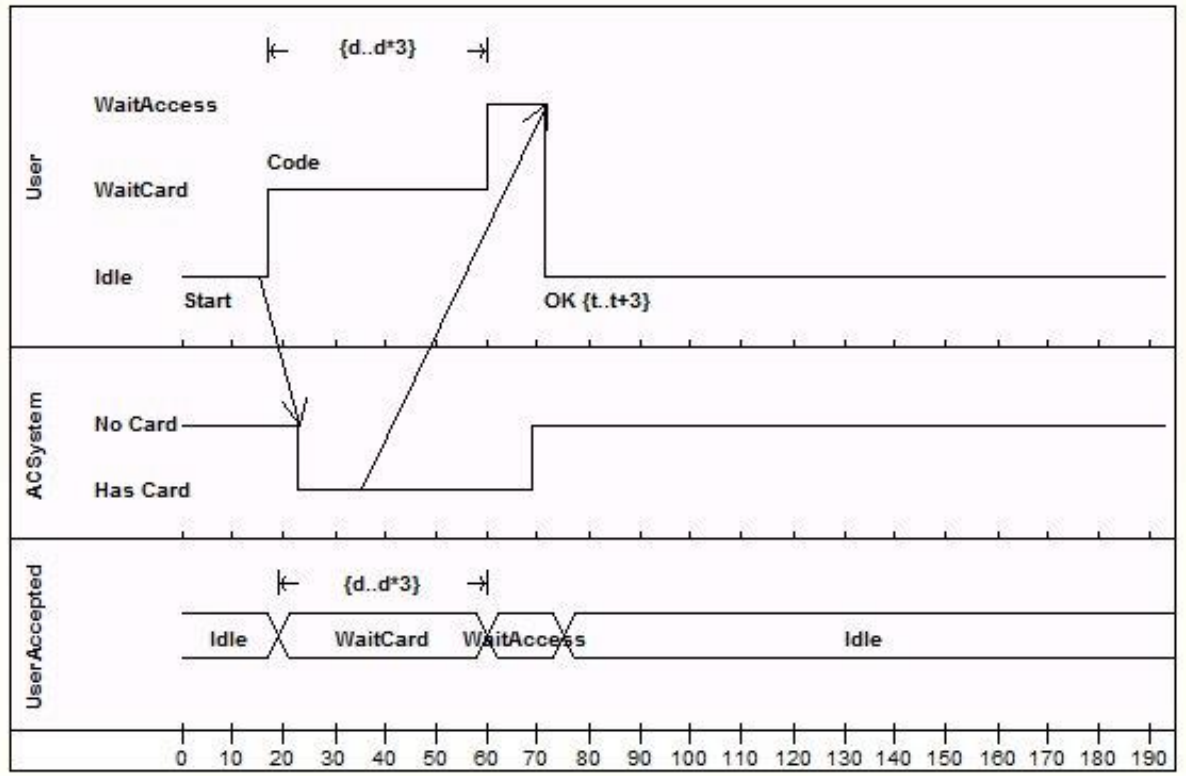
Example Diagram

An example of a Timing diagram is shown below:



(See OMG *UML Superstructure Specification, v2.1.1, p. 454, figures 14.30 and 14.31*).

Weitere Diagramme: Kommunikations-Diagramm

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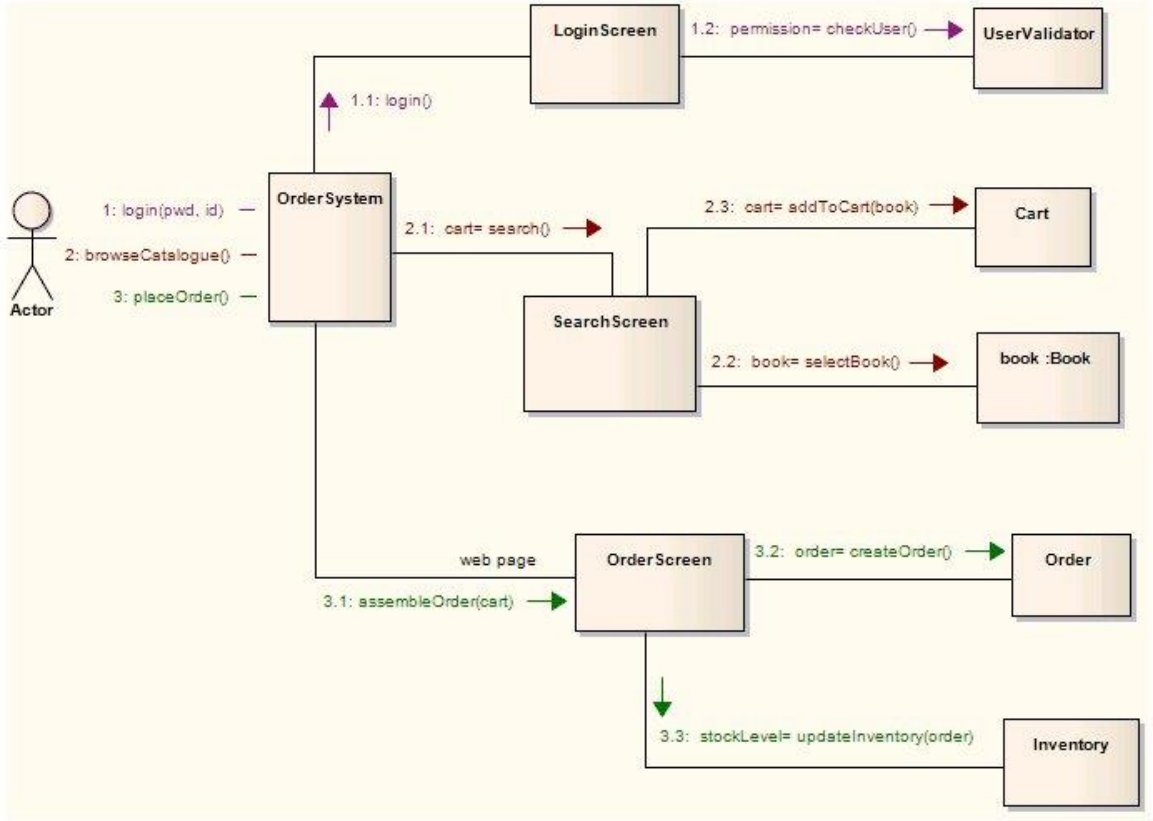
- Kommunikations-Diagramme sind eine alternative zu den Sequenz-Diagrammen

Example Diagram

The example below illustrates a Communication diagram among cooperating object instances. Note the use of message levels to capture related flows, and the different colors of the messages.



Weitere Diagramme: Kommunikations-Übersichts-Diagramm

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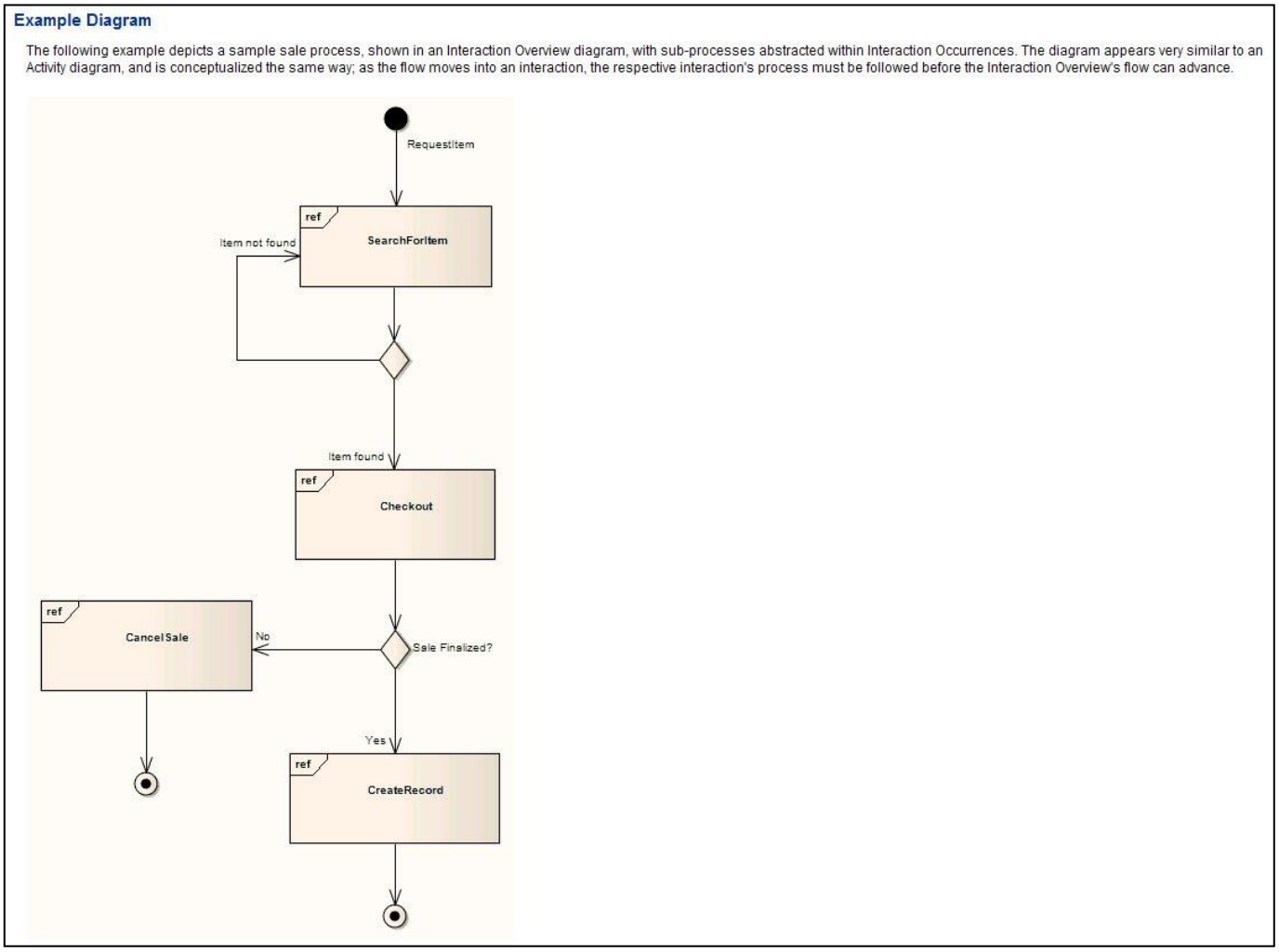
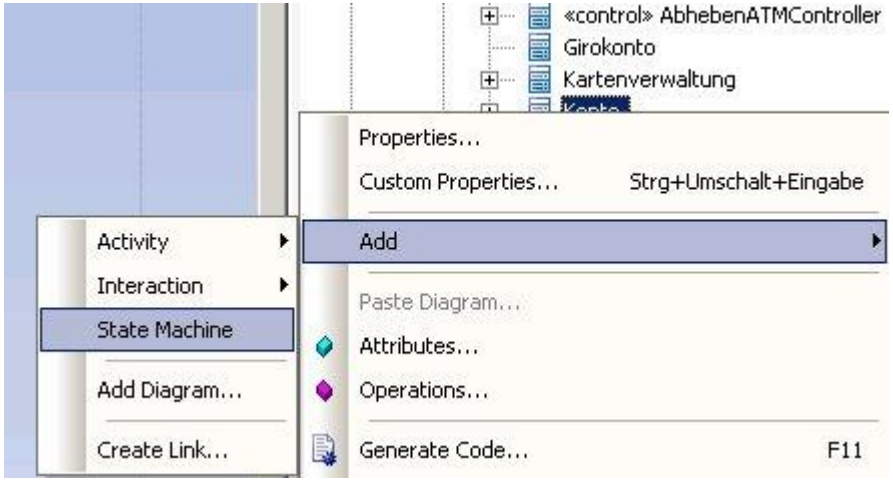
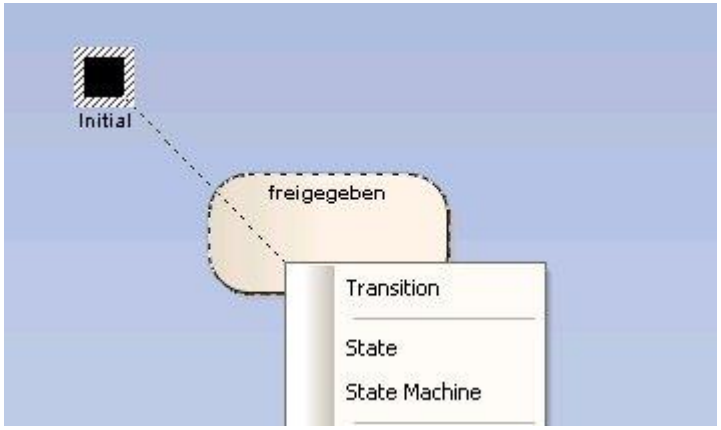
- Die Kommunikations-Übersichts-Diagramme können bei komplexen Zusammenhängen als Übersicht und Referenz auf verschiedene Unter-Diagrammtypen verwendet werden

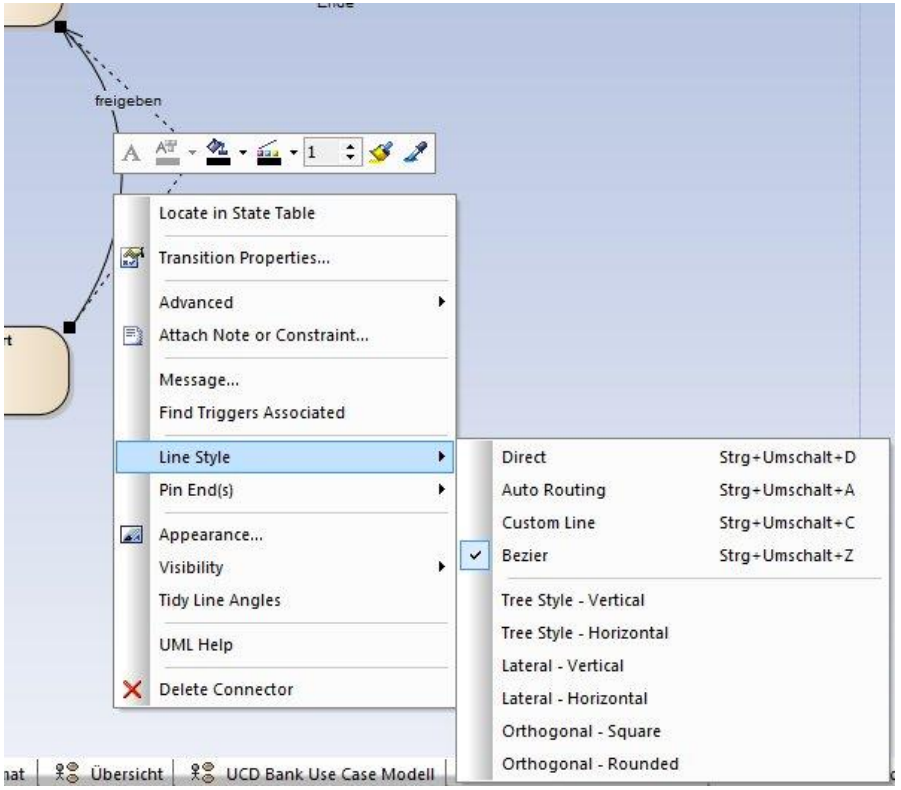


Zustands-Diagramm (1)

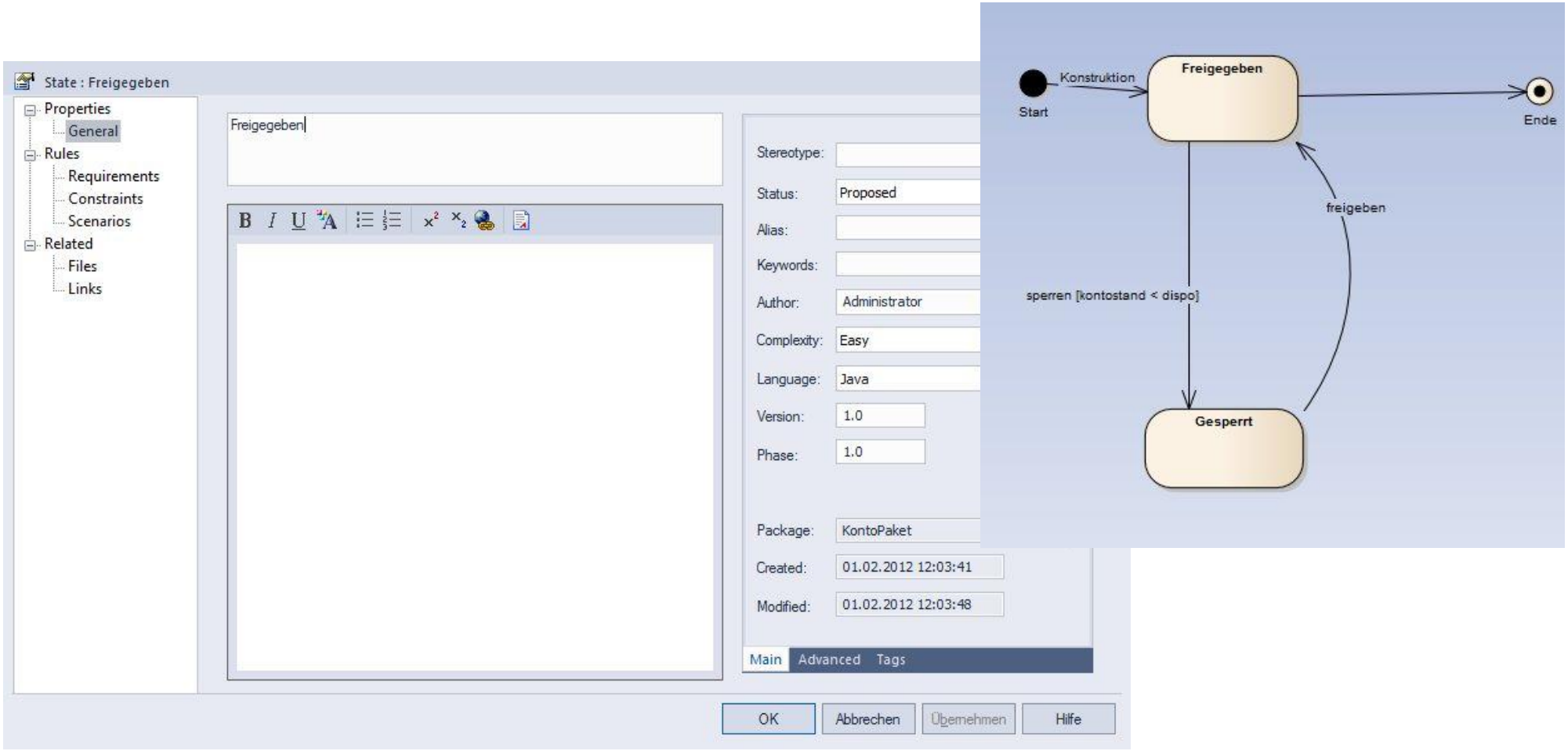




- Zustand-Diagramme werden pro Klasse erstellt



Zustands-Diagramm (2)



4

TECHNISCHES MODELL

4.1

SPRACH-SPEZIFISCHE DETAILS

Verfeinerung auf Klassen-Ebene im EA

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- Spätesten jetzt muss das Modell weiter verfeinert werden
  - Anpassung an die Zielsprache
  - Klassen müssen vollständig beschrieben sein
  - Alle Beziehungen müssen vollständig dargestellt sein
  - Das Klassen-Diagramm muss spätestens jetzt in Pakete unterteilt werden
- Die meisten Verfeinerungen auf Klassenebene im EA wurden bereits angesprochen
- Ergänzungen in diesem Kapitel

Verfeinerung des vorhandenen Modells

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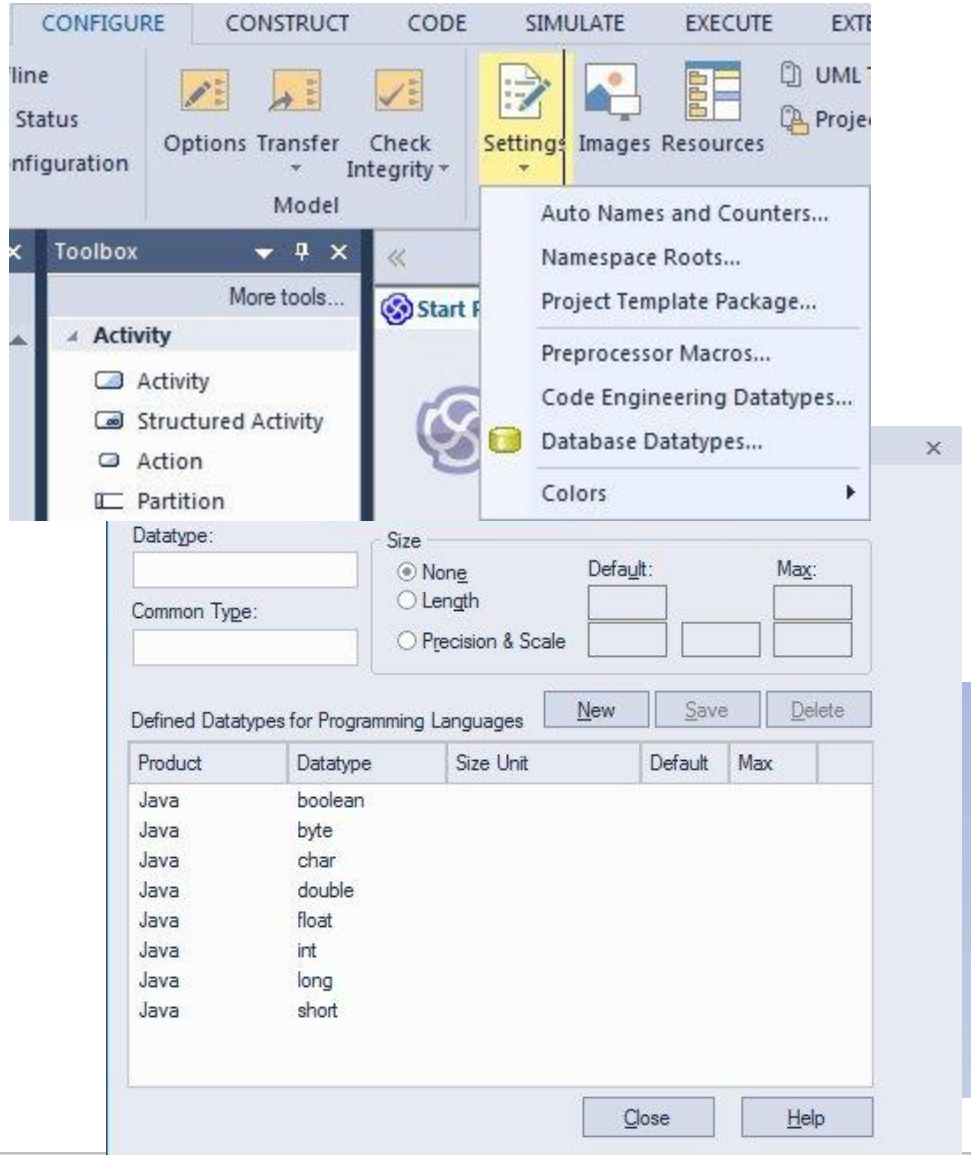
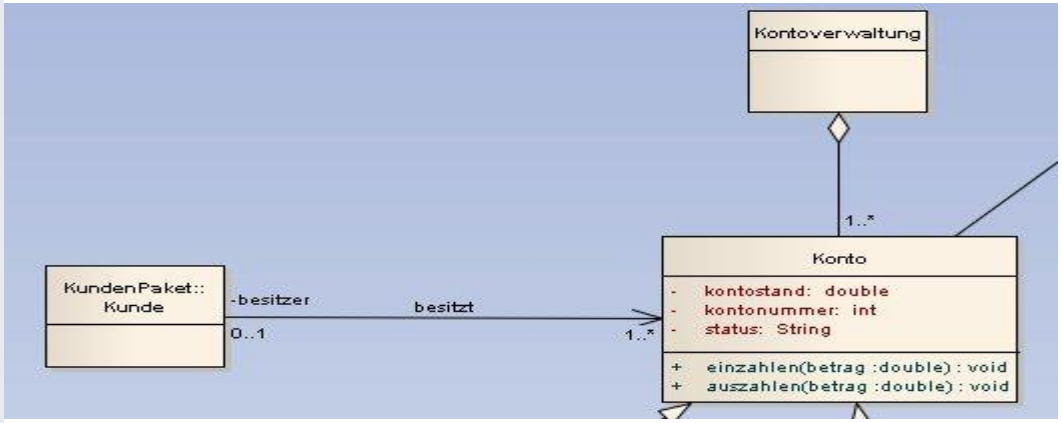


- Das vorhandene Modell muss hinsichtlich der Realisierung verfeinert werden:
  - Attribute und Methoden vollständig festlegen
  - Traversieren der Beziehungen
  - Rollen
  - Datentypen der Zielsprache



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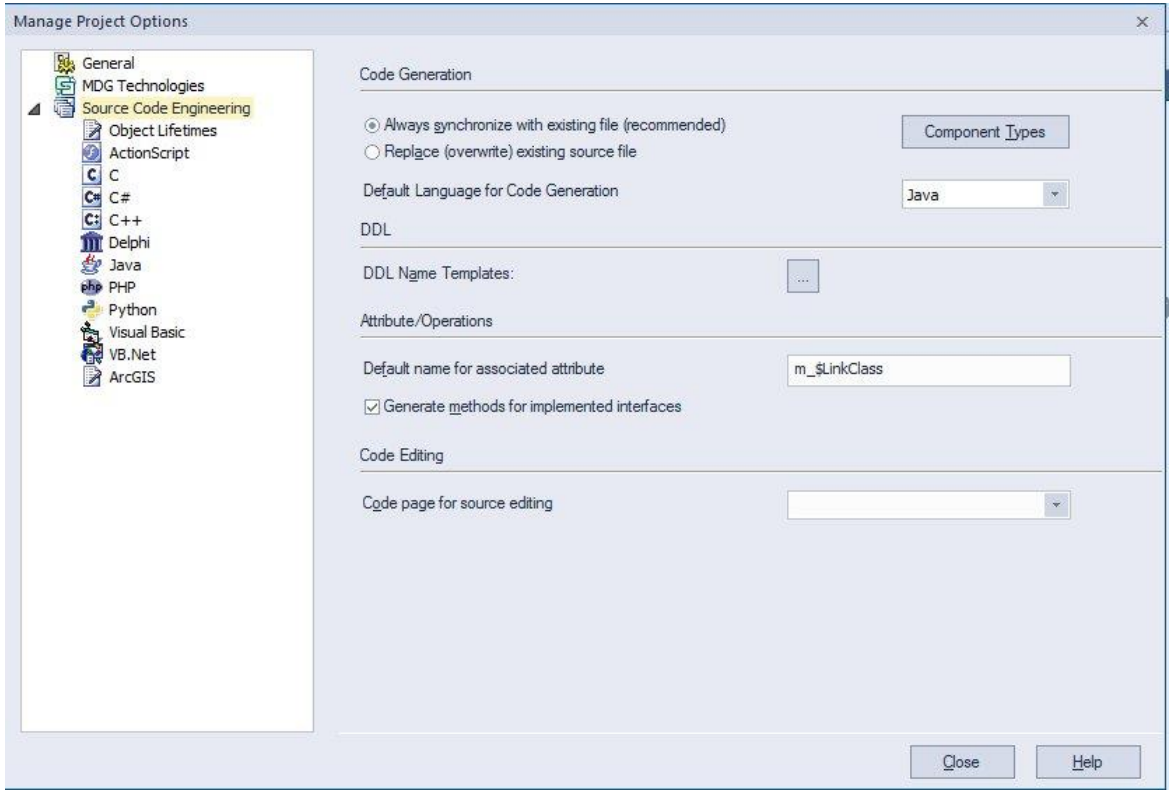
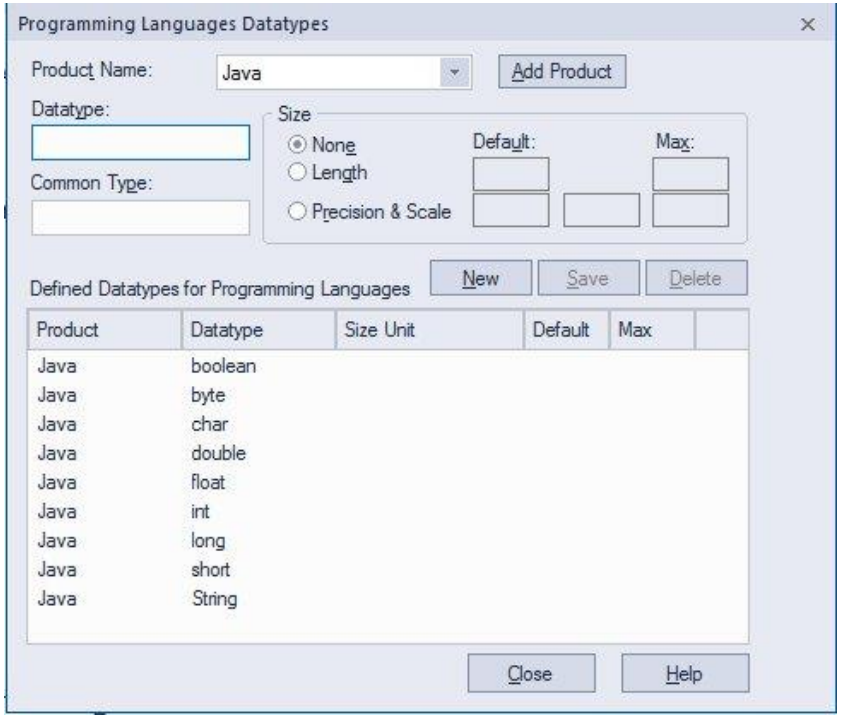
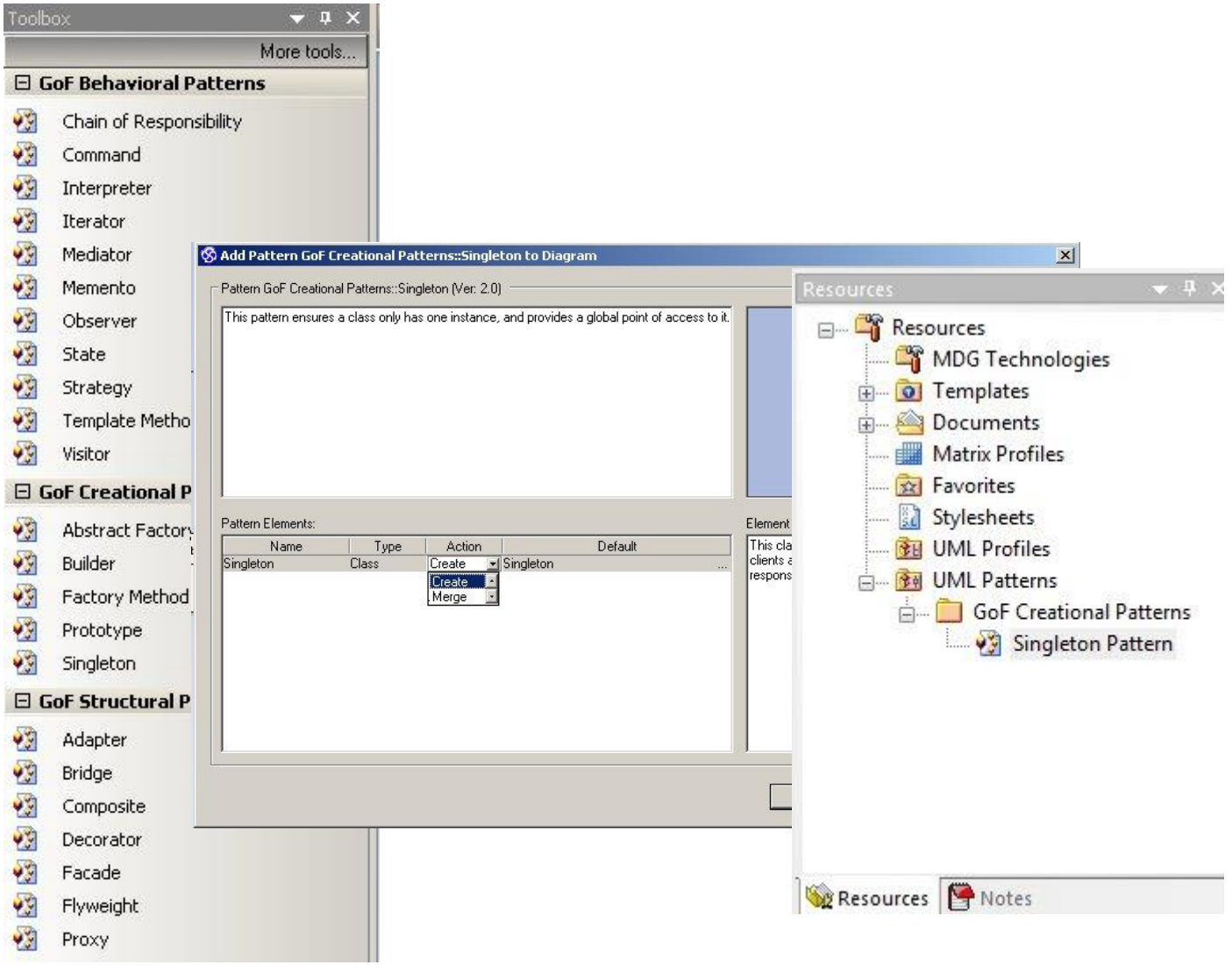
Festlegen über Register Configure -> Options

- Das vorhandene Modell muss hinsichtlich der Realisierung verfeinert werden:
  - Datentypen der Zielsprache





Die Nutzung der GoF Pattern



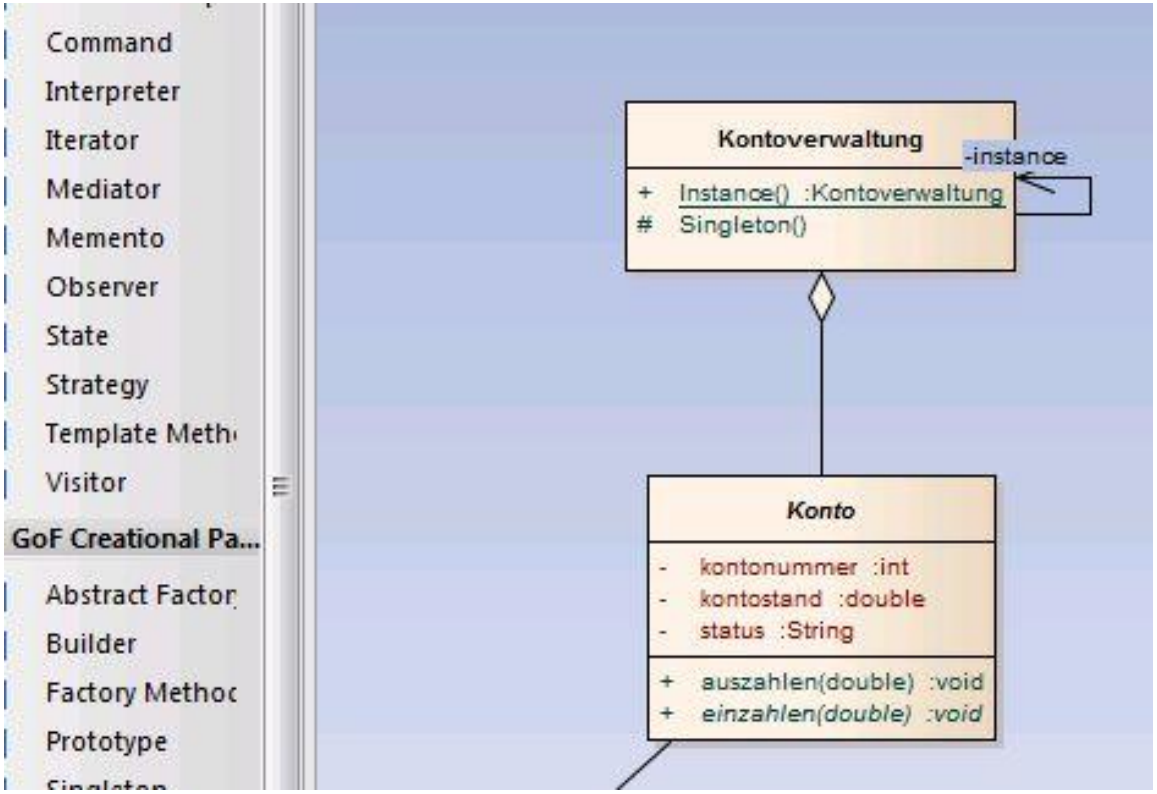
- Alle 23 GoF Pattern können im Modell verwendet werden
- Die Auswahl erfolgt über die Toolbox:

  GoF Behavioral Pattern
  - Create
  - Merge

- Nutzung allerdings nicht ideal

GoF Pattern Ergebnis

- Bei der Verwendung von Merge lassen sich die Pattern auf vorhandene Klassen anwenden



Weitere Diagramme: Komponenten-Diagramm

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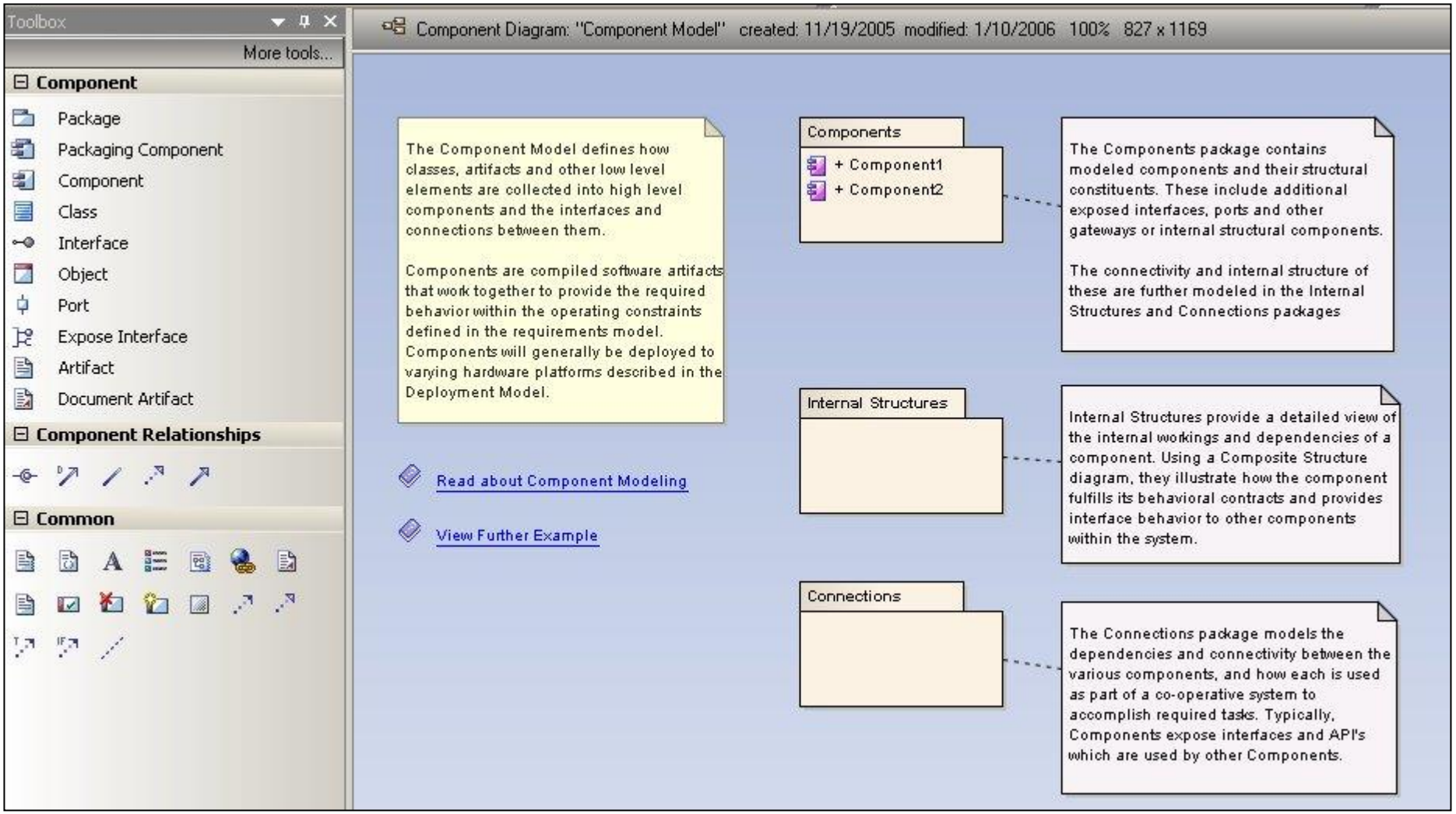

Weitere Diagramme: Deployment-Diagramm

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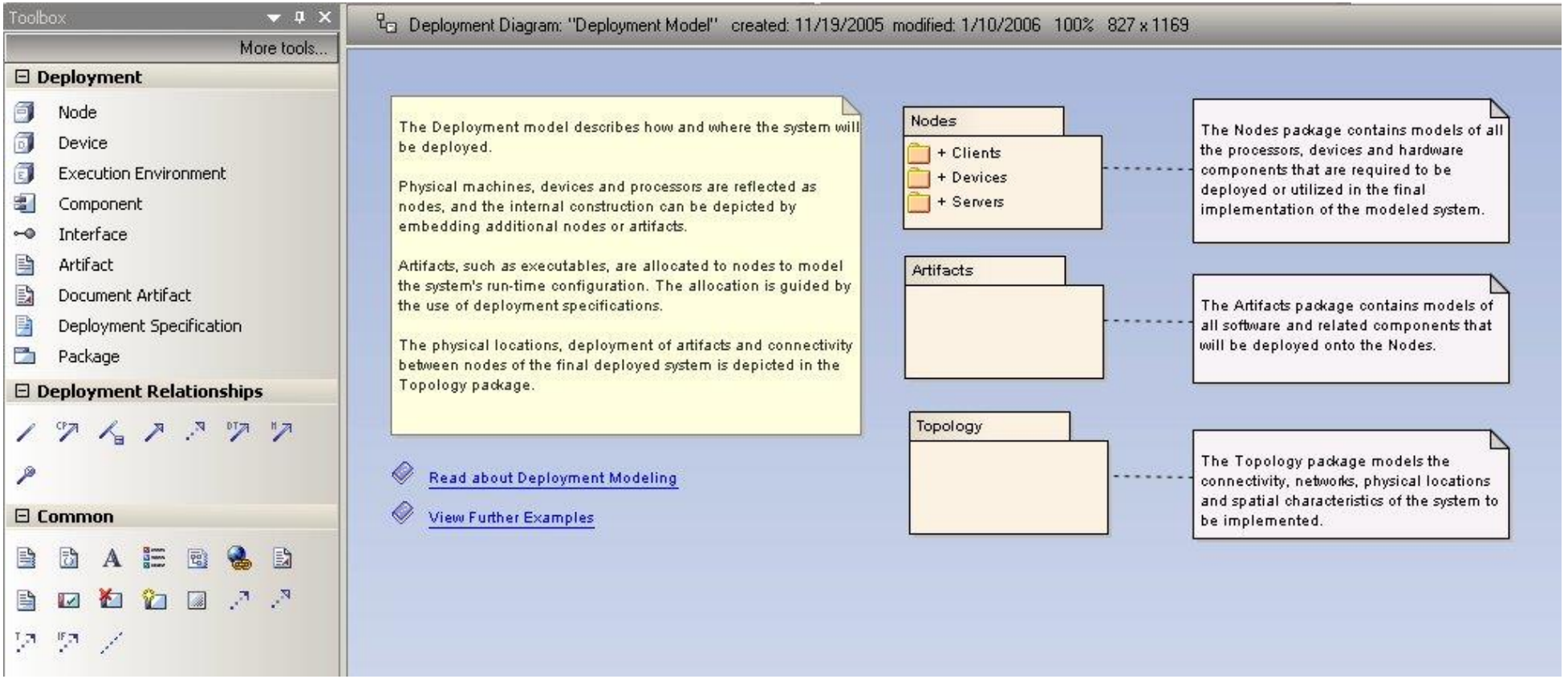

Stereotyped Nodes im Deployment-Diagramm

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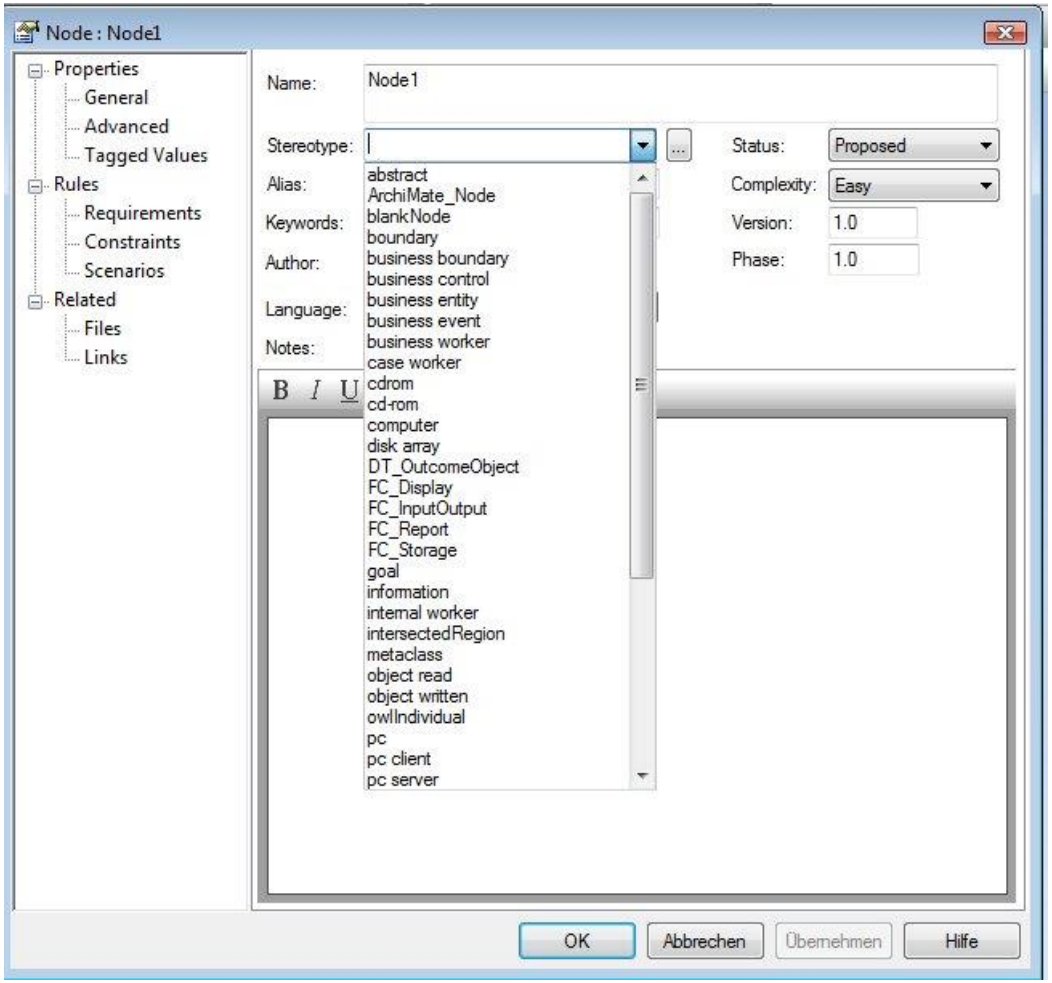
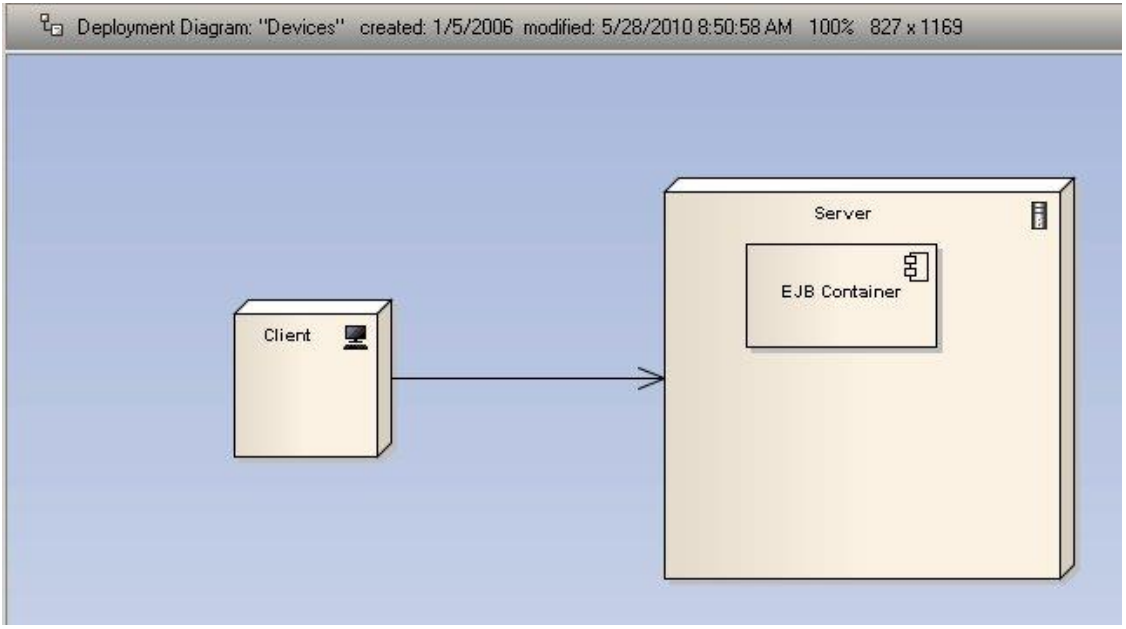
- Seit UML 2 sind stereotyped Nodes möglich





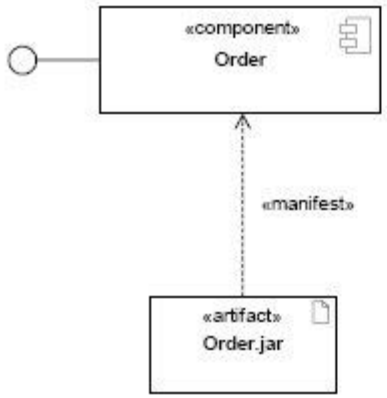


Figure 10.7 - A visual representation of the manifestation relationship between artifacts and components

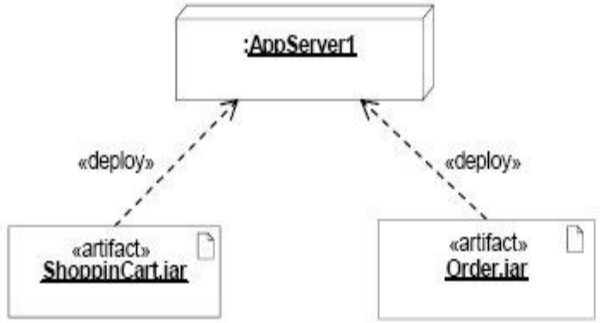
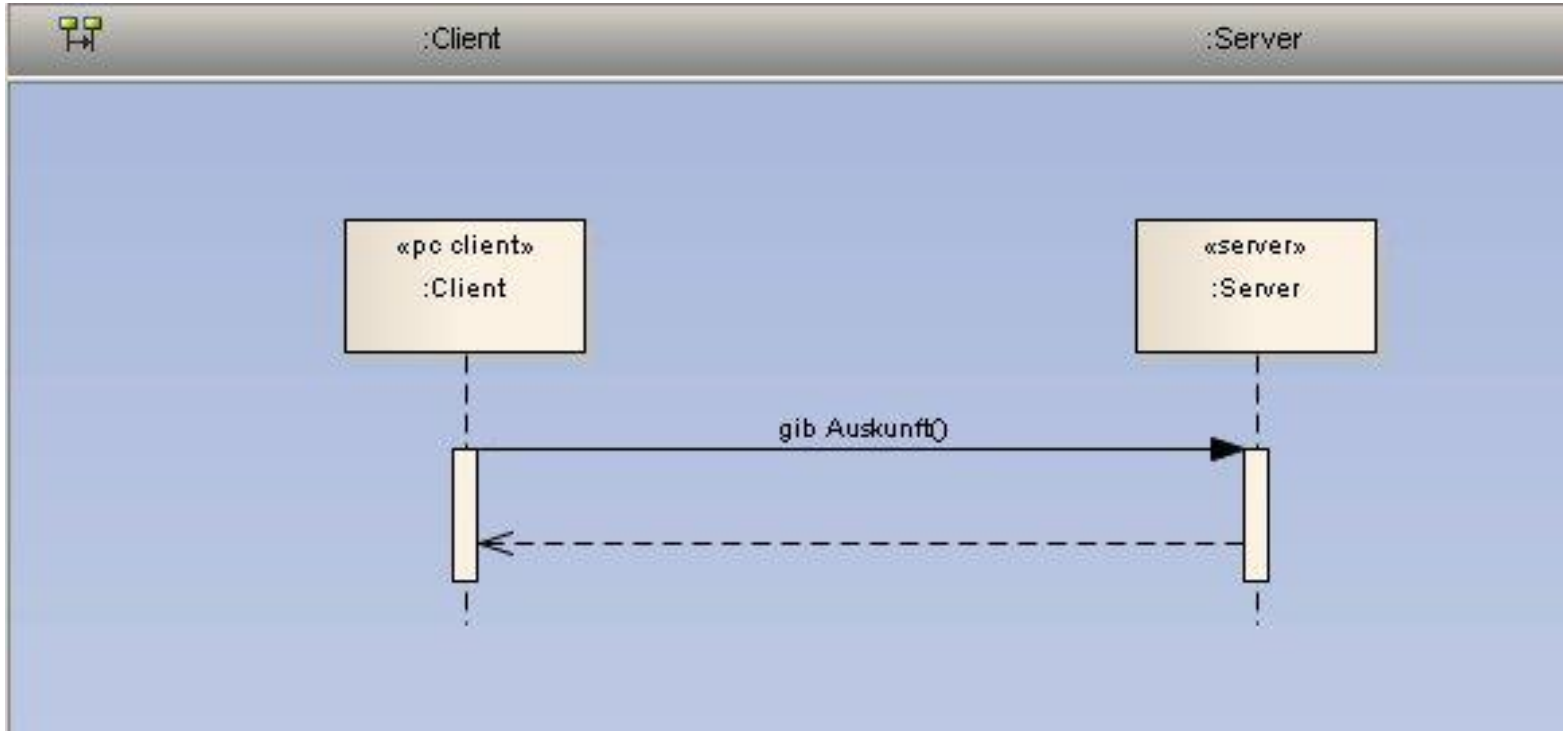


Figure 10.9 - Alternative deployment representation of using a dependency called «deploy»

Sequenz-Diagramme für Deployment - Diagramme

- Die Beschreibung eines Roundtrips z.B. für die Architektur ist mit den Sequenz-Diagrammen auf Basis der Deployment- und Komponenten-Diagramme möglich



4.2

ENTERPRISE ARCHITECT - ERWEITERUNGEN

Code-Generierung Voreinstellungen

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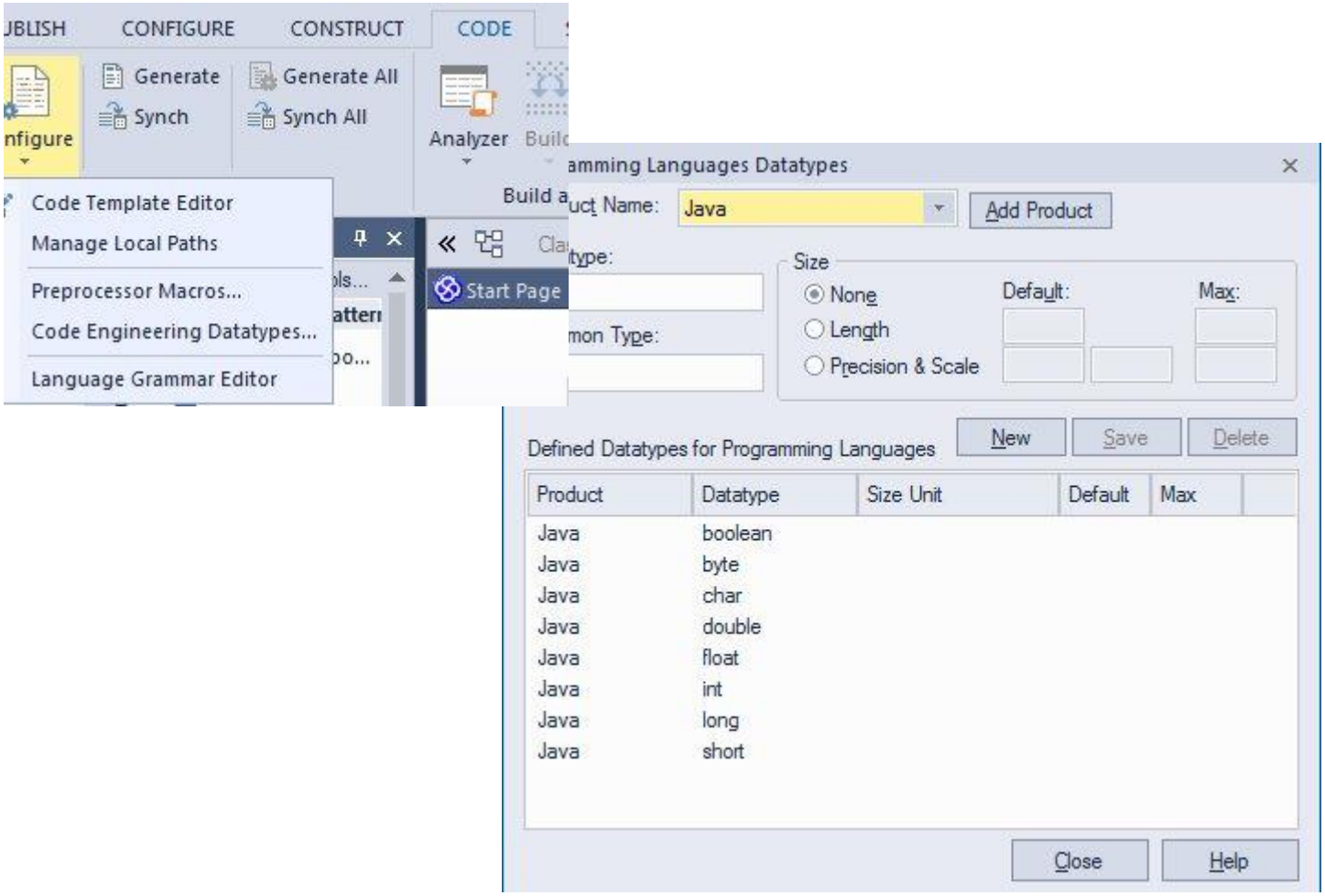
- Code-Generierungs-optionen sind für die jeweiligen Sprachen einstellbar



Sprachspezifische Einstellungen am Beispiel Java

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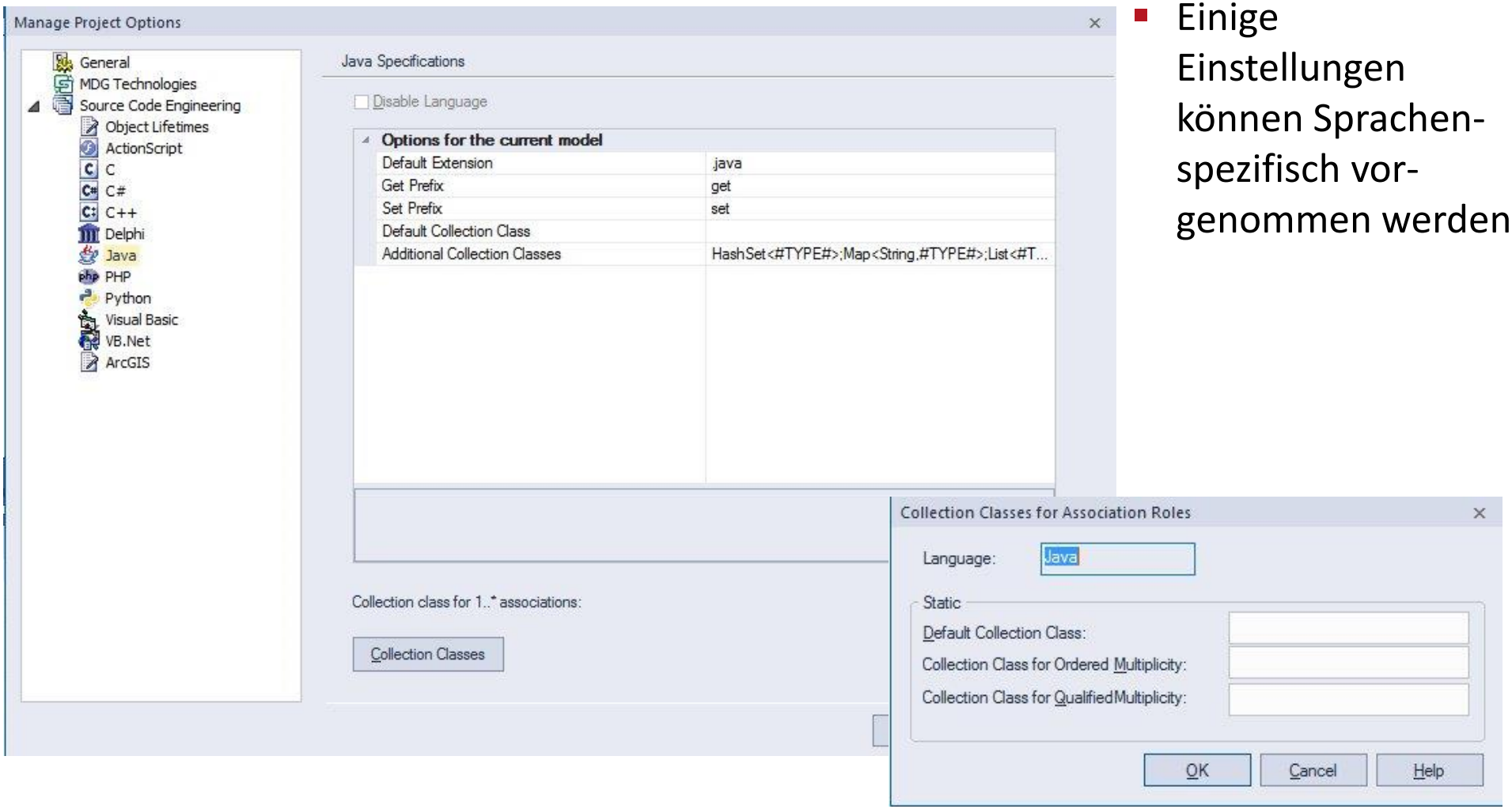

- Einige Einstellungen können Sprachen-spezifisch vor-genommen werden

Die Kontext-Menüs für die Code-Generierung

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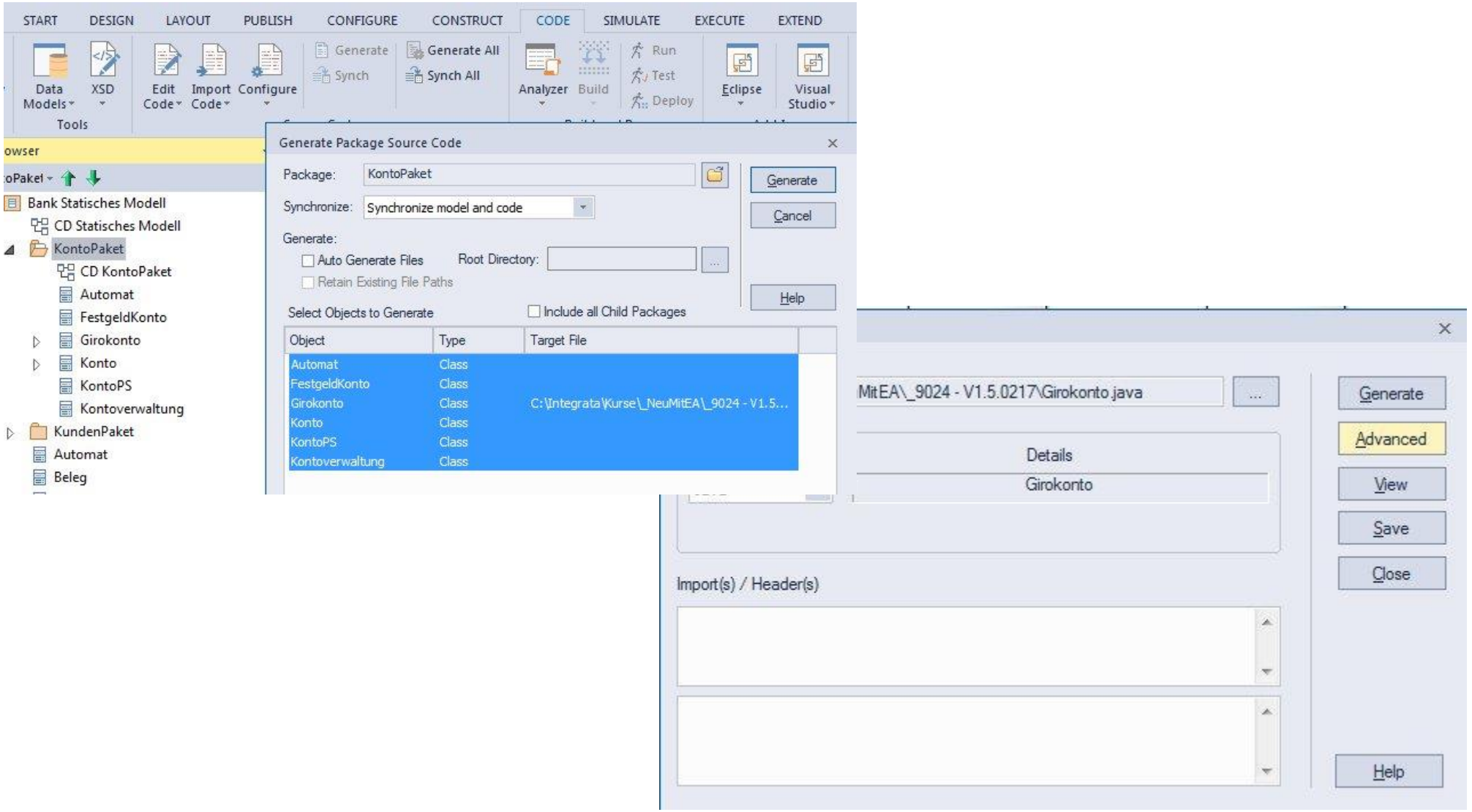

Quellcode Editor im EA

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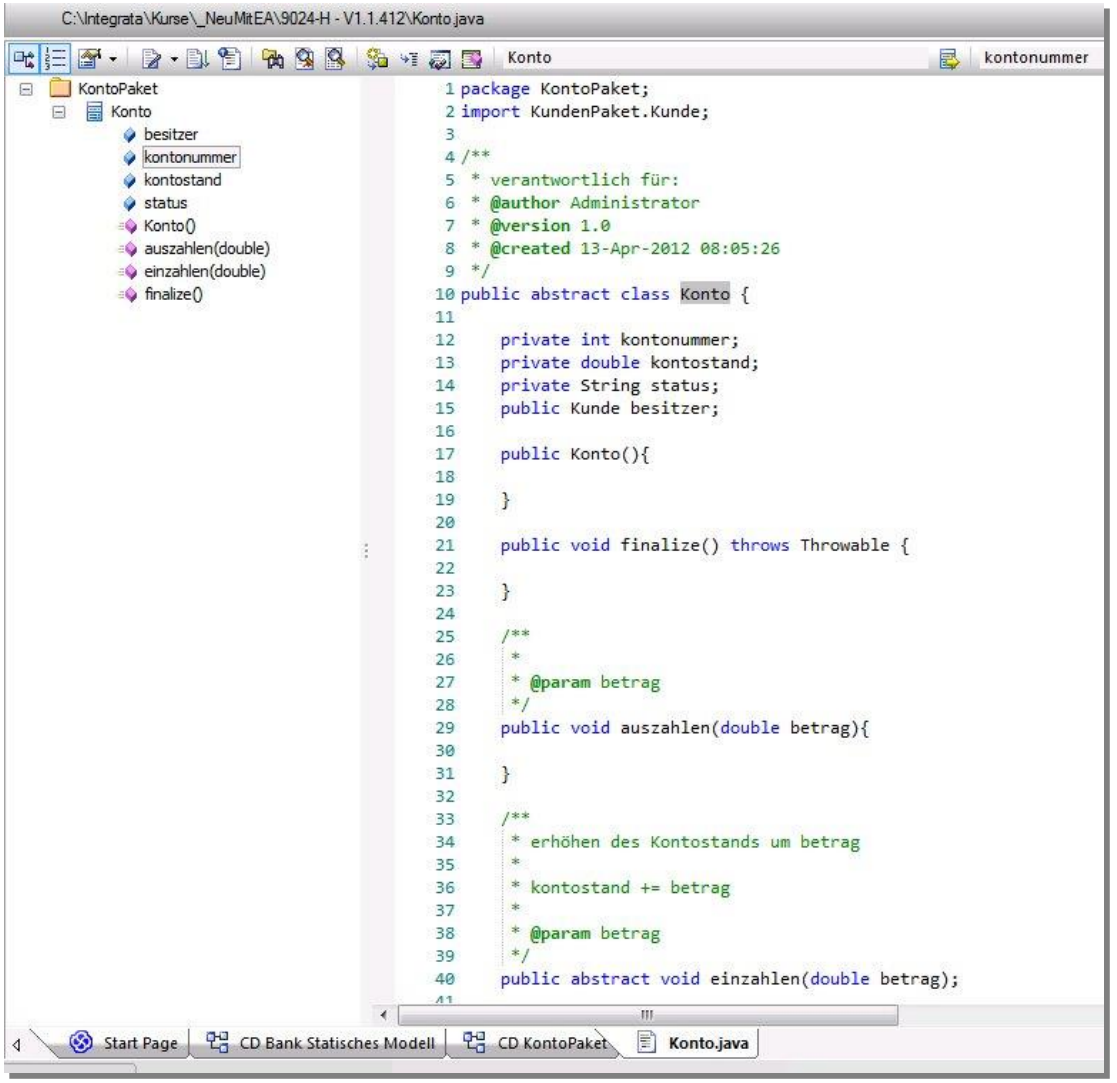

Das Register Code mit den Code Import Möglichkeiten

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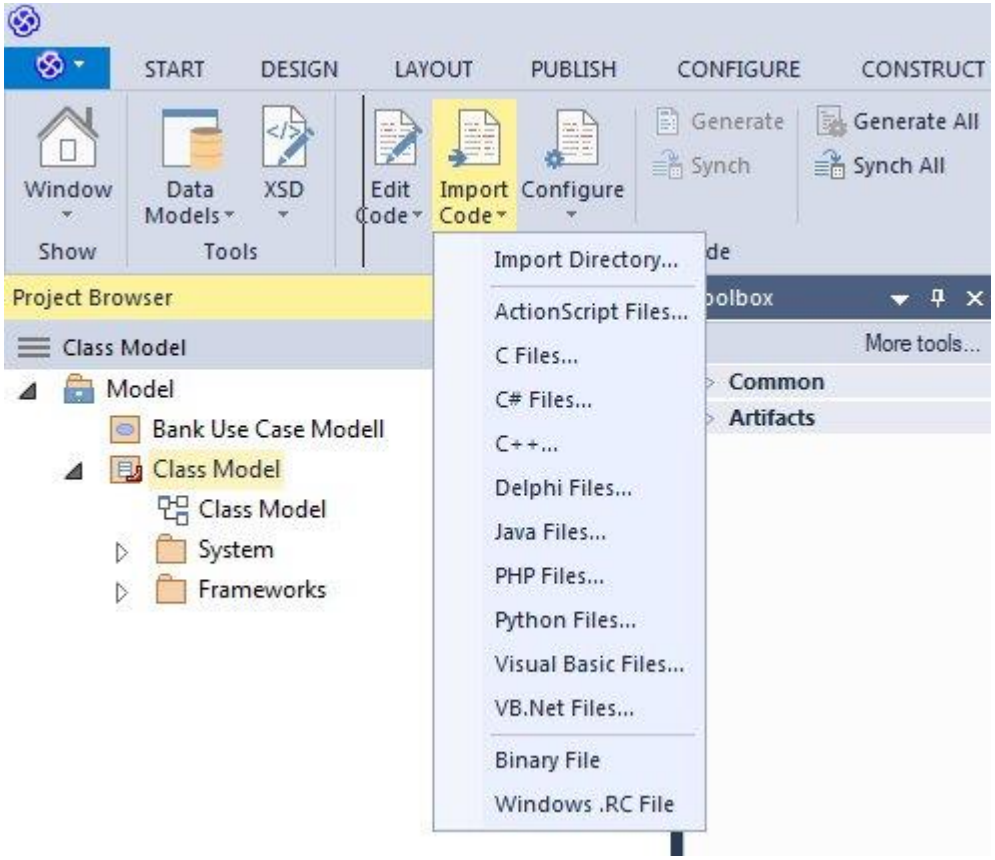
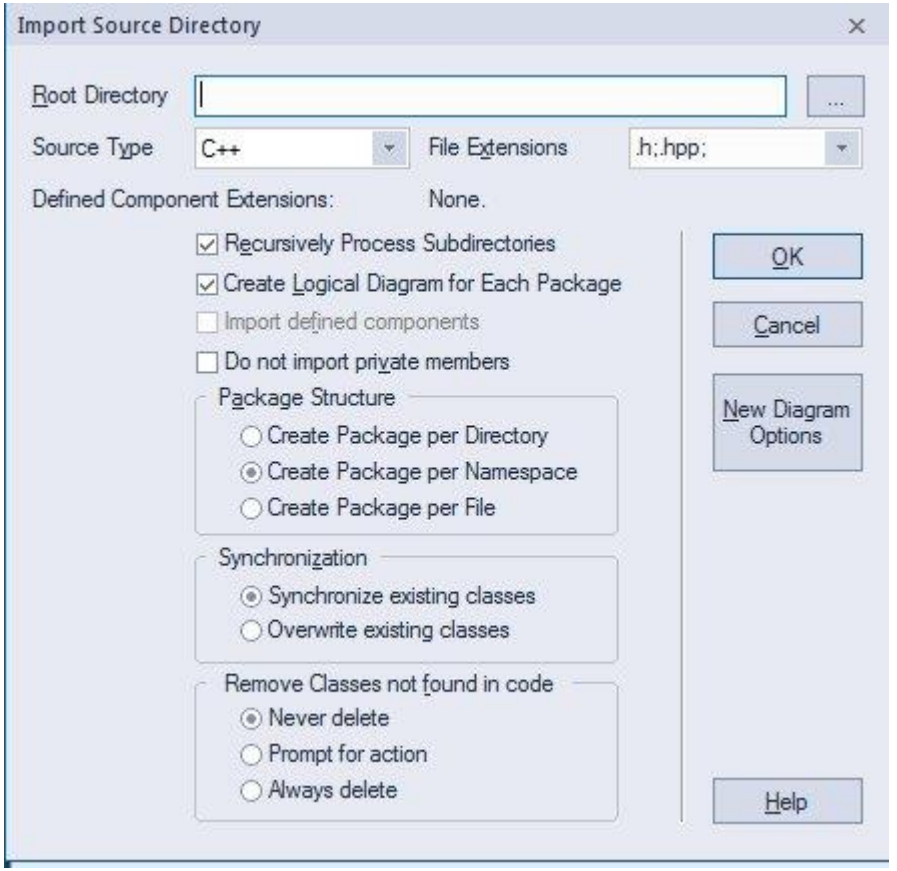
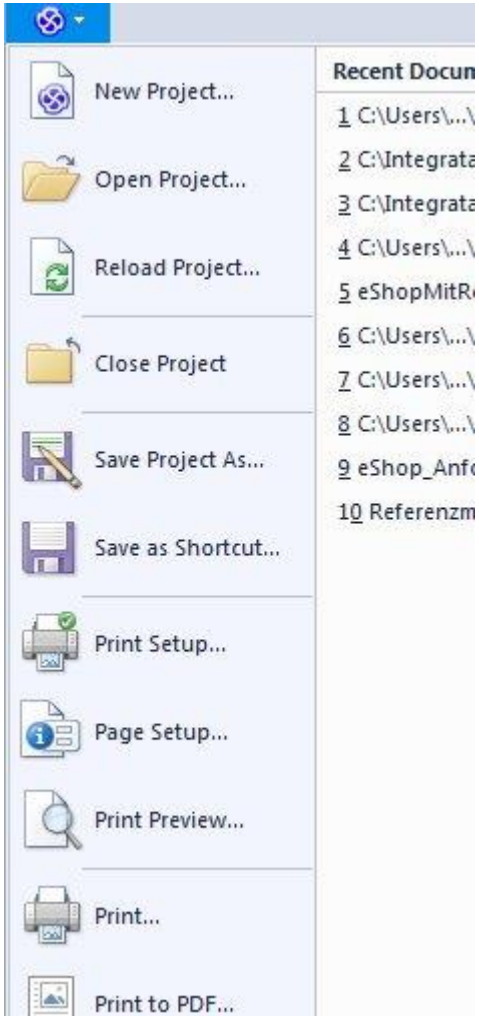
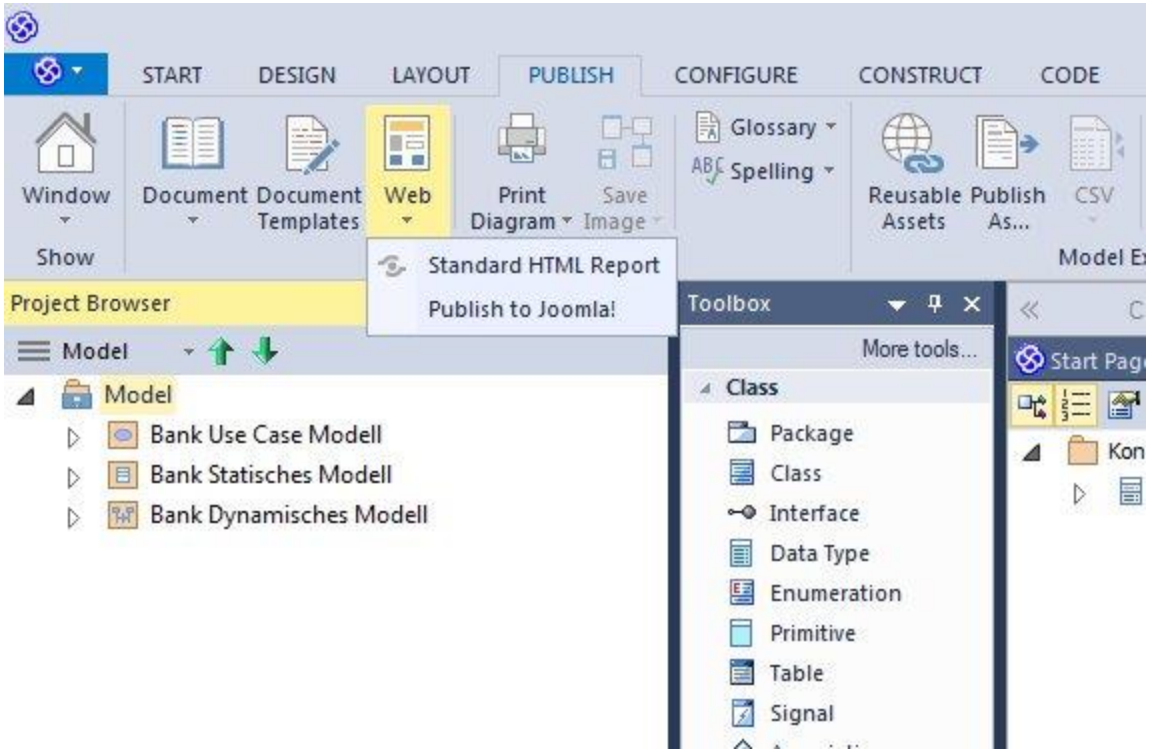




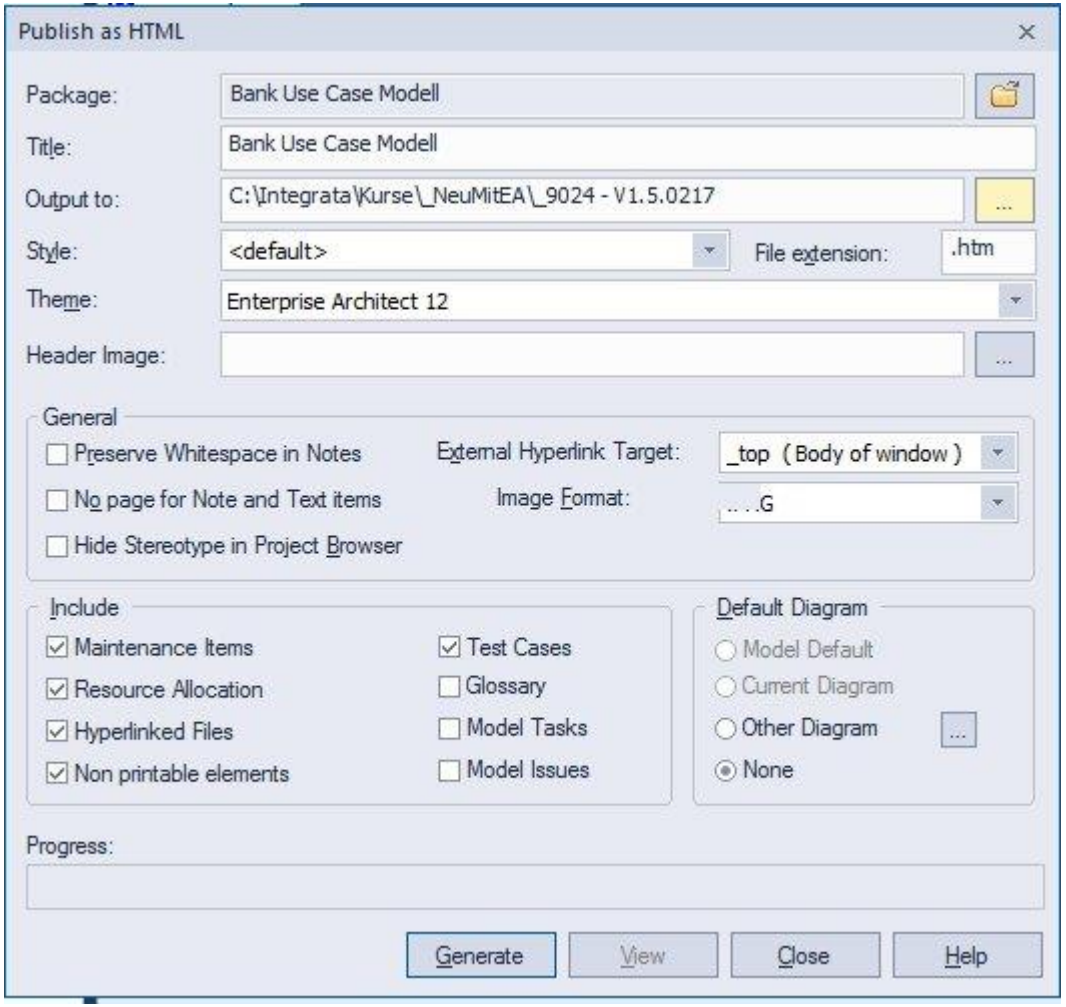
Drucken und HTML Dokumentation





Generieren der HTML Reports

- Achtung: Der Fokus ist wichtig



RTF und DOC Dokumentation erzeugen

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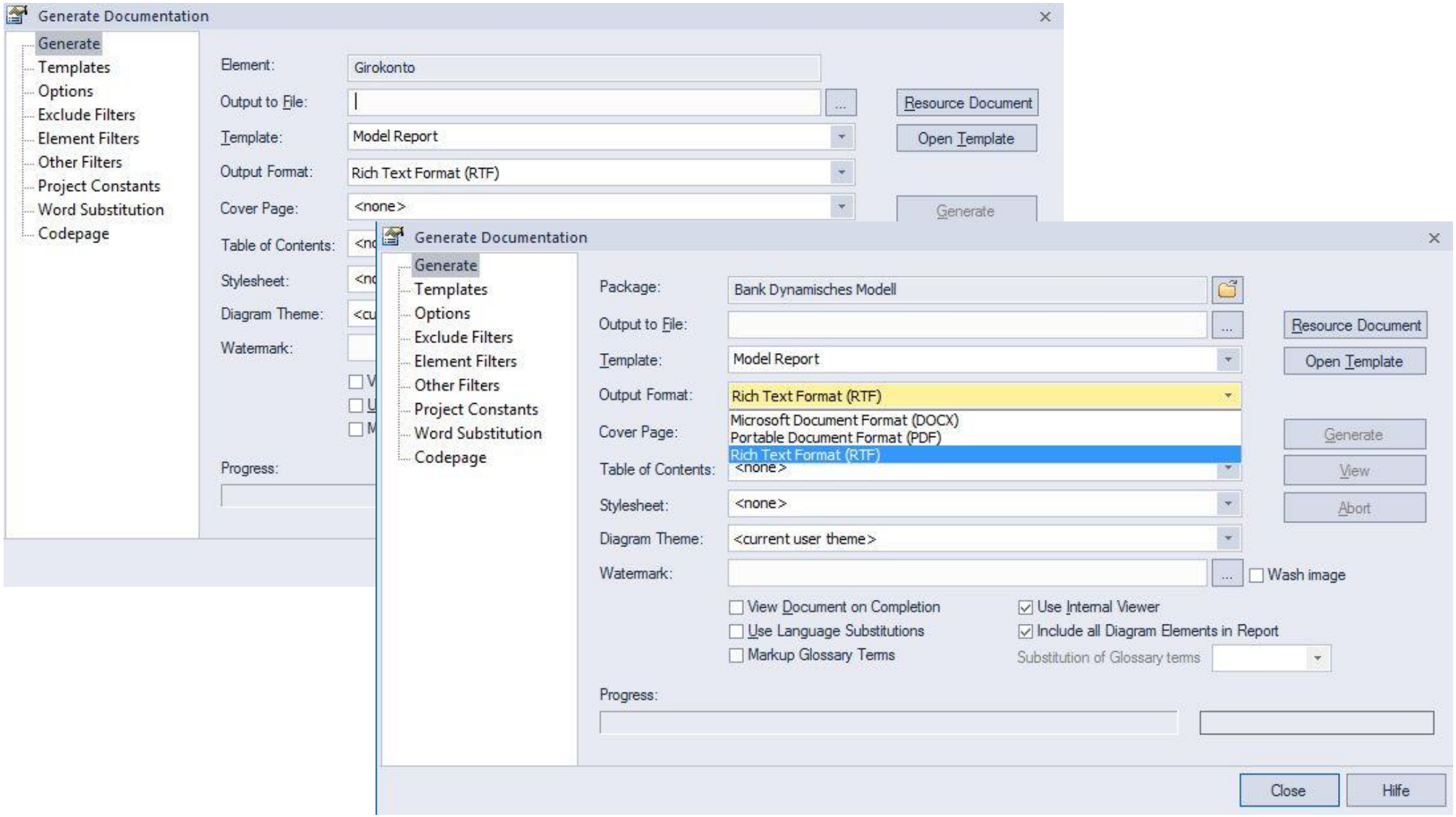

Eigene Templates für die RTF Dokumentation

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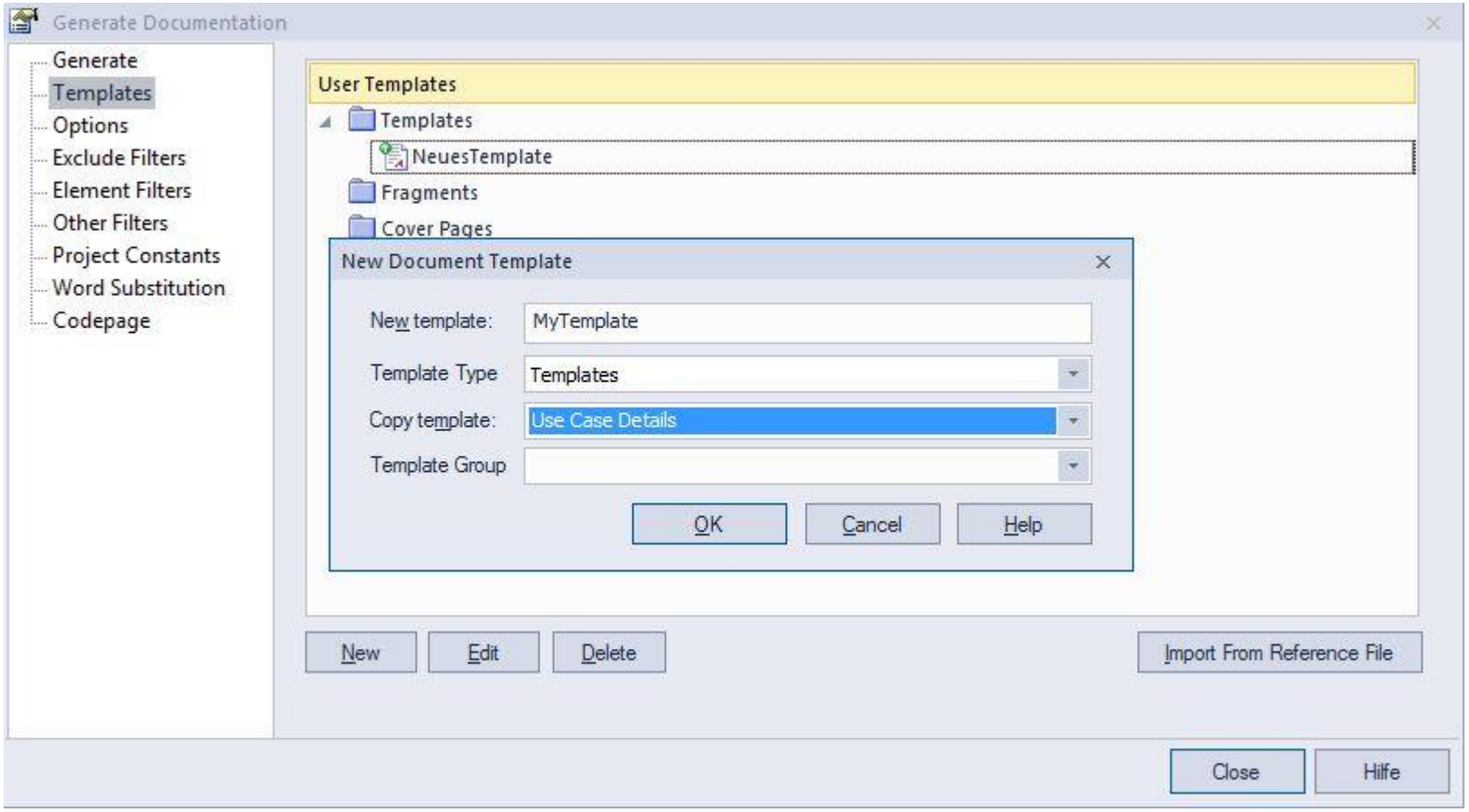
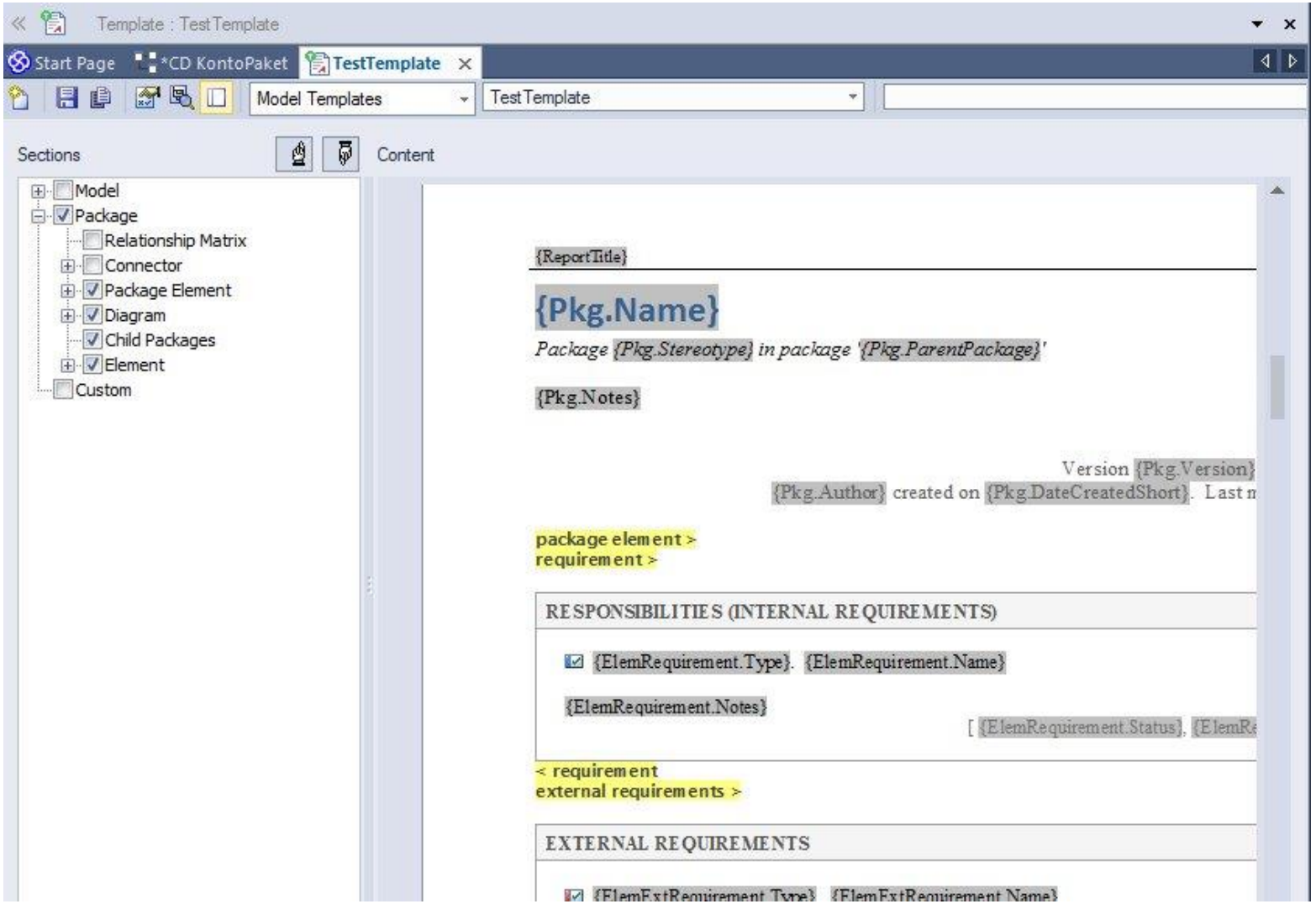
- Vorhandene Templates können als Basis genommen werden



Template Editor



Versionskontrolle

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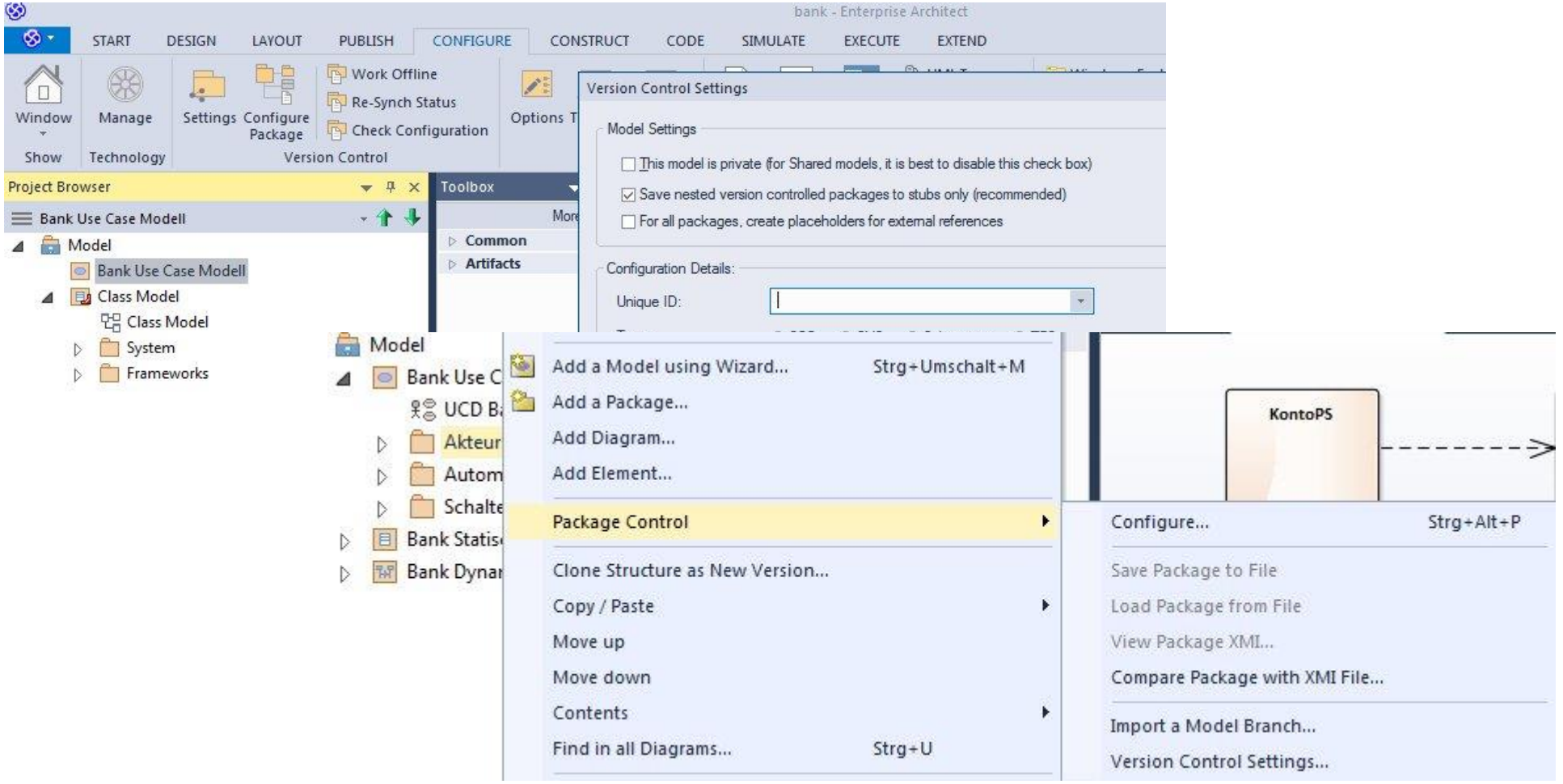
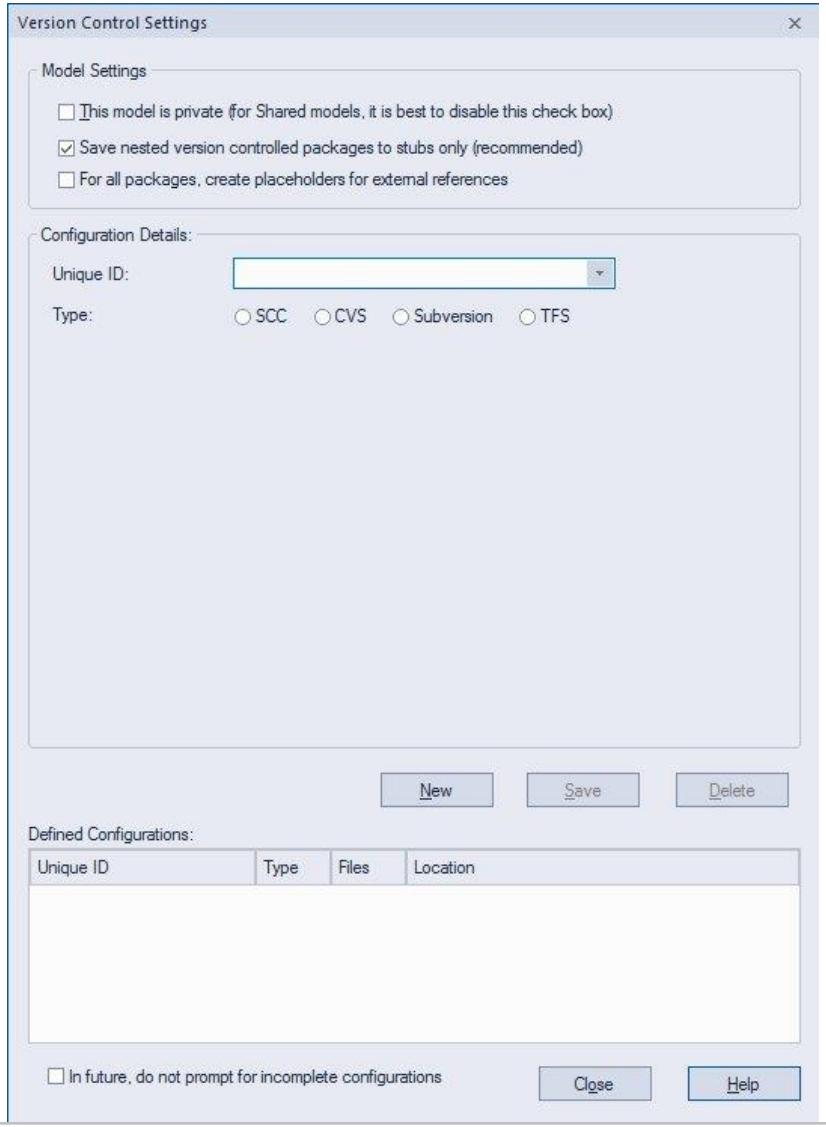
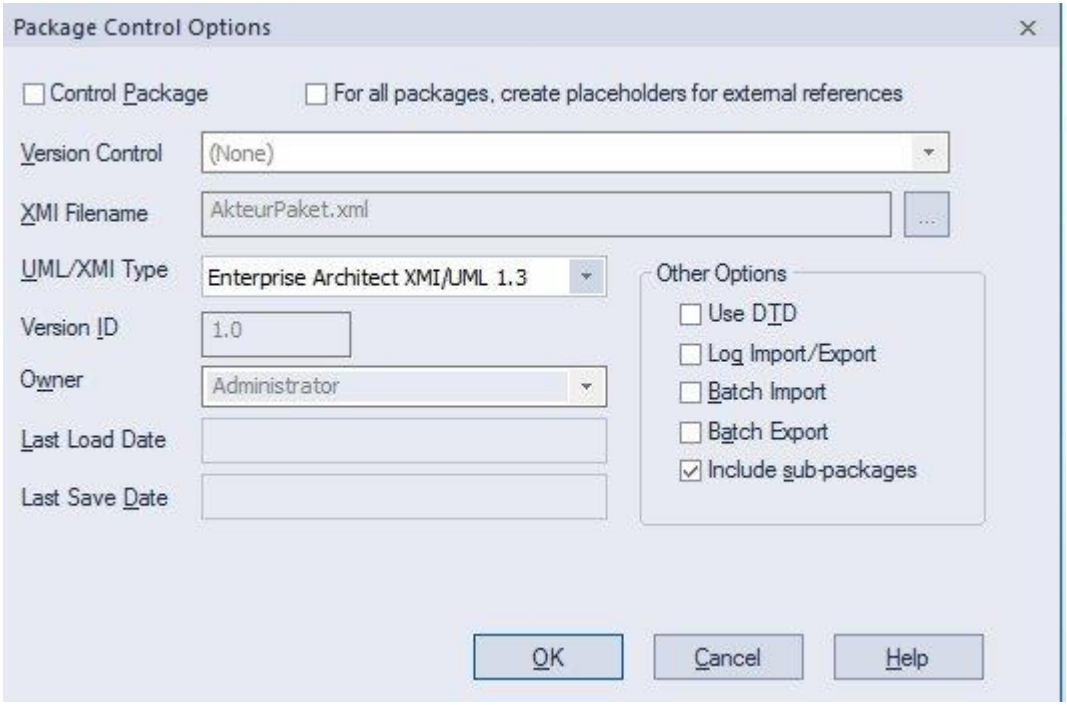
- Verschiedene externe Versionskontrollsysteme sind möglich
- Einbindung über Regsiter Configure - > Settings



Versionskontrolle Einstellungen





Datenbank-Modellierung über den Wizard

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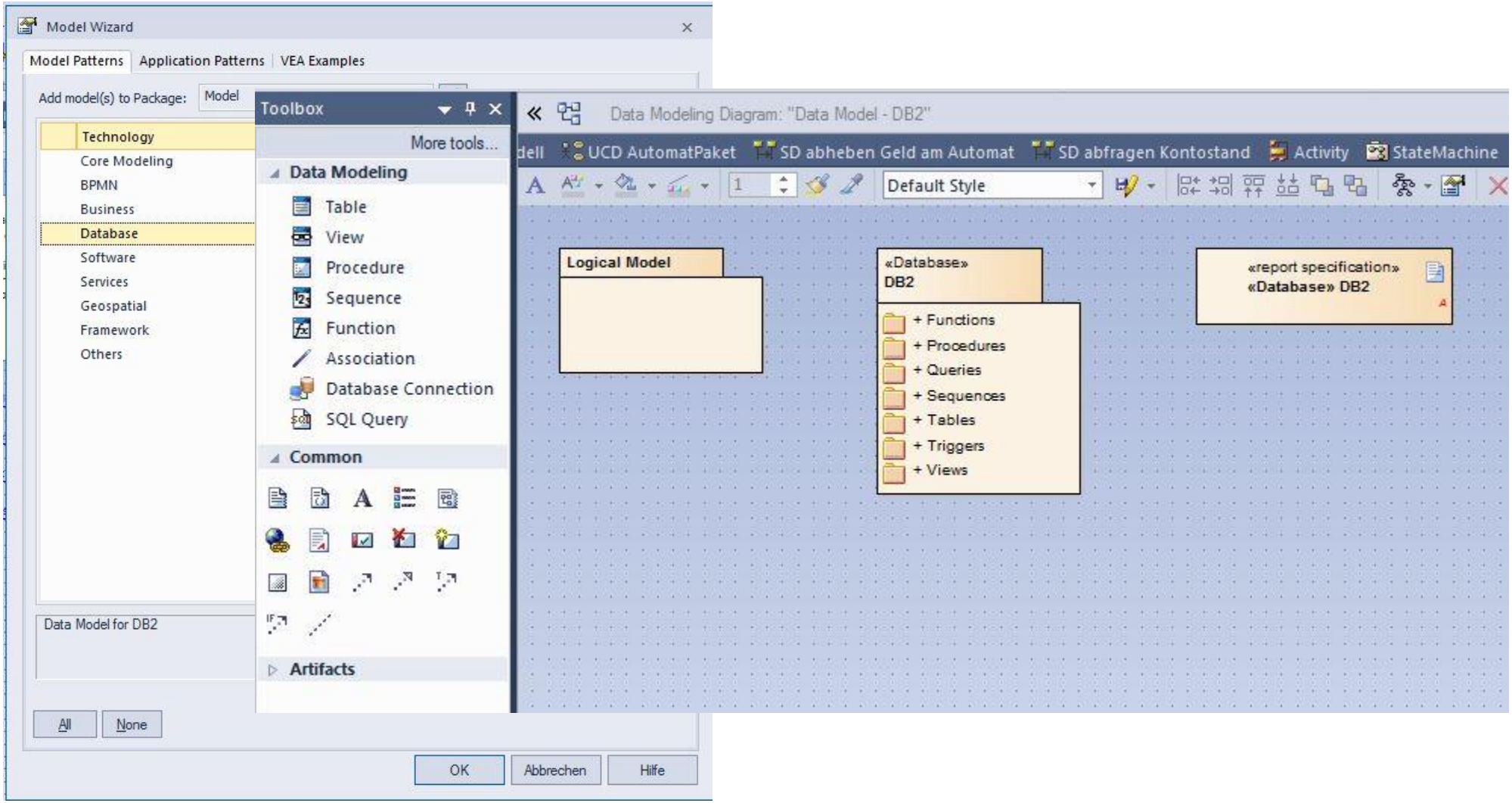
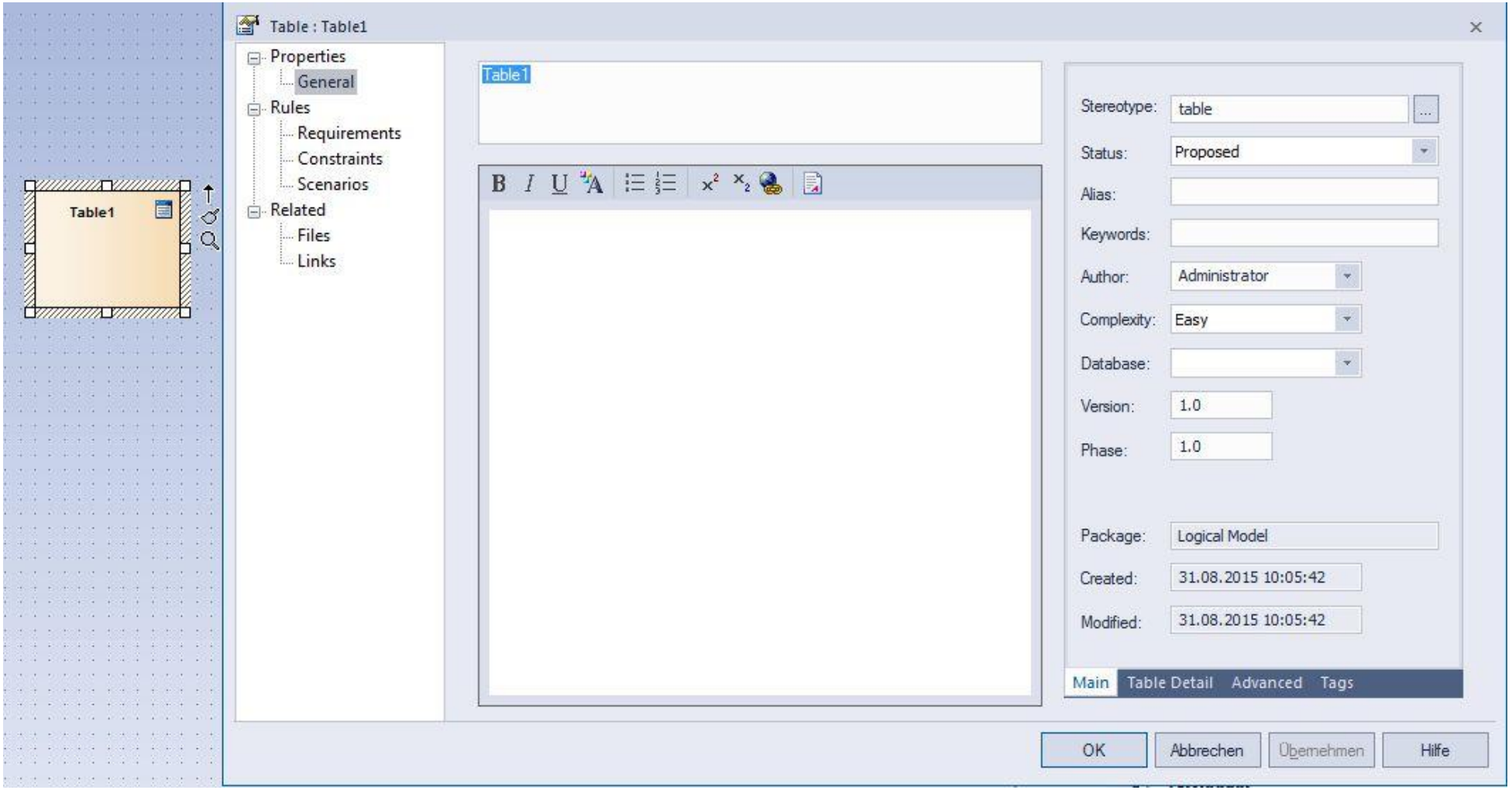
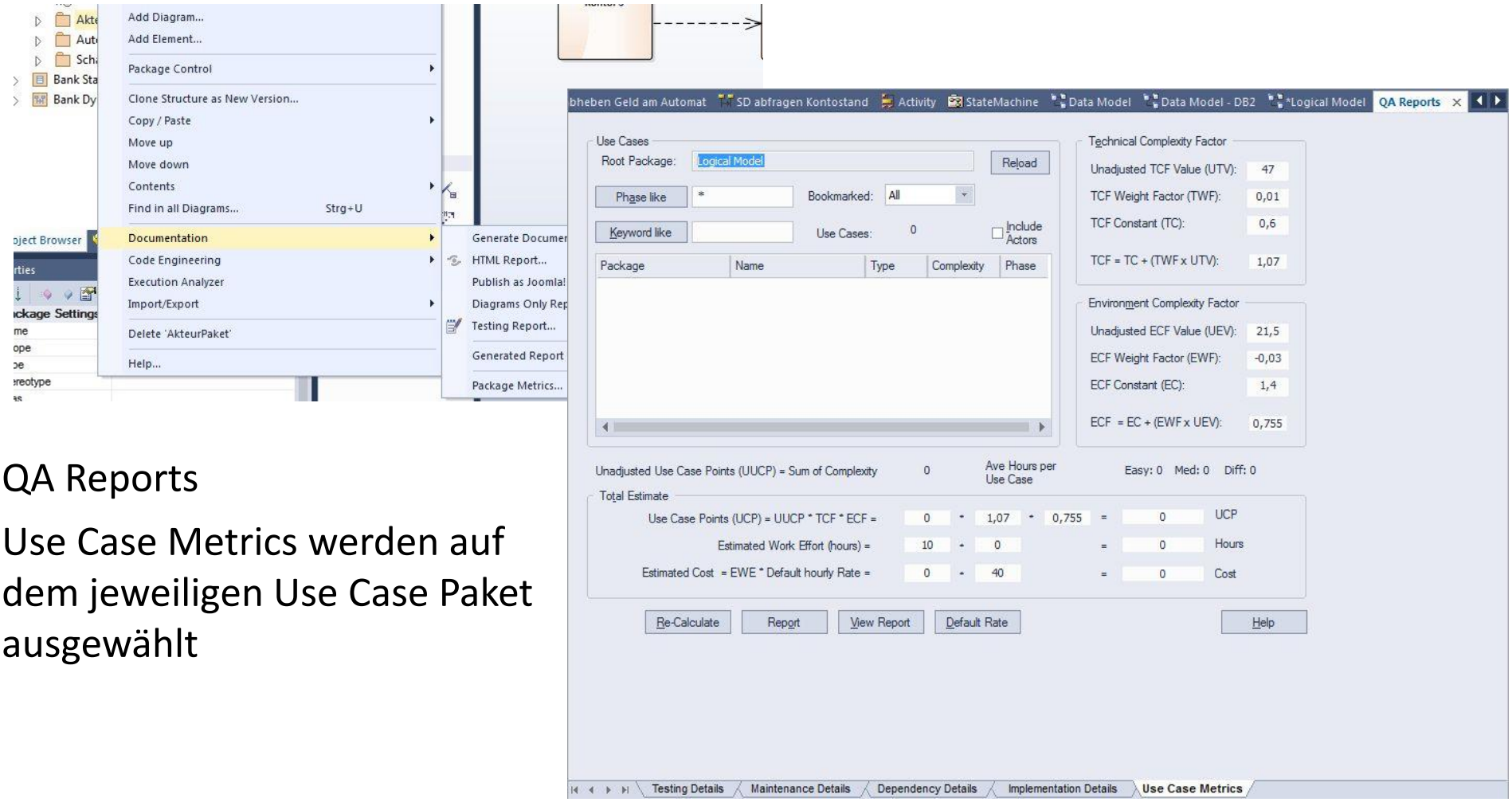


Datenbank-Modellierung Einstellungen



Use Case Point Methode



- QA Reports
- Use Case Metrics werden auf dem jeweiligen Use Case Paket ausgewählt

Die Relationship Matrix

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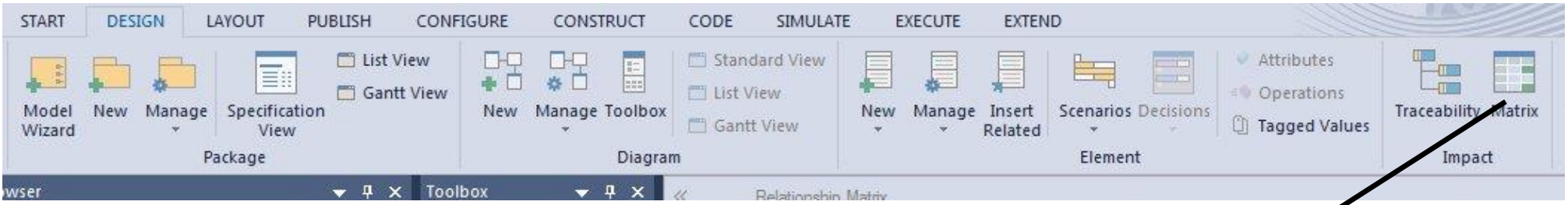
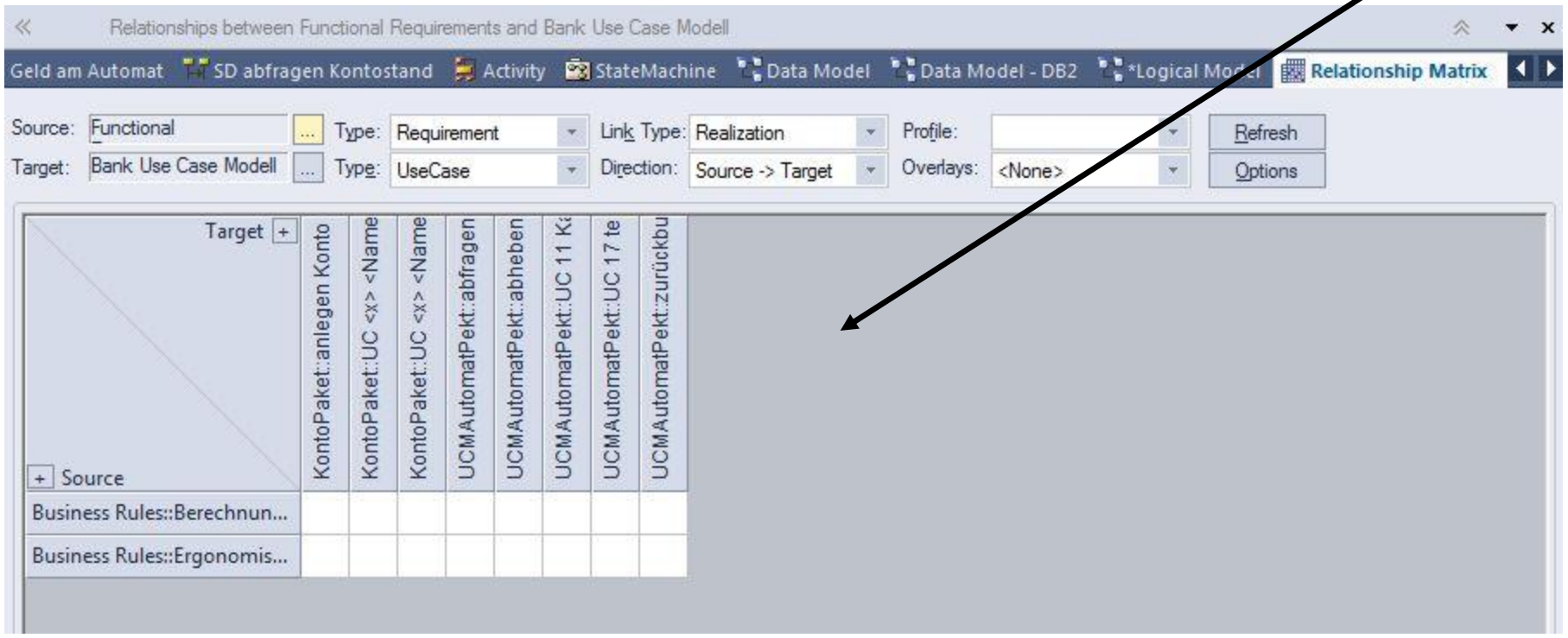
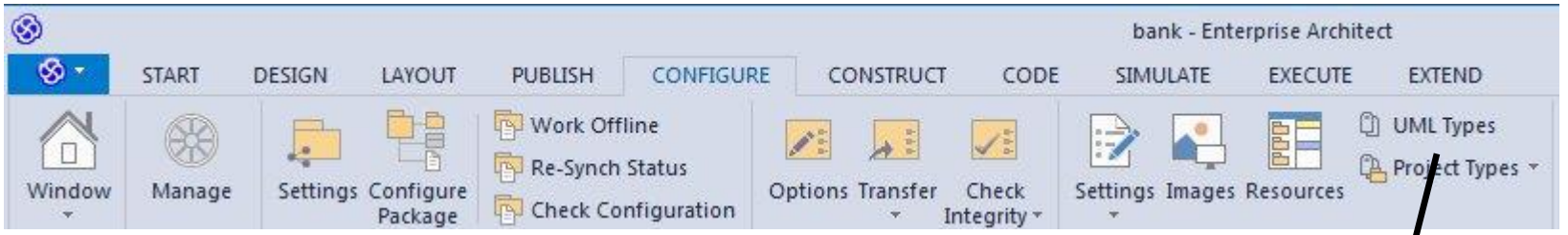
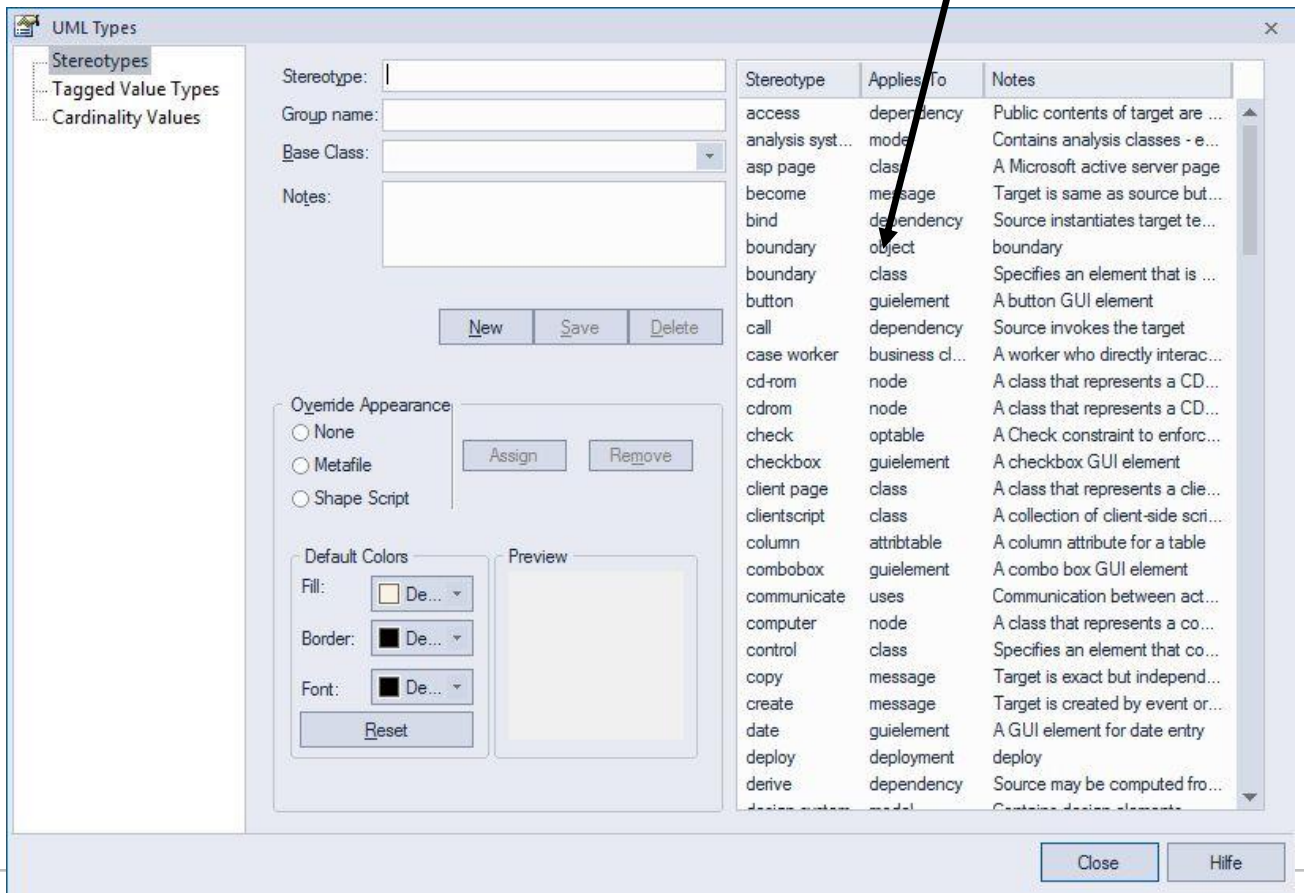


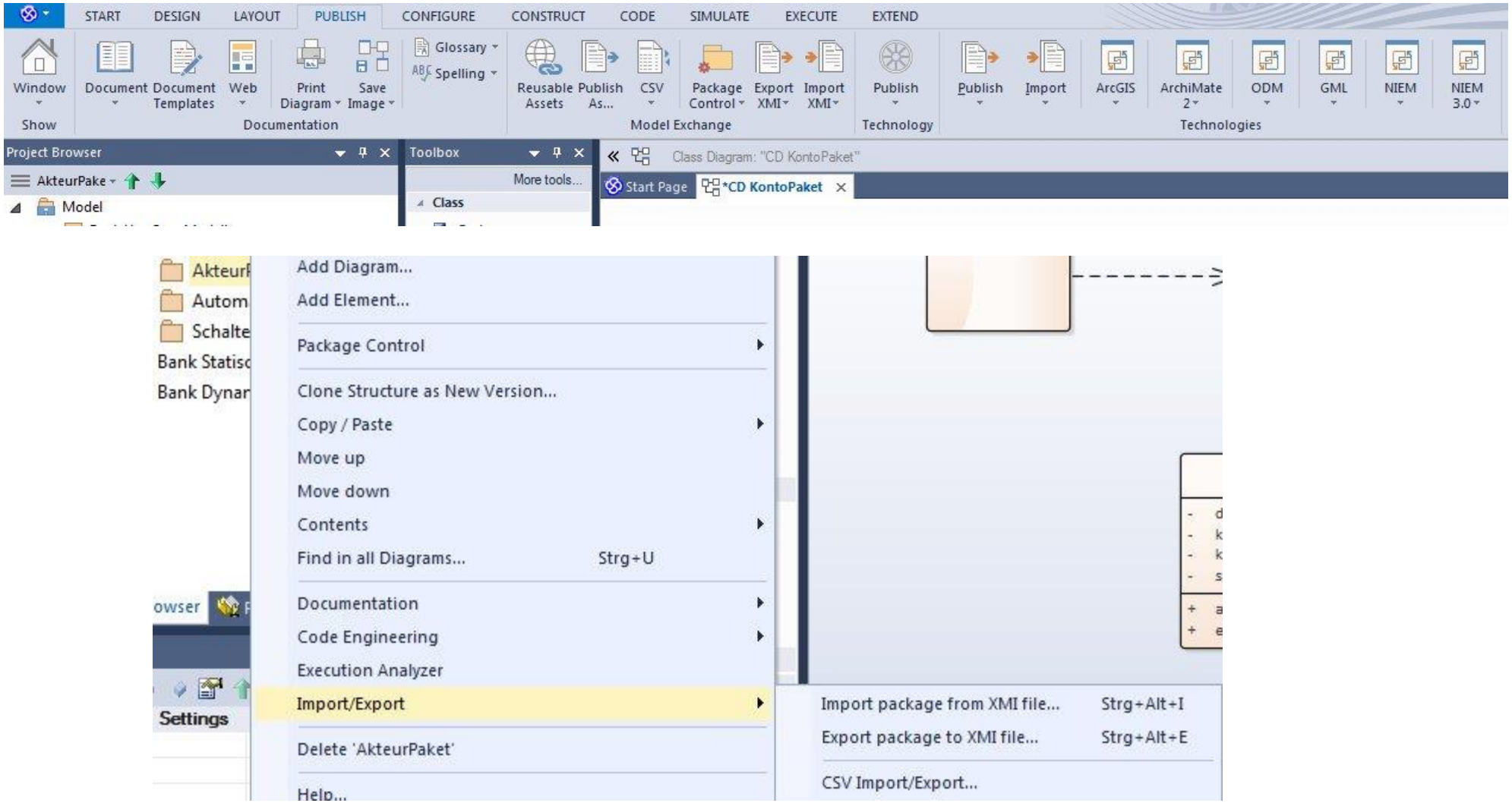


Eigene Stereotypen festlegen





Import und Export Aufruf



Import und Export Konfiguration

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