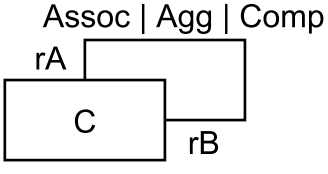
Tweaking Class Model Verification with Specialized Association Bounds

or

Once again on Association, Aggregation and Composition

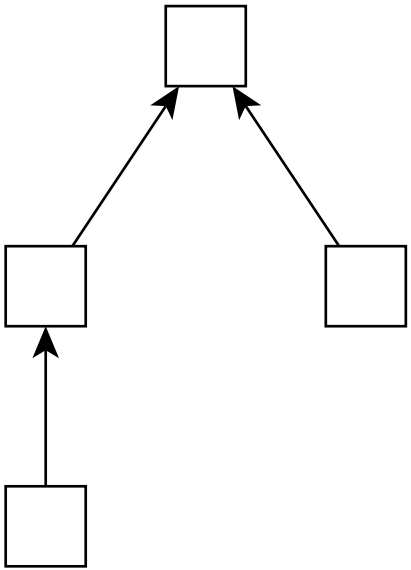
Martin Gogolla

Starting point: a reflexive, binary association,
i.e., an association on a single class with two arms;
how can the association be populated with links?
how many links is a model finder allowed to build in the case of plain association, aggregation and composition?
our view: UML 1 understanding with the three association kinds being different; UML 2 does not distinguish between association and aggregation

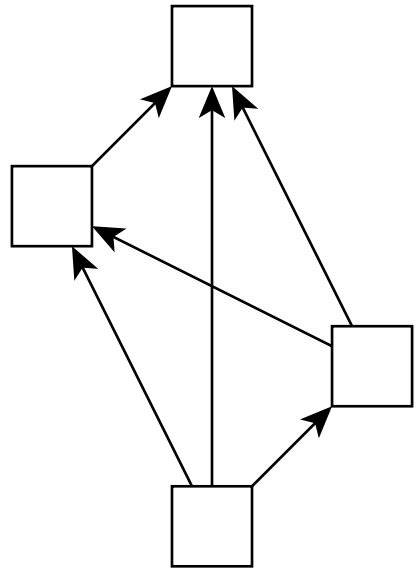


Object model (system state) with n objects given.

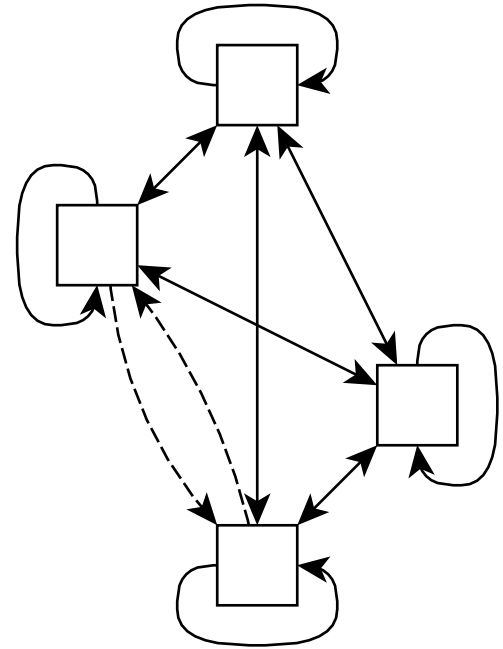
Composition: at most n-1 links
4-1 = 3
tree-like (each node at most 1 root)

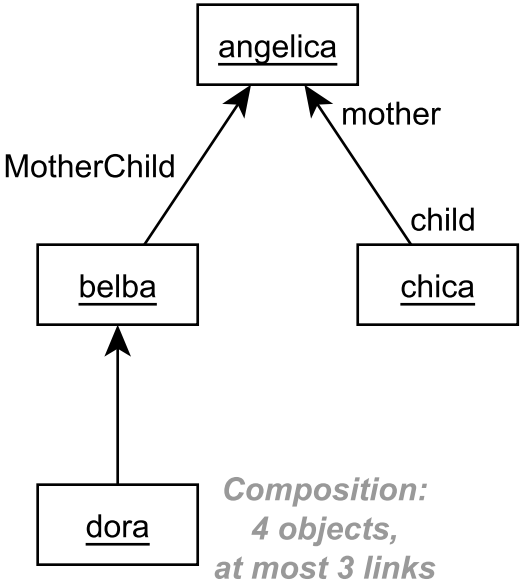


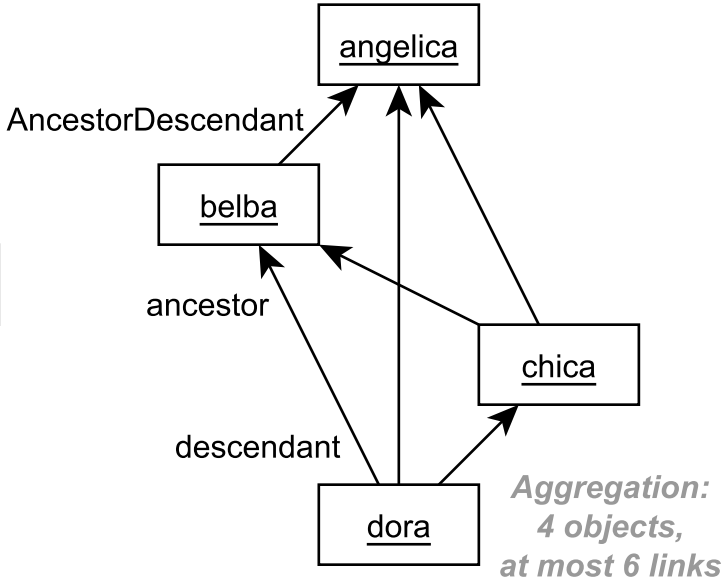
Aggregation: at most
n-1 + n-2 + ... + 2 +1 = n-1 * (n-2) / 2 links
3+2+1 = 6
dag-like (directed, acyclic graph)

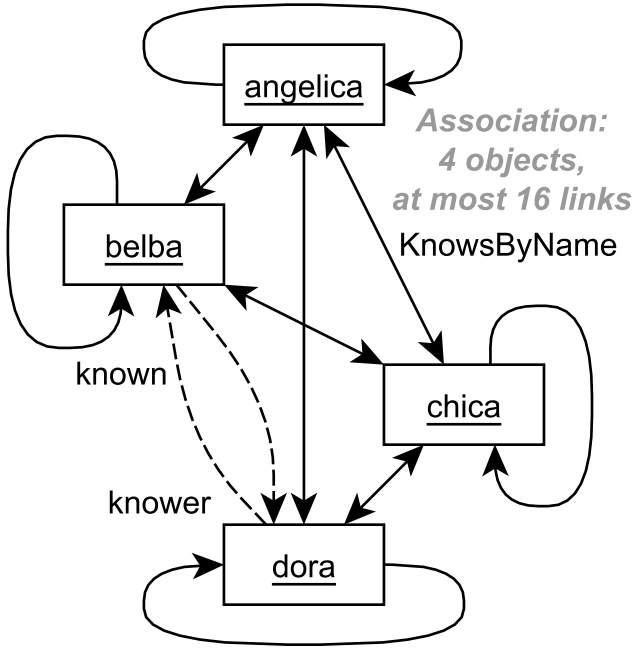


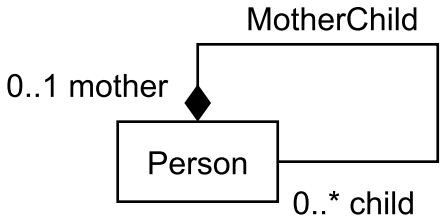
Association: at most n * n links
4*4 = 16
graph-like

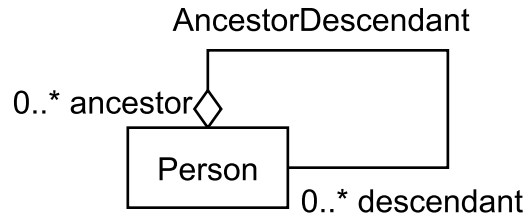


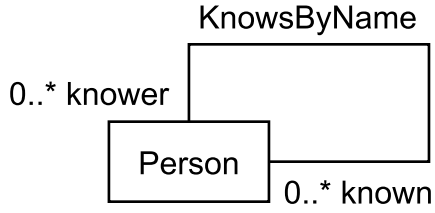

angelica
mother
MotherChild
child
belba
chica
dora
Composition:
4 objects,
at most 3 links

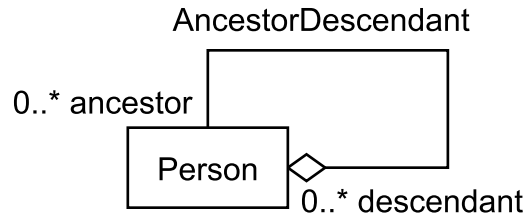

angelica
AncestorDescendant
belba
ancestor
chica
descendant
dora
Aggregation:
4 objects,
at most 6 links


angelica
Association:
4 objects,
at most 16 links
belba
KnowsByName
known
chica
knower
dora


MotherChild
0..1 mother
Person
0..* child


AncestorDescendant
0..* ancestor
Person
0..* descendant


KnowsByName
0..* knower
Person
0..* known


AncestorDescendant
0..* ancestor
Person
0..* descendant

```
Person_min = 1
Person_max = 4
MotherChild_min = 1                MotherChild_min = 0
MotherChild_max = 3                MotherChild_max = *
AncestorDescendant_min = 1         AncestorDescendant_min = 0
AncestorDescendant_max = 6         AncestorDescendant_max = *
KnowsByName_min = 1                KnowsByName_min = 0
KnowsByName_max = 16               KnowsByName_max = *
```