Project 1 - Gruppe_2

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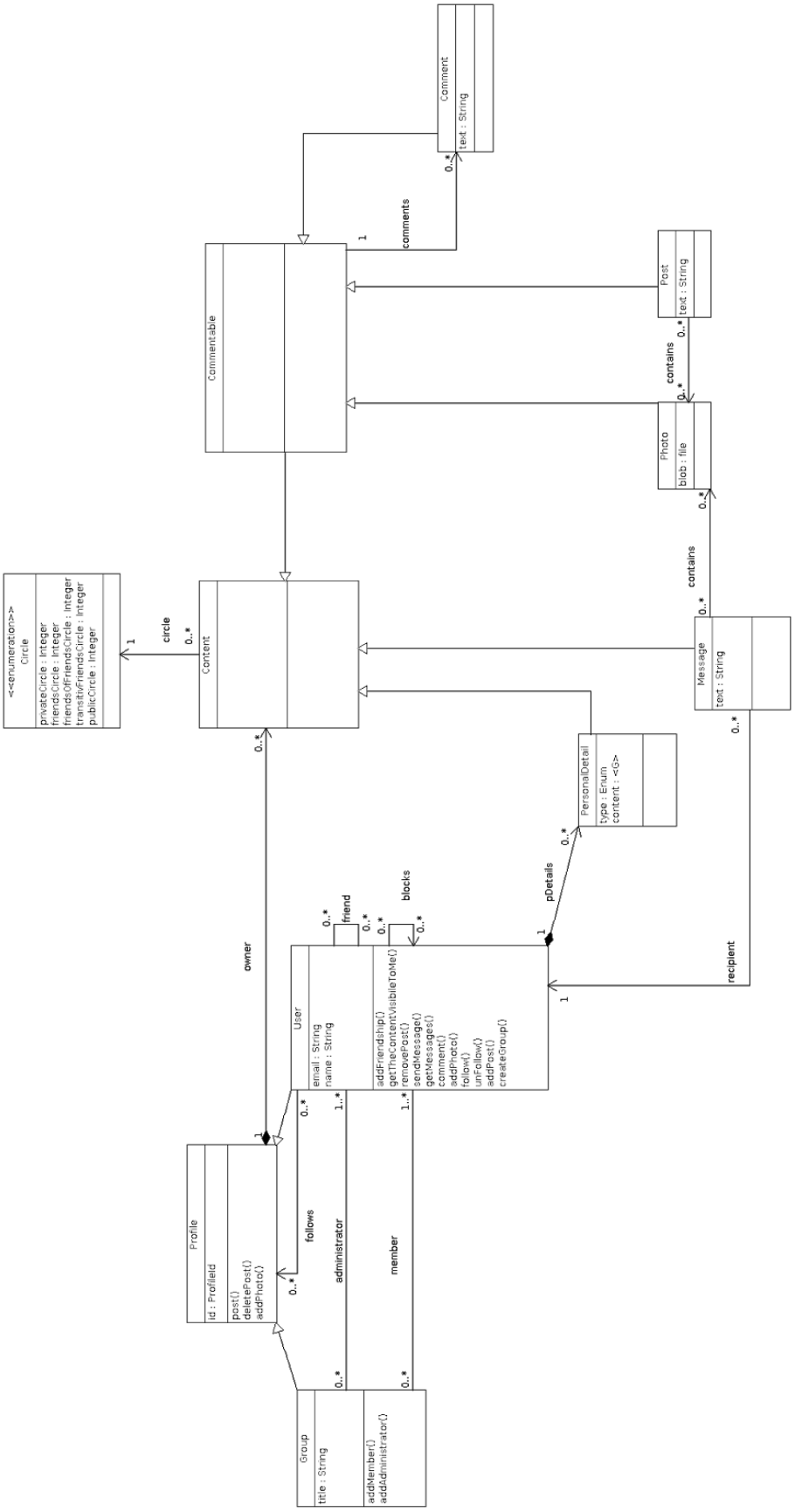
UML Class Diagram

See next page….


Comment
text : String
comments
Commentable
Post
text : String
contains
Photo
blob : file
contains
<<enumeration>>
Circle
privateCircle : Integer
friendsCircle : Integer
friendsOfFriendsCircle : Integer
transitiveFriendsCircle : Integer
publicCircle : Integer
circle
Content
Message
text : String
PersonalDetail
type : Enum
content : <G>
pDetails
friend
blocks
owner
User
email : String
name : String
addFriendship()
getTheContentVisibleToMe()
removePost()
sendMessage()
getMessages()
comment()
addPhoto()
follow()
unFollow()
addPost()
createGroup()
reciplent
Profile
id : ProfileId
post()
deletePost()
addPhoto()
follows
administrator
member
Group
title : String
addMember()
addAdministrator()

List of details that cannot be expressed by the UML model

- Comments are always owned by a User and not by a Group
- Any content posted by a group is always private (with respect to the group), so only members of the group can see it.
- If a user posts to a group, the owner of the post is the group
- Every admin of a group has to be a member too
- A user cannot block himself
- Friendship is symmetric but not reflexive
- Users cannot follow themselves
- Comment-chains have to have a non-comment content as a root
- The receiver and sender of

Alloy Model

```
open util/integer

-------------------------
-- Profile Signatures --
-------------------------

abstract sig Profile {}

sig Group extends Profile {
	administrator: some User,
	member: some User
}

sig User extends Profile {
	follows: set Profile,
	friend: set User,
	blocks: set User,
	--canSee: set Content, -- for debug purposes - see below
	pDetails: set PersonalDetail
}

-- Add this line (and the one in the user signature) to get arrows for the content each user can see:
--fact validCanSee {all u: User | all c: Content | c in u.canSee <=> canSee[u, c]}

--------------------
-- Profile Facts --
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fact friendship {all u1:User | all u2:u1.friend | u1 in u2.friend} -- friendship is symmetric
fact friendshipNonReflexiv {no u: User | u in u.friend}
fact blocks{no u:User | u in u.blocks} -- users cannot block themselves
fact follows {no u:User | u in u.follows} -- users cannot follow themselves
fact personalDetail {all pd: PersonalDetail | all p: Profile | pd in p.pDetails <=> pd.owner = p} -- Each PersonalDetail must be connected to exactly one user
fact administratorIsMember {all g:Group | g.administrator in g.member}
fact oneAdmin {all admin:Group.administrator | #{admin} > 0} -- There must be at least one administrator

---------------------------
-- Content Signatures --
```

```
----------------------------

abstract sig Content{
	circle: one Int,
	owner: one Profile
}

abstract sig Commentable extends Content{
	comments: set Comment
}

sig Post extends Commentable{
	contains: set Photo
}

sig Photo extends Commentable{}

sig Comment extends Commentable{}

sig PersonalDetail extends Content{}

sig Message extends Content{
	recipient: one User,
	contains: set Photo
}

---------------------
-- Content Facts --
---------------------

fact message {all m:Message | m.recipient != m.owner}
fact commentCommentsOnOneThing{all com:Comment | {one con:Content | com in con.comments}} -- a comment belongs to
exactly one content
fact commentChainCannotStartWithComment{all com:Comment | one con:(Content-Comment) | com in con.^comments} -- at
the root of a comment chain there has to be a non-comment content
fact groupsDontPostComments{all c:Comment | no g:Group | c.owner = g}

-- posts created by groups count either as "private" (the group members, and only they, can see them) or as "public" (anyone
can see them).
fact groupPostPrivacy{all c:Content | c.owner in Group => (c.circle = 1 or c.circle = 5)}

-- the circle enum has numbers from 1 to 5, representing private/friends/friends of friends/friends chain/public, respectively
fact validCircle {all c: Content | c.circle >= 1 and c.circle <= 5}

-- note: a post CAN contain photos which are not visible to its owner (for example if their privacy setting has been changed since
the post has been created)

-----------------
-- Predicates --
-----------------

pred checkCirc3 {
	#{c: Content | c.circle != 3} <= 2 and #{c: Content | c.circle = 3} >= 2 and
	#{User} = 7  and #{PersonalDetail} = 1 and #{Post} = 5 and #{Photo} = 2 and {all u:User | #{u.friend}=2}
}

run checkCirc3 for 15
```

```
pred showSomeComments {
	#{Comment}>3  and #{Comment.comments}>0
}
run showSomeComments for 10

pred personalDetails {
	#{PersonalDetail} >= 5 and #{User} >= 3 and #{Group} >= 2 and {all u: User | #{u.friend} >= 1 and #{u.blocks} = 0}
}
run personalDetails for 9

-----------------
-- Assertions --
-----------------

check pDBelongsToOneUser {all disj u1,u2: User | no upd:u1.pDetails | upd in u2.pDetails}--Two user cannot have the same
personal detail
check twoContentsCannotHaveSameComment {all disj c1,c2: Content | no com:c1.comments | com in c2.comments}--Two
Contents cannot have the same comment
check groupsDontPostPD {all g:Group | all pd: PersonalDetail | not g in pd.owner}

----------------
-- Exercises --
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-- Task C --

pred canSee[u: User, c: Content] {
	(
	-- circle logic
	((c.circle = 1 => (u = c.owner) or (u in c.owner.member))
	and (c.circle = 2 => (u in c.owner.friend or u = c.owner))
	and (c.circle = 3 => (u in c.owner.friend.friend or u in c.owner.friend or u = c.owner))
	and (c.circle = 4 => (u in c.owner.*friend or u = c.owner)))
	or (c.circle = 5) -- anyone can see public content
	or (u = c.recipient) -- message recipients can always see the message
	) and (not u in c.owner.blocks) -- EXCEPT if the content owner blocked them
}
run canSee for 5

pred canModify[u: User, c: Content] {
	{u in c.owner} or {u in c.owner.administrator}
}
run canModify for 3

pred isOnNewsFeed[u: User, c: Content] {
	{canSee[u,c]} and {c.owner in u.follows}
}
run isOnNewsFeed for 3

-- Task D --

--1
check commentChainsAcyclic{all c:Comment | c not in c.^comments}

--2
check canModifyOnlyWhatCanSee{all u: User | all c: Content | canModify[u,c] => canSee[u,c] }
```

```
--3
-- This property is not true, as a user can post a content to a group while not being an administrator
-- and thus not being allowed, to change the content.

--4
-- This Property is not true, as the Circle for the Photo can me more restrictive, then the Circle of the Post itself.

--5
check groupHasMembers{no g:Group | #{g.member}=0}

--6
check allNewsFeedContentIsVisible{all u:User | all c:Content | isOnNewsFeed[u,c] implies canSee[u,c]}

--7
check cannotSeeContentByAnyoneWhoBlockedThem {all u:User | all c:Content | u in c.owner.blocks => not canSee[u,c]}

-- Task E --

--1
pred showChainOfSizeFive {one c:Comment |  #{c.comments.comments.comments.comments} > 0}
run showChainOfSizeFive for 6

--2
pred threeUsersSevenGroups {#{User}=3 and #{Group}=7 and {all disj g1,g2:Group | g1.member != g2.member}}
run threeUsersSevenGroups for 10

--3
pred fourUsersOneFriendNotTransitiv{#{User}=4 and {all u:User | #{u.friend}>0} and {some u1:User | some u2:(User - u1) | u1
not in u2.^friend}} -- {one u1,u2:User | u1 != u2 and u1 not in u2.^friend }}
run fourUsersOneFriendNotTransitiv for 10

--4
pred weird{some u1:User | some u2:u1.friend | some u3:u2.friend | some c:Post | some p:Photo | (#{Group} = 0) and u3 in
c.owner and u3 not in u1.friend and not u3 = u1 and c.circle = 3 and canSee[u1,c] and p in c.contains and p.owner in {User - u1
- u2 - u3}}
run weird for 10
-- added the group limitation for clarity

--5
pred photoWithPhotoNotByPoster{ #{Post} = 1 and #{Post.contains}=1
        and {some u:User | some post:Post | some photo:Photo | photo in post.contains
                and u not in photo.owner
                and u in post.owner
                and photo.circle != 5
                and photo.owner not in Group
                and post.owner not in Group} }
run photoWithPhotoNotByPoster for 3

--6
pred friendOfFriendPostWithPhoto{#{Post} = 1 and {some post:Post | some photo:Photo | some fr:post.owner.friend | post.circle
= 3 and photo in post.contains and photo.owner in post.owner.friend and canSee[fr, post] and not canSee[fr, photo]}}
run friendOfFriendPostWithPhoto for 5
```

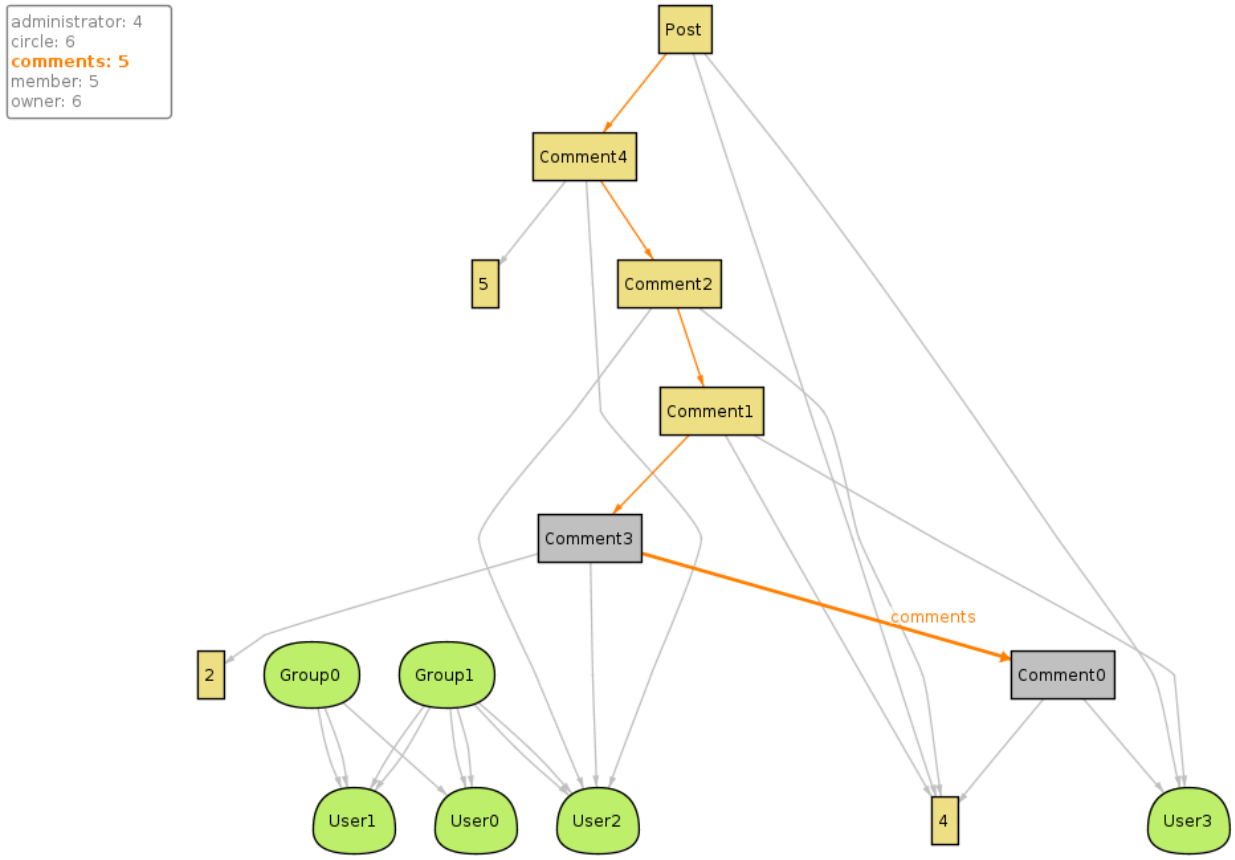
List of Properties from task D unable to check

- Property 3 is not true, as a user can post a content to a group while not being an administrator and thus not being allowed, to change the content.
- Property 4 is not true, as the Circle for the Photo can be more restrictive, than the Circle of the Post itself.

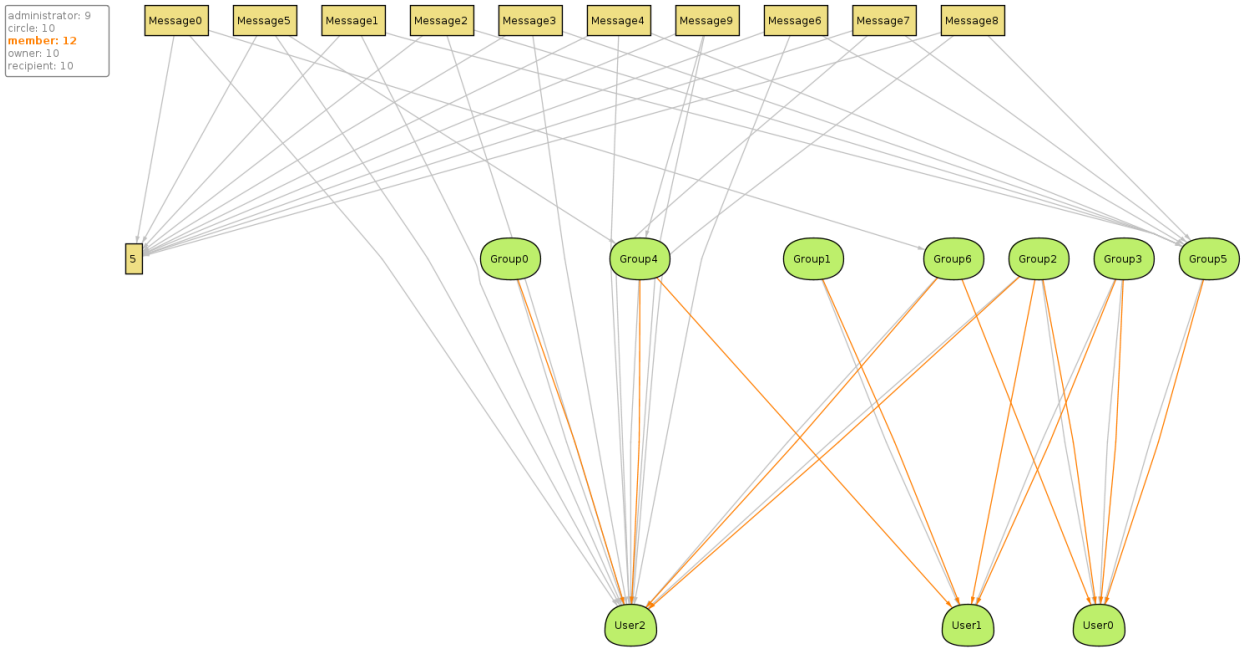
List of Instances from task E unable to produce

- We were able to produce all instances as you can see below…

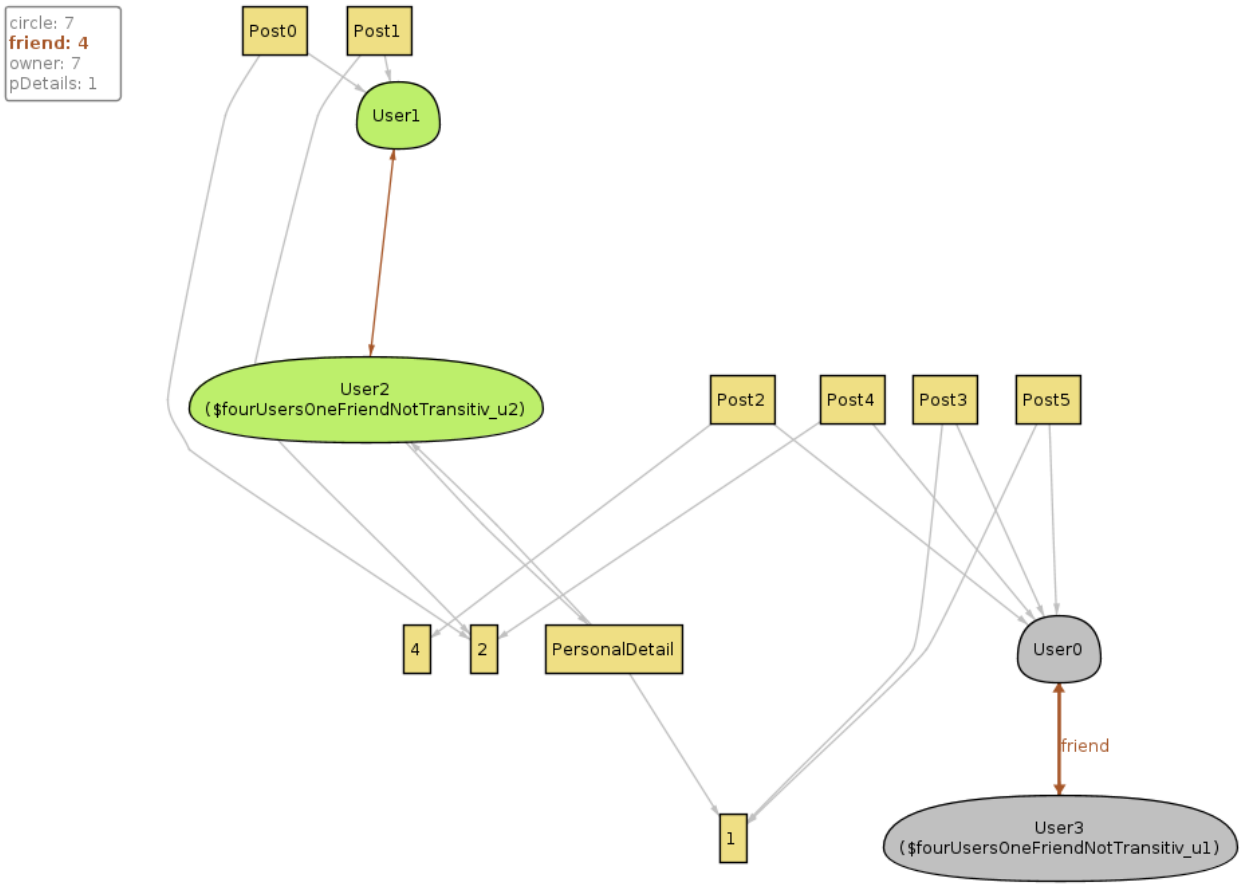
Diagrams of all generated instances from task E



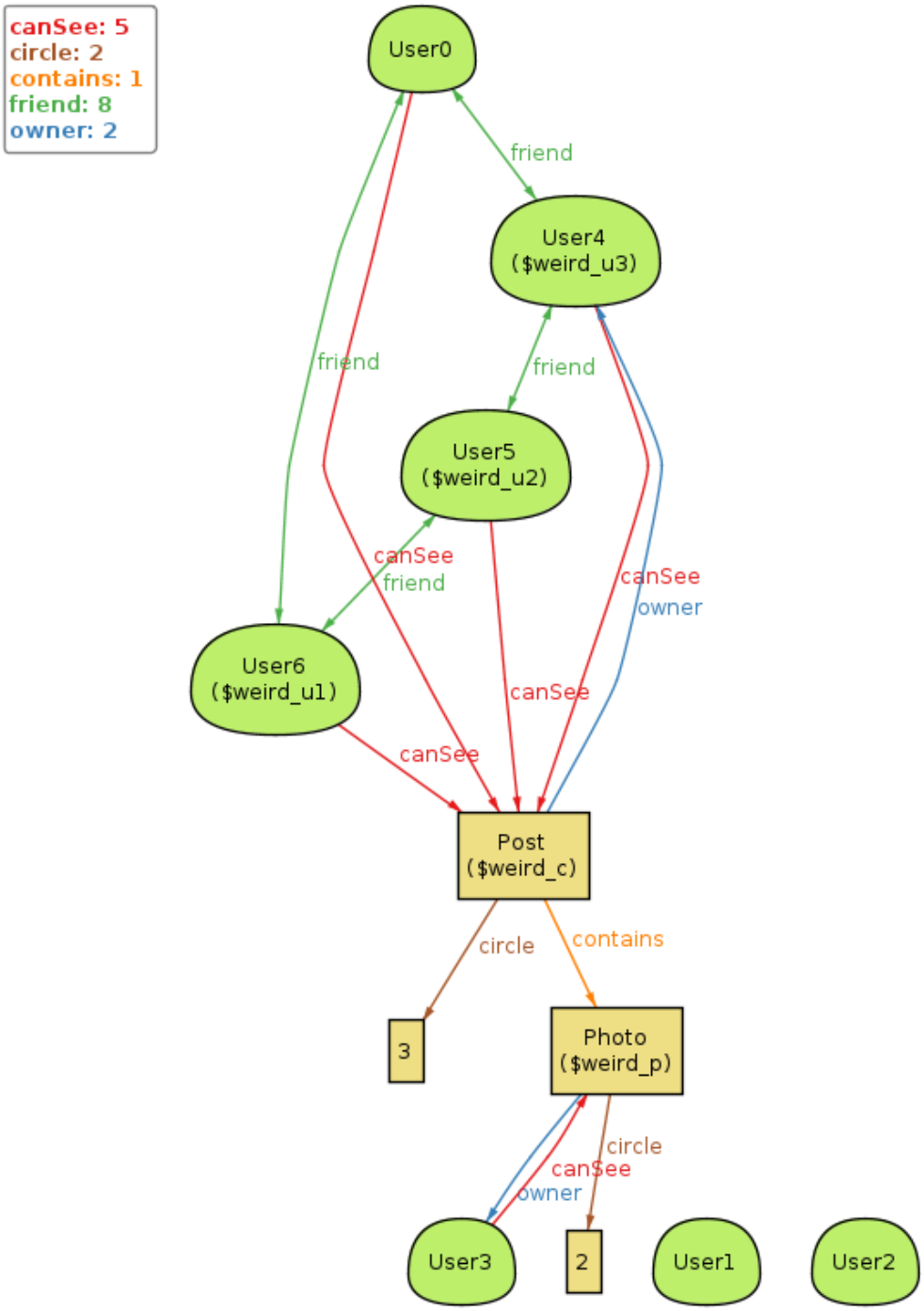
Instance 1


administrator: 9
circle: 10
member: 12
owner: 10
recipient: 10
Message0
Message5
Message1
Message2
Message3
Message4
Message9
Message6
Message7
Message8
5
Group0
Group4
Group1
Group6
Group2
Group3
Group5
User2
User1
User0

Instance 2

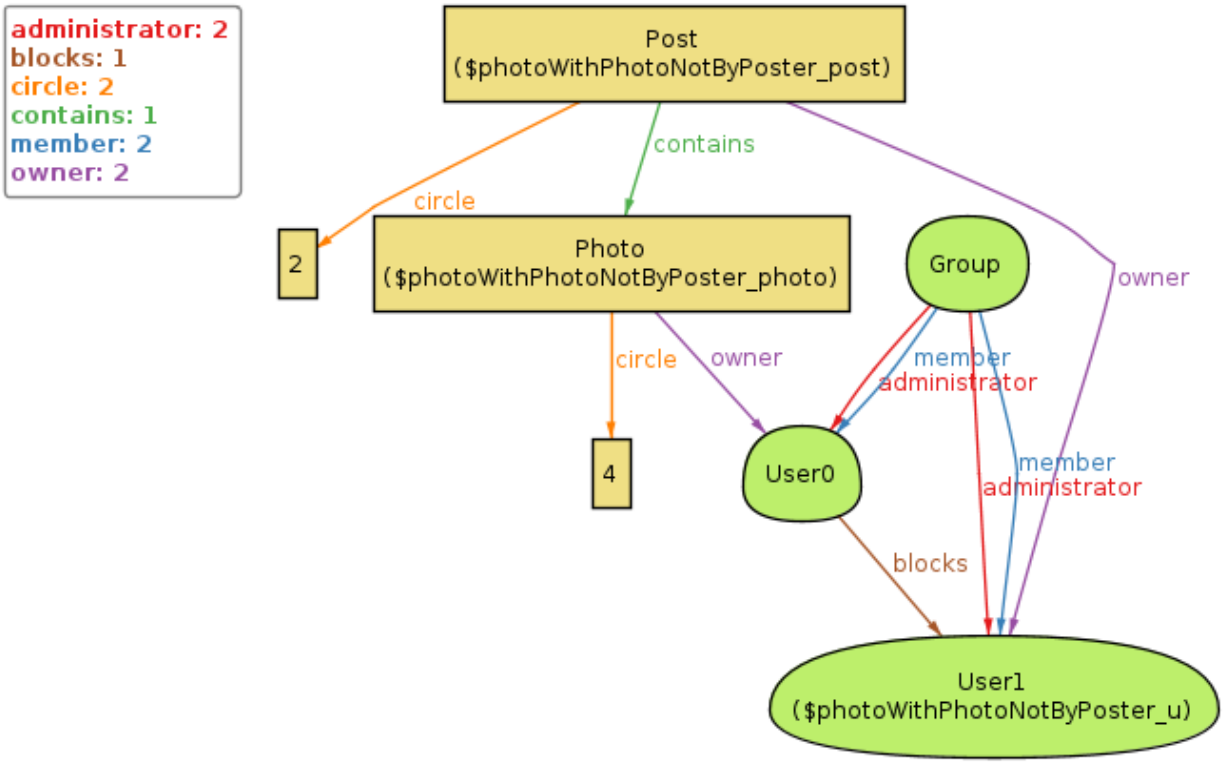

circle: 7
friend: 4
owner: 7
pDetails: 1
Post0
Post1
User1
User2
($fourUsersOneFriendNotTransitiv_u2)
Post2
Post4
Post3
Post5
4
2
PersonalDetail
User0
friend
1
User3
($fourUsersOneFriendNotTransitiv_u1)

Instance 3

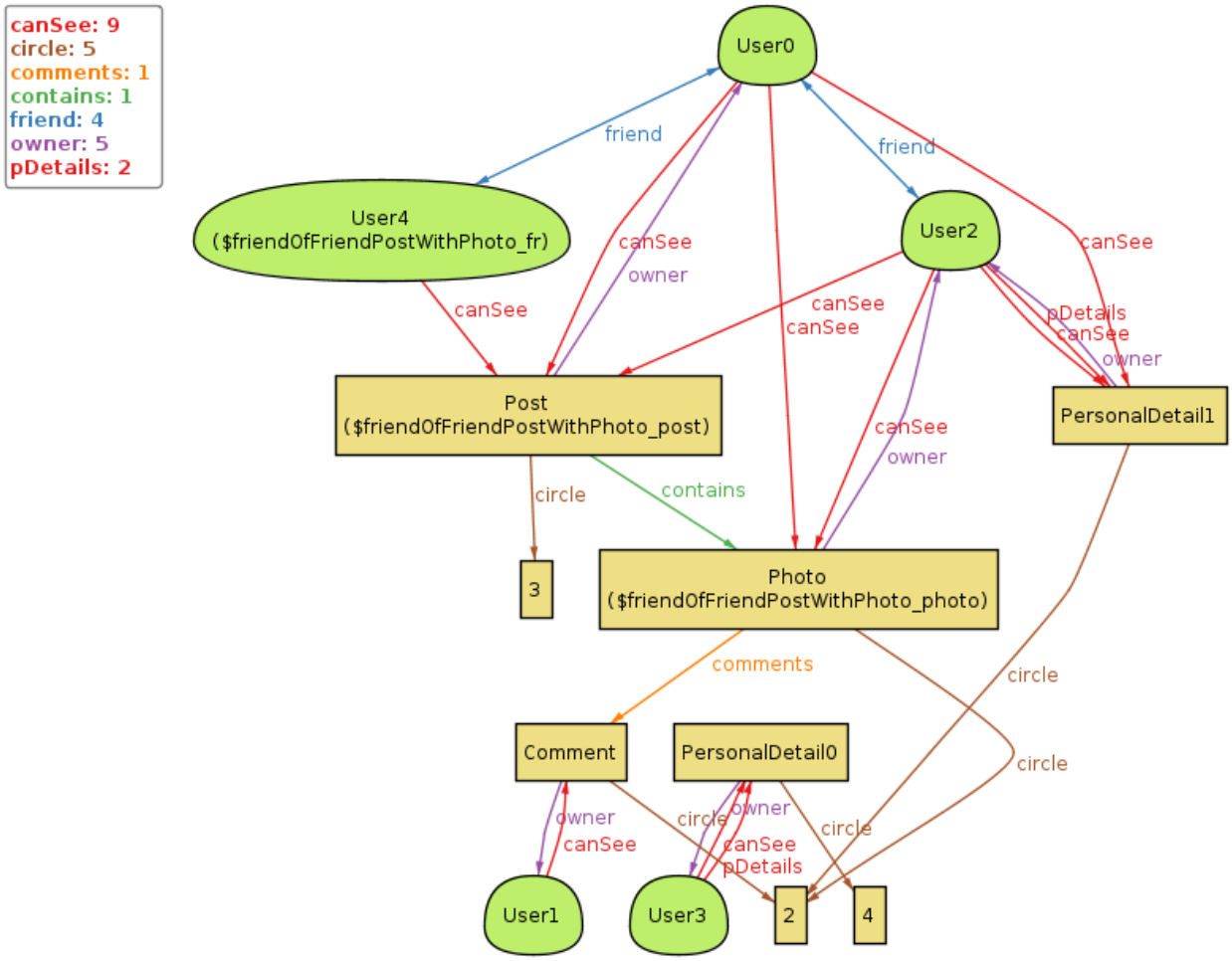


Instance 4

(here we made the can see predicate visible and removed all the groups to simplify the diagram)


administrator: 2
blocks: 1
circle: 2
contains: 1
member: 2
owner: 2
Post
($photoWithPhotoNotByPoster_post)
contains
circle
2
Photo
($photoWithPhotoNotByPoster_photo)
Group
owner
circle
owner
member
administrator
4
User0
member
administrator
blocks
User1
($photoWithPhotoNotByPoster_u)

Instance 5



Instance 6

(here we made the canSee predicate visible…)