Modeling Social Networking Privacy

Carolina Dania
IMDEA Software Institute - Spain
Universidad Complutense de Madrid
(Partially funded by NeSSOS)

Supervisors
Manuel Clavel
IMDEA Software Institute
Universidad Complutense de Madrid

Marina Egea
Atos Research & Innovation Dept.
Outline

• Social Networks
  - Facebook
  - Privacy
  - Example
• Research project
  - Goals
  - Requirements
• Preliminary results
• Research plan
Outline

- Social Networks
  - Facebook
  - Privacy
  - Example
- Research project
  - Goals
  - Requirements
- Preliminary results
- Research plan
Social Networks
Social Networks

• online services that reflect social relations among people. E.g. shared interests and/or activities
Social Networks

• online services that reflect social relations among people. E.g. shared interests and/or activities

• Many people act as “Internet natives”
Social Networks

• online services that reflect social relations among people. E.g. shared interests and/or activities

• Many people act as “Internet natives”

- when they need information, they open a browser and search for it
Social Networks

• online services that reflect social relations among people. E.g. shared interests and/or activities

• Many people act as “Internet natives”
  - when they need information, they open a browser and search for it
  - when they want to share information, they post it on a social network
Facebook

• is the leader among social networking sites
Facebook

• is the leader among social networking sites
• created by Mark Zuckerberg in 2004
Facebook

• is the leader among social networking sites

• created by Mark Zuckerberg in 2004

• some figures:
  - has more than 800 million users,
  - the users upload, on average, 250 million photos per day
Everybody knows Facebook
Everybody knows Facebook!

You are in Facebook!
Nora Parcus

Trabajo en Universidad de Múnich
Estudió en Universidad de Buenos Aires, Argentina
Vive en Múnich
De Buenos Aires
Nació el 2 de octubre de 1951

Formación y empleo

Empresas
- Universidad de Múnich
- NESSOS, ASCENS

Universidad
- Universidad de Buenos Aires, Argentina

Escuela secundaria
- Escuela Comercial de San Isidro, Buenos Aires, Argentina
  Promoción del 1969

Actividades e intereses

Otros
- Ascens, Latino Sur

Información básica

Sexo
- Mujer
Anton Philippov

Vive en Trento
De Petropavlovsk, Soltüstik Qazaqstan, Kazakhstan

Información
Fotos
Mapa
Me gusta

Anton y tú no son amigos(as). Si conoces a Anton, envíale una solicitud de amistad o envíale un mensaje.

Acerca de Anton

Sebas PF
Anton Fasching
Guille de Leona...

Buscar amigos | Inicio | 

Novedades
Tarot Gratis
A Marquetti y 4 amigos más les gusta esto.
Me gusta

Mila
A Marquetti le gusta esta pía.
Me gusta

Cardo Arjona
A Marquetti y 12 amigos más les gusta esto.
Me gusta

rbucks
A Teresa Trigo y 11 amigos más les gusta esto.
Me gusta

: NY
A Marquetti le gusta esta pía.
Me gusta

National Geographic
A Elaonora Sacco y 6 amigos más les gusta esto.
Me gusta

Dr. House
A Flor Dani y 29 amigos más les gusta esto.
Me gusta
Bert Lagaisse
Lives in Leuven, Belgium  From Oostrozebeke, Belgium

Wall

RECENT ACTIVITY

🔗 Bert likes Wordfeud.  ·  Like This Page

🔗 Bert likes Flanders DC.  ·  Like This Page
🔗 Bert likes Starbucks and 2 other pages.

🔗 Bert Lagaisse likes a link.

Google, I See What You Did There...
Funny Pictures brought to you by LolSnaps. Constant updates of the best funny pictures on the web.

🔗 Share  ·  January 28 at 9:04pm  ·

👍 2 people like this.
Maarten De Cat

harde werker at colruyt
Went to Miniemeninstituut
Lives in Leuven, Belgium
Knows Nederlands taal, Francais, English
From Leuven, Belgium

Wall

Maarten De Cat
Just een goei fritteke gegeten van bij @ frituur sportcentrum.
See Translation

Share · 16 hours ago near HEverlee, Brabant ·

Annelies Vansantvoet likes this.

Maarten De Cat
Freezing to work!!!

Share · February 8 at 6:31am near Everlee, Brabant ·

Decremer Johan likes this.

Maarten De Cat
likes a link.

Kom NU naar Den Dreef en voorkom een forfait-
nederland!
Zonet kregen wij telefoon van de
veiligheidsverantwoordelijke van OHL met een
rampzalige boodschap: Onder de ballon van de
veiligheidsboer is onlangs ontstaan dat beginnen
met een forfait. Komen we in een forfait-
nederland. En dat is geen schande. Onze club loopt de
boze traktatie op.

RECENT ACTIVITY

A Flor Dana y 29 amigos más
les gusta esto.

Me gusta
Carmen Fernandez-Gago

Formación y empleo

Empresas

Universidad de Málaga

Actividades e intereses

Otros

Feria de Málaga, Campero malagueño, Pampling
Marianne Busch

Doktorand at Ludwig Maximilian University of Munich

Wall

RECENT ACTIVITY

Marianne likes Ascens and LMU Alumni Informatik e.V.

There are no more posts to show.
Privacy on social networks
Privacy on social networks

- is a growing concern among the users of social networking sites, and their developers
Privacy on social networks

• is a growing concern among the users of social networking sites, and their developers

“I also understand that many people are just naturally skeptical of what it means for hundreds of millions of people to share so much personal information online, especially using any one service...” M. Zuckerberg. Nov 2011
Privacy on social networks

- is a growing concern among the users of social networking sites, and their developers

  “I also understand that many people are just naturally skeptical of what it means for hundreds of millions of people to share so much personal information online, especially using any one service...” M. Zuckerberg. Nov 2011

  “Many policies and procedures that are in operation are not formally documented. This should be remedy.” Irish Data Protection Commissioner. Dec 2011
Privacy on Facebook
Privacy on Facebook

- is difficult to understand
  e.g. when tagging policies and privacy settings conflict each other
Privacy on Facebook

- is difficult to understand
  e.g. when tagging policies and privacy settings conflict each other

- has been in a constant state of flux and is prompted to change again soon
Privacy on Facebook

- is difficult to understand
  e.g. when tagging policies and privacy settings conflict each other

- has been in a constant state of flux and is prompted to change again soon

- is only informally and partially described
Outline

• Social Networks
  - Facebook
  - Privacy
  - Example
• Research project
  - Goals
  - Requirements
• Preliminary results
• Research plan
Posting and Tagging
(from Facebook Help Center)
Posting and Tagging
(from Facebook Help Center)

• What is tagging and how does it work? A tag links a person (...) to something that you post.
Posting and Tagging
(from Facebook Help Center)

• What is tagging and how does it work? A tag links a person (...) to something that you post.

• When I tag someone in a photo or post, who can see it?
Posting and Tagging
(from Facebook Help Center)

- What is tagging and how does it work? A tag links a person (...) to something that you post.

- When I tag someone in a photo or post, who can see it?
  1. The audience you selected for your post
  2. Friends of the person you tagged (if the audience is set to ‘Friends’ or more)
Example (friendship)
Example (friendship)

Alice
Example (friendship)

Alice           Bob
Example (friendship)

Alice

Bob

Ted
Example (friendship)

Alice       Bob

Peter       Ted
Example (friendship)

Alice

Bob

Peter

Ted
Example (friendship)

Bob is friend of Alice and Ted

Alice ← Bob

Peter ← Ted
Example (friendship)

Bob is friend of Alice and Ted

Ted is friend of Peter
Example (friendship)

Bob is friend of Alice and Ted

Bob

Alice ←

Peter

Peter is not friend of Alice and Bob
Example (friendship)

- Alice is friends with Bob
- Ted is friends with Bob
- Ted is friends with Peter

- Peter is not friends with Alice and Bob
- Ted is not friends with Alice
Example
Example
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”

Bob tags Ted in this photo
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall?
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall? Yes
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”
Bob tags Ted in this photo
Can Peter see this photo in Alice’s wall? Yes

Scenario 2: Bob posts a photo in Alice’s wall where the default audience is set to ‘Friends’
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall? Yes

Scenario 2: Bob posts a photo in Alice’s wall where the default audience is set to ‘Friends’

Bob tags Ted in this photo
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall? Yes

Scenario 2: Bob posts a photo in Alice’s wall where the default audience is set to ‘Friends’

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall?
Example

Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall? Yes

Scenario 2: Bob posts a photo in Alice’s wall where the default audience is set to ‘Friends’

Bob tags Ted in this photo

Can Peter see this photo in Alice’s wall? No.
Scenario 1: Alice posts a photo in her wall and set its audience to “Friends”
Bob tags Ted in this photo
Can Peter see this photo in Alice’s wall? Yes

Scenario 2: Bob posts a photo in Alice’s wall where the default audience is set to ‘Friends’
Bob tags Ted in this photo
Can Peter see this photo in Alice’s wall? No. Why?
Outline

- Social Networks
  - Facebook
  - Privacy
  - Example
- Research project
  - Goals
  - Requirements
- Preliminary results
- Research plan
Goals
Goals

• develop a methodology for modeling and analyzing social networking privacy policies
Goals

• develop a methodology for modeling and analyzing social networking privacy policies
  - modeling means for us to use formal model with rigorous semantics
Goals

• develop a methodology for modeling and analyzing social networking privacy policies
  - modeling means for us to use formal model with rigorous semantics
  - analyzing means for us to use formal methods (as automated as possible)
Goals

• develop a methodology for modeling and analyzing social networking privacy policies
  - modeling means for us to use formal model with rigorous semantics
  - analyzing means for us to use formal methods (as automated as possible)

• validate this methodology with a case study: modeling and analyzing Facebook’s privacy policy
Requirements
Requirements

• [modeling] it is crucial to use a language able to formalize fine-grained access control policies (dynamic access control)
Requirements

• [modeling] it is crucial to use a language able to formalize fine-grained access control policies (dynamic access control)
E.g. Can Peter see a photo in Alice’s wall if Peter is a friend of Alice?
Requirements

- [modeling] it is crucial to use a language able to formalize fine-grained access control policies (dynamic access control)

E.g. Can Peter see a photo in Alice’s wall if Peter is a friend of Alice? simple RBAC is not sufficient
Requirements

• [modeling] it is crucial to use a language able to formalize fine-grained access control policies (dynamic access control)
  E.g. Can Peter see a photo in Alice’s wall if Peter is a friend of Alice?
  simple RBAC is not sufficient

• [analyzing] it is crucial to use a language with a formal semantics
Requirements

- [modeling] it is crucial to use a language able to formalize fine-grained access control policies (dynamic access control)
  E.g. Can Peter see a photo in Alice’s wall if Peter is a friend of Alice? simple RBAC is not sufficient

- [analyzing] it is crucial to use a language with a formal semantics
  E.g. XACML currently lacks of a formal semantics
SecureUML
SecureUML

• formal language for modeling fine-grained access control policies, both static and dynamic
SecureUML

- formal language for modeling fine-grained access control policies, both static and dynamic
  - dynamic access control policies depend on the run-time satisfaction of authorization constraints
OCL
OCL

• a strongly typed declarative language
OCL

• a strongly typed declarative language

• using OCL you can:
OCL

• a strongly typed declarative language

• using OCL you can:
  
  - refer to any, some, or all the elements in a scenario
OCL

- a strongly typed declarative language
- using OCL you can:
  - refer to any, some, or all the elements in a scenario
  - refer to the value of any properties of any element in a scenario
OCL

• a strongly typed declarative language

• using OCL you can:
  - refer to any, some, or all the elements in a scenario
  - refer to the value of any properties of any element in a scenario
  - perform standard operations on primitive types, or collections of elements in a scenario
Outline

• Social Networks
  - Facebook
  - Privacy
  - Example
• Research project
  - Goals
  - Requirements
• Preliminary results
• Research plan
Modeling Facebook
(posting and tagging)
Modeling Facebook
(posting and tagging)

- Facebook’s profile, walls, posts, photos, tags, etc, can be modeled as entities, and privacy settings can be modeled as attributes
Modeling Facebook
(posting and tagging)

- Facebook’s profile, walls, posts, photos, tags, etc, can be modeled as entities, and privacy settings can be modeled as attributes.

- Facebook’s privacy clauses are modeled using OCL.
Facebook data model
Facebook data model
Facebook

(authorization constraints)
Facebook

(authorization constraints)
Facebook

(authorization constraints)

- anybody (@caller) can read any post (@post) that is posted in his/her wall, independently of the creator of the post
Facebook

(authorization constraints)

- anybody (@caller) can read any post (@post) that is posted in his/her wall, independently of the creator of the post

@caller=@post.posted.profile
Facebook

(authorization constraints)

- anybody (@caller) can read any post (@post) that is posted in his/her wall, independently of the creator of the post
  \@caller=\@post.posted.profile

- anybody (@caller) can read any post (@post) that is posted in a wall when he/she is a friend of the owner of the wall and the audience selected is “Friends”
Facebook

(authorization constraints)

- anybody (@caller) can read any post (@post) that is posted in his/her wall, independently of the creator of the post
  \[\text{@caller} = \text{@post.posted.profile}\]

- anybody (@caller) can read any post (@post) that is posted in a wall when he/she is a friend of the owner of the wall and the audience selected is “Friends”
  \[\text{@post.posted.profile.friends} \rightarrow \text{includes(@caller)} \text{ and } \text{@post.audience} = \text{‘Friends’}\]
Facebook

(authorization constraints)
Facebook

(authorization constraints)
anybody (@caller) can read any post (@post) that is posted in a wall,
- when the audience selected is “Friends”,
- he/she is a friend of somebody tagged on the post,
- he/she is not blocked by the owner of the wall, and
- the owner of the post happens to be the creator of the post
anybody (@caller) can read any post (@post) that is posted in a wall,
- when the audience selected is “Friends”,
- he/she is a friend of somebody tagged on the post,
- he/she is not blocked by the owner of the wall, and
- the owner of the post happens to be the creator of the post

@post.audience='Friends' and
@post.tags.profiling.friends->includes(@caller)
and
@post.posted.profile.blocks->excludes(@caller)
and @post.posted.profile.profile=@post.creator
Outline

- Social Networks
  - Facebook
  - Privacy
- Research project
  - Goals
  - Requirements
- Preliminary results
- Research plan
Research plan
Research plan

- we have formalized, using SecureUML +OCL, the Facebook’s privacy policy for tagging and posting
Research plan

- we have formalized, using SecureUML +OCL, the Facebook’s privacy policy for tagging and posting
  - our understanding of this policy is based on the available information and our “experiments”.
Research plan (cont.)
Research plan (cont.)

• we plan to formalize the whole Facebook’s privacy policy (including for advertisements, applications, and so on).
Research plan (cont.)

• we plan to formalize the whole Facebook’s privacy policy (including for advertisements, applications, and so on).
  - we are trying to contact Facebook: no success yet :-) !!!
Research plan (cont.)

• we plan to formalize the whole Facebook’s privacy policy (including for advertisements, applications, and so on).
  - we are trying to contact Facebook: no success yet :-) !!!

• we plan to use existing mappings from OCL to first order logic to apply theorem proving tools to analyze the Facebook’s privacy policy.
Potential impact
Potential impact

- a tool for checking whether a person can see a post.
Potential impact

• a tool for checking whether a person can see a post.

• a tool for assessing the risk/posibility of a post becoming visible for a person
Potential impact

• a tool for checking whether a person can see a post.

• a tool for assessing the risk/posibility of a post becoming visible for a person.

• a tool for assessing the impact, on the visibility of a post, of a default privacy policy.
Thanks!!

Questions?