

Designing Privacy-Aware Social Networks: A Multi-Agent Approach

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1. Why Privacy? (1)

- March 20, 2010
- Keri and Kurt, New Albany, Indiana, U.S.A.¹
- Nashua, New Hampshire, U.S.A.
- Victor Rodriguez, Mario Rojas and Leonardo Barroso
- 50+ break-ins
- > \$100,000 ²

¹ <http://www.cbsnews.com/stories/2010/03/25/earlyshow/main6331796.shtml>

² <http://www.foxnews.com/scitech/2010/09/10/men-use-networking-site-burglary-ring>

1. Why Privacy? (2)



PLEASE ROB ME

Raising awareness about over-sharing

Check out our [guest blog post](#) on the CDT website.



I Can Stalk U

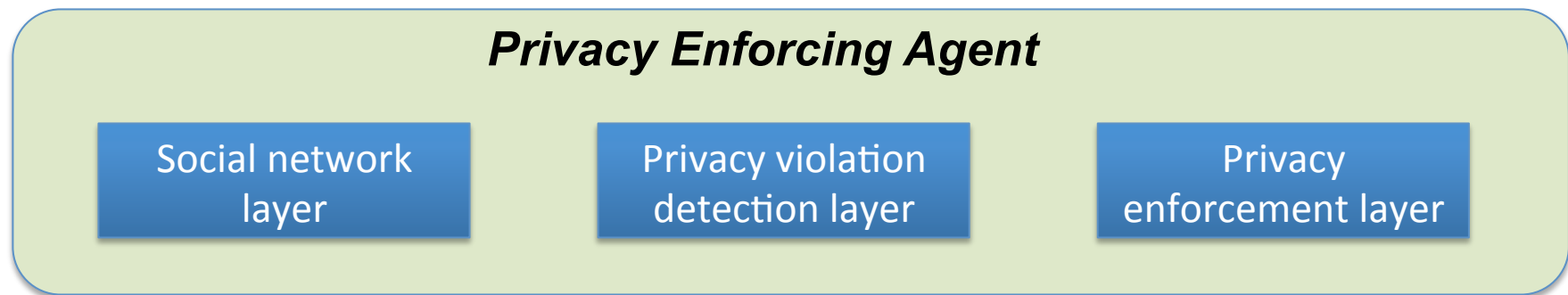
Raising awareness about inadvertent information sharing

2. Contextual Integrity

- H. Nissenbaum [Nissenbaum, 09]
- Privacy norms vary across and within social groups
- Contexts:
 - *Roles*
 - *Activities*
 - *Norms*
 - *Values (or goals)*
- Overlapping contexts
- Context-relative informational norms
 - *Contexts, actors, attributes, transmission principles*

3. PrivaCIAS (1)

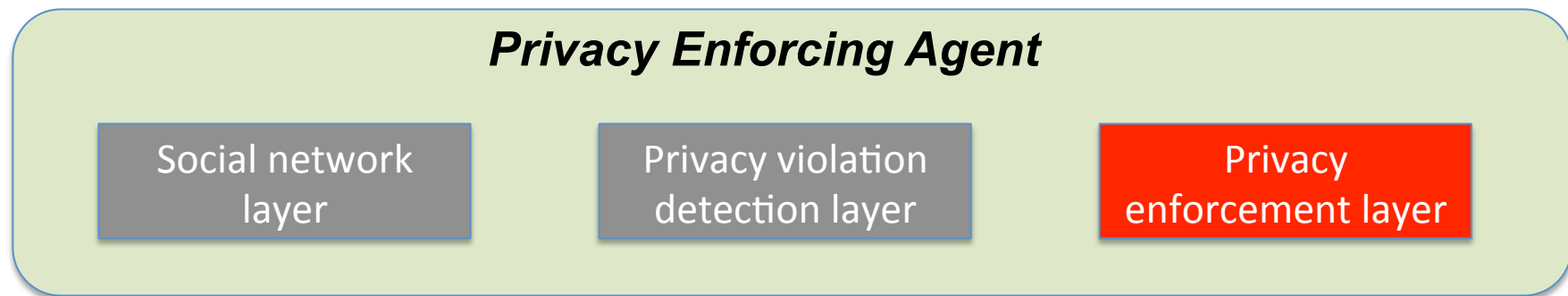
Privacy preservation in open and decentralized communities
[Krupa & Vercouter, 12]



3. PrivaCIAS (2)

Privacy preservation in open and decentralized communities

[Krupa & Vercouter, 12]

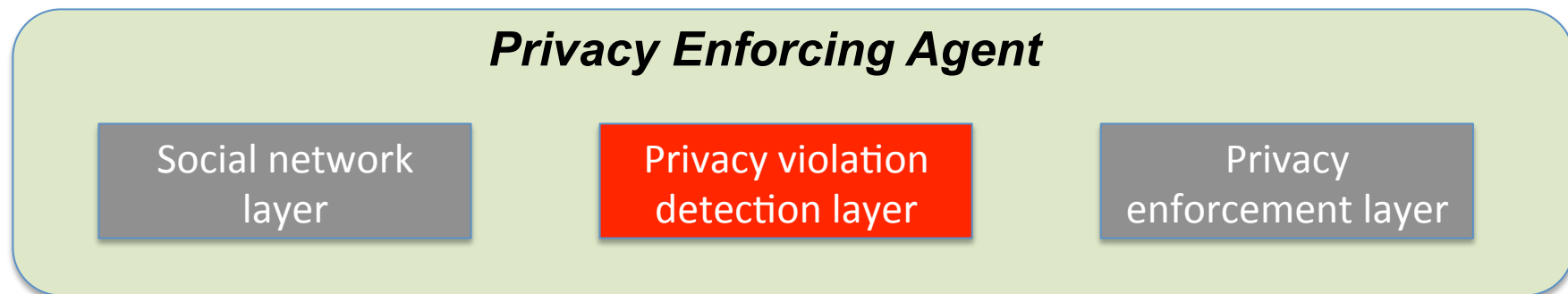


- *Privacy Enforcing Norms (PENs)*
 1. *Respect the Appropriateness Laws.*
 2. *Sign the transmission chain before sending a message.*
 3. *Do not send information to distrusted agents.*
 4. *Delete information from violating or distrusted agents.*
 5. *Punish agents violating this norms (this one excluded).*

3. PrivaCIAS (3)

Privacy preservation in open and decentralized communities

[Krupa & Vercouter, 12]



- *Appropriateness Laws (A-Laws)*
 1. *The transmission context corresponds to the nature of the transmitted information.*
 2. *The users involved in the transaction enact roles in the transmission context.*
 3. ***Receiving users do not have incompatible relationships with the target.***
 4. *The target's preferences (policies) are respected.*

4. Incompatible Relationships (1)

- *Relationship*: the sum of all aspects defining the interaction in all overlapping contexts between two individuals
- *Relationship incompatibility*: conflict between two or more overlapping contexts

4. Incompatible Relationships (2)

Defining Contexts

- Moise organisational model [Hubner et al, 07]
- Structural dimension
 - *Roles*
 - *Links*
 - $l = \langle s, d, t, b \rangle$
 - *authority, communication, acquaintance*
 - Dynamic acquaintance links
- Normative dimension
 - Information types
 - $n = \langle l, I', d, dm \rangle$

$$C = \langle s, R, L, I, N \rangle$$

4. Incompatible Relationships (3)

Defining Contexts

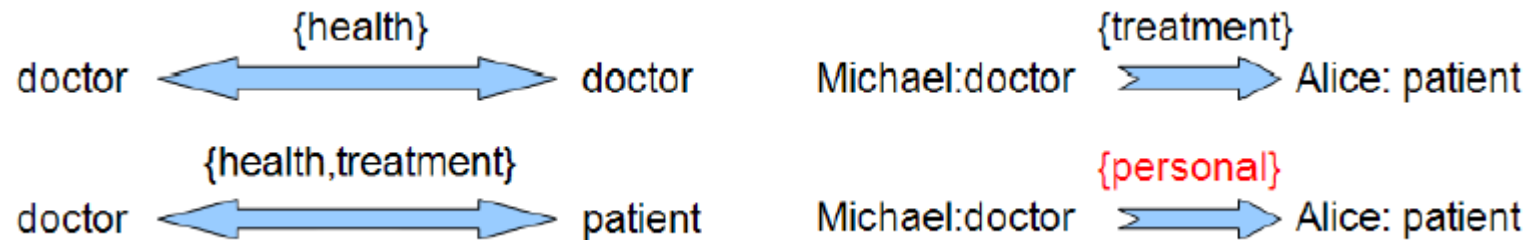


Figure 1. A medical context.

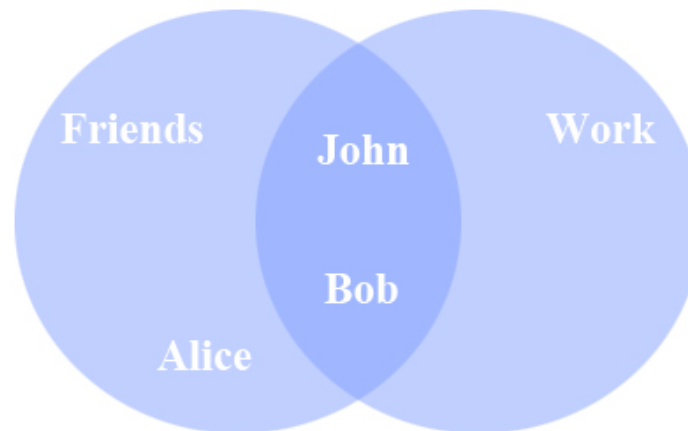


Figure 2: Overlapping contexts.

4. Incompatible Relationships (4)

Detecting Conflicts

- *Permission, obligation*
- *Prohibition*: defined by omission
- Given a transmission between 2 agents, we define conflicts:
 - given the users are connected through an authority link in one context and through a communication link in another, if the transmission is prohibited in the former context (i.e. on the authority link) and is permitted in the latter, a *first degree conflict* is triggered;
 - given the users are connected through communication links in two different contexts, and in one context the transmission is obliged, while in the other it is prohibited, a *second degree conflict* is triggered.

4. Incompatible Relationships (5)

The (target, receiver) relationship

- Given transmission t
- For all *known* overlapping contexts
 - there is at least one such known context in which the target and the receiver enact roles connected through a communication link;
 - there is no such context in which transmission t is made on an authority link and is prohibited (includes checking for first degree conflicts);
 - given a second degree conflict between the target and the receiver, the total number of contexts that support t (*i.e.* in which t is permitted) is greater than the total number of contexts in which t is prohibited.

5. A Photo-Sharing Social Network (1)

- Agent technologies:
 - Jason [Bordini et al, 07], CArtAgO¹, Moise (JaCaMo)²
 - JaCa-Android³

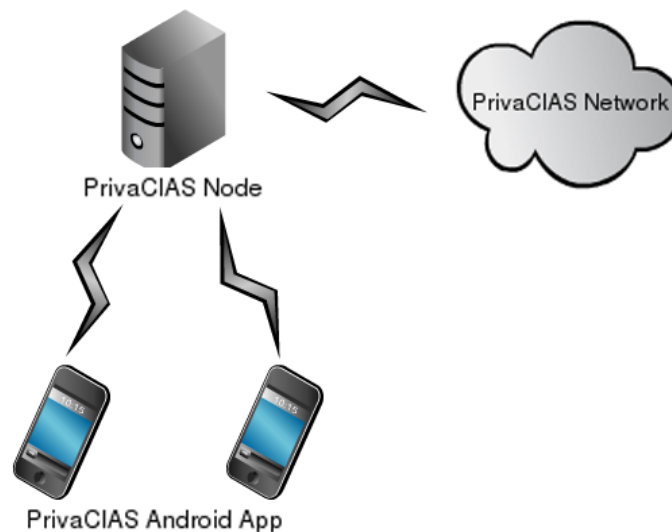


Figure 3: The PrivaCIAS Photo-Sharing Social Network for Android.

¹ <http://cartago.sourceforge.net>

² <http://jacamo.sourceforge.net>

³ <http://jaca-android.sourceforge.net>

5. A Photo-Sharing Social Network (2)

The PrivaCIAS Node

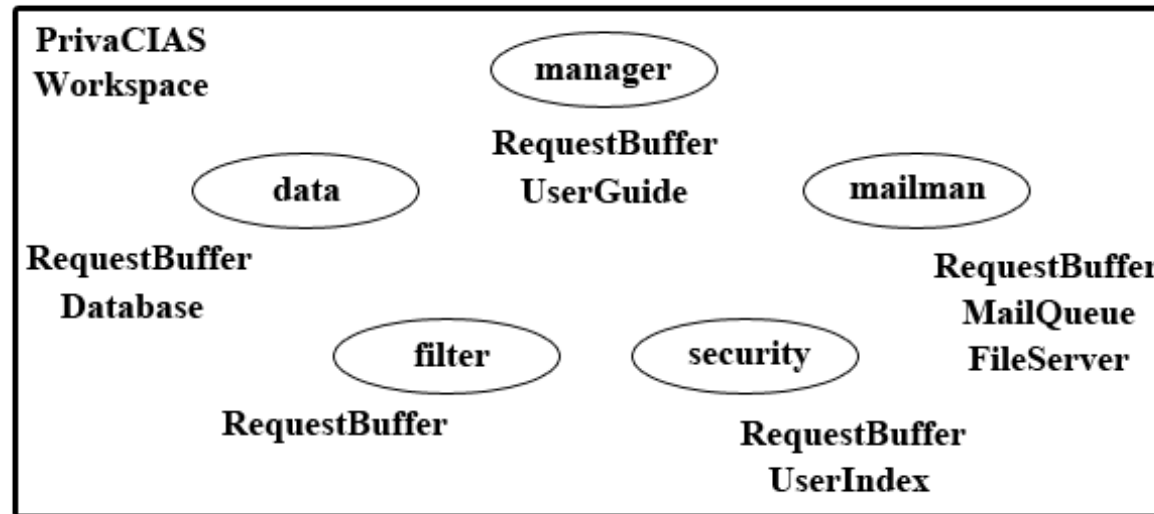


Figure 4: The PrivaCIAS Node organization.

5. A Photo-Sharing Social Network (3)

The PrivaCIAS Android App

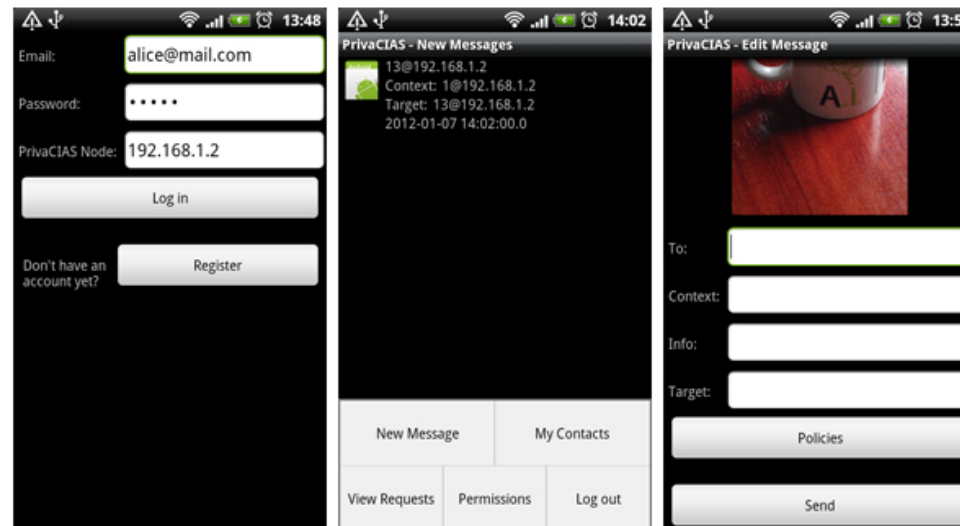


Figure 5: The PrivaCIAS Android App.

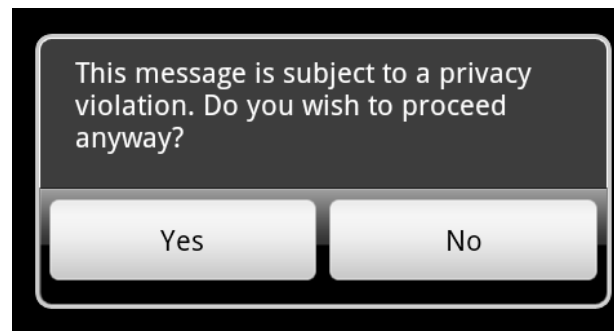


Figure 6: A privacy violation warning.

6. Evaluation (1)

- Context knowledge decentralization
 - *Public vs. private* contexts
 - Sharing knowledge among roles inside a private context
 - Sharing knowledge with individuals inside/outside a private context
- Automatic conflict detection

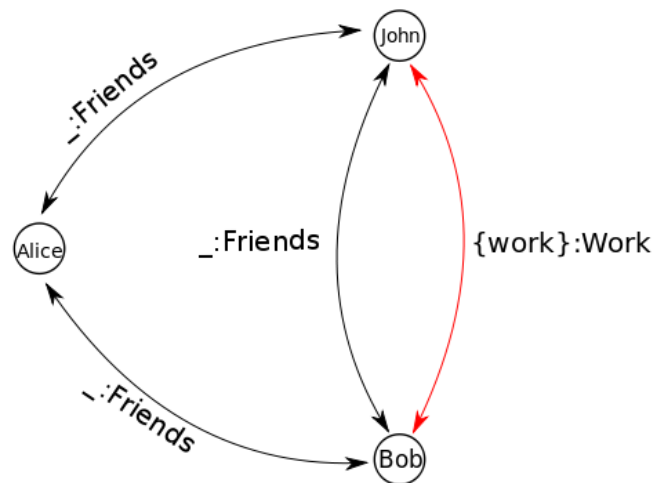


Figure 7: Detecting conflicts.

6. Evaluation (2)

- First and second degree conflicts
 - *First degree conflicts*: emphasize the sensitiveness of a relationship
 - *Second degree conflicts*: emphasize the receivers of some given information
- The PrivaCIAS Photo-Sharing Social Network
 - Proof of concept application for the PrivaCIAS framework
 - JaCaMo
 - All the basic features of a social networking service

7. Conclusions

- Social contexts come in great variety and evolve over time
- Proactive approach for detecting incompatible relationships
- Developed a real-life photo-sharing social network
- Shift the burden of privacy preservation to organization designers
- Developing applications that improve user experience in social networks has already proven to be a market in itself

Thank you!
Q&A

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