pamp.devteam@gmail.com

Privacy as a Service (PaaS)

Enabling Privacy Interoperability in Social Networks

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The team

IBM Almaden Research Center

- Tyrone Grandison

- Kun Liu

- Michael Maximilien

IBM Silicon Valley Lab

- Sherry Guo

- Dwayne Richardson

- Tony Sun

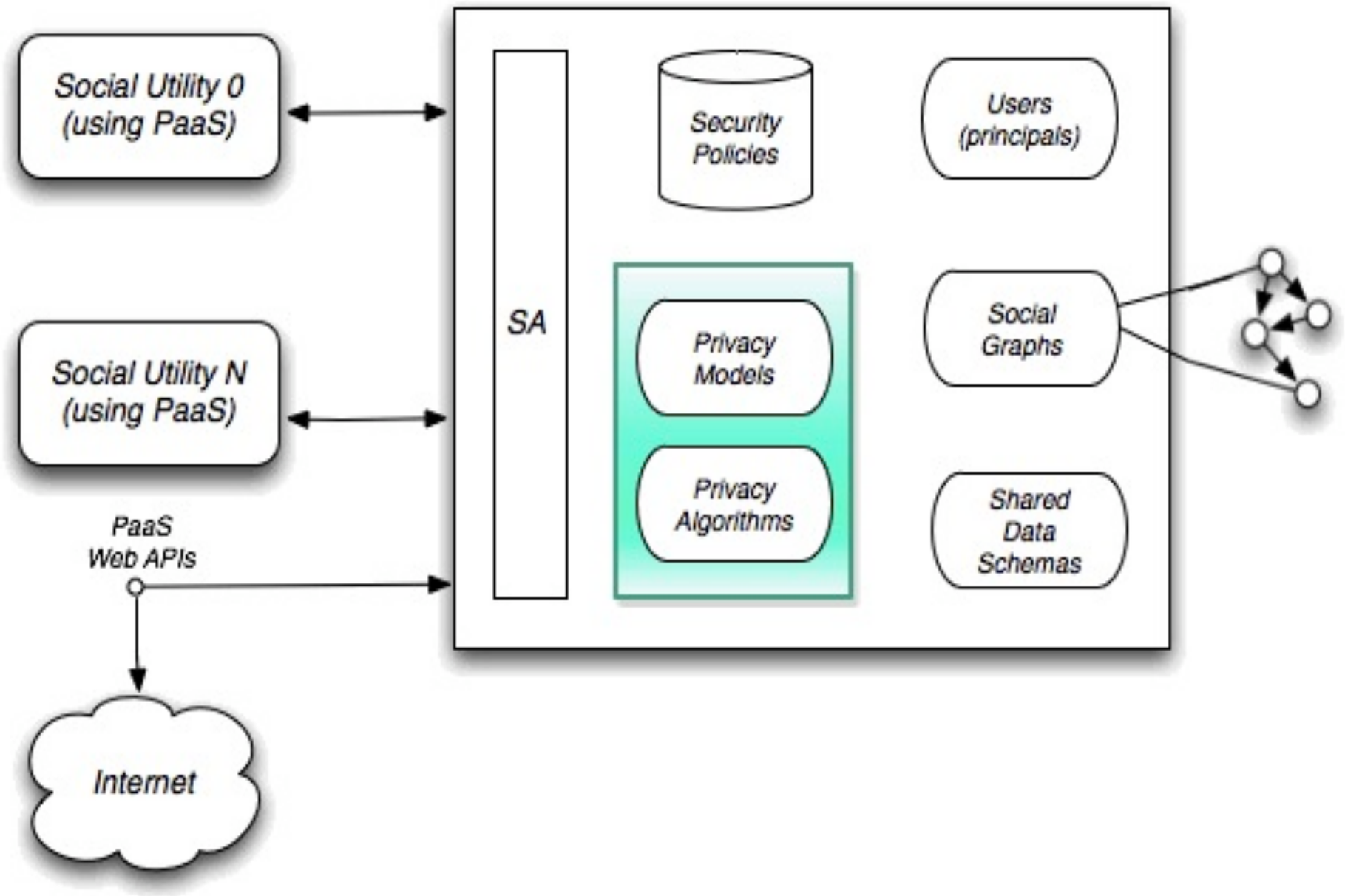
Motivation, Goal, and Assumptions

- **Motivation**
  - **Real world social relationships are being mirrored in online social networks**
  - The consequences of **sharing** the current level of information is **either unknown, under-estimated or ignored**

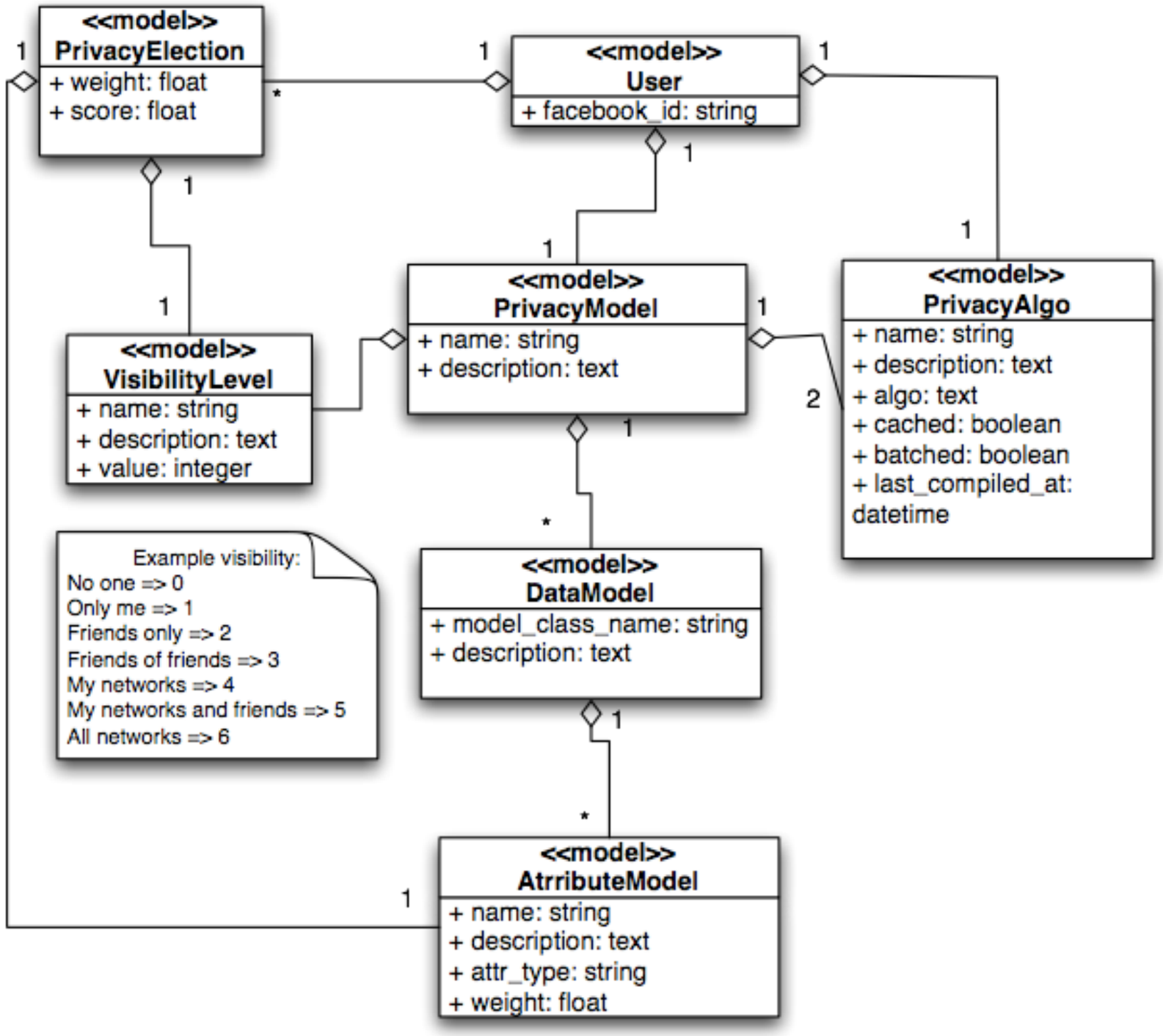
- **Goal**
  - To develop a platform that allows users to manage their privacy settings **across social networks**
  - **Reducing the cognitive burden** on a user; leveraging the **wisdom of his crowd**

- **Assumptions**
  - User **owns** data, has **full rights** over data, and has **free will** to change settings
  - The **system determines and recommends safer privacy states**

Privacy-As-A-Service (PaaS): The Architecture



PaaS – The Data Model

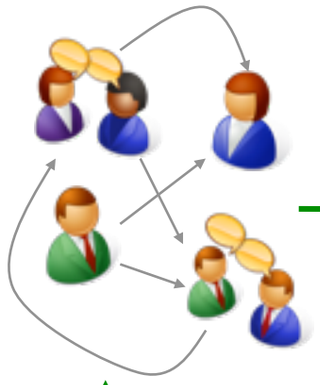


PaaS – The Privacy Risk Score (Overview)

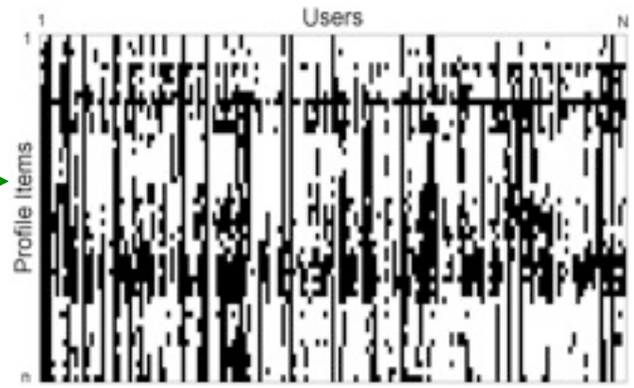
- What is it?
  - It is a **credit-score-like indicator** to measure the **potential privacy risks** of online social-networking users.

- Why is the Privacy Risk Score (PRS) Useful?
  - It aims to **boost public awareness of privacy**, and to **reduce the cognitive burden** on end-users in managing their privacy settings.
    - Active monitoring of privacy state, e.g., a PrivacyOmeter
    - Privacy Risk Monitoring & Early Detection system
    - Comparison with the rest of population and or with other populations
    - Privacy Recommendation & Propagation
    - Help sociologists to study online behaviors, information propagation, etc.

Privacy Risk Score Life Cycle



Extract Privacy Settings



Privacy Risk Score Computation

- sensitivity of profile items
- visibility of profile items
- attitude of users

privacy risk scores of users

Utilize Privacy Risk Scores

- privacy risk monitoring & early alarm

- compare with the rest of population
- boost public awareness of privacy

- privacy propagation & recommendation
- reduce cognitive burden of privacy management

- help sociologists to study online behaviors

How is Privacy Score Calculated? – Basic Premises

- **Sensitivity**: The more sensitive the information revealed by a user, the higher his privacy risk.

> ***mother's maiden name*** is more sensitive than ***mobile-phone number***

- **Visibility**: The wider the information about a user spreads, the higher his privacy risk.

> home address known ***by everyone*** poses higher risks than ***by friends only***

- **Group Invariance**: Privacy risk scores calculated within different social networks are comparable.
  - *Facebook*, *LinkedIn* and *MySpace* users can compare their scores
- **Model fitness:** The mathematical model used to compute the scores fit the observed data well
  - the model passes χ^2 goodness-of-fit test.

Interesting Results from User Study

Survey

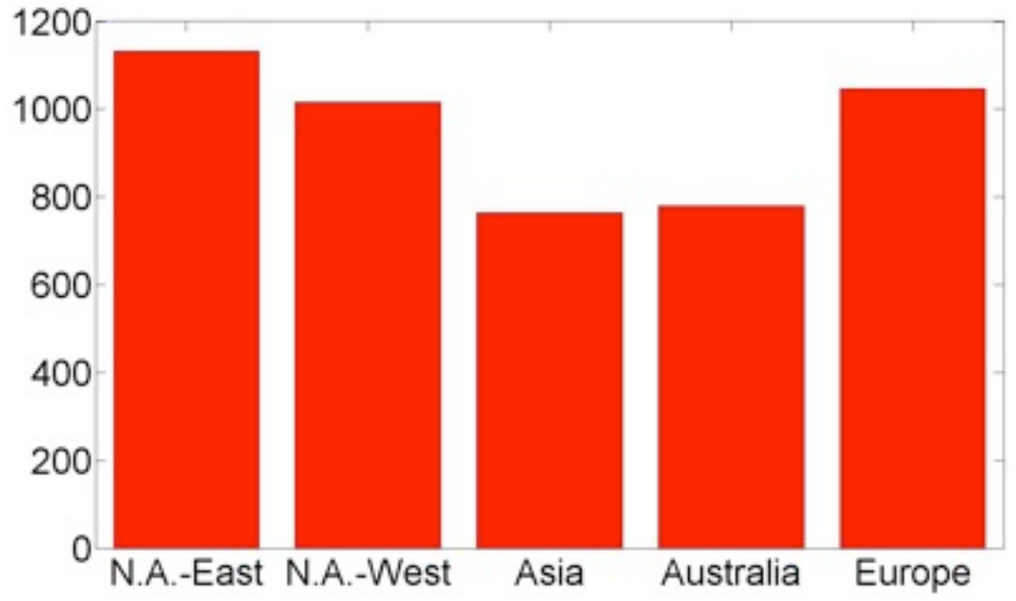
We collected the information-sharing preferences of 153 users on 49 profile items such as *name, gender, birthday, political views, address, phone number, degree, job*, etc.

Statistics

- 49 profile items
- 153 users from 18 countries/areas
- 53.3% are male and 46.7% are female
- 75.4% are in the age of 23 to 39
- 91.6% hold a college degree or higher
- 76.0% spend 4+ hours online per day

Sensitivity of The Profile Items Computed by IRT Model

Average Privacy Scores Grouped by Geographical Regions



Proof-of-Concept Implementation

- **Facebook app implemented in Ruby and Rails**
  - Rails 2.3.2 with mongrel using Facebooker
  - DB2 and MySQL databases
  - BackgroundRb and Skynet Map Reduce framework

- **acts_as_privacy_enabled**
  - Plugin to *privatize* any model's attributes
  - Uses metaprogramming to intercept ActiveRecord attribute getters
  - No changes to view ERBs

- **Speed of development**
  - Four developers:
    - one experienced Ruby/Rails and Facebook developer as coach
    - three completely new to Ruby and Rails and Facebook development
  - Developed in three months

Demo

Questions?

http://maximilien.org

PIMP photo from: http://pimphats.com