Graphing webs of trust

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Outline

- Relationships are everywhere
- Graphs can be used to express them
- Popular with PKI

GnuPG

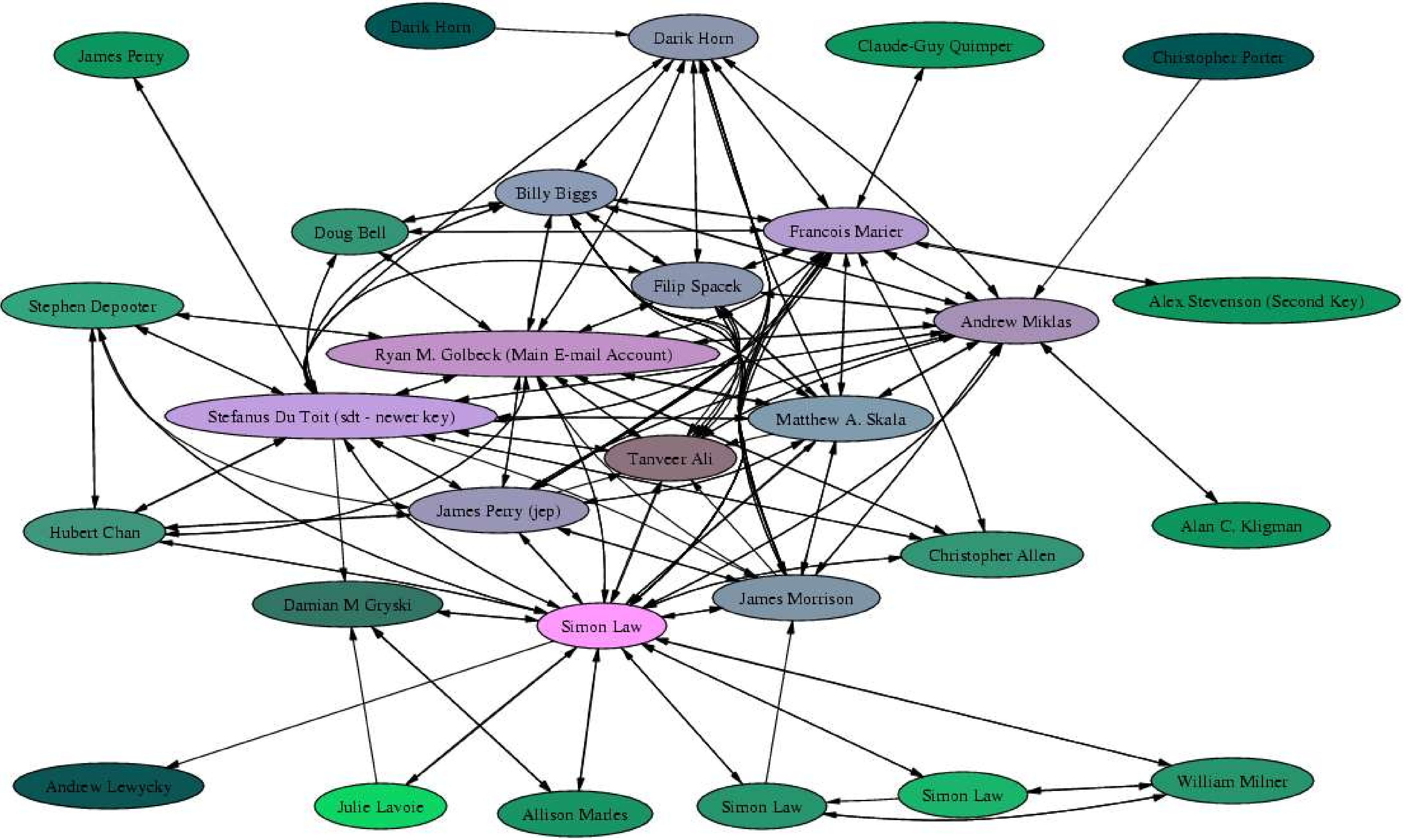
- Public key cryptography
- Keys are signed to verify identity

```
pub  1024D/7796A60B 2001-07-03 Simon Law <sfllaw@debian.org>
sig         C326D07F 2002-11-28   Allison Marles <apmarles@uwaterloo.ca>
sig         E86453B8 2003-03-16   Gary Wong <gtw@gnu.org>
sig         2A4D17FE 2003-03-16   Kurt B. Kaiser <kbk@shore.net>
sig         A7632721 2003-03-19   Avery Pennarun <apenwarr@nit.ca>
                           .
                           .
                           .
```

- Trust is distributed through a web

Using gpg

- Importing
  ```
  gpg --recv-keys 7796A60B
  ```
- Listing
  ```
  gpg --list-keys
  ```
- Signatures
  ```
  gpg --list-sigs 7796A60B
  ```


Darik Horn
Darik Horn
James Perry
Claude-Guy Quimper
Christopher Porter
Billy Biggs
Doug Bell
Francois Marier
Filip Spacek
Stephen Depooter
Alex Stevenson (Second Key)
Andrew Miklas
Ryan M. Golbeck (Main E-mail Account)
Stefanus Du Toit (sdt - newer key)
Matthew A. Skala
Tanveer Ali
James Perry (jep)
Hubert Chan
Alan C. Kligman
Christopher Allen
Damian M Gryski
James Morrison
Simon Law
Andrew Lewycky
Julie Lavoie
Allison Marles
Simon Law
Simon Law
William Milner

Graphing

- GnuPG - www.gnupg.org
- sig2dot - www.chaosreigns.com/code/sig2dot
- Springgraph - www.chaosreigns.com/code/springgraph

- Graphviz - www.research.att.com/sw/tools/graphviz/
- Imagemagick - www.imagemagick.org
- GhostScript - www.ghostscript.com

dotty

- Format created by AT&T
- Used to express graphs
- sig2dot turns gpg output into dotty

Springgraph / Graphviz

- Graphviz was original software
- `dot` and `neato`
- Non-free

- Springgraph written as replacement
- Uglier output

Makefile

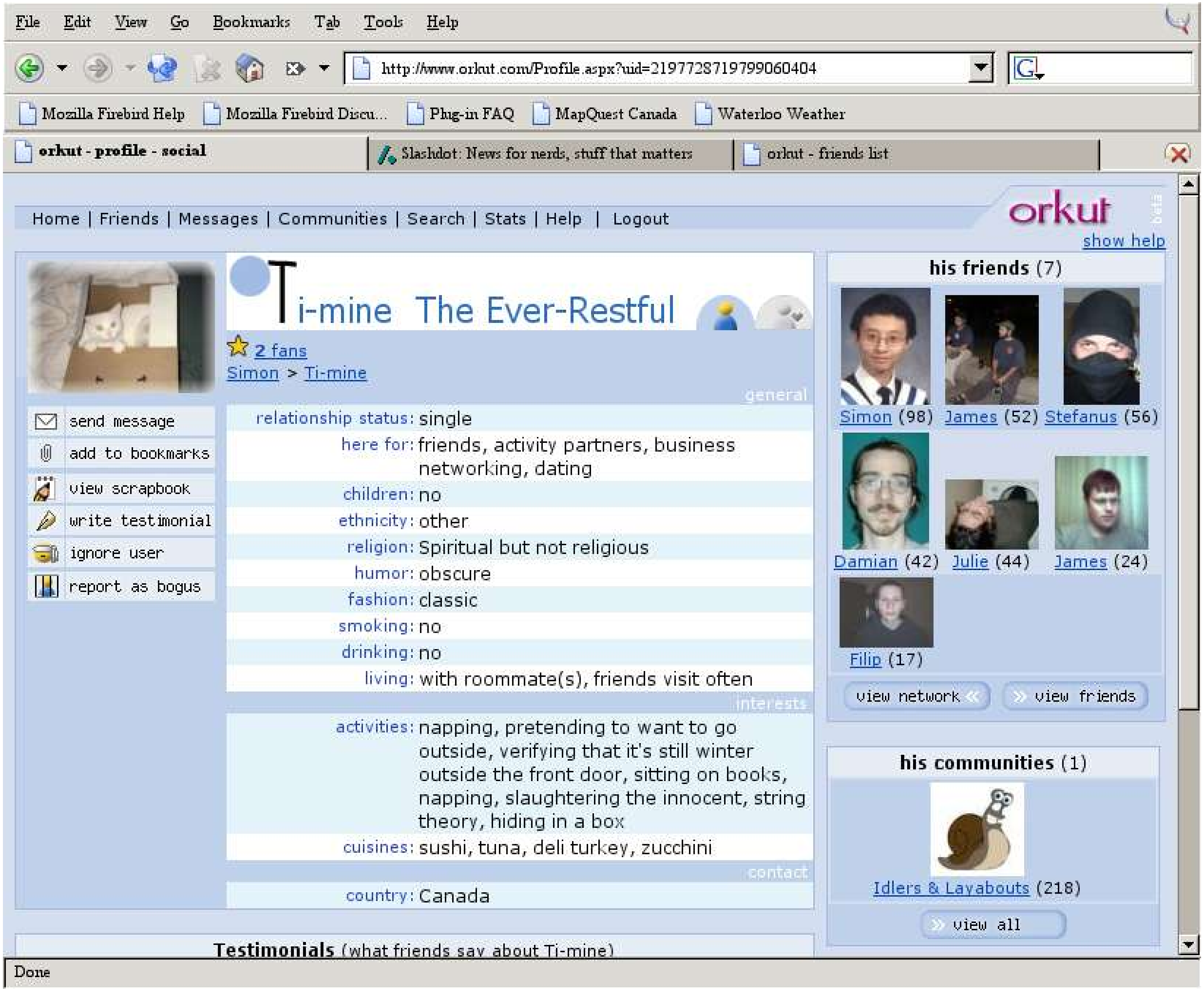
- Automated graph generation
- Choose keys
  ```
  vi small.keys
  ```
- Generate graph
  ```
  make small.ps
  ```
- www.law.yi.org/~sfllaw/webotrust/

orkut

- Friendship networks:
  - LiveJournal
  - Orkut
- No API – Bad web services
- Screenscraping to the rescue

WWW::Mechanize

- Perl module for screen-scraping
- Extract information through brute-force
- Python programmers have Mechanize



Ti-mine The Ever-Restful

☆ 2 fans

Simon > Ti-mine

general

relationship status: single

here for: friends, activity partners, business networking, dating

children: no

ethnicity: other

religion: Spiritual but not religious

humor: obscure

fashion: classic

smoking: no

drinking: no

living: with roommate(s), friends visit often

interests

activities: napping, pretending to want to go outside, verifying that it's still winter outside the front door, sitting on books, napping, slaughtering the innocent, string theory, hiding in a box

cuisines: sushi, tuna, deli turkey, zucchini

contact

country: Canada

Testimonials (what friends say about Ti-mine)

his friends (7)

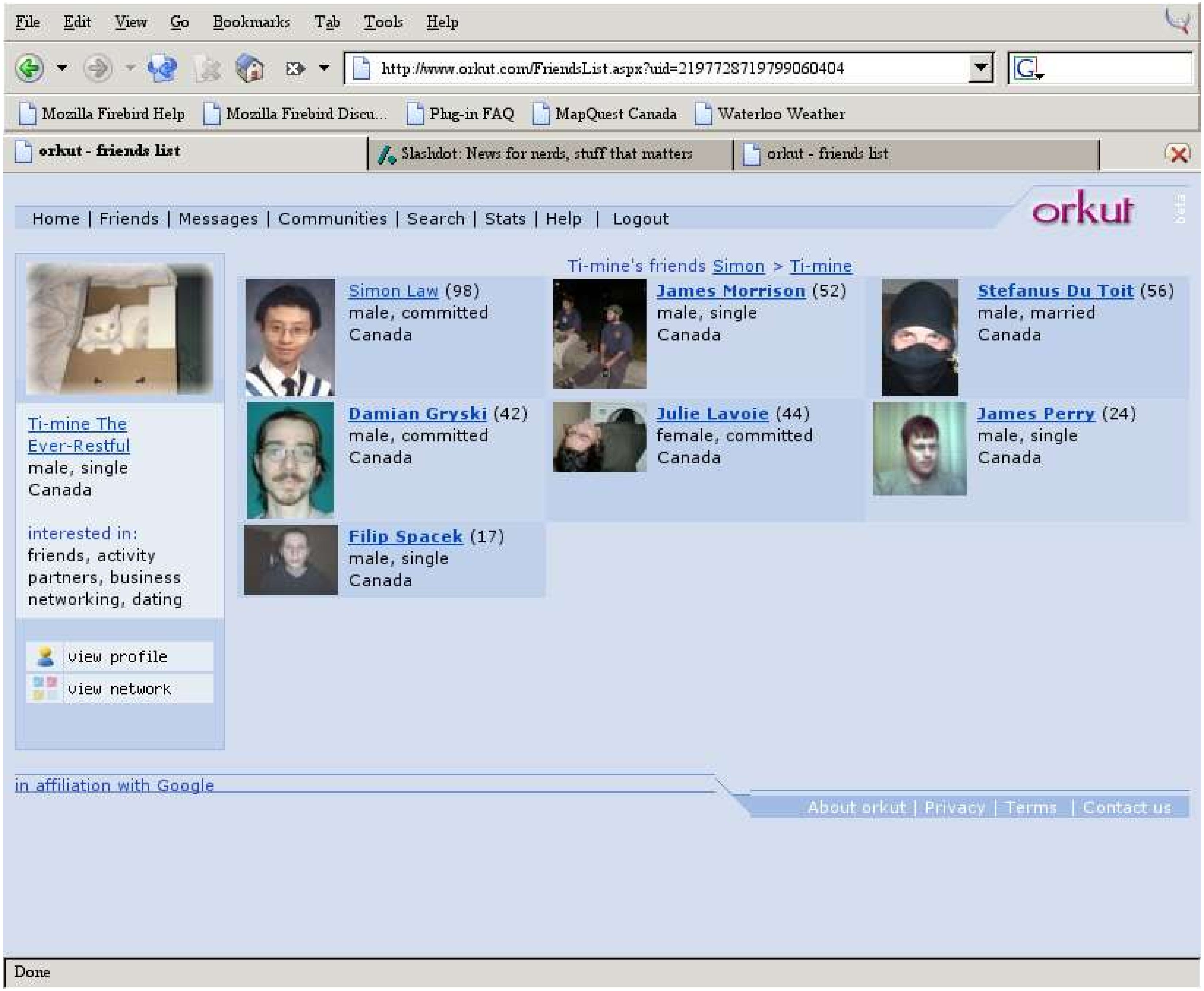
Simon (98) James (52) Stefanus (56)

Damian (42) Julie (44) James (24)

Filip (17)

his communities (1)

Idlers & Layabouts (218)


File Edit View Go Bookmarks Tab Tools Help
http://www.orkut.com/FriendsList.aspx?uid=2197728719799060404
Mozilla Firebird Help
Mozilla Firebird Discu...
Plug-in FAQ
MapQuest Canada
Waterloo Weather
orkut - friends list
Slashdot: News for nerds, stuff that matters
orkut - friends list
Home | Friends | Messages | Communities | Search | Stats | Help | Logout
orkut
beta

Ti-mine The Ever-Restful
male, single
Canada

interested in:
friends, activity partners, business networking, dating

view profile
view network

Ti-mine's friends Simon > Ti-mine

Simon Law (98)
male, committed
Canada

James Morrison (52)
male, single
Canada

Stefanus Du Toit (56)
male, married
Canada

Damian Gryski (42)
male, committed
Canada

Julie Lavoie (44)
female, committed
Canada

James Perry (24)
male, single
Canada

Filip Spacek (17)
male, single
Canada

in affiliation with Google
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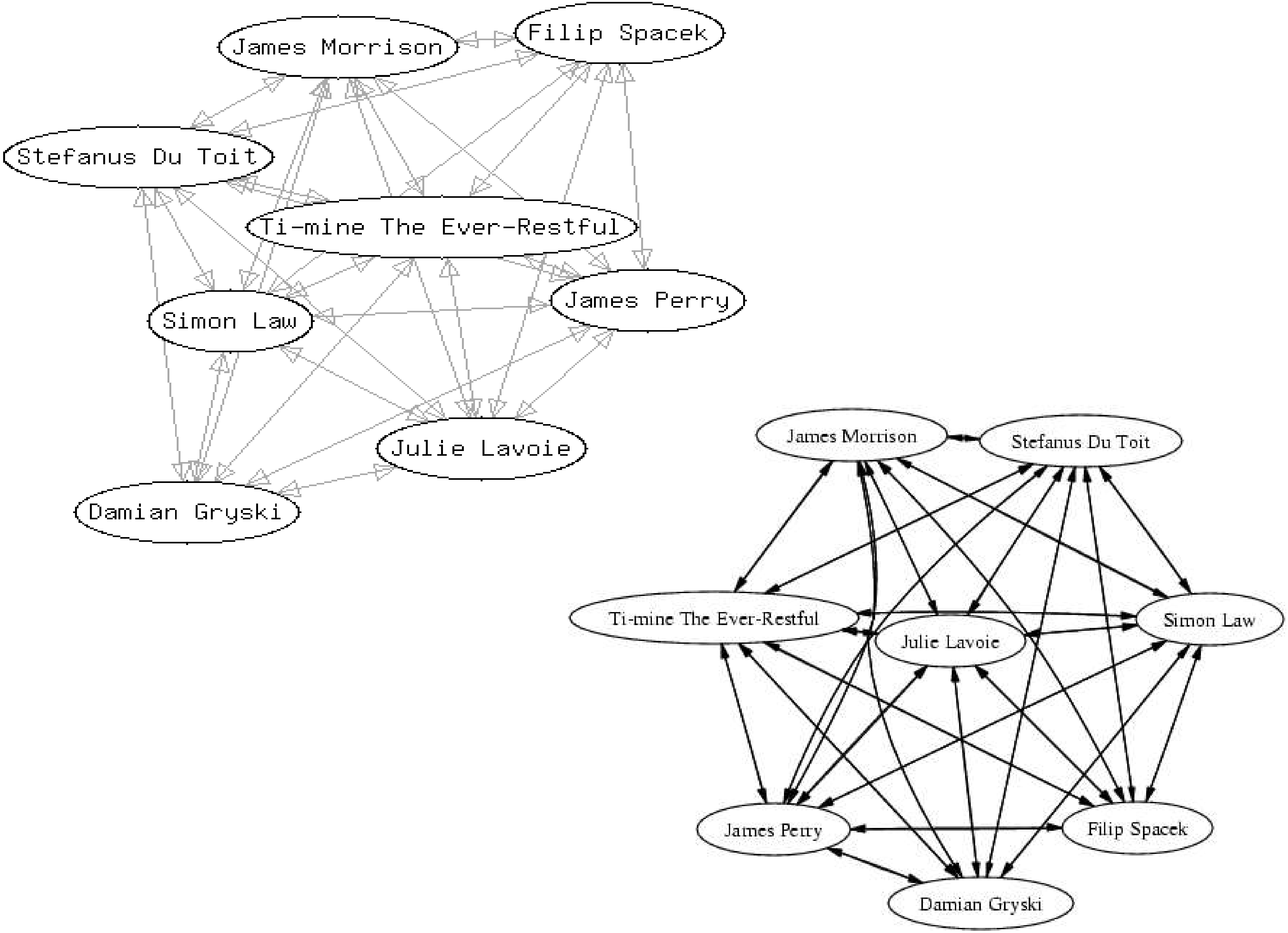
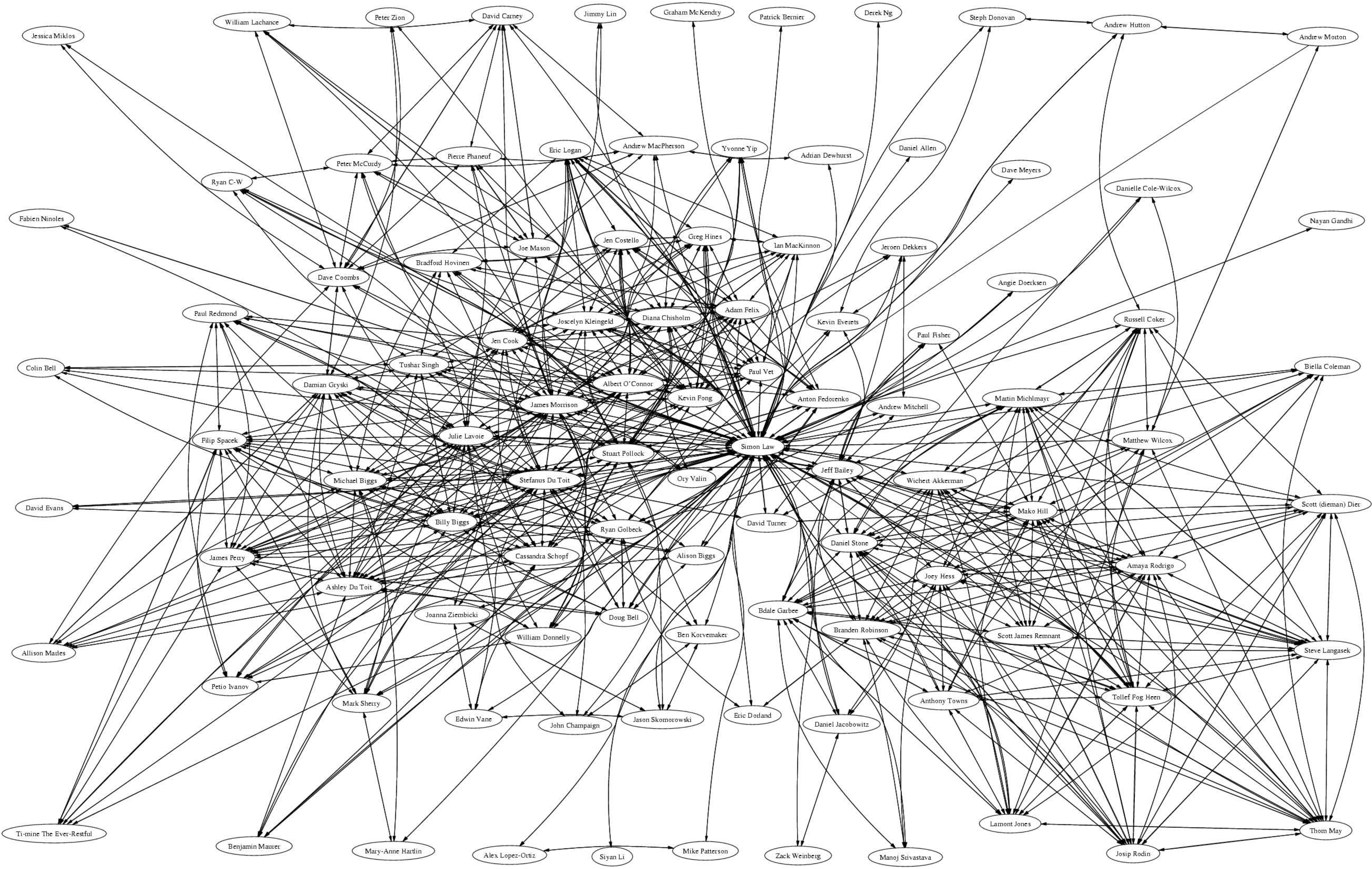
Done

orkut2dot

- www.law.yi.org/~sfllaw/orkut/
- Login to Orkut
- Grab friends list
- Express friend relationships as dotty

```
digraph "orkut-friends" {
overlap=scale
splines=true
sep=.1
"2197728719799060404" [label="Ti-mine The Ever-Restful"]
"12844995540901076604" [label="Simon Law"]
"18382718694854960532" [label="Damian Gryski"]
"8816214453087733190" [label="James Morrison"]
"18319254315441690879" [label="Stefanus Du Toit"]
"4164908175145436156" [label="Julie Lavoie"]
"15146410253928514438" [label="James Perry"]
"9627834213480323082" [label="Filip Spacek"]
{ "12844995540901076604" "18382718694854960532" "8816214453087733190"
"18319254315441690879" "4164908175145436156" "15146410253928514438"
"9627834213480323082" } -> "2197728719799060404"
{ "18382718694854960532" "8816214453087733190" "18319254315441690879"
"4164908175145436156" "15146410253928514438" "9627834213480323082" "2197728719799060404" }
-> "12844995540901076604"
{ "12844995540901076604" "8816214453087733190" "18319254315441690879"
"4164908175145436156" "15146410253928514438" "2197728719799060404" } ->
"18382718694854960532"
{ "12844995540901076604" "18382718694854960532" "18319254315441690879"
"4164908175145436156" "15146410253928514438" "9627834213480323082" "2197728719799060404" }
-> "8816214453087733190"
{ "12844995540901076604" "18382718694854960532" "8816214453087733190"
"4164908175145436156" "15146410253928514438" "9627834213480323082" "2197728719799060404" }
-> "18319254315441690879"
{ "12844995540901076604" "18382718694854960532" "8816214453087733190"
"18319254315441690879" "15146410253928514438" "9627834213480323082"
"2197728719799060404" } -> "4164908175145436156"
{ "12844995540901076604" "18382718694854960532" "8816214453087733190"
"18319254315441690879" "4164908175145436156" "9627834213480323082" "2197728719799060404" }
-> "15146410253928514438"
{ "12844995540901076604" "8816214453087733190" "18319254315441690879"
"4164908175145436156" "15146410253928514438" "2197728719799060404" } ->
"9627834213480323082"
}
```


James Morrison
Filip Spacek
Stefanus Du Toit
Ti-mine The Ever-Restful
James Perry
Simon Law
Julie Lavoie
Damian Gryski
James Morrison
Stefanus Du Toit
Ti-mine The Ever-Restful
Julie Lavoie
Simon Law
James Perry
Filip Spacek
Damian Gryski


Graham McKendry
Jimmy Lin
David Carney
Derek Ng
Peter Zion
Patrick Bernier
Steph Donovan
William Lachance
Andrew Hutton
Jessica Miklos
Andrew Morton
Andrew MacPherson
Yvonne Yip
Eric Logan
Daniel Allen
Adrian Dewhurst
Pierre Phaneuf
Peter McCurdy
Dave Meyers
Ryan C-W
Danielle Cole-Wilcox
Fabien Ninoles
Nayan Gandhi
Greg Hines
Jen Costello
Ian MacKinnon
Joe Mason
Jeroen Dekkers
Bradford Hovinen
Dave Coombs
Angie Doerksen
Adam Felix
Paul Redmond
Diana Chisholm
Joscelyn Kleingeld
Kevin Everets
Russell Coker
Jen Cook
Paul Fisher
Colin Bell
Tushar Singh
Paul Vet
Biella Coleman
Damian Gryski
Albert O'Connor
Kevin Fong
Anton Fedorenko
Martin Michlmayr
James Morrison
Andrew Mitchell
Filip Spacek
Julie Lavoie
Matthew Wilcox
Simon Law
Stuart Pollock
Jeff Bailey
Michael Biggs
Stefanus Du Toit
Ory Valin
Wichert Akkerman
David Evans
Scott (dieman) Dier
Mako Hill
Billy Biggs
Ryan Golbeck
David Turner
Daniel Stone
James Perry
Cassandra Schopf
Alison Biggs
Amaya Rodrigo
Joey Hess
Ashley Du Toit
Bdale Garbee
Joanna Ziembicki
Doug Bell
Branden Robinson
William Donnelly
Ben Korvemaker
Scott James Remnant
Allison Marles
Steve Langasek
Petio Ivanov
Tollef Fog Heen
Mark Sherry
Anthony Towns
Edwin Vane
John Champaign
Jason Skomorowski
Eric Dorland
Daniel Jacobowitz
Lamont Jones
Thom May
Ti-mine The Ever-Restful
Benjamin Maurer
Mary-Anne Hartlin
Alex Lopez-Ortiz
Siyan Li
Mike Patterson
Zack Weinberg
Manoj Srivastava
Josip Rodin

Conclusion

- Graphs can be used to analyse relationships
- Standard format: dotty
- Springgraph / Graphviz
- WWW::Mechanize
- www.law.yi.org/~sfllaw/talks/