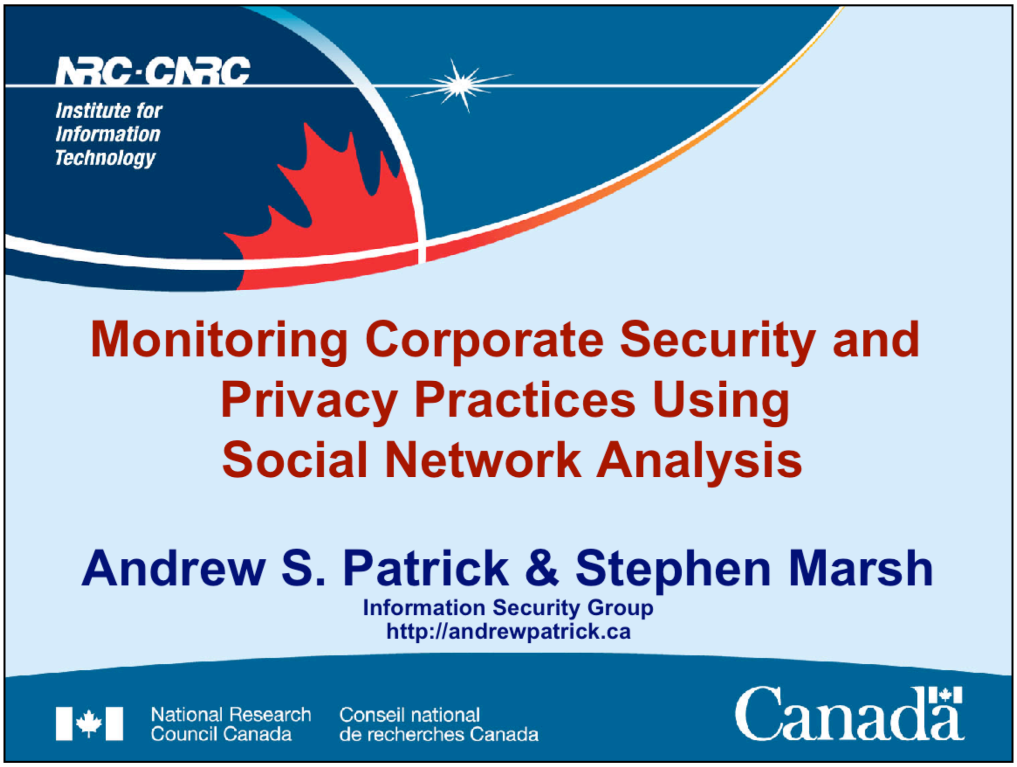

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Monitoring Corporate Security and Privacy Practices Using Social Network Analysis

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http://andrewpatrick.ca

National Research Council Canada

Conseil national de recherches Canada

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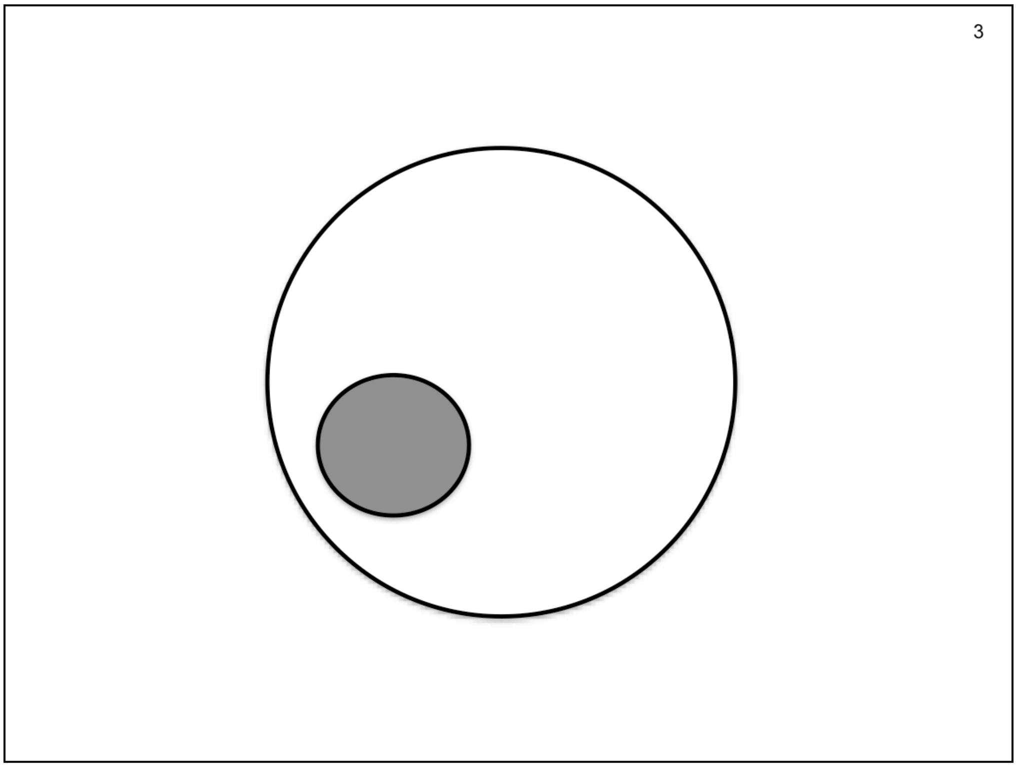
Abstract

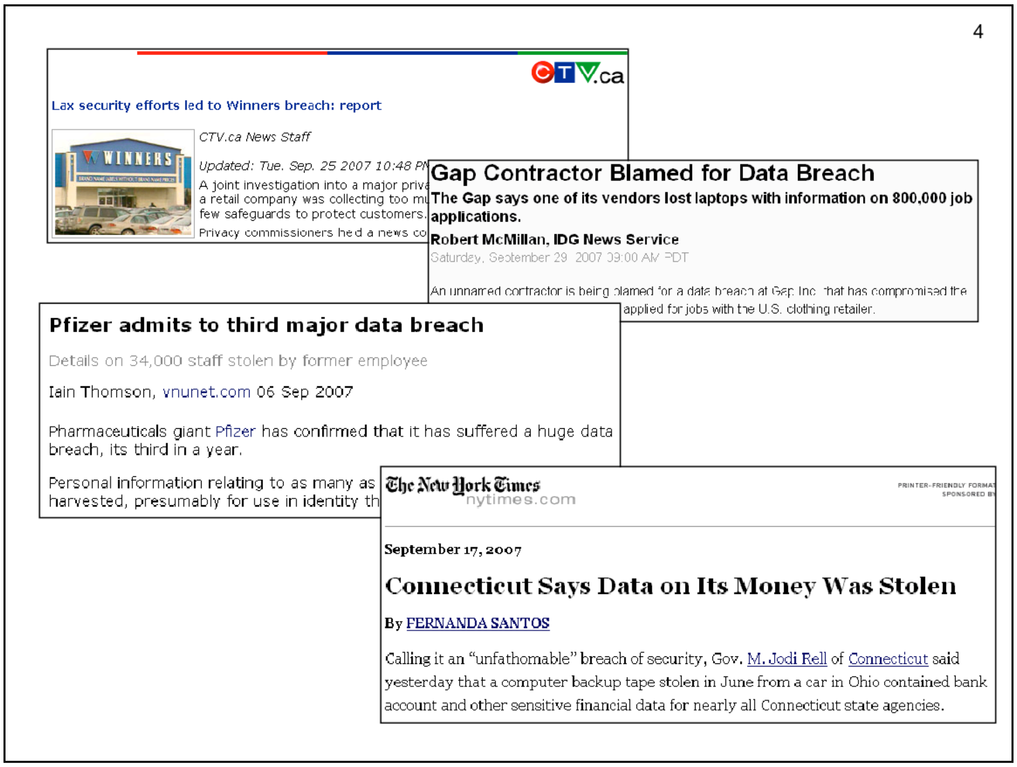
Corporations are facing increasing demands to monitor their compliance with security and privacy policies and regulations. There are a number of activities that take place within corporations that are both related to security and privacy, and amendable to social network analysis. The current studied focused on three such activities: password sharing, transmission of confidential information, and the sharing of salary data. Social network analysis of communications patterns within an organization was able to identify key creators and sharers of passwords, and an analysis of the passwords themselves showed that quality was clearly a problem. This suggests that password management practices were a problem for this organization. Analysis of confidential information flows revealed two highly interconnected groups sharing information freely among themselves. It appears that confidential information was poorly handled within this organization. Salary data, on the other hand, was only shared among small, isolated groups, and this represents an effective and appropriate information privacy practice. In each of these cases, the value of social network analysis was demonstrated and suggestions were made for developing automated compliance tools for security and privacy. Current work is focused on creating models of information flow within groups to detect inappropriate activities.

There has been a lot of discussion this week about “dark networks” – primarily those associated with terrorism. I want to talk about a different kind of dark network – a group of people acting somewhat badly, perhaps without even knowing it.

The “Little Rascals” were a group of kids who often behaved badly, without realizing it, within a positive social context.



We are talking about dark networks working inside a bright network. People behaving badly within a context of good behaviors.



CTV.ca

Lax security efforts led to Winners breach: report

CTV.ca News Staff

Updated: Tue. Sep. 25 2007 10:48 PM

A joint investigation into a major priva
a retail company was collecting too mu
few safeguards to protect customers.
Privacy commissioners held a news co

Gap Contractor Blamed for Data Breach

The Gap says one of its vendors lost laptops with information on 800,000 job applications.

Robert McMillan, IDG News Service

Saturday, September 29, 2007 09:00 AM PDT

An unnamed contractor is being blamed for a data breach at Gap Inc. that has compromised the
applied for jobs with the U.S. clothing retailer.

Pfizer admits to third major data breach

Details on 34,000 staff stolen by former employee

Iain Thomson, vnunet.com 06 Sep 2007

Pharmaceuticals giant Pfizer has confirmed that it has suffered a huge data breach, its third in a year.

Personal information relating to as many as
harvested, presumably for use in identity th

The New York Times
nytimes.com

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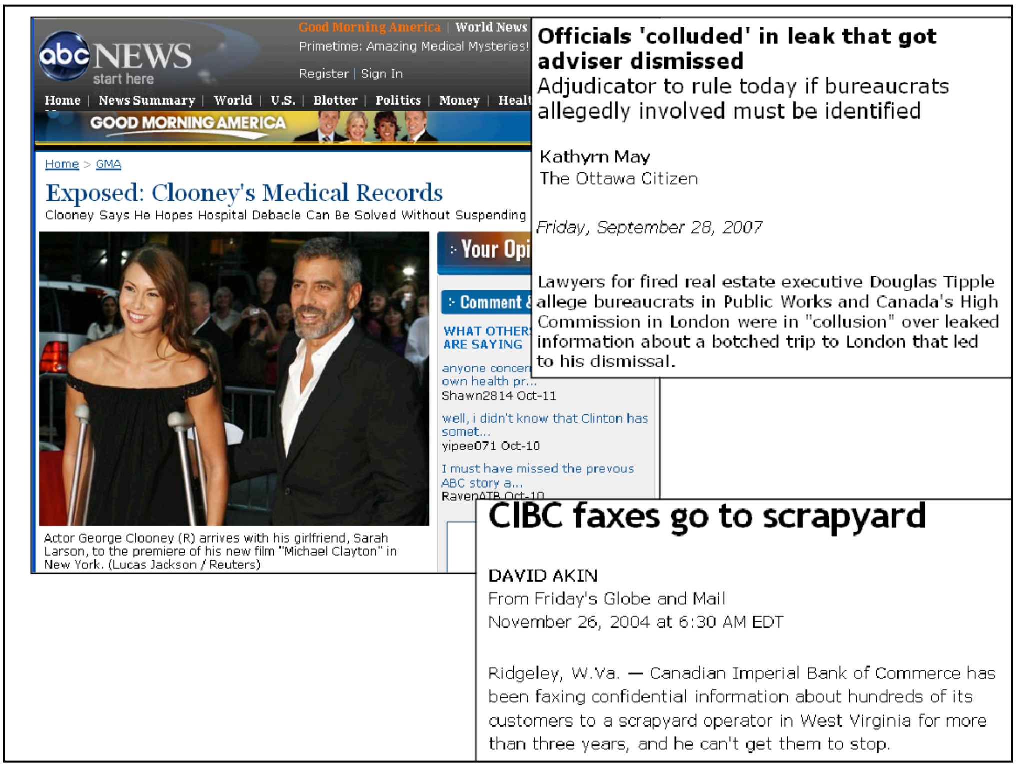
September 17, 2007

Connecticut Says Data on Its Money Was Stolen

By FERNANDA SANTOS

Calling it an "unfathomable" breach of security, Gov. M. Jodi Rell of Connecticut said yesterday that a computer backup tape stolen in June from a car in Ohio contained bank account and other sensitive financial data for nearly all Connecticut state agencies.

Data breaches are becoming far too common. Some are caused by laptop theft, hacks, and sloppy data handling procedures.



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Exposed: Clooney's Medical Records

Clooney Says He Hopes Hospital Debacle Can Be Solved Without Suspending

Actor George Clooney (R) arrives with his girlfriend, Sarah Larson, to the premiere of his new film "Michael Clayton" in New York. (Lucas Jackson / Reuters)

WHAT OTHERS ARE SAYING

anyone concer own health pr...
Shawn2814 Oct-11

well, i didn't know that Clinton has somet...
yipee071 Oct-10

I must have missed the prevous ABC story a...
RavenATB Oct-10

Officials 'colluded' in leak that got adviser dismissed

Adjudicator to rule today if bureaucrats allegedly involved must be identified

Kathyrn May
The Ottawa Citizen

Friday, September 28, 2007

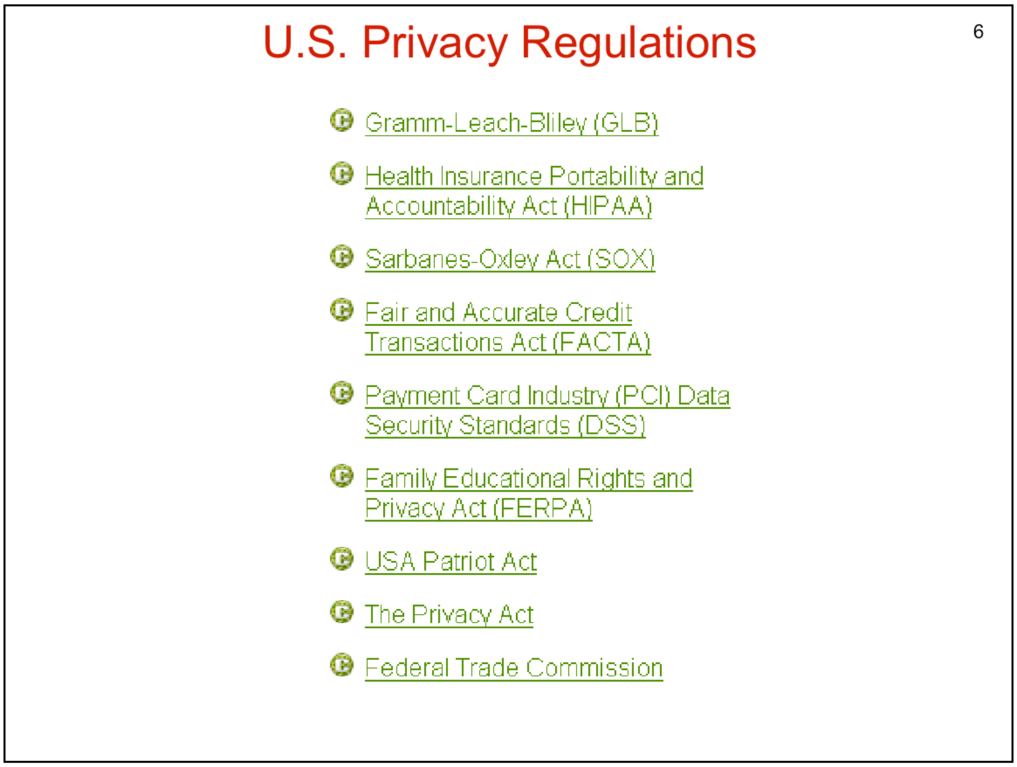
Lawyers for fired real estate executive Douglas Tipple allege bureaucrats in Public Works and Canada's High Commission in London were in "collusion" over leaked information about a botched trip to London that led to his dismissal.

CIBC faxes go to scrapyard

DAVID AKIN
From Friday's Globe and Mail
November 26, 2004 at 6:30 AM EDT

Ridgeley, W.Va. — Canadian Imperial Bank of Commerce has been faxing confidential information about hundreds of its customers to a scrapyard operator in West Virginia for more than three years, and he can't get them to stop.

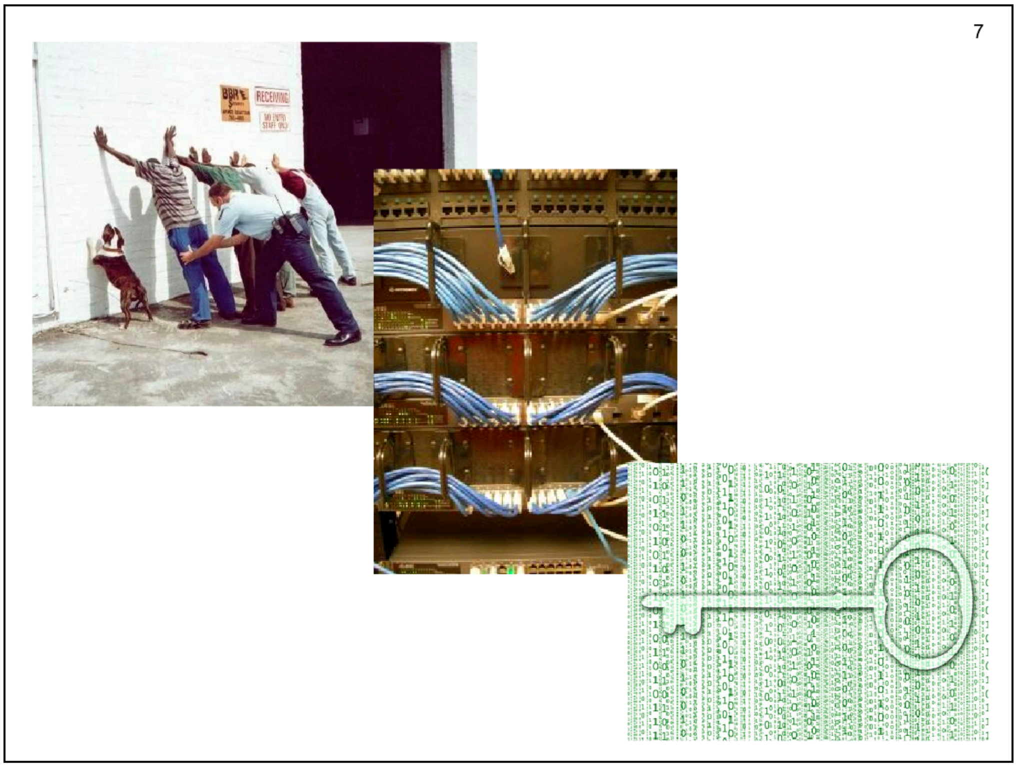
Some data breaches are caused by inappropriate insider activities.



U.S. Privacy Regulations

- Gramm-Leach-Bliley (GLB)
- Health Insurance Portability and Accountability Act (HIPAA)
- Sarbanes-Oxley Act (SOX)
- Fair and Accurate Credit Transactions Act (FACTA)
- Payment Card Industry (PCI) Data Security Standards (DSS)
- Family Educational Rights and Privacy Act (FERPA)
- USA Patriot Act
- The Privacy Act
- Federal Trade Commission

Numerous laws requiring disclosure of data breaches. Here are some examples from the US.



Common solutions to preventing privacy breaches involve searches, traffic monitoring, or encryption.

Our approach has been to augment these with Social Network Analysis.

We are developing methods to discover networks of inappropriate activity, based on a variety of search and monitoring activities.

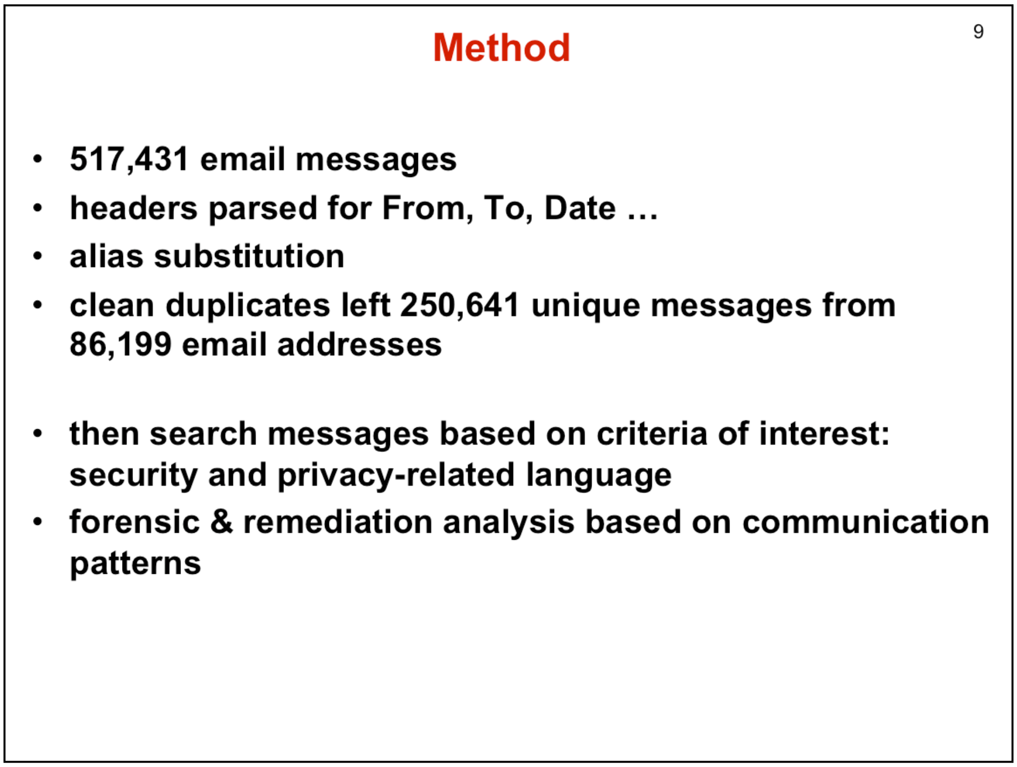
"It leaves you with the exhilarated sensation of understanding the defining financial scandal of the era."
It's Just Business
ENRON
THE SMARTEST GUYS IN THE ROOM
Come see where all your money went.
WWW.ENRONMOVIE.COM

In order to test our methods and provide a publically-visible example of our analysis, we have been looking at the well-know Enron email corpus.

We have been looking in the Enron corpus for examples of interesting social behavior related to security and privacy.

Enron filed for bankruptcy protection in the Southern District of New York in late 2001 and selected Weil, Gotshal & Manges as their bankruptcy counsel. Enron employed around 21,000 people (McLean & Elkind, 2003) and was one of the world's leading electricity, natural gas, pulp and paper, and communications companies, with claimed revenues of $111 billion in 2000. *Fortune* named Enron "America's Most Innovative Company" for six consecutive years. It achieved infamy at the end of 2001, when it was revealed that its reported financial condition was sustained mostly by institutionalized, systematic, and creatively planned accounting fraud. Enron has since become a popular symbol of willful corporate fraud and corruption.

Source: Wikipedia



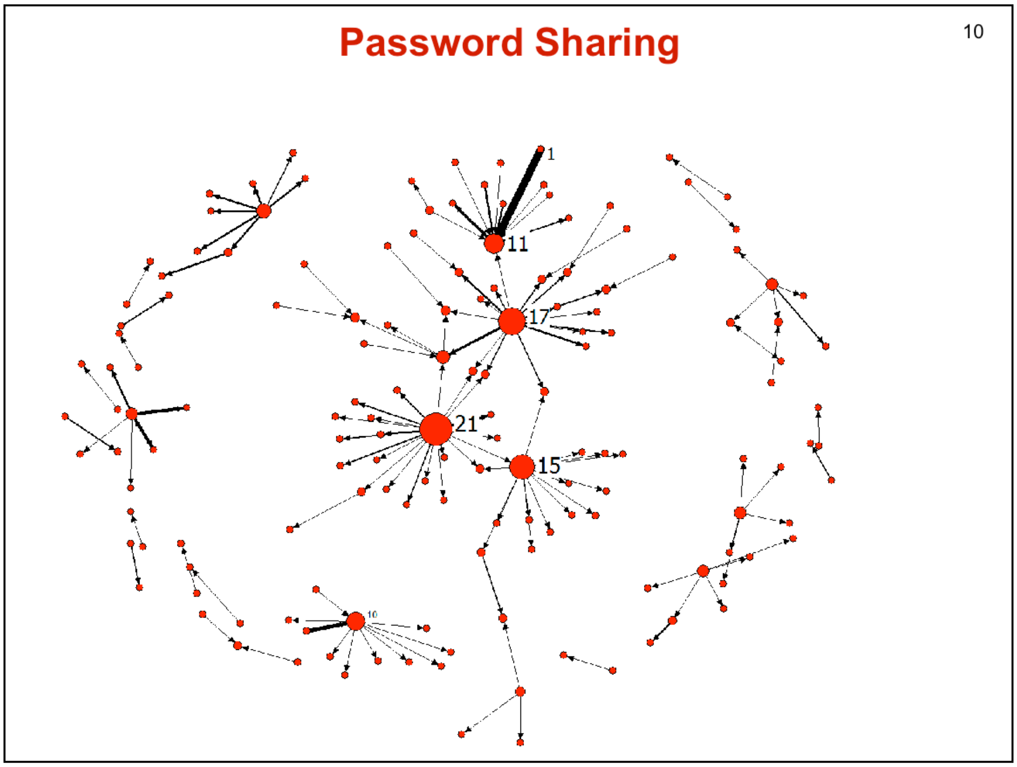
9

Method

- 517,431 email messages
- headers parsed for From, To, Date …
- alias substitution
- clean duplicates left 250,641 unique messages from 86,199 email addresses
- then search messages based on criteria of interest: security and privacy-related language
- forensic & remediation analysis based on communication patterns

We developed our own methods to clean and search the data.

Data comes from: http://www.cs.cmu.edu/~enron/



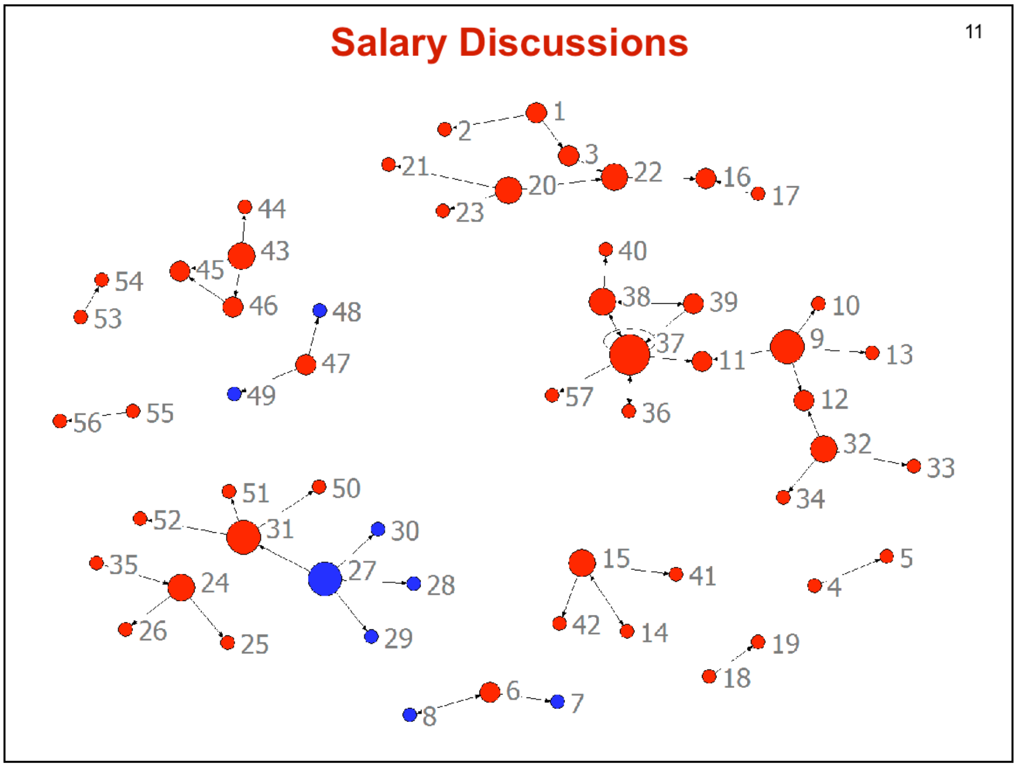
Password Sharing

10

This is the data I presented at last year’s Sunbelt conference.

We were able to uncover interesting examples of password sharing, and key nodes responsible for issuing passwords (and doing it badly).

A paper based on this data is available on my web site.



Salary Discussions

11

Here is new data looking at people discussing the salary of Enron employees. We found this by looking for salary-related language in the body of the email messages.

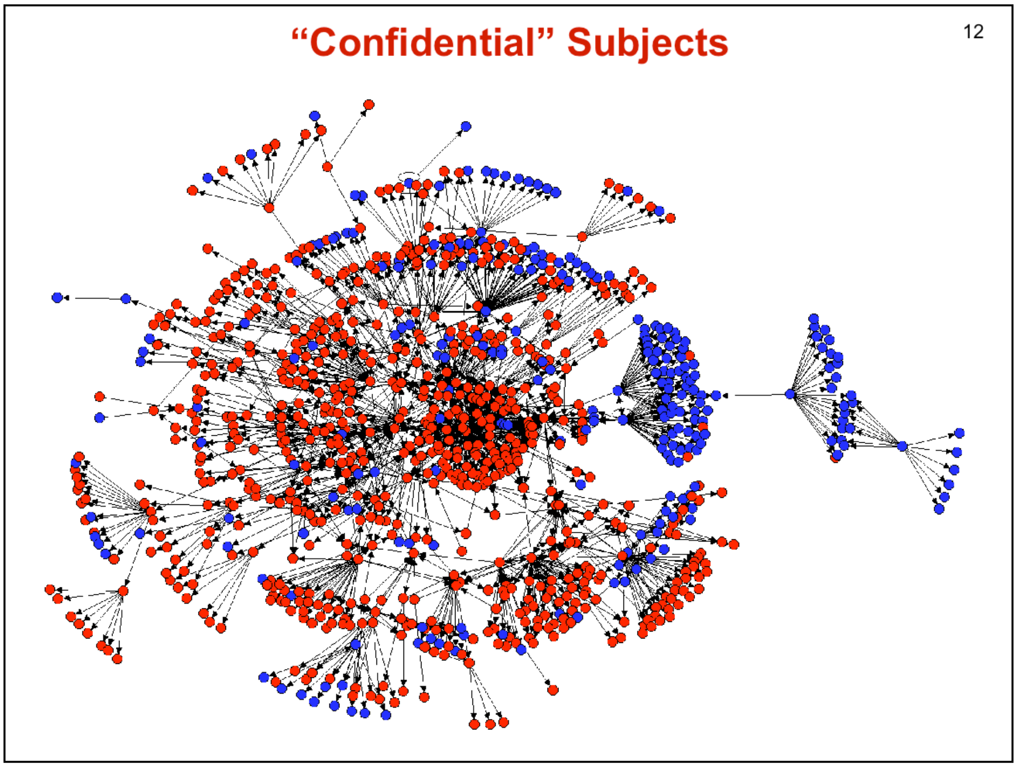
Blue nodes are external to Enron.

Very sparse network (average density 1.85%) with 12 components. Thus, salary information not shared widely.

* most messages sent between managers to discuss offers to job candidates or changes to employee salaries

* one example of a headhunting firm presenting potential job candidates

•two examples of employees being recruited by other companies



“Confidential” Subjects

12

Here is the data when we look for the word “confidential” in the Subject header. This if often used to flag correspondence to/from lawyers, and is an attempt to protect the communication with a form of lawyer-client privilege.

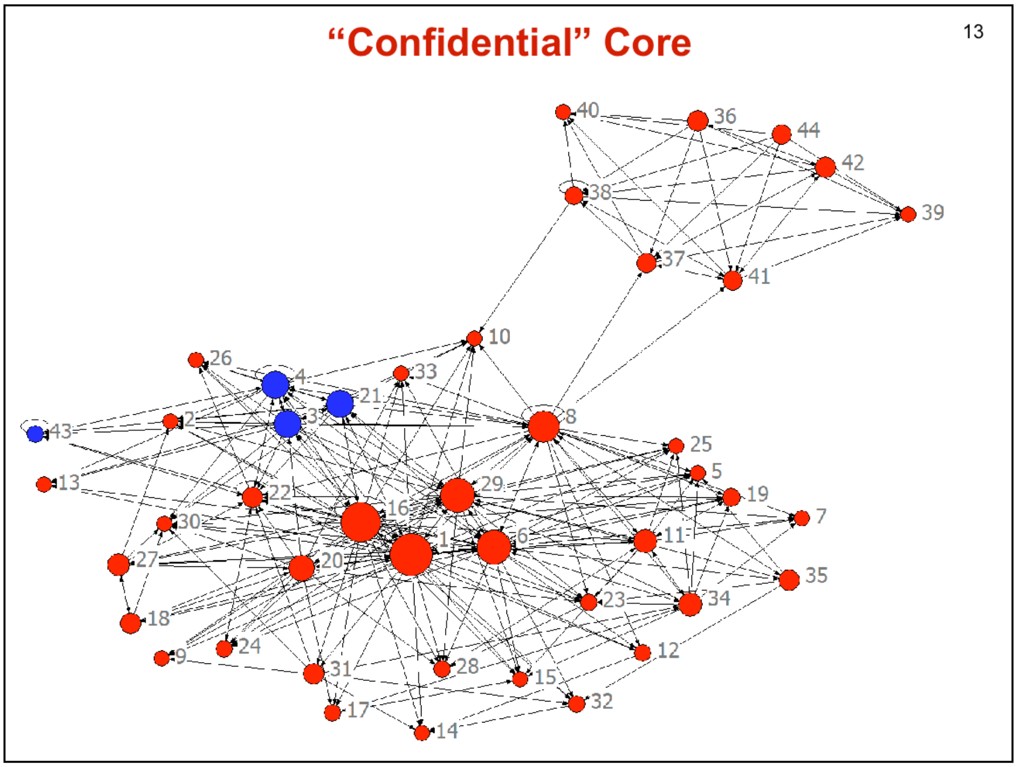
This is a large network with 850 nodes. Clearly, lots of people felt they were in need of legal protection.

Blue nodes are external to Enron

850 nodes, 1579 ties

Density = 0.26%

average degree 2.4 (in or out)



“Confidential” Core

13

This is the core of the confidential network.

Method 2: k-core > 4, size based on out-degree

Key Nodes:

1 Government Affairs exec., involved with pricing schemes

6 Government Affairs exec., involved with influencing government probe

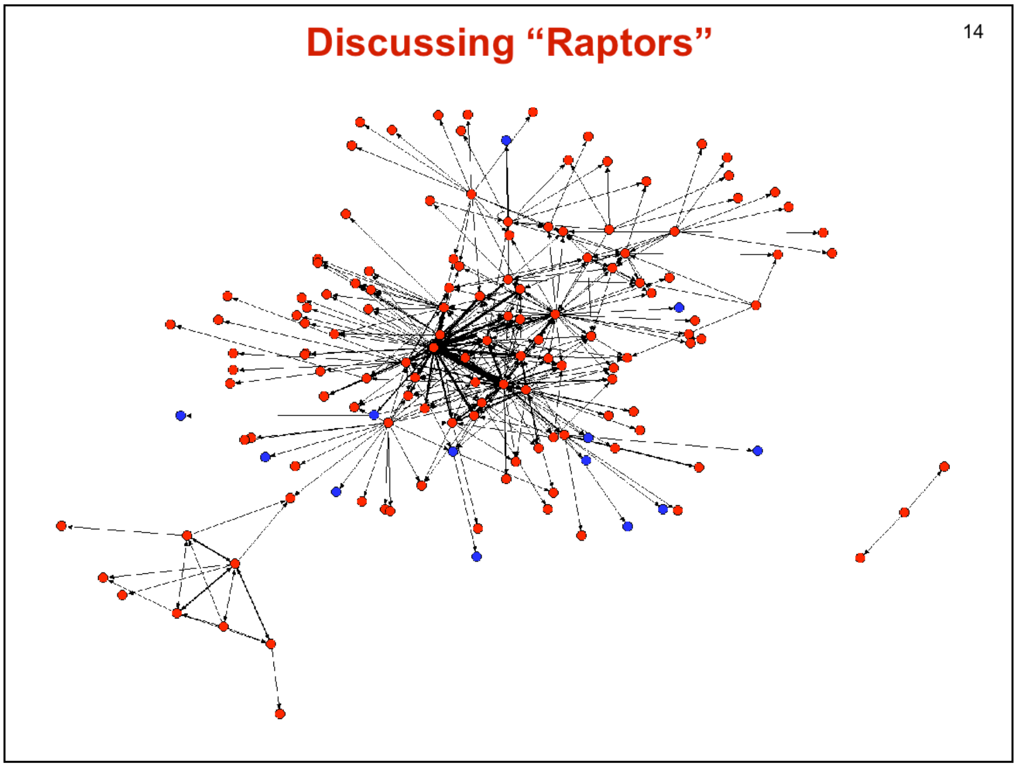
8 Government Affairs exec.

16 in-house lawyer, “knows where the bodies are burried”

29 Government Affairs exec., knew of pricing schemes

External nodes are at two law firms.

There is a secondary cluster of people trying to protect their correspondence. They have not been identified in any of the court documents as key players, and yet something seems to be going on. If this was an active investigation, they might be worth investigating.



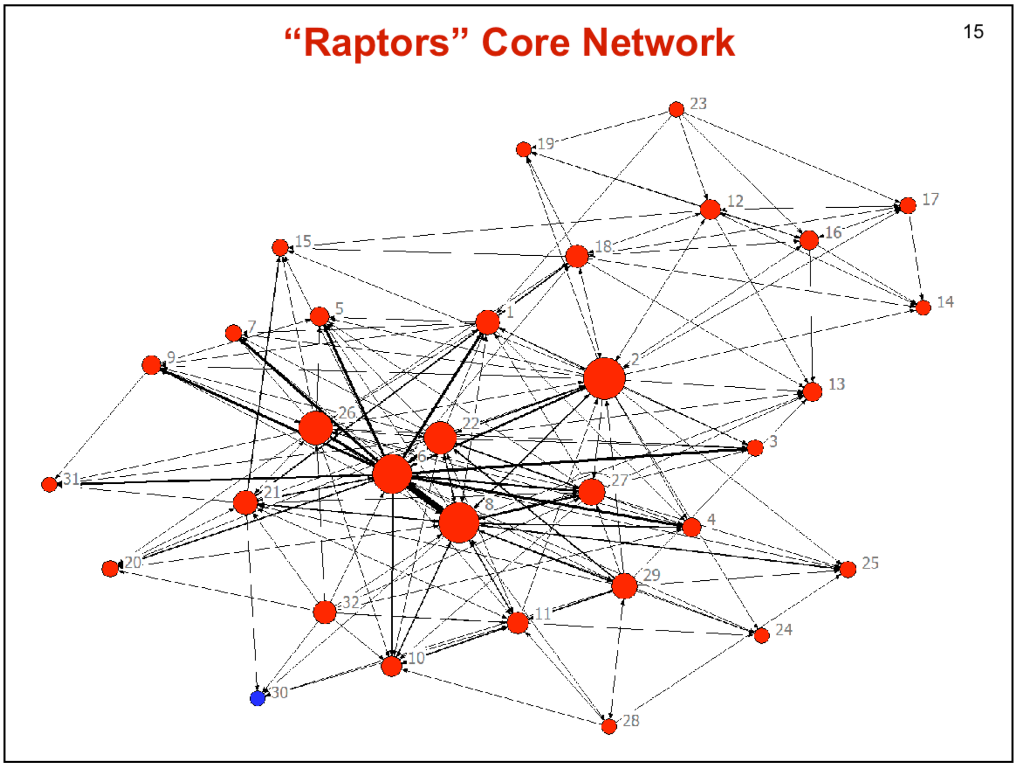
Discussing “Raptors”

Searched for “Raptor” in the Subject header.

The “Raptors” were “Special Purpose Entities” setup by Enron to hide losses.

The “Raptors” were found to be illegal and they were basis for many of the criminal convictions.

This is a fairly small network with a high number of connections.



"Raptors" Core Network

15

This is the core Raptors network. Method was K-cores, k > 4

Nodes 12 and 16 were responsible for Enron Finances and were eventually convicted

But there were lots of other people who seemed to be key players in the conversations:

2 ???

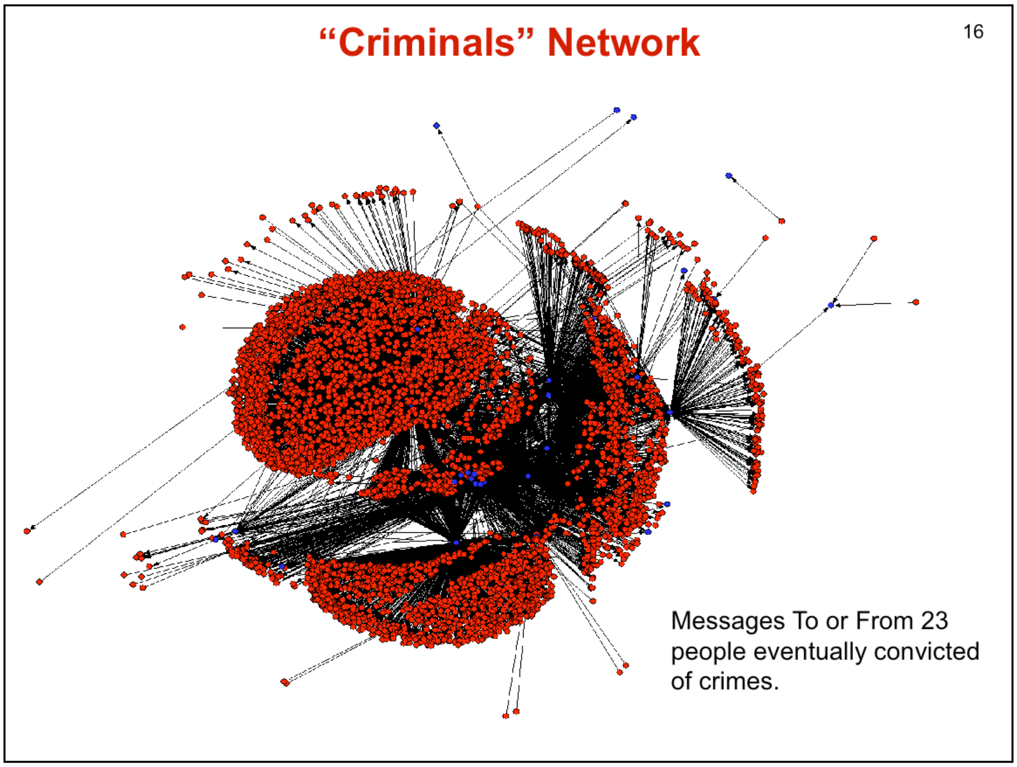
6 ???

8 ???

22 in-house lawyer

26 in-house lawyer

Clearly, some people would be worth talking to.



“Criminals” Network

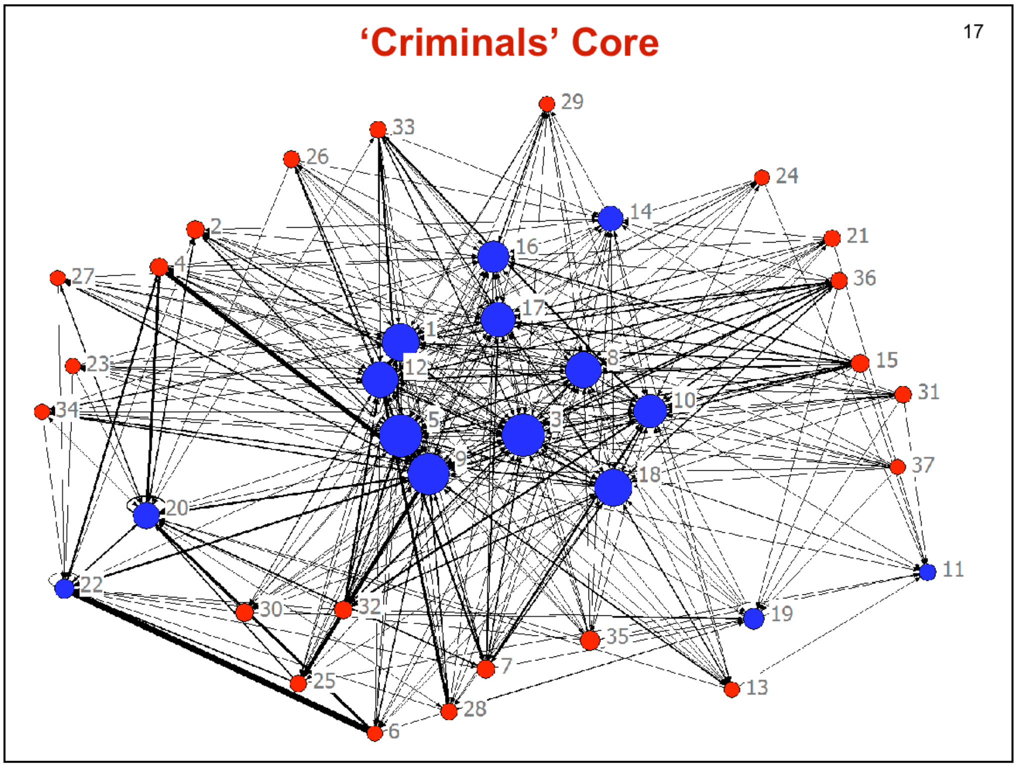
Messages To or From 23 people eventually convicted of crimes.

Messages from/to 23 people eventually convicted of crimes (although at least one under appeal)

Nodes in blue are the criminals.

5363 nodes, 8775 ties

The “criminals” were deeply tied to the rest of the organization.



17

‘Criminals’ Core

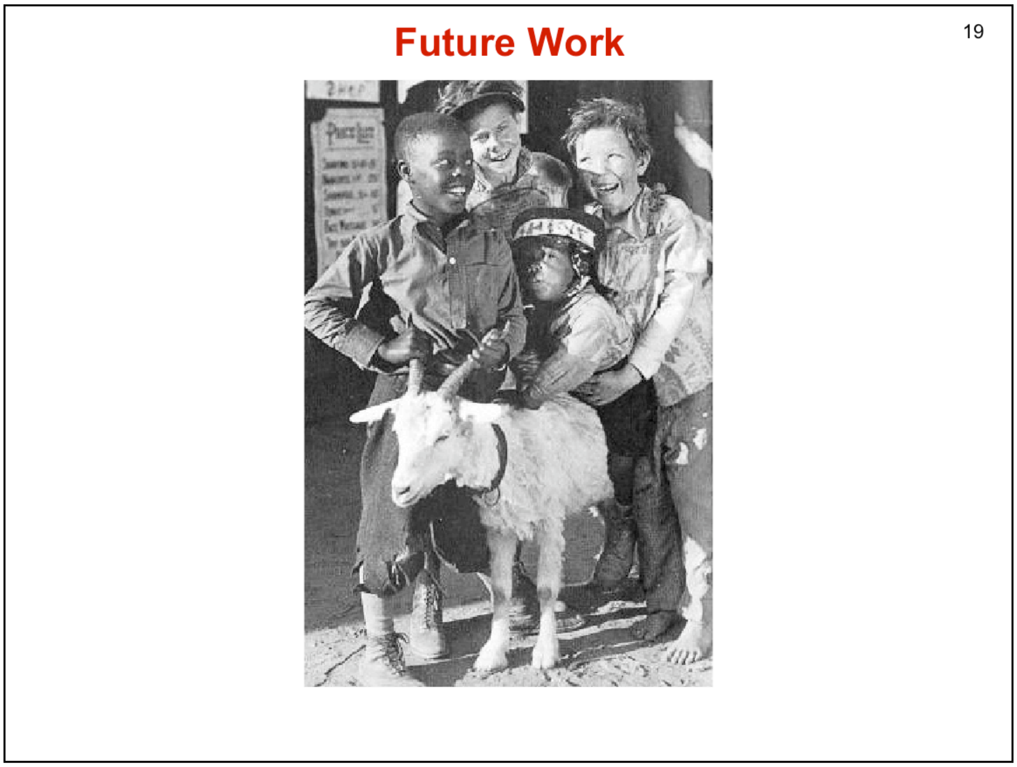
k-cores k > 10

blue nodes were convicted

This is what a conspiracy looks like. A collection of people acting together. It is interesting to note that there does not seem to be other people at the core of this network.

Conclusions

- detecting networks of people behaving badly together
- uncovering possible causes of security and privacy breaches
- detecting persons of interest during investigations
- scoping inappropriate activity through ‘naïve moles’
- suggesting “direct and indirect” remedial measures



Future Work

19

- analysis of specific ‘emotional’ networks to uncover inappropriate or covered-up activities (regret analysis)

- combining network and workflow analyses (anomaly detection)

20

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