Welcome to the SNE Graduation Ceremony

Please be seated, we will start momentarily

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SECURITY AND NETWORK ENGINEERING

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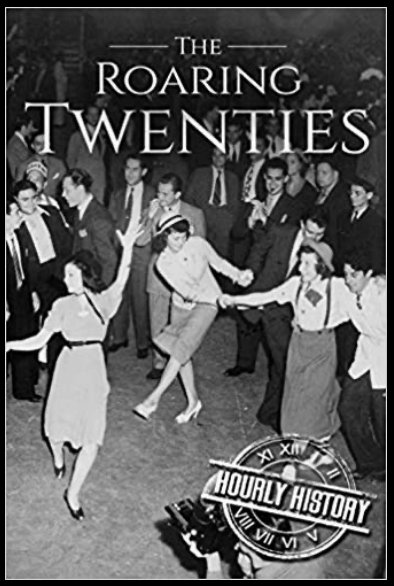
ICT to support Science & Society in the Roaring Twenties

Cees de Laat

Systems and Networking Laboratory
Complex Cyber Infrastrure group
University of Amsterdam

ICT to support the transformation of Science in the Roaring Twenties



From Wikipedia: The Roaring Twenties refers to the decade of the 1920s in Western society and Western culture. It was a period of economic prosperity with a distinctive cultural edge in the United States and Western Europe, particularly in major cities such as Berlin, Chicago, London, Los Angeles, New York City, Paris, and Sydney. In France, the decade was known as the "années folles" ('crazy years'), emphasizing the era's social, artistic and cultural dynamism. Jazz blossomed, the flapper redefined the modern look for British and American women, and Art Deco peaked….

This period saw the large-scale development and use of automobiles, telephones, movies, radio, and electrical appliances being installed in the lives of thousands of Westerners. Aviation soon became a business. Nations saw rapid industrial and economic growth, accelerated consumer demand, and introduced significantly new changes in lifestyle and culture. The media focused on celebrities, especially sports heroes and movie stars, as cities rooted for their home teams and filled the new palatial cinemas and gigantic sports stadiums. In most major democratic states, women won the right to vote. The right to vote made a huge impact on society.

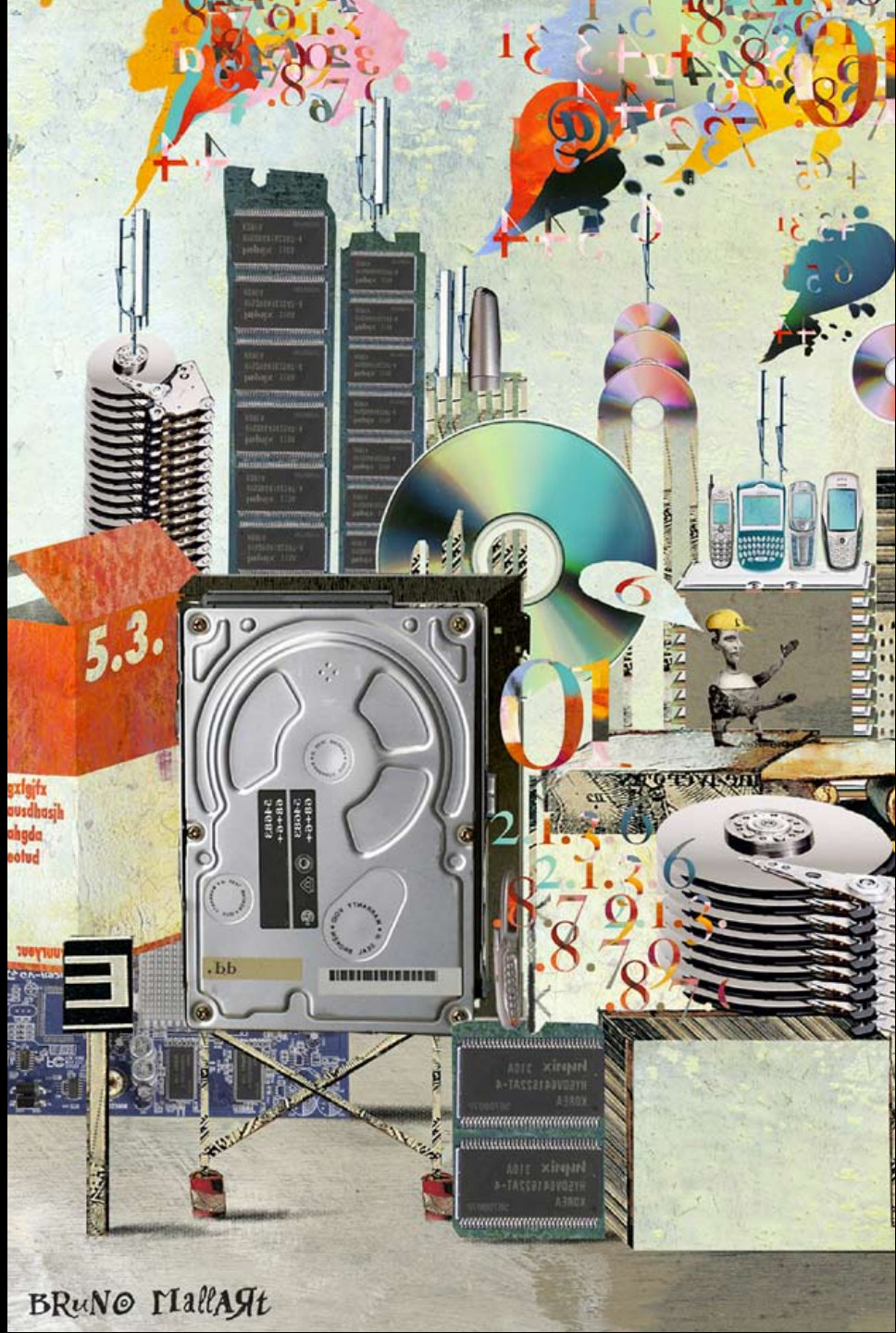
From King's Dutch Academy of Sciences

The Dutch Research Agenda

"Information technology (IT) now permeates all aspects of public, commercial, social, and personal life. bank cards, satnav, and weather radar... IT has become completely indispensable."

"But to guarantee the reliability and quality of constantly bigger and more complicated IT, we will need to find answers to some fundamental questions!"

https://www.knaw.nl/nl/actueel/publicaties/the-dutch-research-agenda/@@download/pdf_file/20111029.pdf



Reduction of Complexity by Integration

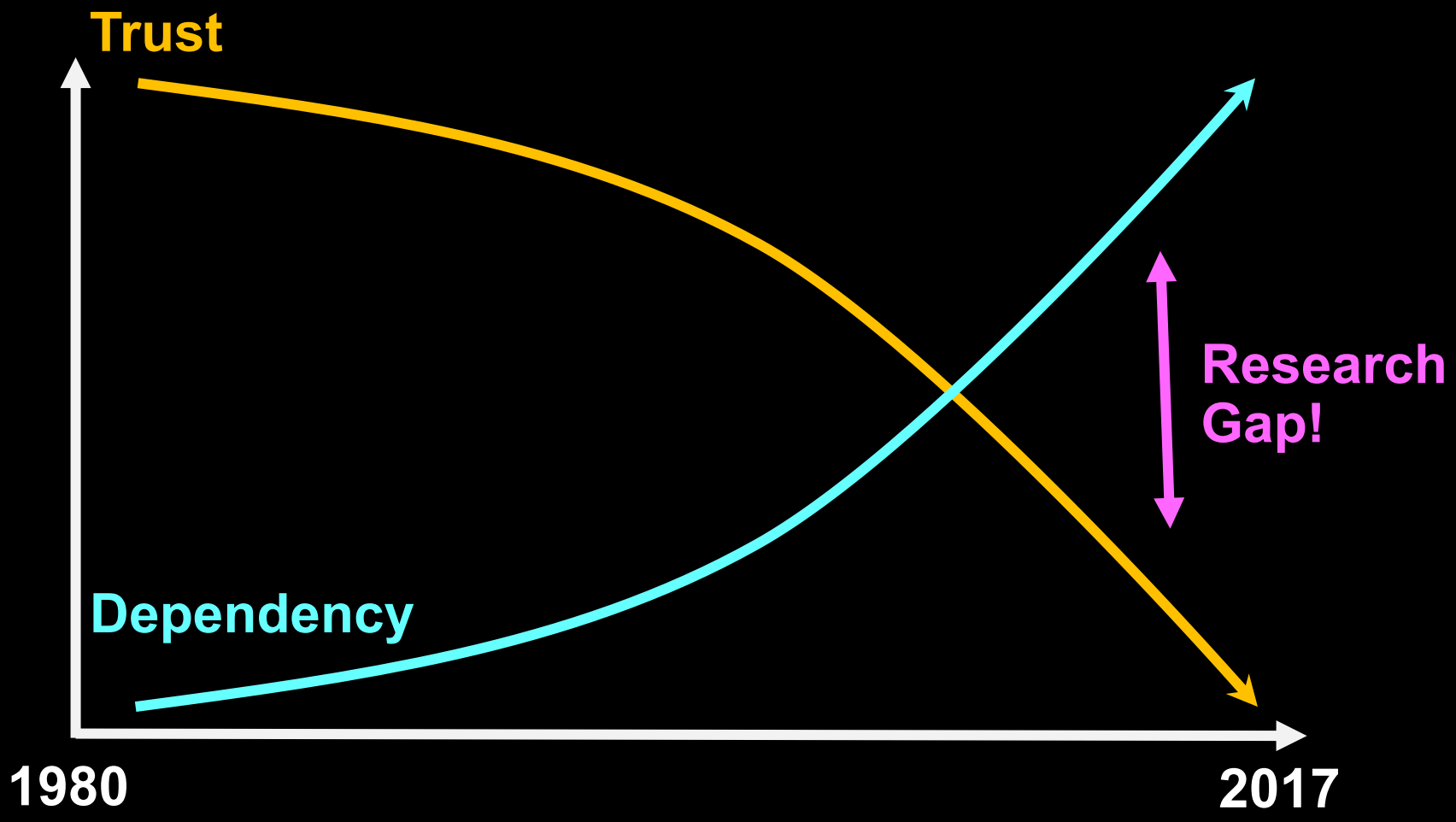
By combining services such as telephony, television, data, and computing capacity within a single network, we can cut down on complexity, energy consumption and maintenance.

- How can we describe and analyze complex information systems effectively?
- How can we specify and measure the quality and reliability of a system?
- How can we combine various different systems?
- How can we design systems in which separate processors can co-operate efficiently via mutual network connections within a much larger whole?
- Can we design information systems that can diagnose their own malfunctions and perhaps even repair them?
- How can we specify, predict, and measure system performance as effectively as possible?

SNE addresses a.o. the **highlighted** questions!

http://www.knaw.nl/Content/Internet_KNAW/publicaties/pdf/20111029.pdf

Fading Trust in Internet



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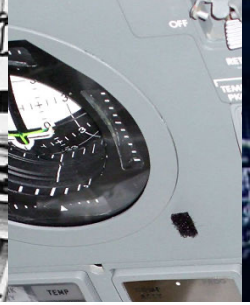


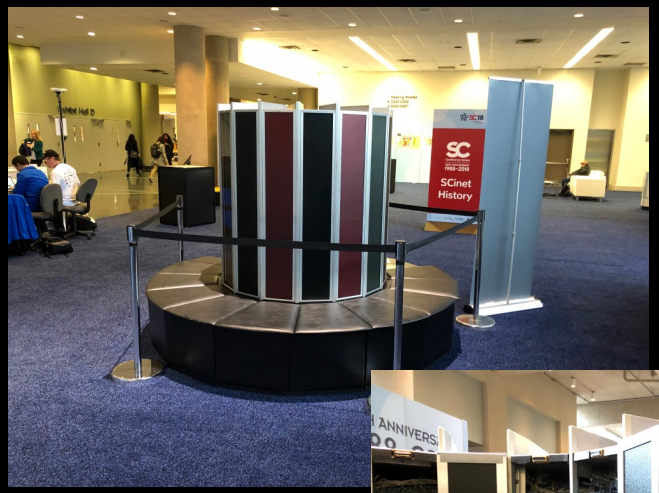
AT&T 3G
9:42 AM
SMS
Text
Tuesday
9
Calendar
Photos
Camera
YouTube
Stocks
280
Maps
73°
Weather
Clock
Calculator
Notes
Settings
iTunes
App Store
Phone
Mail
Safari
iPod

Some progress

2018

? 540 MHz
? MFlops
1000 MByte memory
16000 MByte ssd
0,0012 kWh – 18 h

7



1976

80 MHz
160 MFlops
8 MByte memory
300 MByte disks
120 kW

What Happens in an **Internet Minute?**

And **Future Growth** is **Staggering**

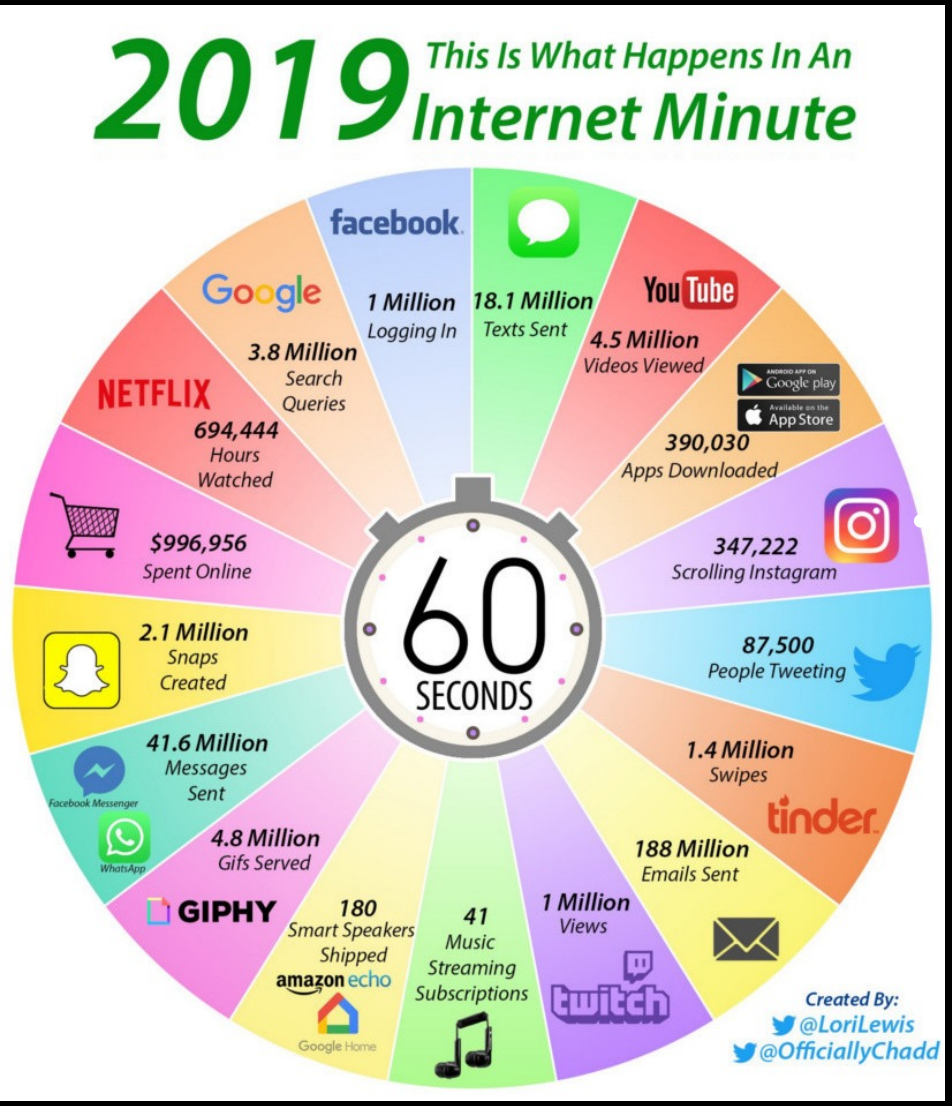
Today, the number of networked devices = the global population

By **2015**, the number of networked devices = 2x the global population

In **2015**, it would take you **5 years** to view all video crossing IP networks each **second**

intel

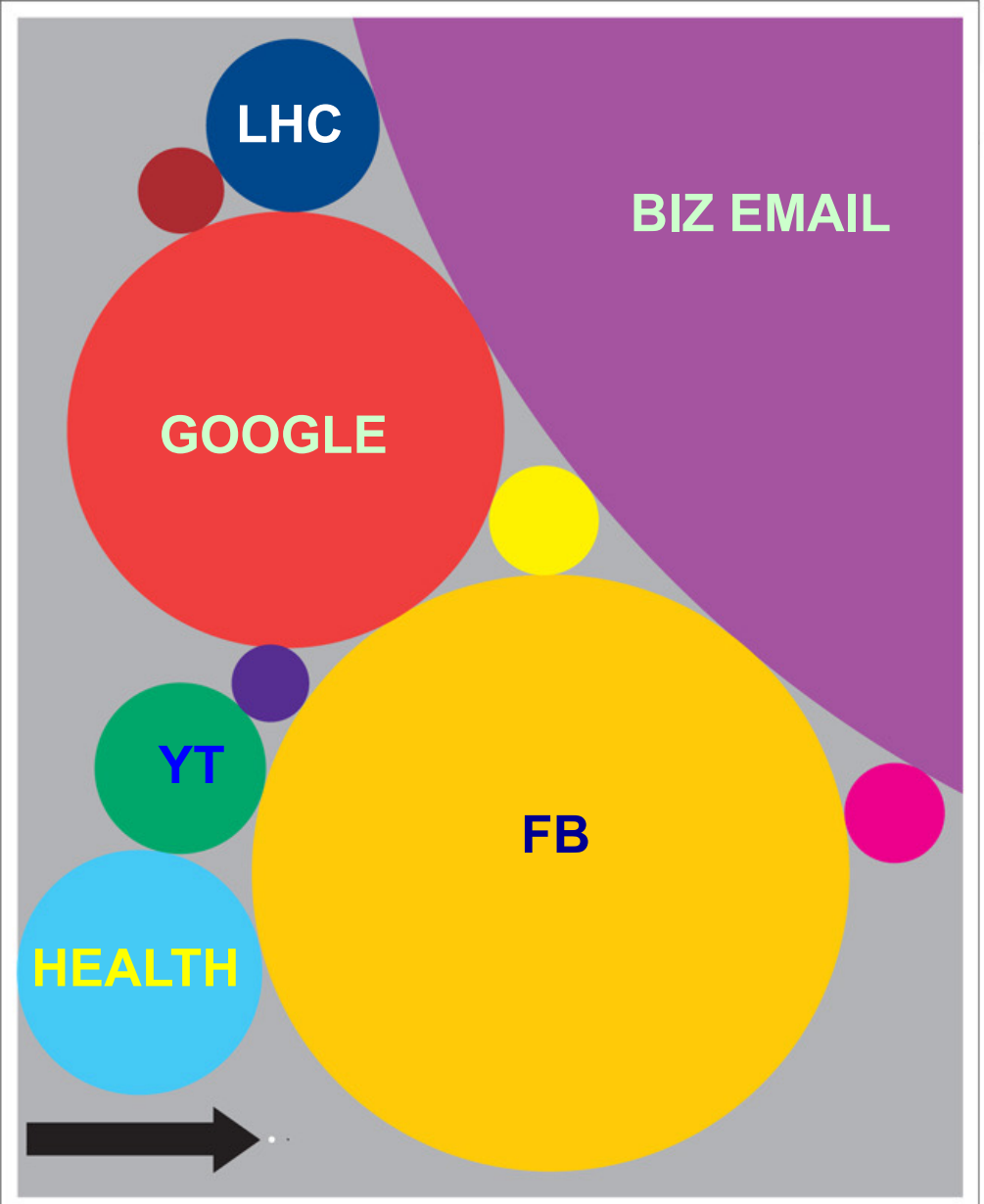
Now, how do we get and use data?



- Move towards streaming
  - Netflix
  - youtube
  - Same in science world
  - SKA / LOFAR
  - Light Source

Environmental (Marine, Meteorology, …)

- Data is not always huge
- Sometimes it is very complex
- Some example:
  - biodiversity



Size of data sets in terabytes

Business email sent per year	2,986,100	National Climactic Data Center database	6,144
Content uploaded to Facebook each year	182,500	Library of Congress' digital collection	5,120
Google's search index	97,656	US Census Bureau data	3,789
Kaiser Permanente's digital health records	30,720	Nasdaq stock market database	3,072
Large Hadron Collider's annual data output	15,360	Tweets sent in 2012	19
Videos uploaded to YouTube per year	15,000	Contents of every print issue of WIRED	1.26

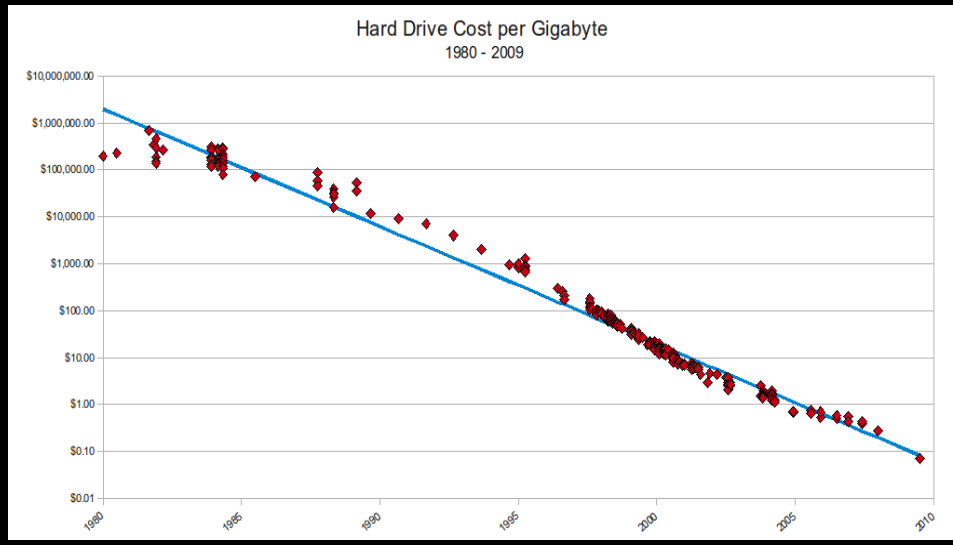
There
is
always
a
bigger
fish

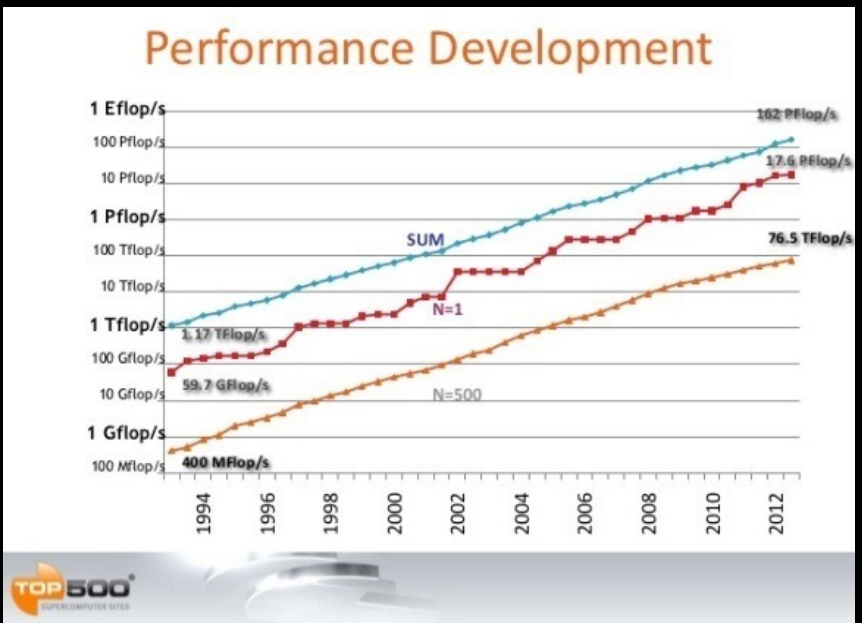
Reliable and Safe!

This omnipresence of IT makes us not only strong but also vulnerable.

- A virus, a hacker, or a system failure can instantly send digital shockwaves around the world.

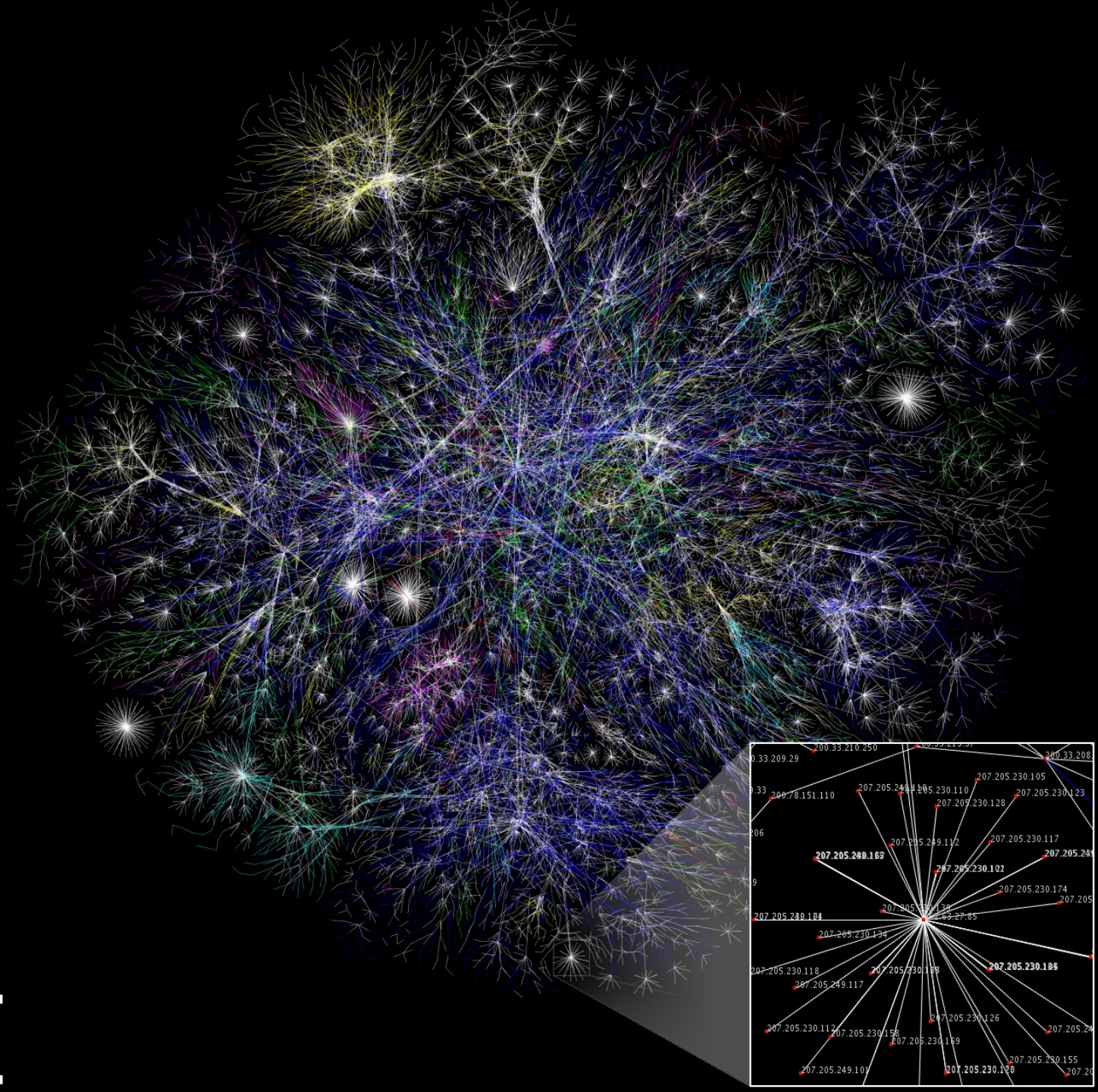
The hardware and software that allow all our systems to operate is becoming bigger and more complex all the time, and the capacity of networks and data storage is increasing by leaps and bounds.





We will soon reach the limits of what is currently feasible and controllable.

http://www.knaw.nl/Content/Internet_KNAW/publicaties/pdf/20111029.pdf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207.205.230.117
207.205.230.174
207.205.230.118
207.205.249.117
207.205.230.126
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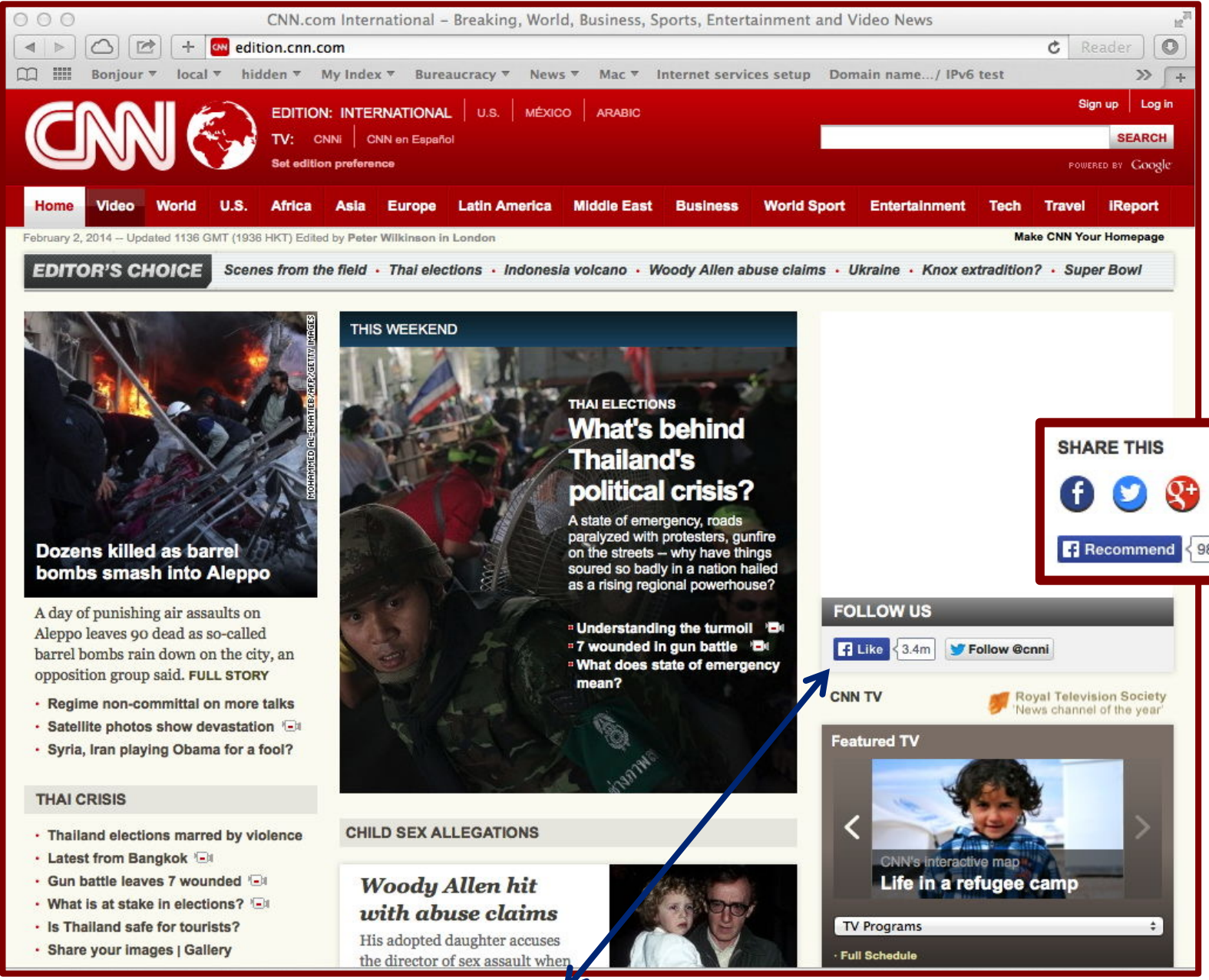
Internet moves from IXP's into datacenters

Bundles

&

ragmentation



I will follow you!

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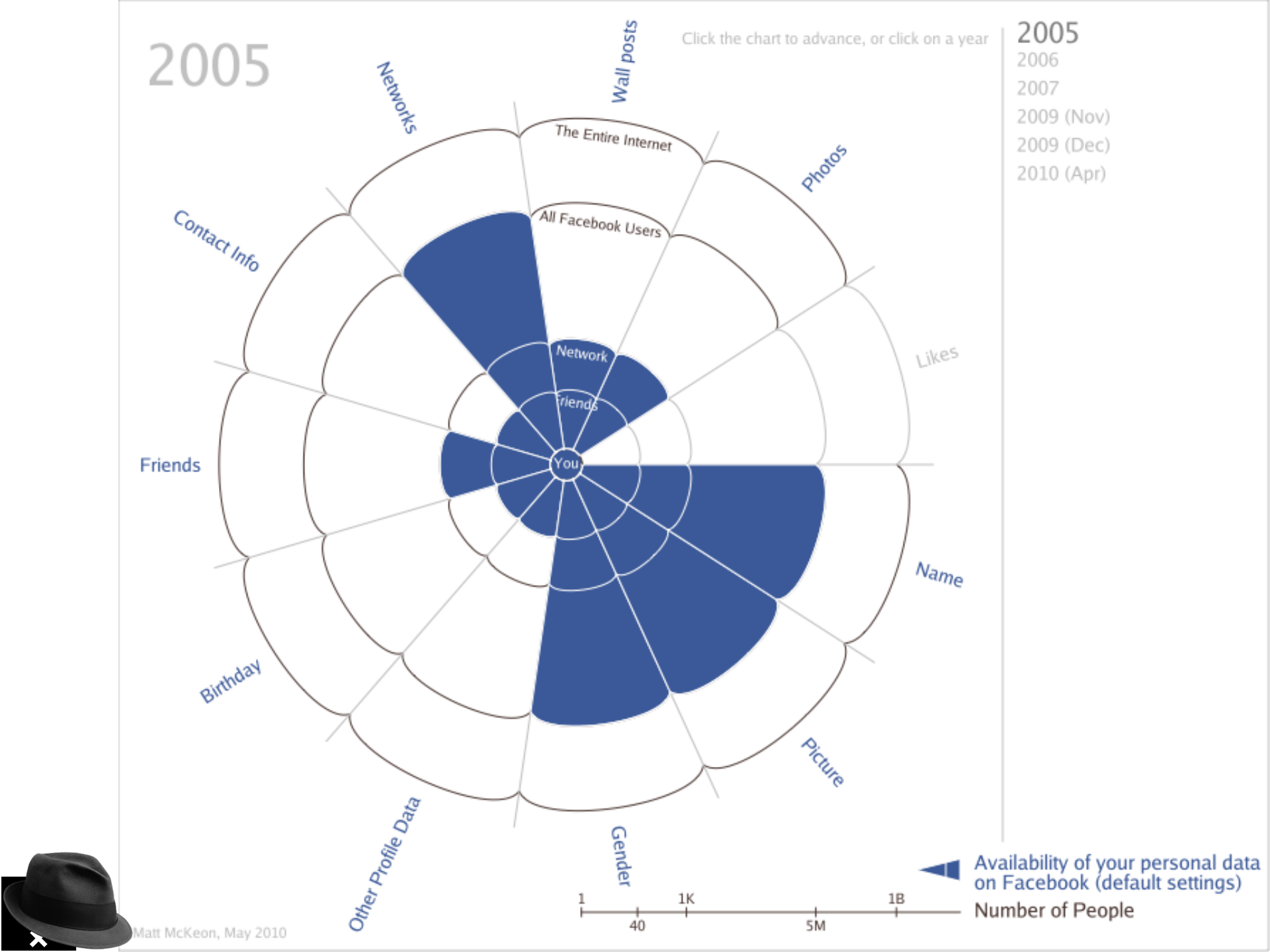
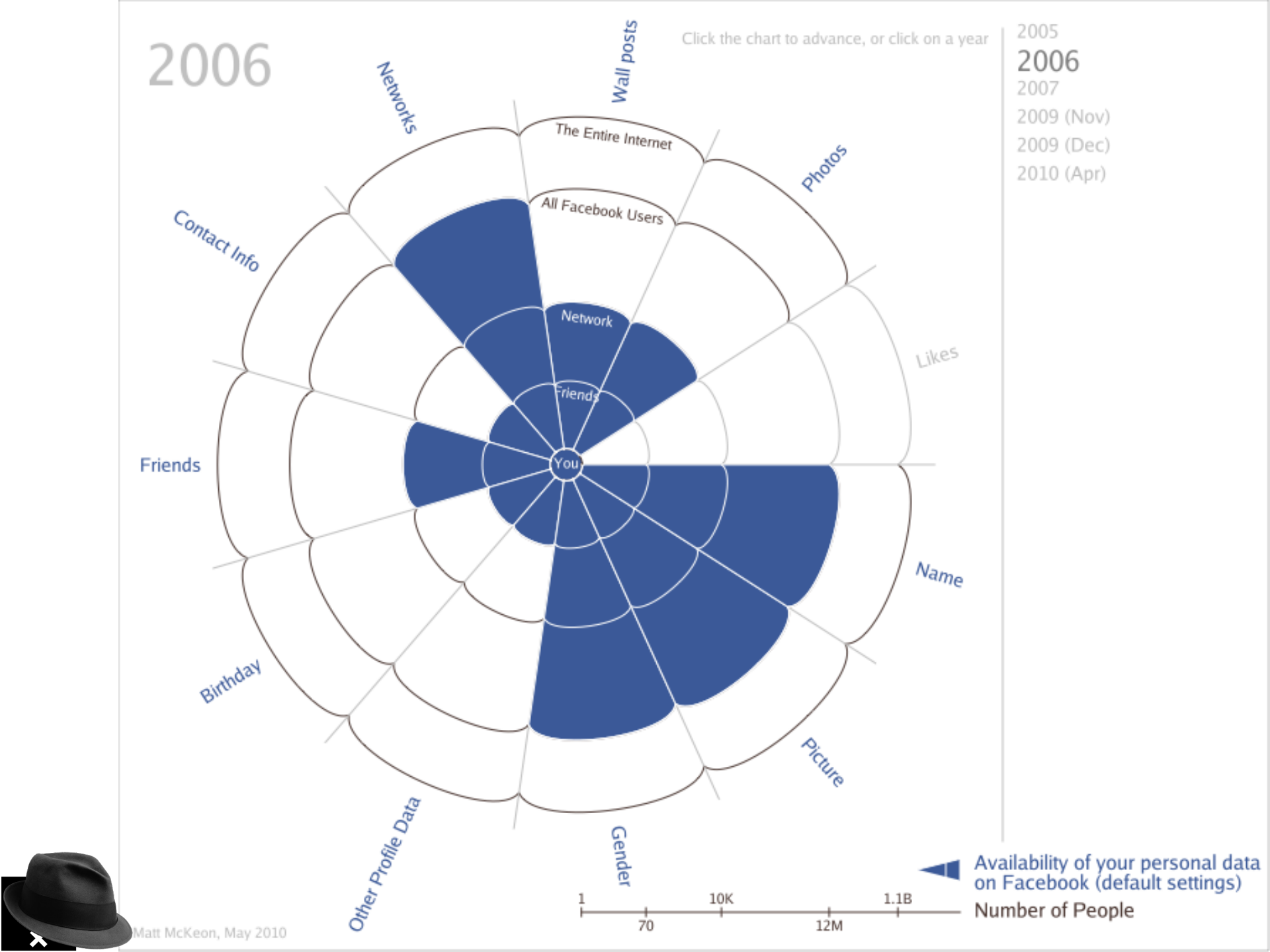

2005
Click the chart to advance, or click on a year
2005
2006
2007
2009 (Nov)
2009 (Dec)
2010 (Apr)
Wall posts
Photos
Likes
Name
Picture
Gender
Other Profile Data
Birthday
Friends
Contact Info
Networks
The Entire Internet
All Facebook Users
Network
Friends
You
Availability of your personal data on Facebook (default settings)
1
40
1K
5M
1B
Number of People
Matt McKeon, May 2010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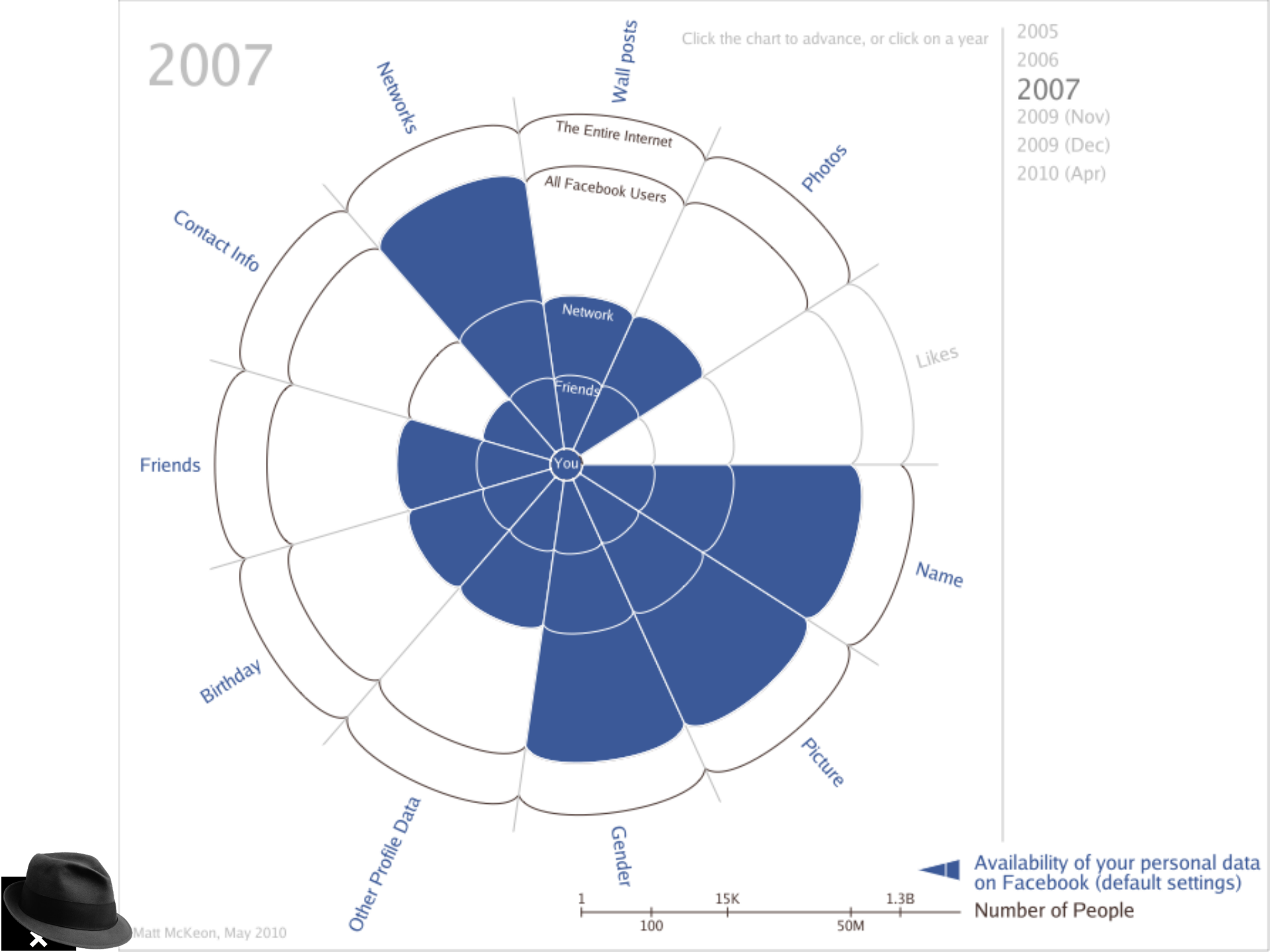
You
Availability of your personal data on Facebook (default settings)
1
70
10K
12M
1.1B
Number of People
Matt McKeon, May 2010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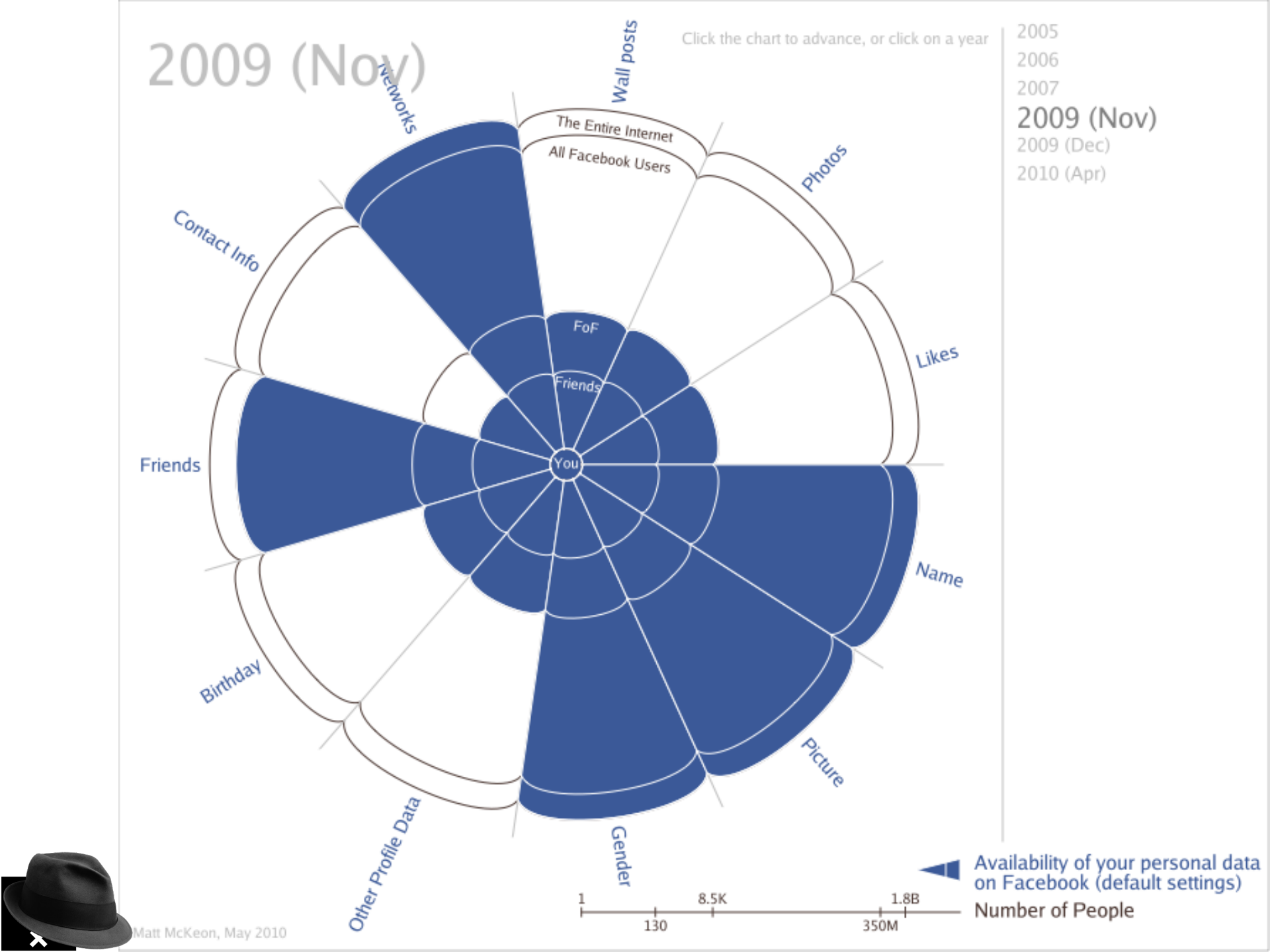
1
100
15K
50M
1.3B
Number of People
Matt McKeon, May 2010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All Facebook Users
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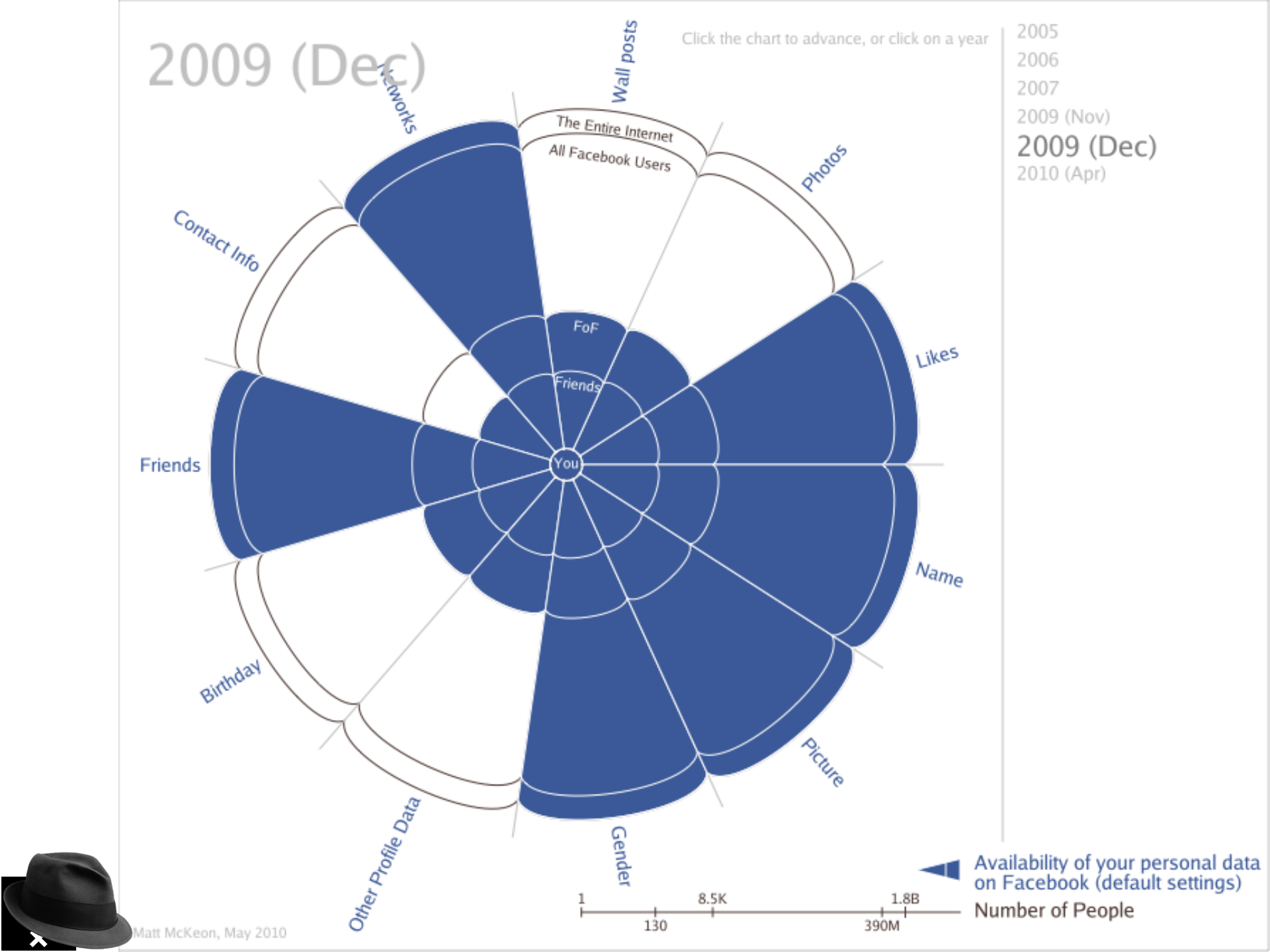
Availability of your personal data on Facebook (default settings)
1
130
8.5K
350M
1.8B
Number of People
Matt McKeon, May 2010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8.5K
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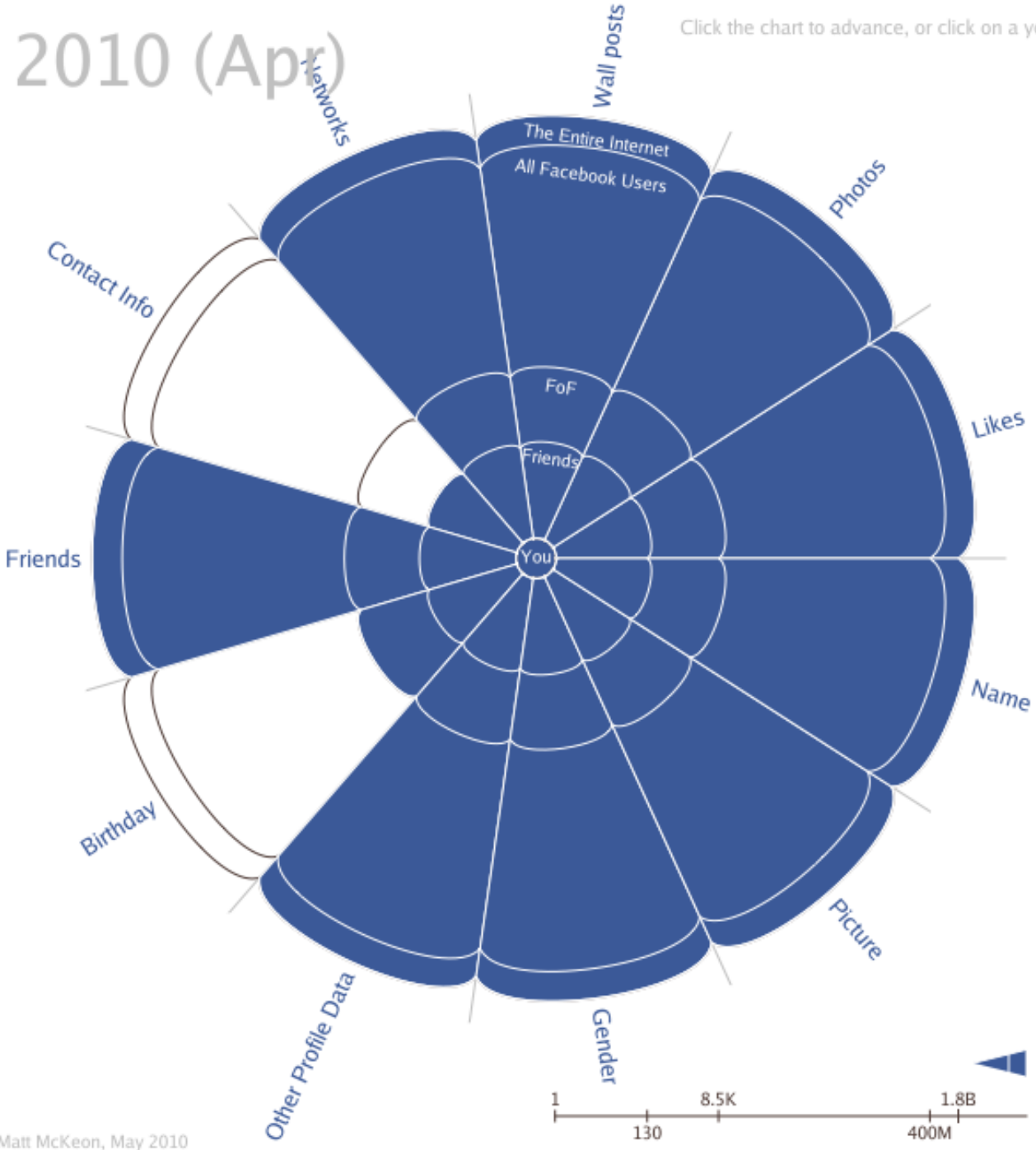
Number of People
Matt McKeon, May 2010

2010 (Apr)



Click the chart to advance, or click on a year

2005
2006
2007
2009 (Nov)
2009 (Dec)
2010 (Apr)

Availability of your personal data on Facebook (default settings)

1 130 8.5K 400M 1.8B

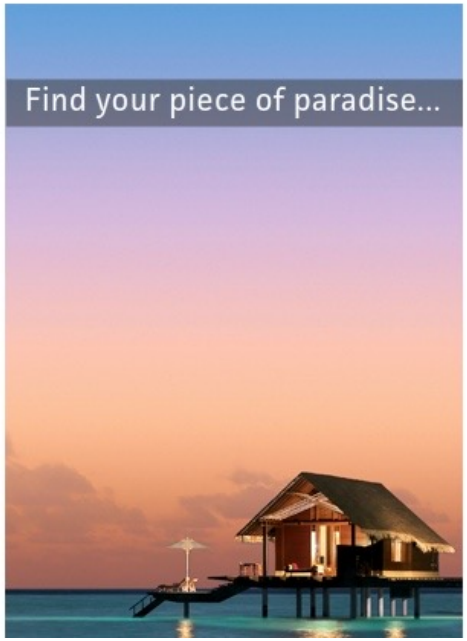
Number of People

Matt McKeon, May 2010

WIRED

You are Facebook's product, not customer

TECHNOLOGY / 21 SEPTEMBER 11 / by OLIVIA SOLON



People need to understand that they are the product of Facebook and not the customer, according to media theorist and writer Douglas Rushkoff.

Speaking at the inaugural Hello Etsy conference in Berlin, the author of *Program or Be Programmed* said: "Ask a kid what Facebook is for and they'll answer 'it's there to help me make friends'. Facebook's boardroom isn't talking about how to make Johnny more friends. It's talking about how to monetise Johnnny's social graph."

Flickr.com/designbyfront

The constant factor in our field is Change!

The 50 years it took Physicists to find one particle, the Higgs, we came from:

"Fortran goto", Unix, c, SmallTalk, DECnet, TCP/IP, c++, Internet, WWW, Semantic Web, Photonic networks, Google, grid, cloud, Data, App's

to:

Ransomware attacks destroying Banks and Bitcoins.

Conclusion:

Need for Safe, Smart, Resilient Sustainable Infrastructure.

CHANGE!

With knowledge comes power

With power comes responsibility

Ethically apply your expertise!

SECURITY AND NETWORK ENGINEERING