Snowden & Internet

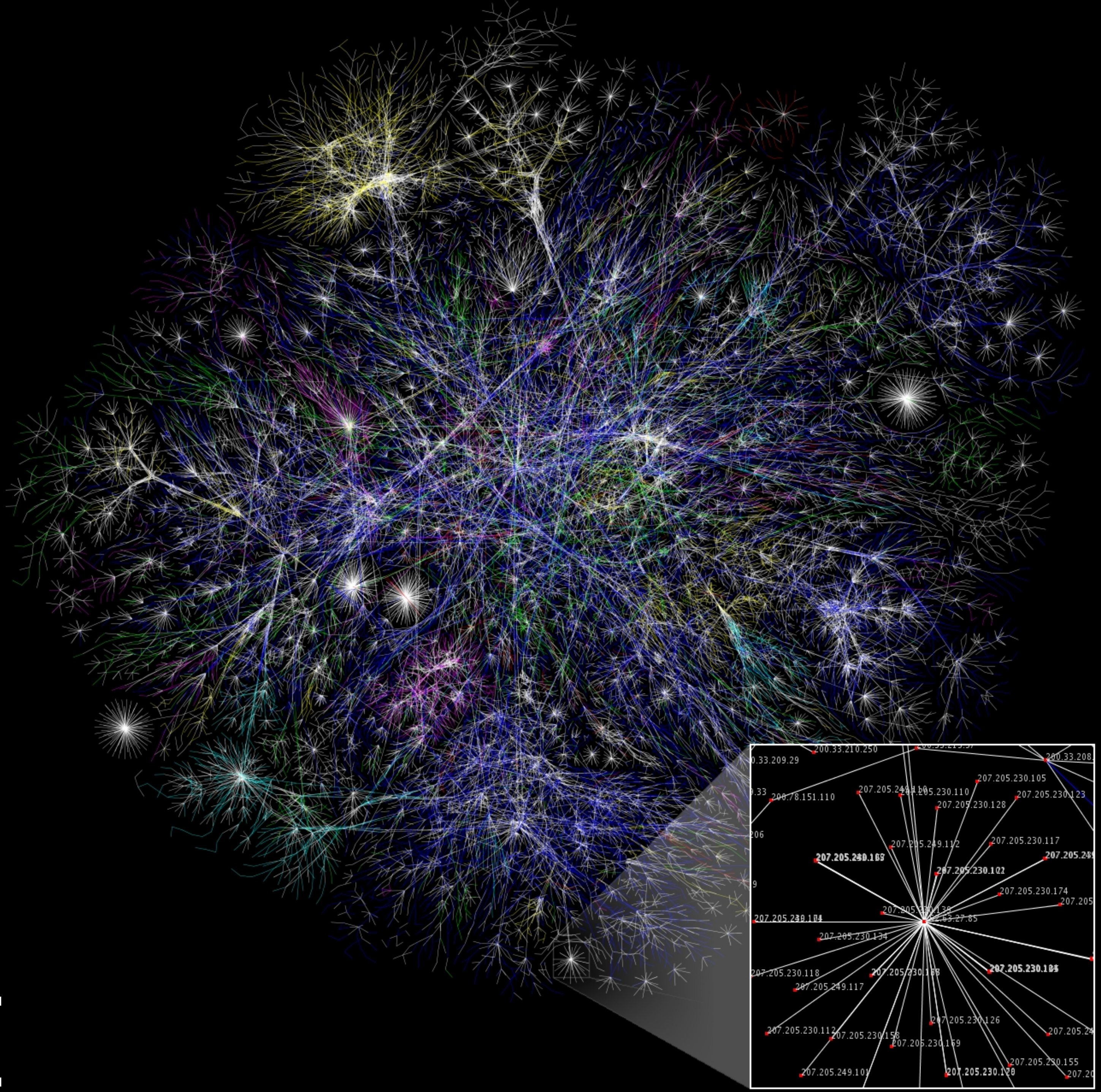
Cees de Laat

The relevations

- A series of exposés beginning June 5, 2013 revealed Internet surveillance programs such as PRISM, XKeyscore and Tempora, as well as the interception of US and European telephone metadata.

Snowden personalia

- Edward Joseph Snowden
- Elizabeth City (NC), 21 juni 1983
- Former employee of the CIA
- System manager subcontracted from the company Booz Allen Hamilton by the National Security Agency (NSA)
- In june 2013 Snowden leaked classified information on a number of espionage activities by the NSA on the Internet
- Activities included global surveillance programs run by NSA & Five Eyes Intel Alliance and many other agencies.
- "Collect it All," "Process it All," "Exploit it All," "Partner it All," "Sniff it All" and "Know it All.


200.33.210.250
0.33.209.29
200.33.208.
207.205.230.105
9.33
200.78.151.110
207.205.230.110
207.205.230.123
207.205.230.128
206
207.205.249.112
207.205.230.117
9
207.205.230.174
207.205
207.205.230.139
207.205.230.134
207.205.230.118
207.205.249.117
207.205.230.126
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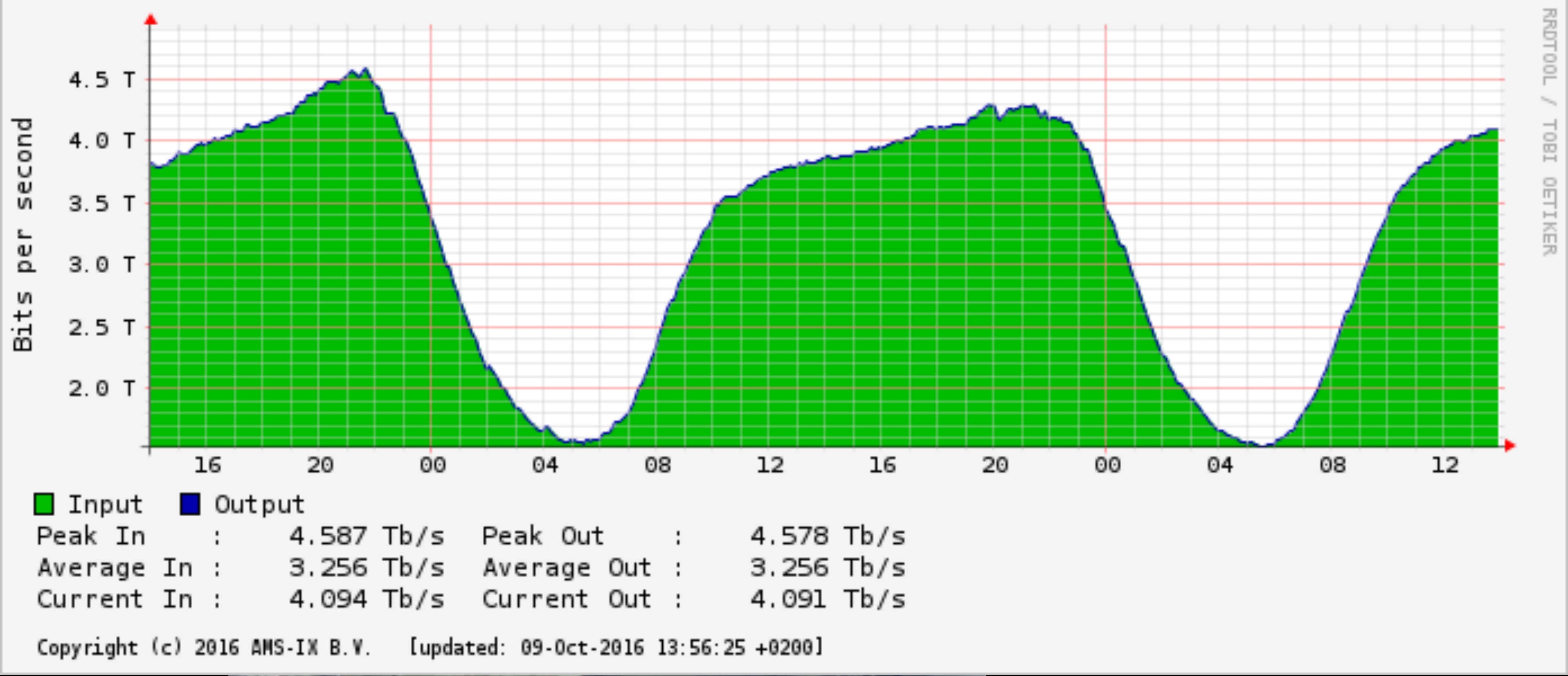
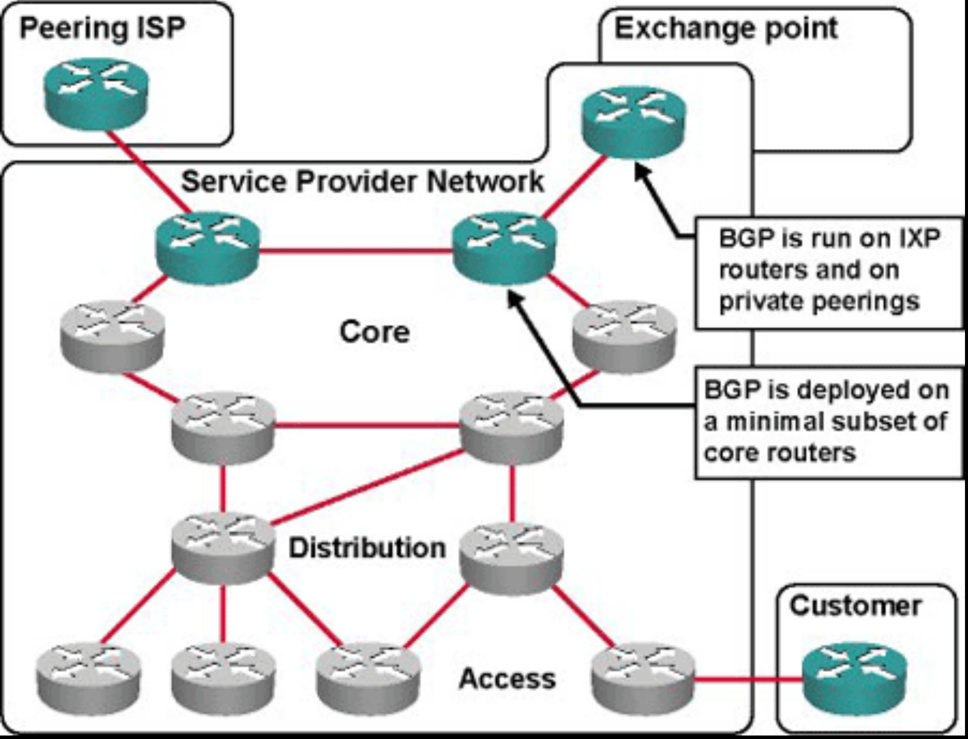
207.205.249.101
207.20

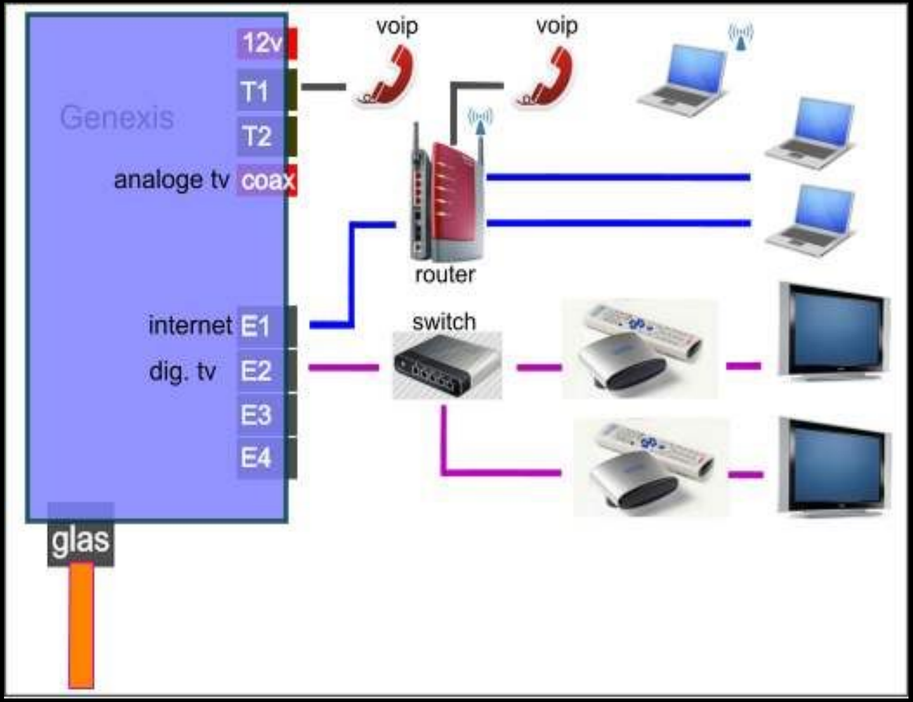


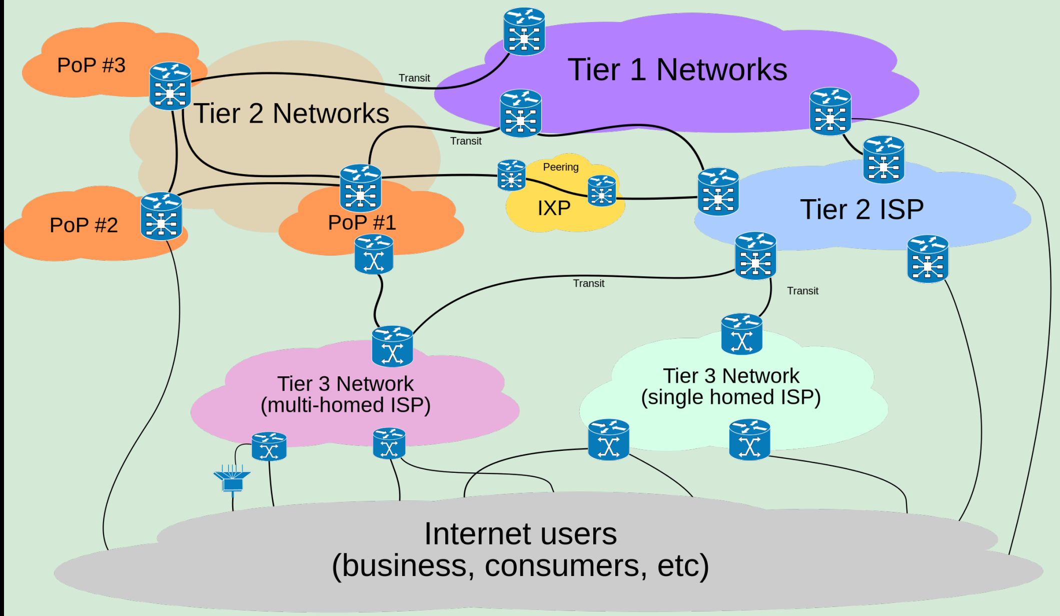
```
🟩 Input   ■ Output
Peak In    :    4.587 Tb/s   Peak Out    :    4.578 Tb/s
Average In :    3.256 Tb/s   Average Out :    3.256 Tb/s
Current In :    4.094 Tb/s   Current Out :    4.091 Tb/s

Copyright (c) 2016 AMS-IX B.V.   [updated: 09-Oct-2016 13:56:25 +0200]
```

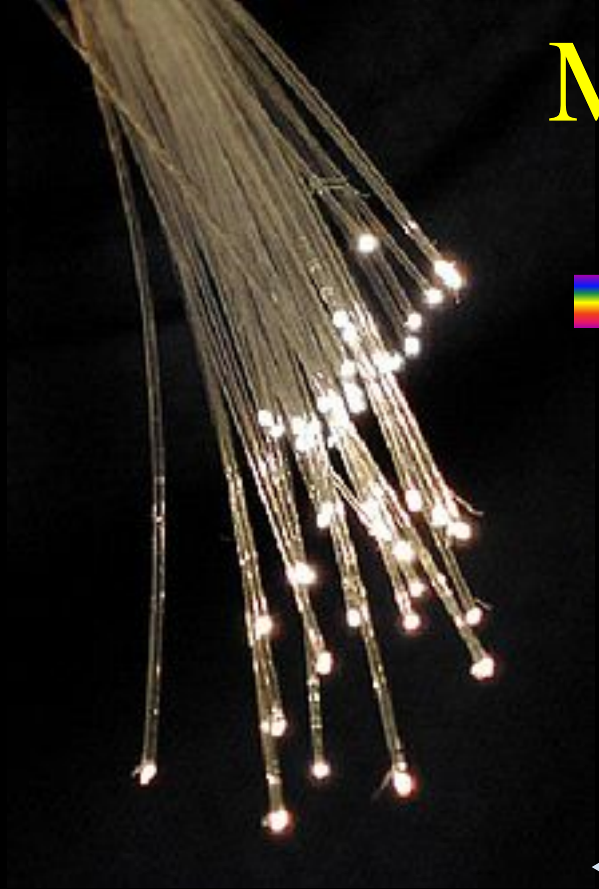
amsix
amsterdam internet exchange

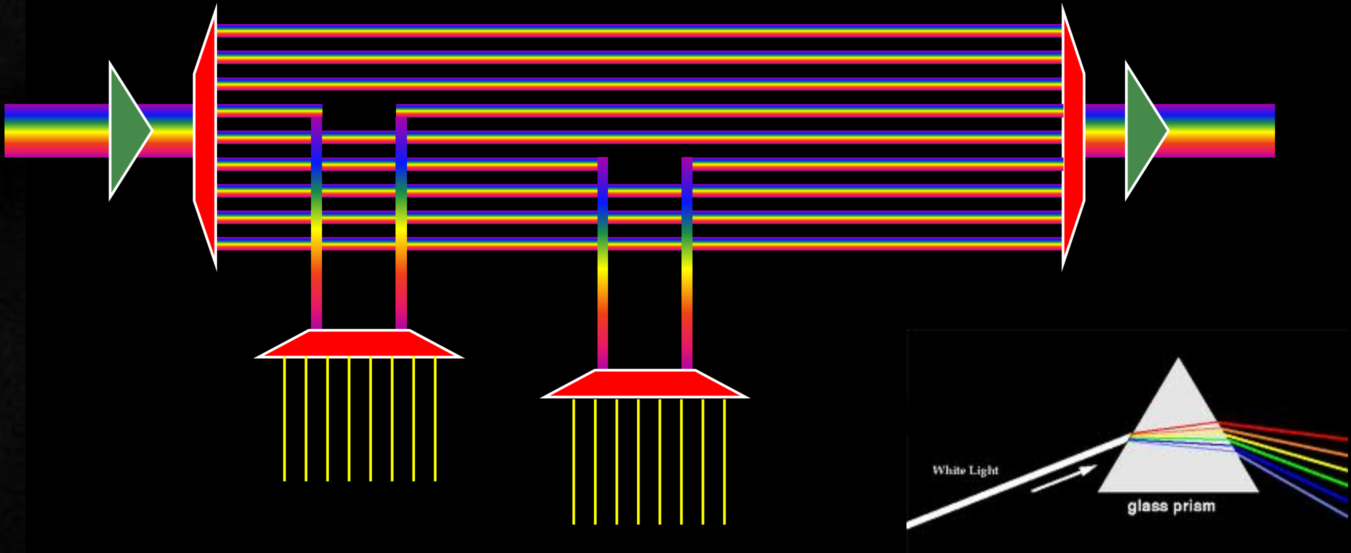

Peering ISP
Exchange point
Service Provider Network
Core
BGP is run on IXP routers and on private peerings
BGP is deployed on a minimal subset of core routers
Distribution
Customer
Access

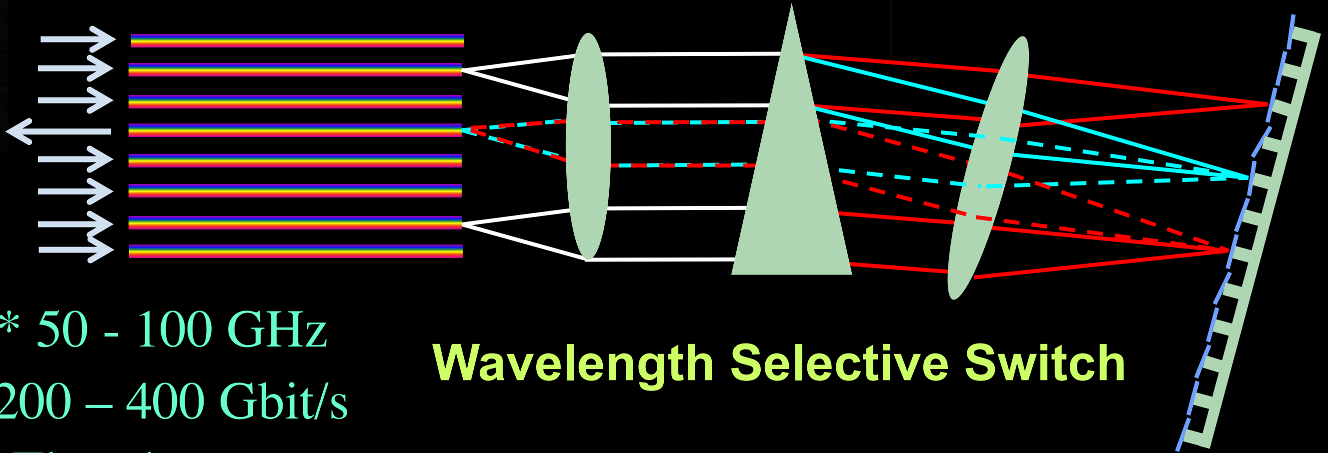

Genexis
12v
T1
T2
analoge tv
coax
internet
E1
dig. tv
E2
E3
E4
glas
voip
voip
router
switch


PoP #3
Transit
Tier 1 Networks
Tier 2 Networks
Transit
Peering
PoP #2
PoP #1
IXP
Tier 2 ISP
Transit
Transit
Tier 3 Network
(multi-homed ISP)
Tier 3 Network
(single homed ISP)
Internet users
(business, consumers, etc)

Multiple colors / Fiber







Wavelength Selective Switch

Per fiber: ~ 80-100 colors * 50 - 100 GHz

Per color: 10 – 40 – 100 - 200 – 400 Gbit/s

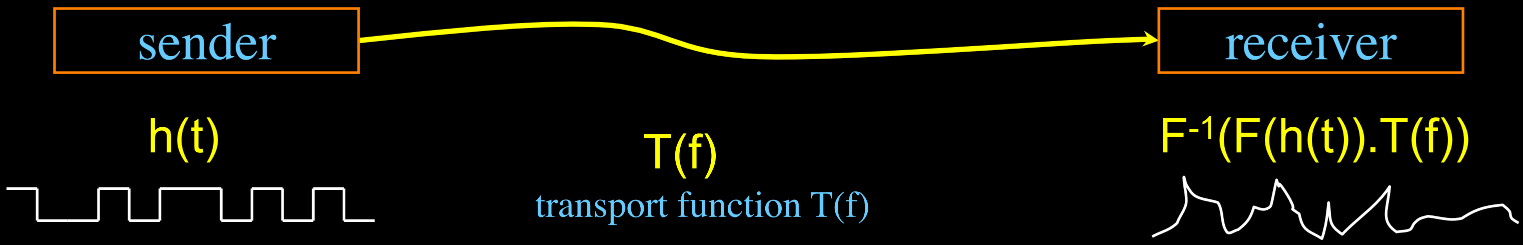
Max total: ~20 Tbit/s = ~2 Tbyte/s

New: Hollow Fiber!

➔ less RTT!

Dispersion compensating modem: eDCO from NORTEL

(Try to Google eDCO :-)



sender

receiver

$h(t)$

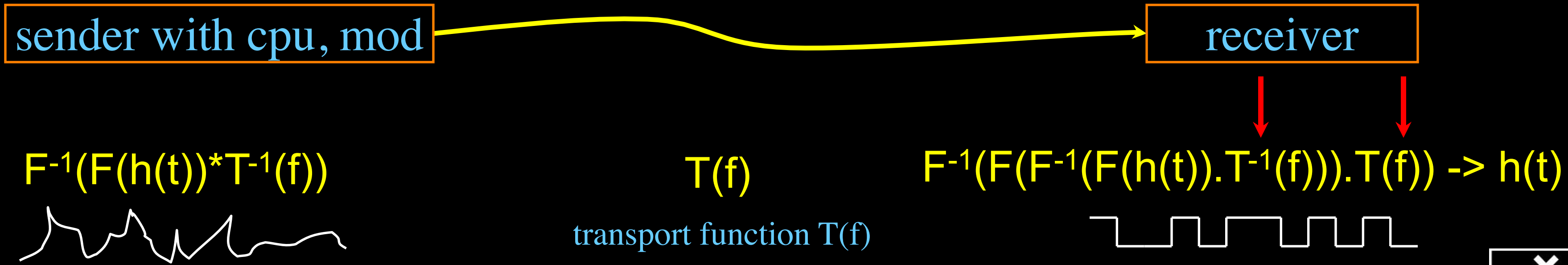
$T(f)$

transport function T(f)

$F^{-1}(F(h(t)).T(f))$

Solution in 5 easy steps for dummy's :

- try to figure out T(f) by trial and error
- invert T(f) -> $T^{-1}(f)$
- computationally multiply $T^{-1}(f)$ with Fourier transform of bit pattern to be send
- inverse Fourier transform the result from frequency to time space
- modulate laser with resulting $h'(t) = F^{-1}(F(h(t)).T^{-1}(f))$



sender with cpu, mod

receiver

$F^{-1}(F(h(t))*T^{-1}(f))$

$T(f)$

transport function T(f)

$F^{-1}(F(F^{-1}(F(h(t)).T^{-1}(f))).T(f))$ -> $h(t)$

(ps. due to power ~ square E the signal to send looks like uncompensated received but is not)

Gridless colors.

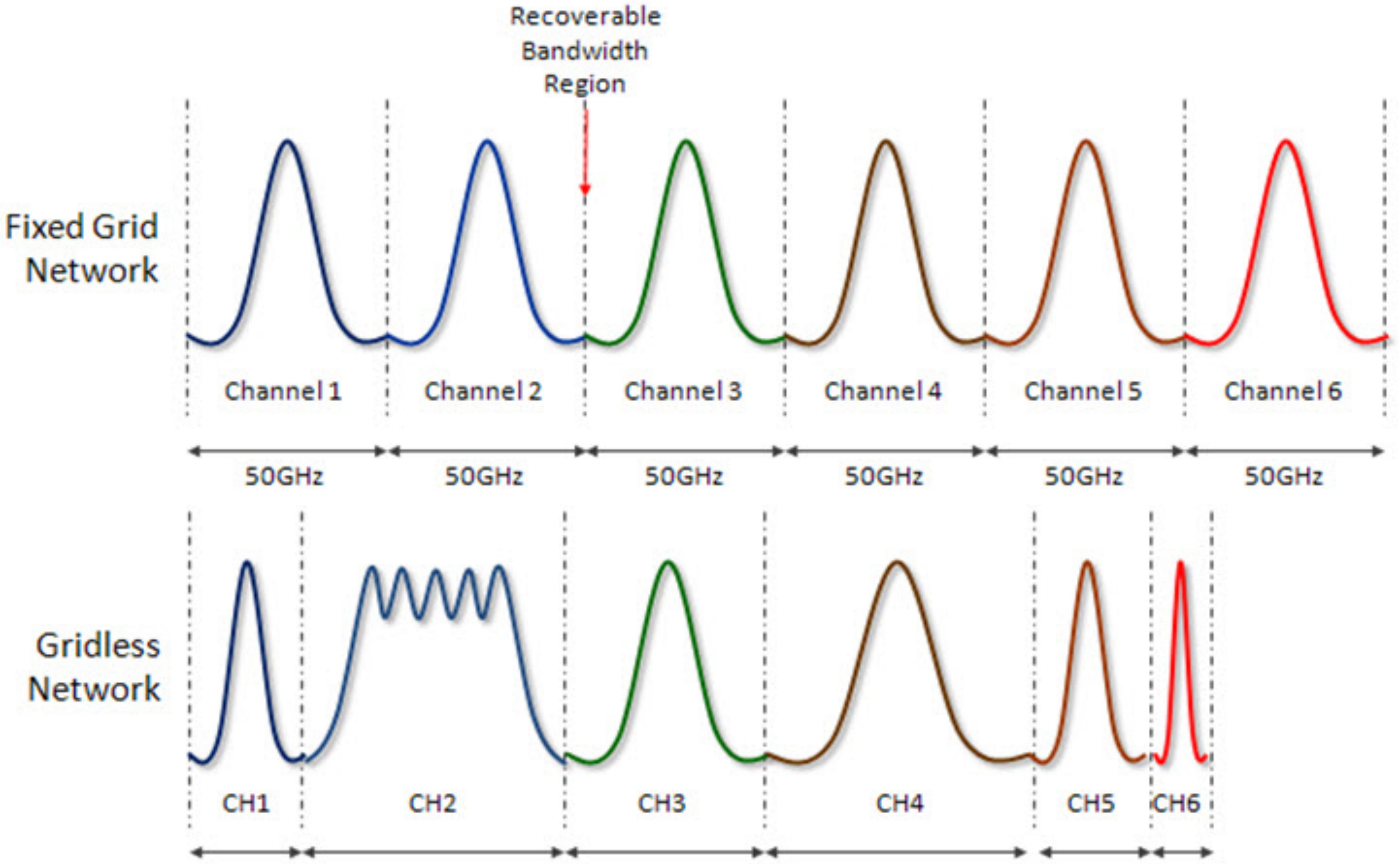
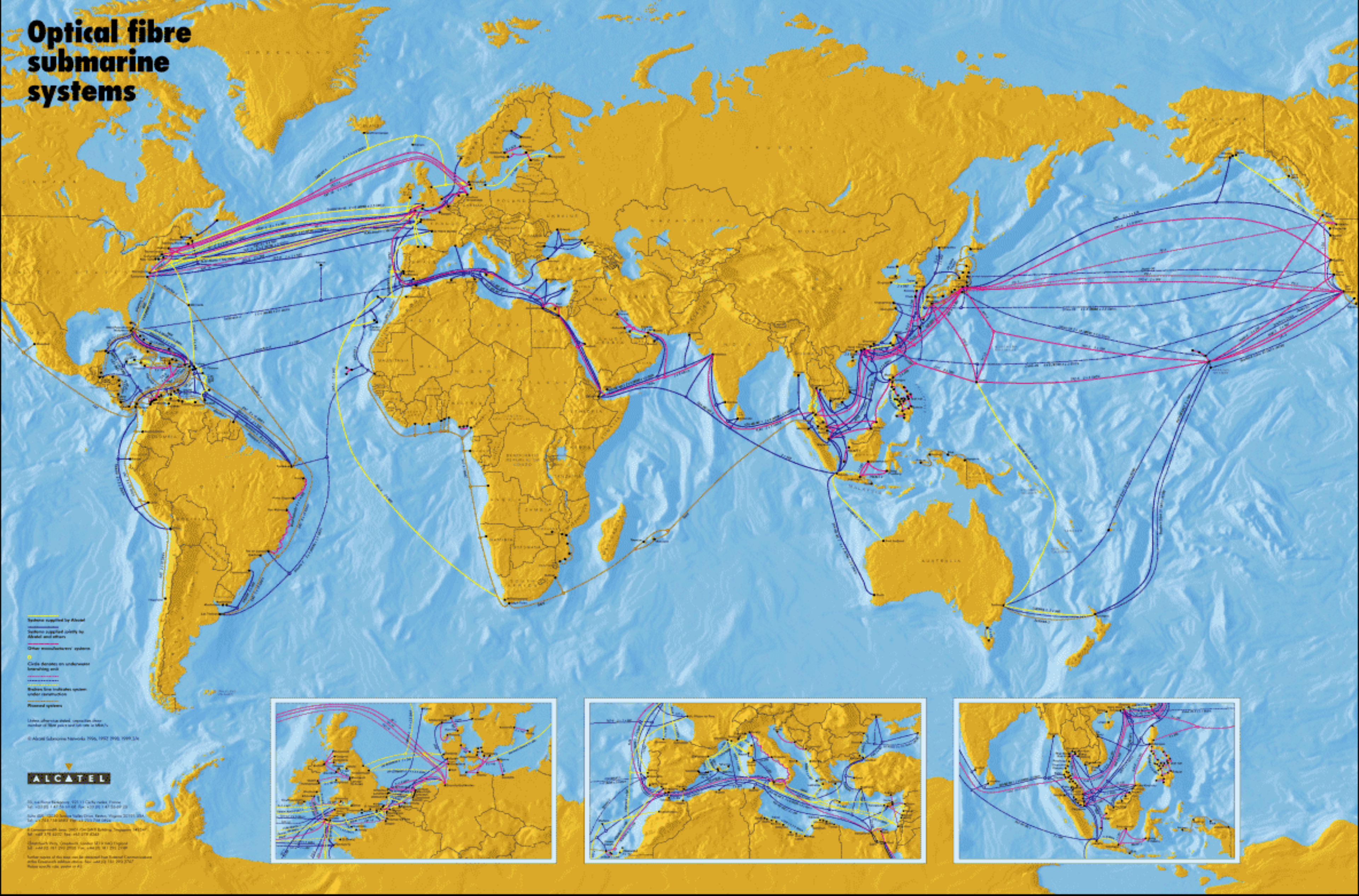
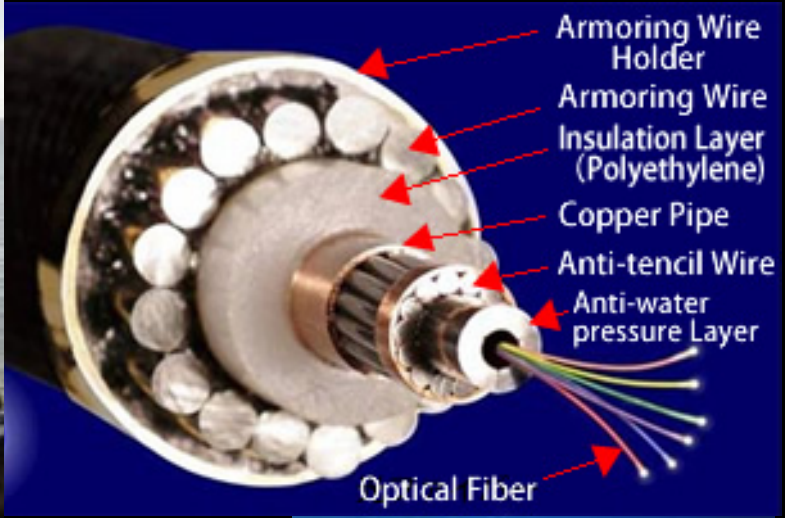


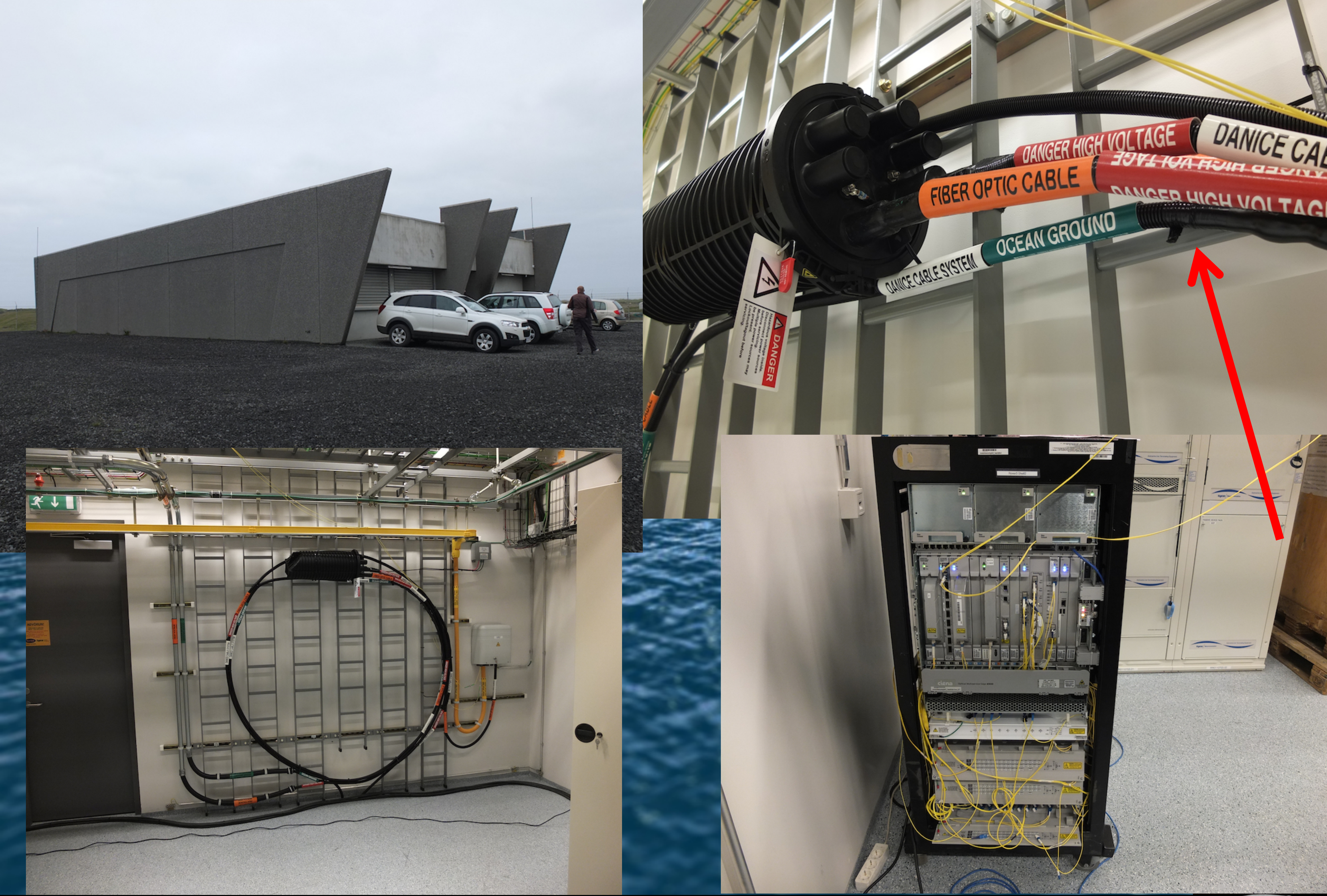
Figure 1 – Fixed Grid vs. Gridless Networking


Optical fibre submarine systems
Systems supplied by Alcatel
Systems supplied jointly by Alcatel and others
Other manufacturers' systems
Circle denotes an underwater branching unit
Broken line indicates system under construction
Planned systems
Unless otherwise stated, capacities show number of fibre pairs and bit rate in Mbit/s
© Alcatel Submarine Networks 1996, 1997, 1998, 1999 3/e
ALCATEL
AUSTRALIA

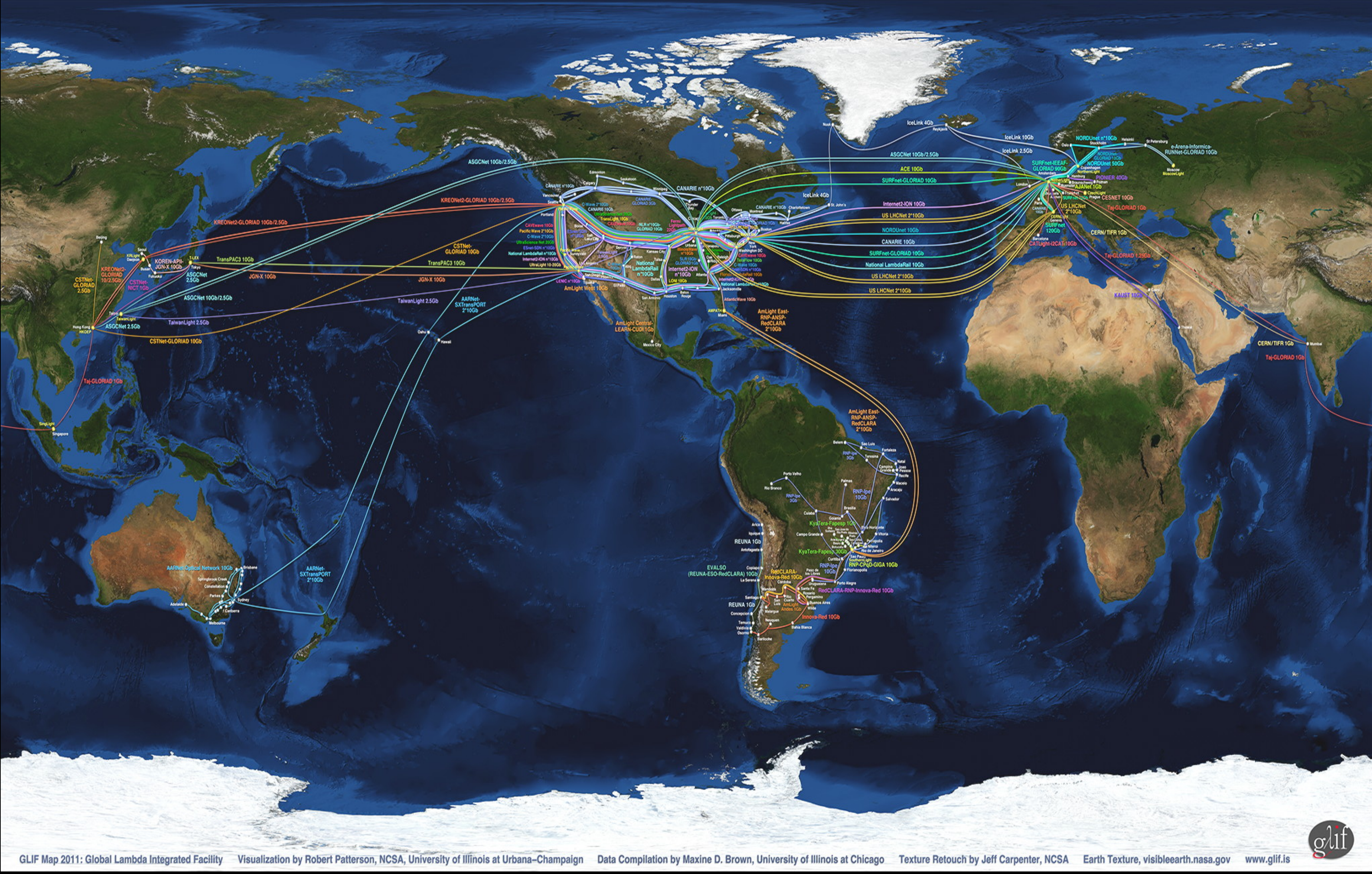
Undersea Cable System



A **cable landing station** may or may not be required, depending on whether, for example, the submarine cable requires power to power submarine repeaters or amplifiers. The voltages applied to the cables can be high **3,000 to 4,000 volts** for a typical trans-Atlantic telecommunications cable system, and 1,000 volts for a cross-channel telecommunications cable system. Submarine power cables can operate at many kilovolts: for example, theFenno-Skan power cable operates at 400 kV DC.



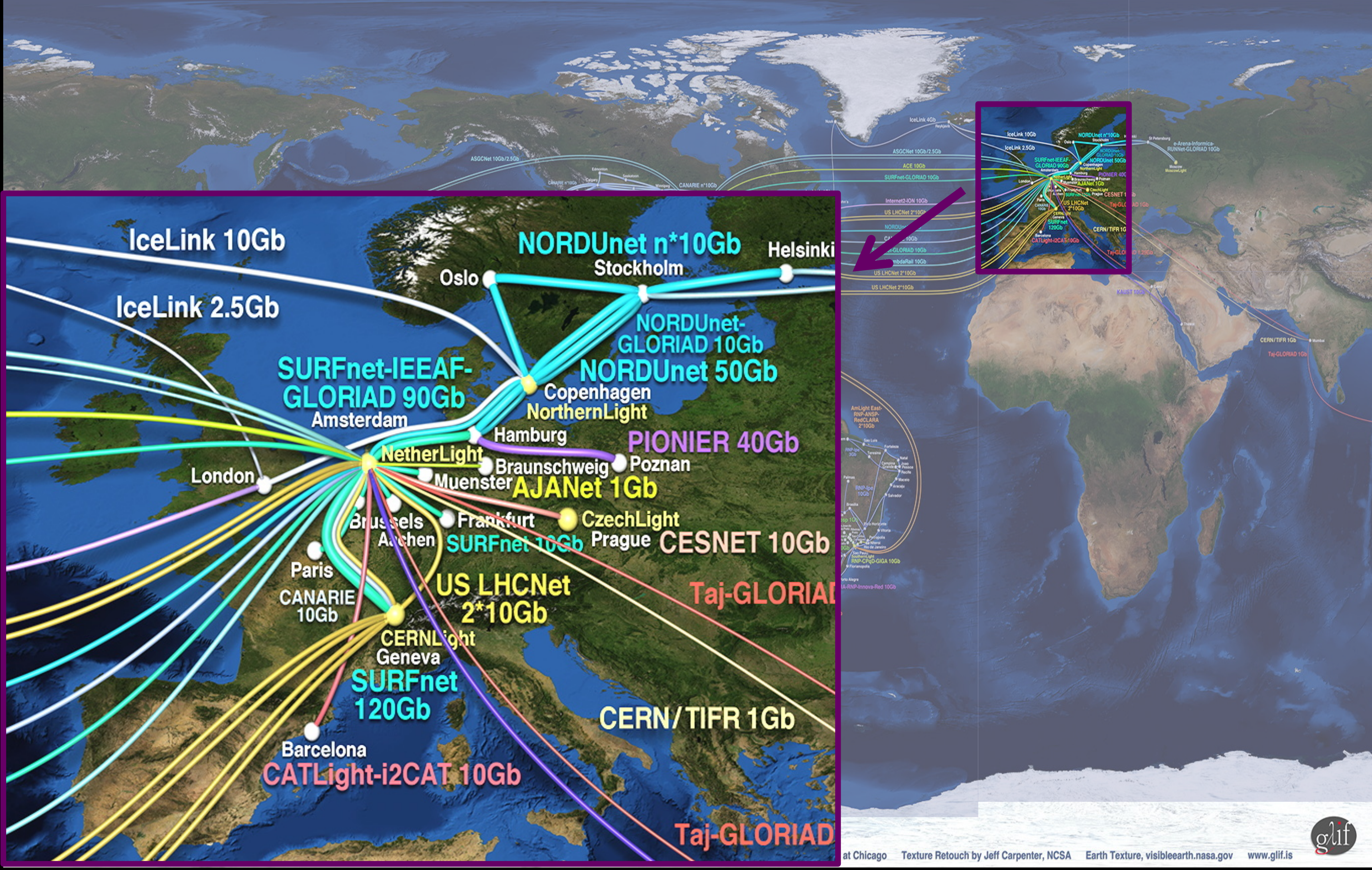
Undersea Cable HV



GLIF Map 2011: Global Lambda Integrated Facility   Visualization by Robert Patterson, NCSA, University of Illinois at Urbana–Champaign   Data Compilation by Maxine D. Brown, University of Illinois at Chicago   Texture Retouch by Jeff Carpenter, NCSA   Earth Texture, visibleearth.nasa.gov   www.glif.is

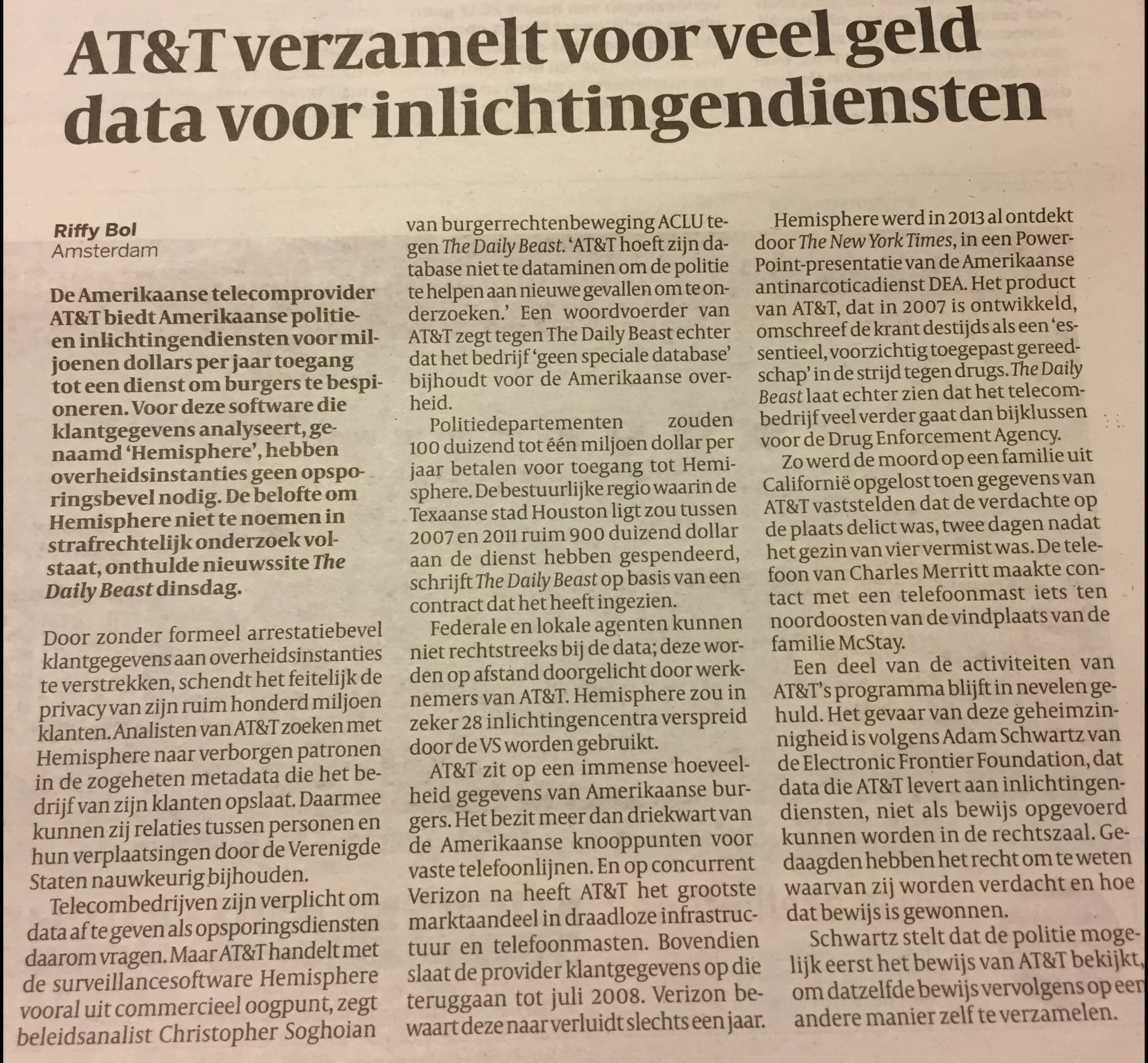
F Dijkstra, J van der Ham, P Grosso, C de Laat, “A path finding implementation for multi-layer networks”, Future Generation Computer Systems 25 (2), 142-146.

The GLIF – LightPaths around the World



F Dijkstra, J van der Ham, P Grosso, C de Laat, “A path finding implementation for multi-layer networks”, Future Generation Computer Systems 25 (2), 142-146.

The GLIF – LightPaths around the World



AT&T verzamelt voor veel geld data voor inlichtingendiensten

Riffy Bol
Amsterdam

De Amerikaanse telecomprovider AT&T biedt Amerikaanse politie- en inlichtingendiensten voor miljoenen dollars per jaar toegang tot een dienst om burgers te bespioneren. Voor deze software die klantgegevens analyseert, genaamd 'Hemisphere', hebben overheidsinstanties geen opsporingsbevel nodig. De belofte om Hemisphere niet te noemen in strafrechtelijk onderzoek volstaat, onthulde nieuwssite *The Daily Beast* dinsdag.

Door zonder formeel arrestatiebevel klantgegevens aan overheidsinstanties te verstrekken, schendt het feitelijk de privacy van zijn ruim honderd miljoen klanten. Analisten van AT&T zoeken met Hemisphere naar verborgen patronen in de zogeheten metadata die het bedrijf van zijn klanten opslaat. Daarmee kunnen zij relaties tussen personen en hun verplaatsingen door de Verenigde Staten nauwkeurig bijhouden.

Telecombedrijven zijn verplicht om data af te geven als opsporingsdiensten daarom vragen. Maar AT&T handelt met de surveillancesoftware Hemisphere vooral uit commercieel oogpunt, zegt beleidsanalist Christopher Soghoian van burgerrechtenbeweging ACLU tegen *The Daily Beast*. 'AT&T hoeft zijn database niet te dataminen om de politie te helpen aan nieuwe gevallen om te onderzoeken.' Een woordvoerder van AT&T zegt tegen The Daily Beast echter dat het bedrijf 'geen speciale database' bijhoudt voor de Amerikaanse overheid.

Politiedepartementen zouden 100 duizend tot één miljoen dollar per jaar betalen voor toegang tot Hemisphere. De bestuurlijke regio waarin de Texaanse stad Houston ligt zou tussen 2007 en 2011 ruim 900 duizend dollar aan de dienst hebben gespendeerd, schrijft *The Daily Beast* op basis van een contract dat het heeft ingezien.

Federale en lokale agenten kunnen niet rechtstreeks bij de data; deze worden op afstand doorgelicht door werknemers van AT&T. Hemisphere zou in zeker 28 inlichtingencentra verspreid door de VS worden gebruikt.

AT&T zit op een immense hoeveelheid gegevens van Amerikaanse burgers. Het bezit meer dan driekwart van de Amerikaanse knooppunten voor vaste telefoonlijnen. En op concurrent Verizon na heeft AT&T het grootste marktaandeel in draadloze infrastructuur en telefoonmasten. Bovendien slaat de provider klantgegevens op die teruggaan tot juli 2008. Verizon bewaart deze naar verluidt slechts een jaar.

Hemisphere werd in 2013 al ontdekt door *The New York Times*, in een PowerPoint-presentatie van de Amerikaanse antinarcoticadienst DEA. Het product van AT&T, dat in 2007 is ontwikkeld, omschreef de krant destijds als een 'essentieel, voorzichtig toegepast gereedschap' in de strijd tegen drugs. *The Daily Beast* laat echter zien dat het telecombedrijf veel verder gaat dan bijklussen voor de Drug Enforcement Agency.

Zo werd de moord op een familie uit Californië opgelost toen gegevens van AT&T vaststelden dat de verdachte op de plaats delict was, twee dagen nadat het gezin van vier vermist was. De telefoon van Charles Merritt maakte contact met een telefoonmast iets ten noordoosten van de vindplaats van de familie McStay.

Een deel van de activiteiten van AT&T's programma blijft in nevelen gehuld. Het gevaar van deze geheimzinnigheid is volgens Adam Schwartz van de Electronic Frontier Foundation, dat data die AT&T levert aan inlichtingendiensten, niet als bewijs opgevoerd kunnen worden in de rechtszaal. Gedaagden hebben het recht om te weten waarvan zij worden verdacht en hoe dat bewijs is gewonnen.

Schwartz stelt dat de politie mogelijk eerst het bewijs van AT&T bekijkt, om datzelfde bewijs vervolgens op een andere manier zelf te verzamelen.

Revelations on:

name	orig	partners	purpose
Xkeyscore	USA	D, S	searching and analyzing global Internet data
PRISM	USA	AU, UK, NL	collect info from Micro$oft, Google, Facebook, Apple
ECHELON	USA	5Y	global network to eavesdrop on telephones, faxes and computers, bank accounts
Carnivore	USA		Monitor electronic communications using customizable packet sniffer on target user's Internet
DISHFIRE	USA	UK	covert global surveillance collection system and database
Stone Ghost	USA		information sharing and exchange between the United States, the United Kingdom, Canada and Australia
Tempora	UK	USA	Telcos: BT, Interoute, L3, Global Crossing, Verizon, Viatel, Vodafone cable
MUSCULAR	UK	USA	records from internal Yahoo! and Google
Frenchelon	FR		French global network to eavesdrop on telephones, faxes and computers, bank accounts
Fairview	USA	AT&T	collect phone, internet and e-mail data of foreign countries' citizens at major cable landing stations and switching stations inside the United States
MYSTIC	USA		collect the metadata as well as the content of phone calls from several entire countries
DCSN	USA	FBI	surveillance system to perform instant wiretaps on almost any telecommunications device in the US
Boundless Informant	USA		a big data analysis and data visualization tool
BULLRUN	USA		to crack encryption of online communications and data (UK -> Edgehill)
PINWALE	USA		Digital Network Intelligence, including internet e-mail
Stingray	USA		IMSI-catcher, cellular phone surveillance device, manufactured by Harris Corporation
LOVEINT	USA		Spying on colleague's, spouses ☺

- The two principal components of Tempora are called (wikipedia)
  - "Mastering the Internet" (MTI)
  - "Global Telecoms Exploitation"
- Collate online and telephone traffic
- Data from fibre-optic cable communications.
- Data is preserved for three days, metadata for thirty days.
- By May 2012 300 GCHQ analysts and 250 NSA analysts had been assigned to sort data.[4]
- About 850,000 people have security clearance to access the data.
- Tempora said to include recordings of telephone calls, content of email messages, Facebook entries and personal internet history of users.
- Snowden said of Tempora that "It's not just a U.S. problem. “They [GCHQ] are worse than the U.S.”
- Dutch programs (iColumbo: http://columbo.nl/)

TEMPORA

What is XKEYSCORE?

1. DNI Exploitation System/Analytic Framework

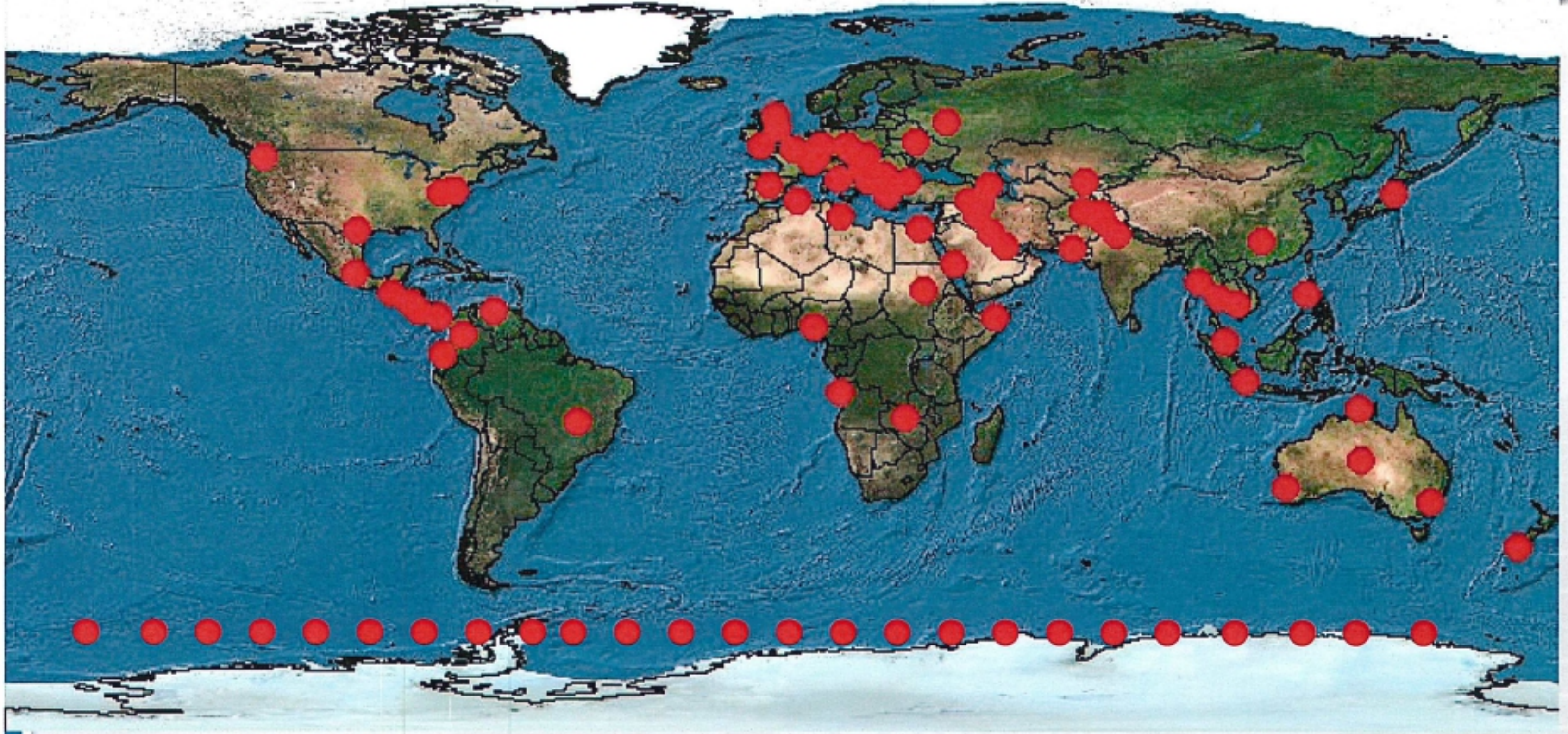
2. Performs strong (e.g. email) and soft (content) selection

3. Provides real-time target activity (tipping)

4. "Rolling Buffer" of ~3 days of ALL unfiltered data seen by XKEYSCORE:
   - Stores full-take data at the collection site – indexed by meta-data
   - Provides a series of viewers for common data types

1. Federated Query system – one query scans all sites
   - Performing full-take allows analysts to find targets that were previously unknown by mining the meta-data

Where is X-KEYSCORE?

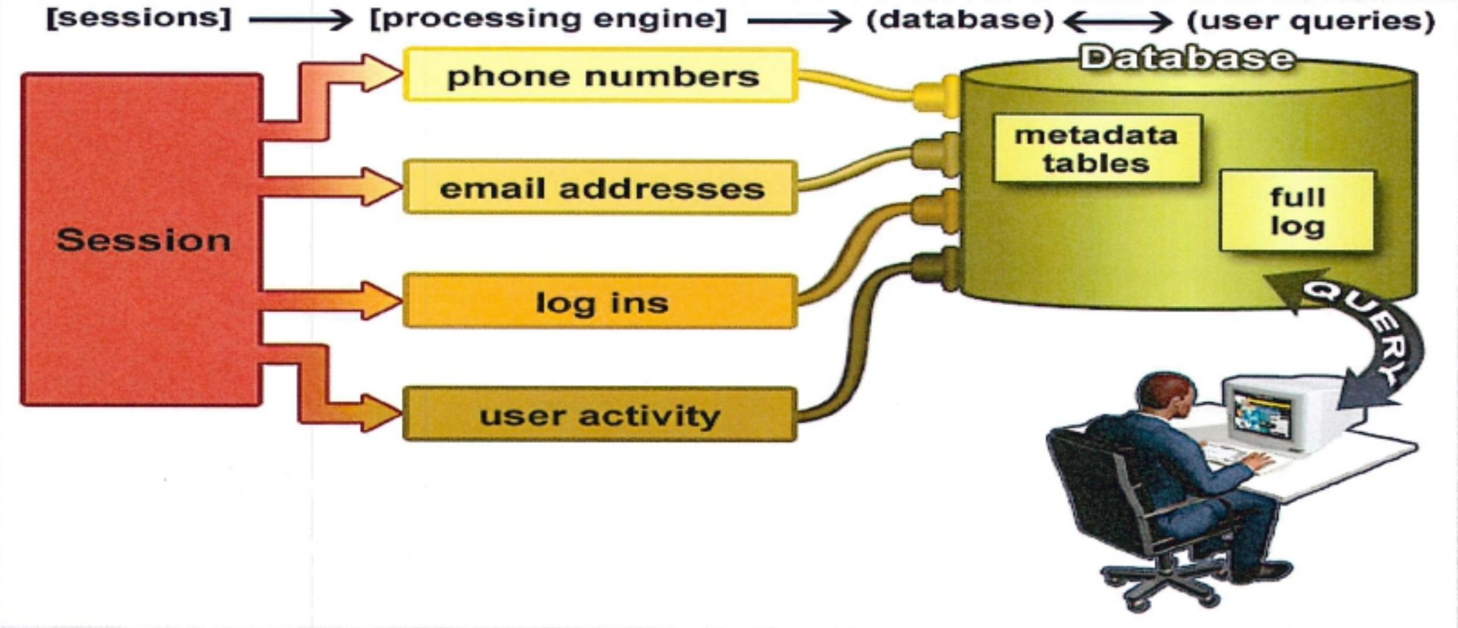


Approximately 150 sites

Over 700 servers

What XKS does with the Sessions

Plug-ins extract and index metadata into tables

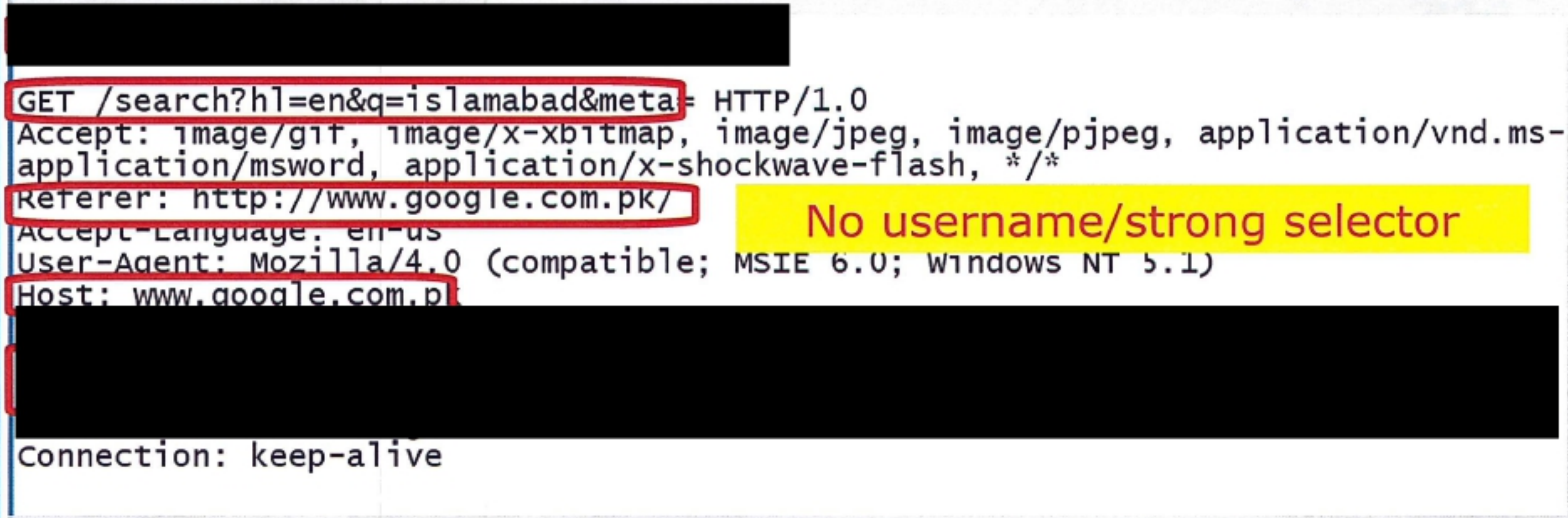


Plug-ins

Plug-in	DESCRIPTION
E-mail Addresses	Indexes every E-mail address seen in a session by both username and domain
Extracted Files	Indexes every file seen in a session by both filename and extension
Full Log	Indexes every DNI session collected. Data is indexed by the standard N-tupple (IP, Port, Casenotation etc.)
HTTP Parser	Indexes the client-side HTTP traffic (examples to follow)
Phone Number	Indexes every phone number seen in a session (e.g. address book entries or signature block)
User Activity	Indexes the Webmail and Chat activity to include username, buddylist, machine specific cookies etc.

What Can Be Stored?

- Anything you wish to extract
  - Choose your metadata
  - Customizable storage times
  - Ex: HTTP Parser



[redacted]

```
GET /search?hl=en&q=islamabad&meta= HTTP/1.0
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/vnd.ms-
application/msword, application/x-shockwave-flash, */*
Referer: http://www.google.com.pk/
Accept-Language: en-us
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)
Host: www.google.com.p
```

[redacted]

```
Connection: keep-alive
```

No username/strong selector

GMail facebook msn Hotmail YAHOO! Google skype paltalk.com YouTube AOL mail

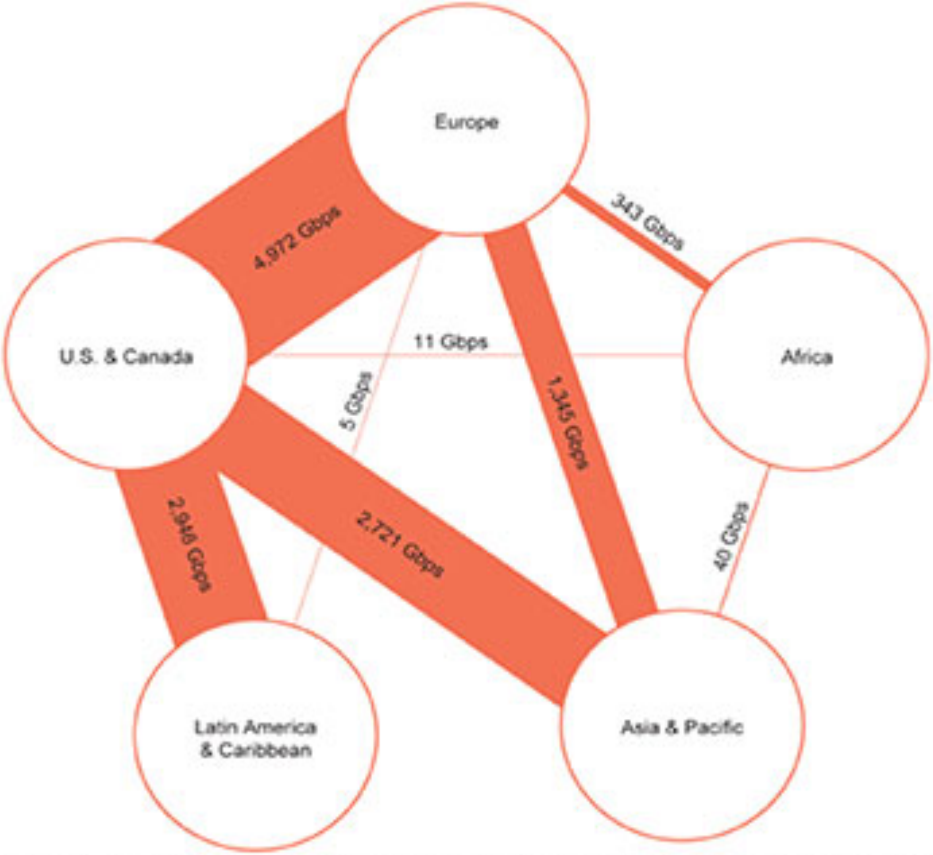
SPECIAL SOURCE OPERATIONS

(TS//SI//NF) Introduction

U.S. as World's Telecommunications Backbone

PRISM

- Much of the world's communications flow through the U.S.
- A target's phone call, e-mail or chat will take the **cheapest** path, **not the physically most direct** path – you can't always predict the path.
- Your target's communications could easily be flowing into and through the U.S.



International Internet Regional Bandwidth Capacity in 2011

Source: Telegeography Research

TOP SECRET//SI//ORCON//NOFORN

(TS//SI//NF) PRISM Collection Details

Current Providers

- Microsoft (Hotmail, etc.)
- Google
- Yahoo!
- Facebook
- PalTalk
- YouTube
- Skype
- AOL
- Apple

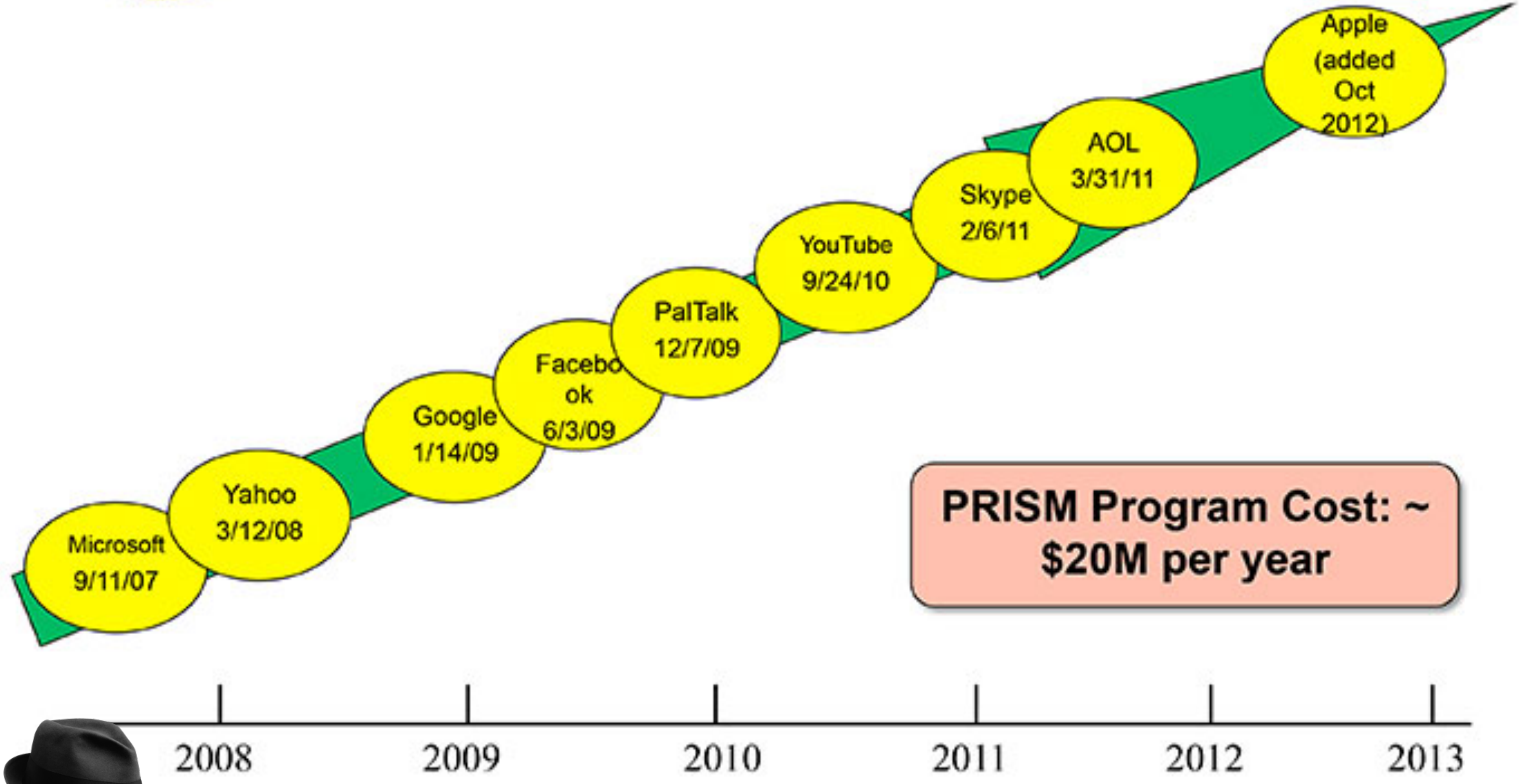
What Will You Receive in Collection (Surveillance and Stored Comms)?
It varies by provider. In general:

- E-mail
- Chat – video, voice
- Videos
- Photos
- Stored data
- VoIP
- File transfers
- Video Conferencing
- Notifications of target activity – logins, etc.
- Online Social Networking details
- **Special Requests**

Complete list and details on PRISM web page:
Go PRISMFAA

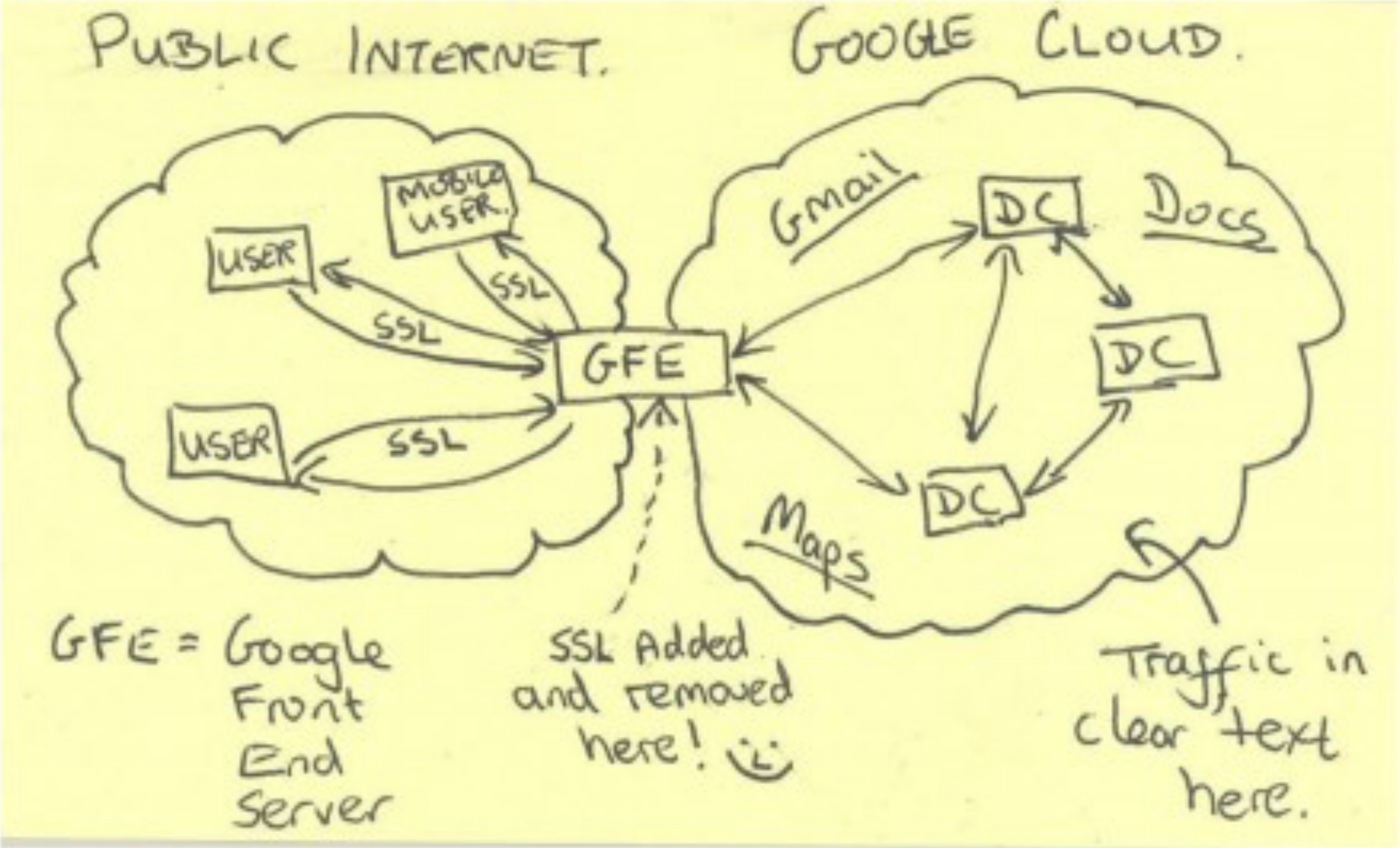
TOP SECRET//SI//ORCON//NOFORN

(TS//SI//NF) Dates When PRISM Collection Began For Each Provider



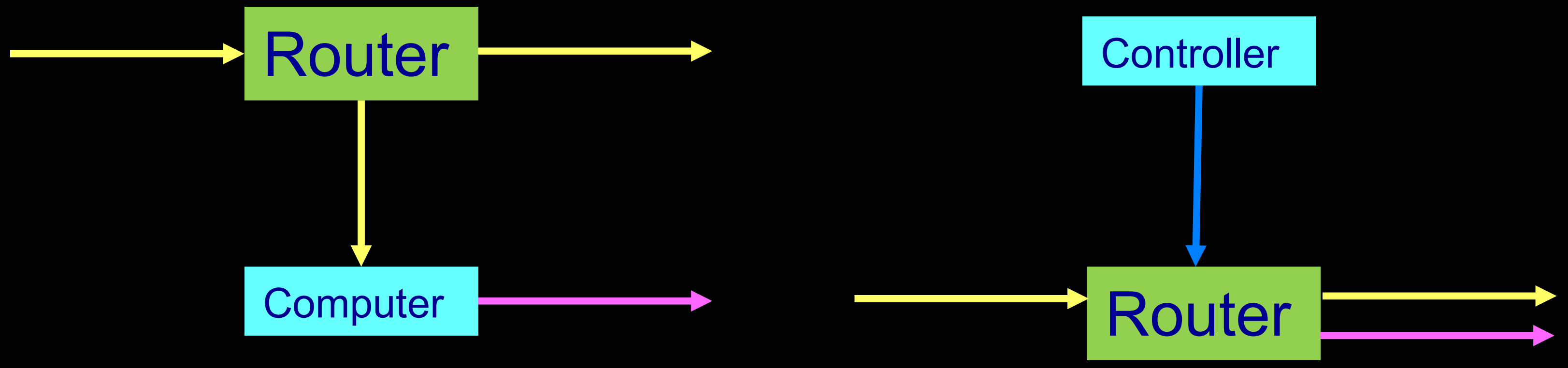
PRISM Program Cost: ~ $20M per year

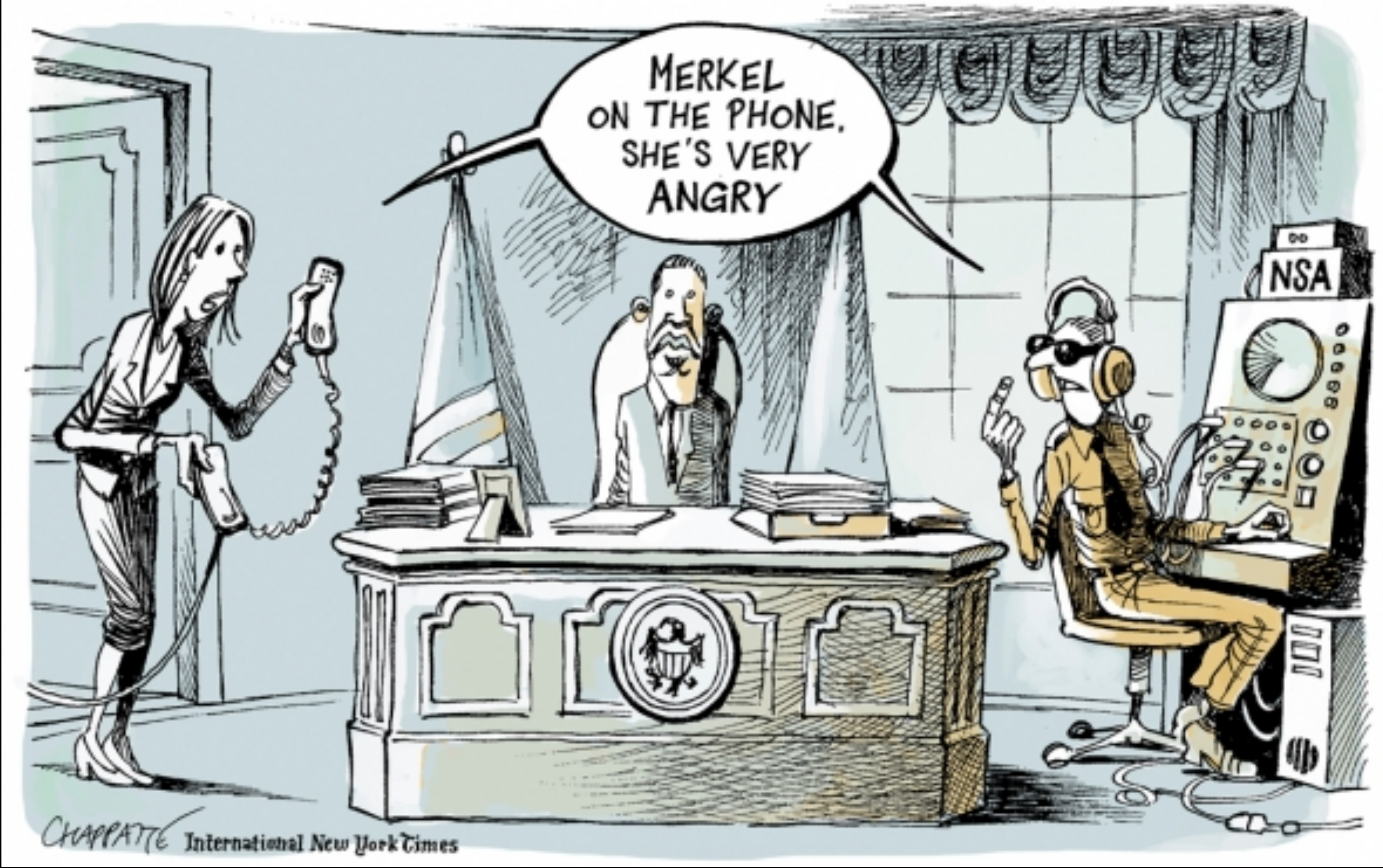
Current Efforts - Google


PUBLIC INTERNET.
GOOGLE CLOUD.
MOBILE USER.
USER
USER
SSL
SSL
SSL
GFE
Gmail
DC
Docs
DC
DC
DC
Maps
GFE = Google Front End Server
SSL Added and removed here! ☺
Traffic in clear text here.

New Internet Technology

- SDN, NFV, OpenFlow
- Decoupling logic from forwarding plane
- Rules that encode in forwarding plane TCAM’s
  - – Ternary Content Addressable Memory





CHAPPATTE International New York Times

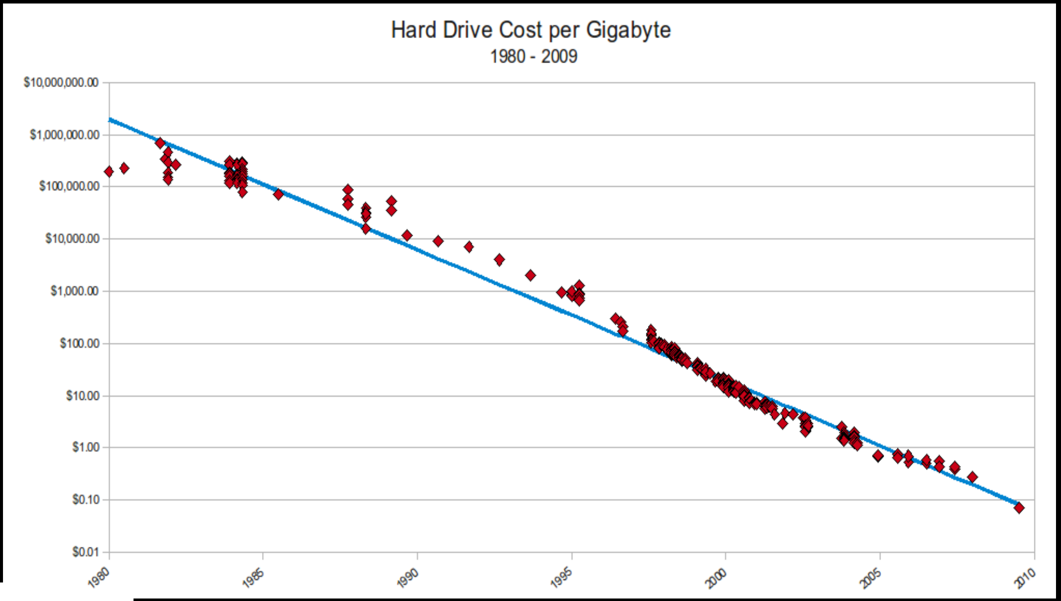
Encryption?

The NSA follows specific procedures to target non-U.S. persons and to minimize data collection from U.S. persons.

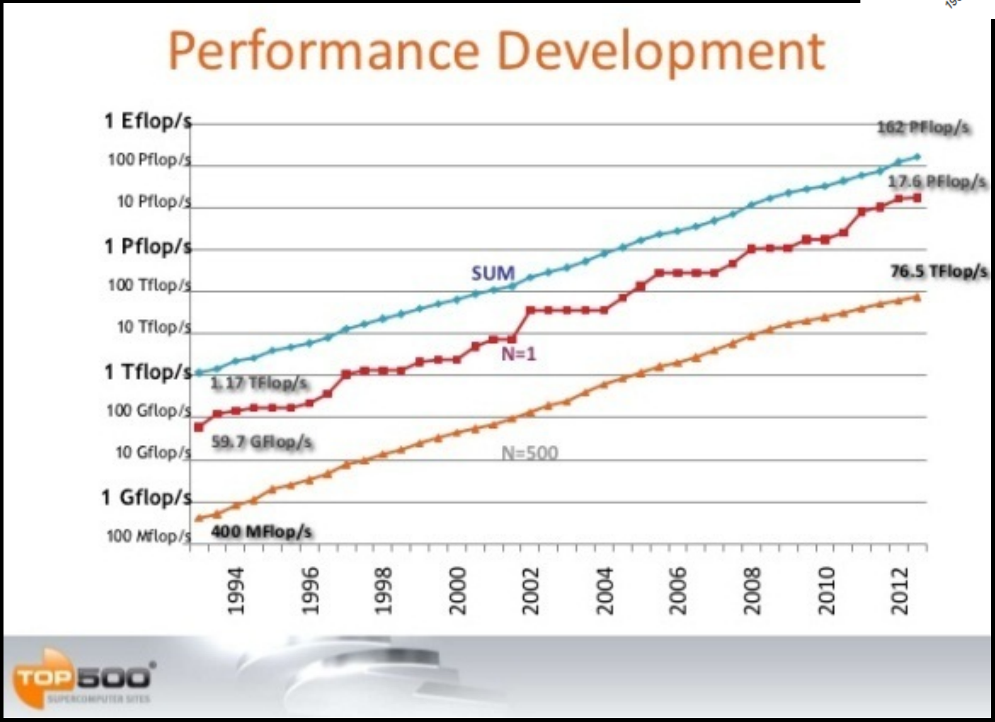
These court-approved policies allow the NSA to:

- keep data that could potentially contain details of U.S. persons for up to five years;
- retain and make use of "inadvertently acquired" domestic communications if they contain usable intelligence, information on criminal activity, threat of harm to people or property, are encrypted, or are believed to contain any information relevant to cybersecurity;
- preserve "foreign intelligence information" contained within attorney–client communications
- access the content of communications gathered from "U.S. based machine[s]" or phone numbers in order to establish if targets are located in the U.S., for the purposes of ceasing further surveillance.

Computing vs Data



Computing per unit cost has doubled roughly every 18 months (Moore's law).



Space per unit cost has doubled roughly every 14 months (Kryder's law).

So: data becomes exponentially uncomputable.

http://www.mkomo.com/cost-per-gigabyte

NSA seeks to build quantum computer that could crack most types of encryption

HOW BAD IS IT?

If you take the development of serious quantum computing power as a given, all of the encryption methods based on factoring primes or doing modular exponentials, most notably RSA, elliptic curve cryptography, and Diffie-Hellman are all in trouble. Specifically, Shor’s algorithm, when applied on a quantum computer, will render the previously difficult math problems that underlie these methods trivially easy almost irrespective of chosen key length. That covers most currently used public-key crypto and the key exchange that’s used in negotiating an SSL connection.

http://hackaday.com/2015/09/29/quantum-computing-kills-encryption/

Post Quantum encryption

- https://en.wikipedia.org/wiki/Post-quantum_cryptography
- https://www.schneier.com/blog/archives/2016/07/googles_post-qu.html
- https://eprint.iacr.org/2015/1092.pdf

Note the difference

🡐==

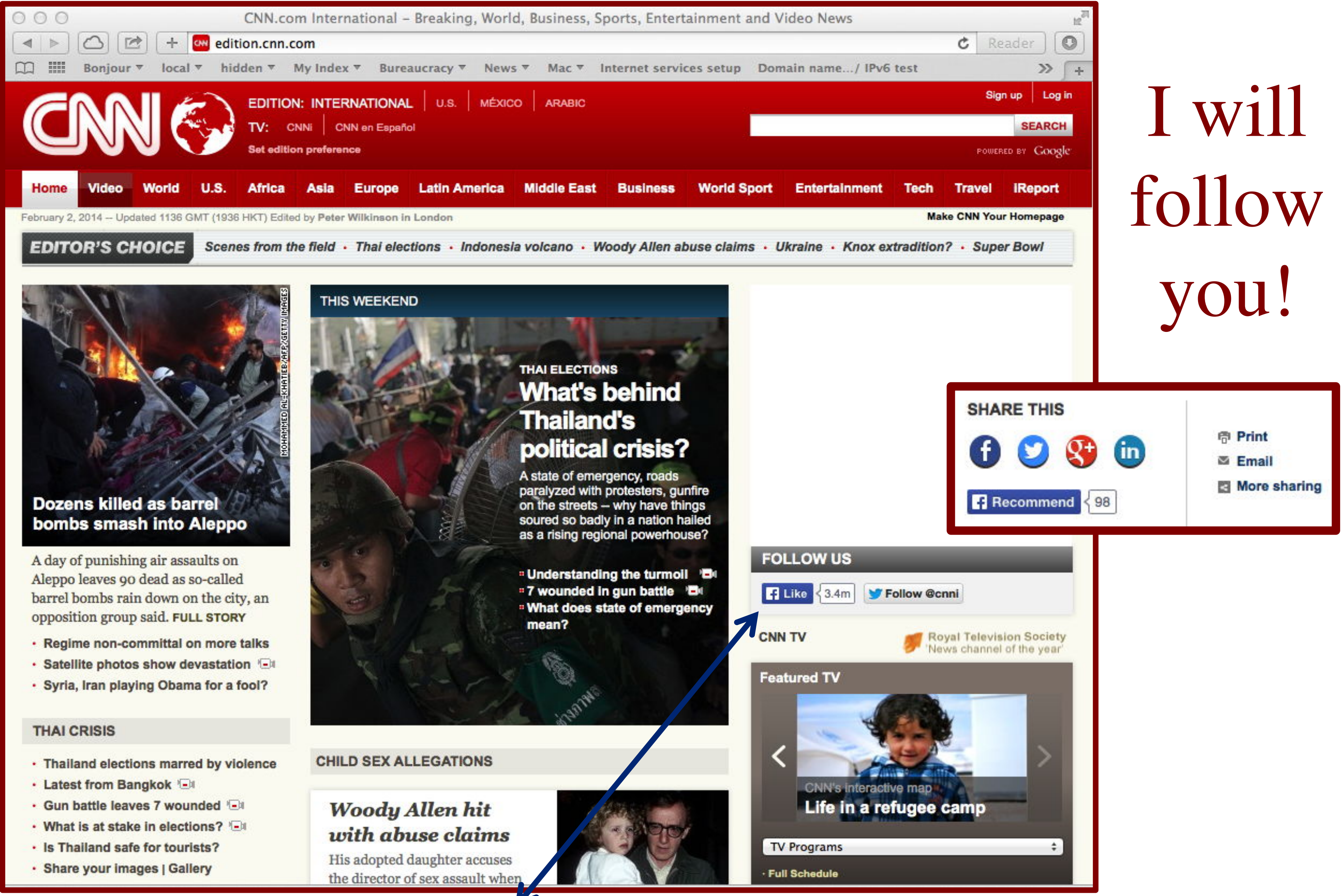
Fact & Fiction

- Claims that BT pre-cooks adsl modems to send information from home networks to NSA and British Intelligence
  - http://cryptome.org/2013/12/Full-Disclosure.pdf
  - Modem connects to specific IP addresses at boot time
- Critical responses:
  - DOD uses lots of address space that is not publicly routed
    - http://blog.erratasec.com/2013/12/dod-address-space-its-not-conspiracy.html
  - See also the comment:

    "lucent uses 152.148.0.0/16 for 'management' on lots of their old big telco iron as if it was RFC-1918 space. (...)”
  - Also BT-competitor AAISP claims this is FUD:
    - https://s.aa.net.uk/1871
  - Claims: "They use DOD space because it's not internet-routable, and it’s for the TR-069 (http://en.wikipedia.org/wiki/TR-069) service. This is *NOT* news."
    - http://www.bit-tech.net/news/hardware/2013/12/17/bt-back-door/1

What has this to do with the National Science quiz 2013?

- Q13: For an illness that 1 out of 1000 people suffer, a 99% accurate test is developed. You are tested with that method and found bearer of the illness. What is the probability that you really have the specific illness?
- Choose: [A: 99%, B: 50%, C: 9%]
- Answer C: because you are in the set of true and false positives!
- Suppose the accuracy of PRISM, Tempora, Xkeyscore, etc. is 99% and 1 out of 100000 of the subjects are indeed terrorists
- False positives among 100k … ~1000 !
- Send in the drones: http://www.businessinsider.com/nsa-cia-drone-program-2013-10?international=true&r=US&IR=T



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February 2, 2014 -- Updated 1136 GMT (1936 HKT) Edited by Peter Wilkinson in London

Make CNN Your Homepage

EDITOR'S CHOICE Scenes from the field · Thai elections · Indonesia volcano · Woody Allen abuse claims · Ukraine · Knox extradition? · Super Bowl

MOHAMMED AL-KHATEEB/AFP/GETTY IMAGES

Dozens killed as barrel bombs smash into Aleppo

A day of punishing air assaults on Aleppo leaves 90 dead as so-called barrel bombs rain down on the city, an opposition group said. FULL STORY

- Regime non-committal on more talks
- Satellite photos show devastation
- Syria, Iran playing Obama for a fool?

THAI CRISIS

- Thailand elections marred by violence
- Latest from Bangkok
- Gun battle leaves 7 wounded
- What is at stake in elections?
- Is Thailand safe for tourists?
- Share your images | Gallery

THIS WEEKEND

THAI ELECTIONS

What's behind Thailand's political crisis?

A state of emergency, roads paralyzed with protesters, gunfire on the streets -- why have things soured so badly in a nation hailed as a rising regional powerhouse?

- Understanding the turmoil
- 7 wounded in gun battle
- What does state of emergency mean?

CHILD SEX ALLEGATIONS

Woody Allen hit with abuse claims

His adopted daughter accuses the director of sex assault when

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Royal Television Society 'News channel of the year'

Featured TV

CNN's interactive map

Life in a refugee camp

TV Programs

· Full Schedule

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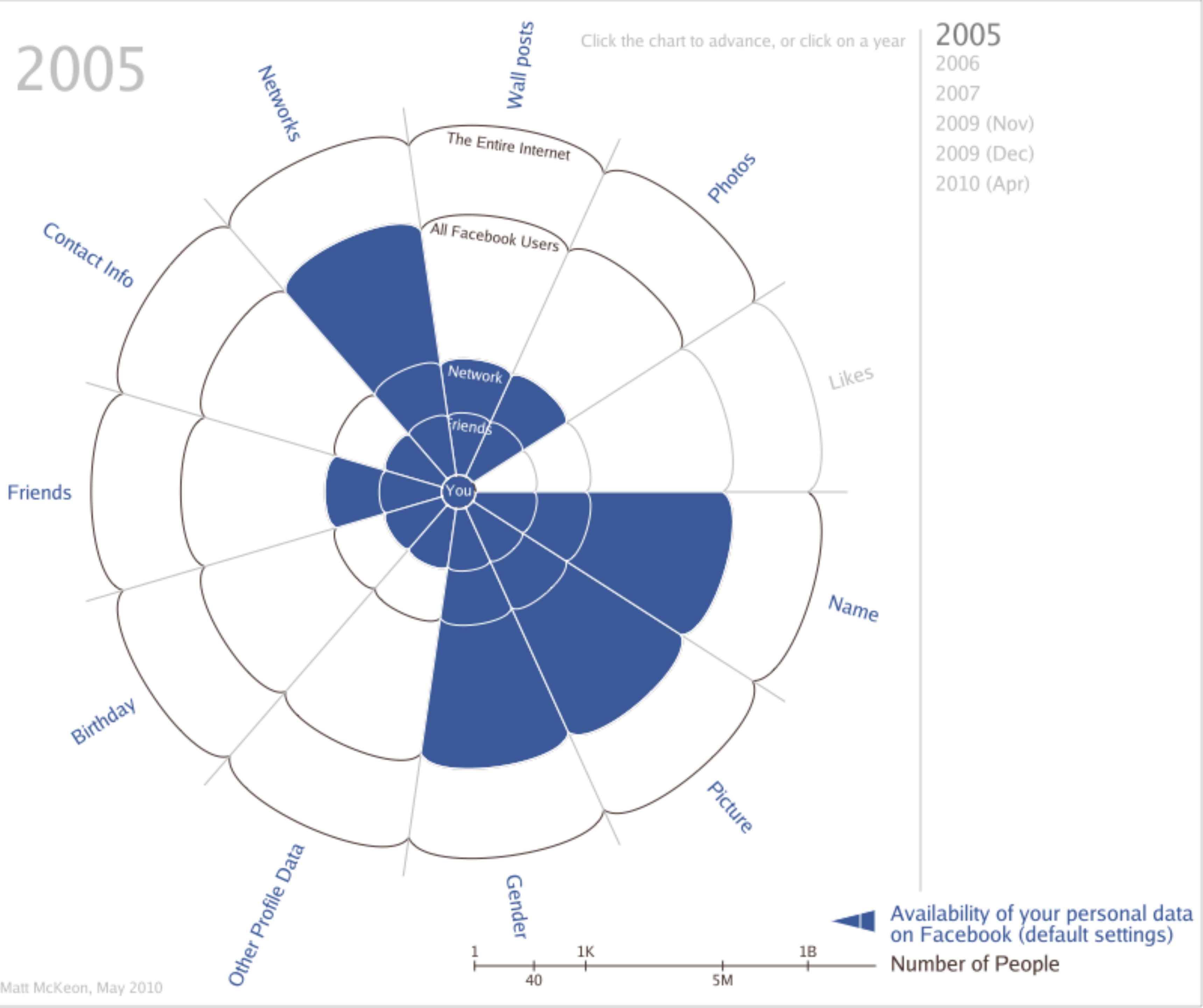
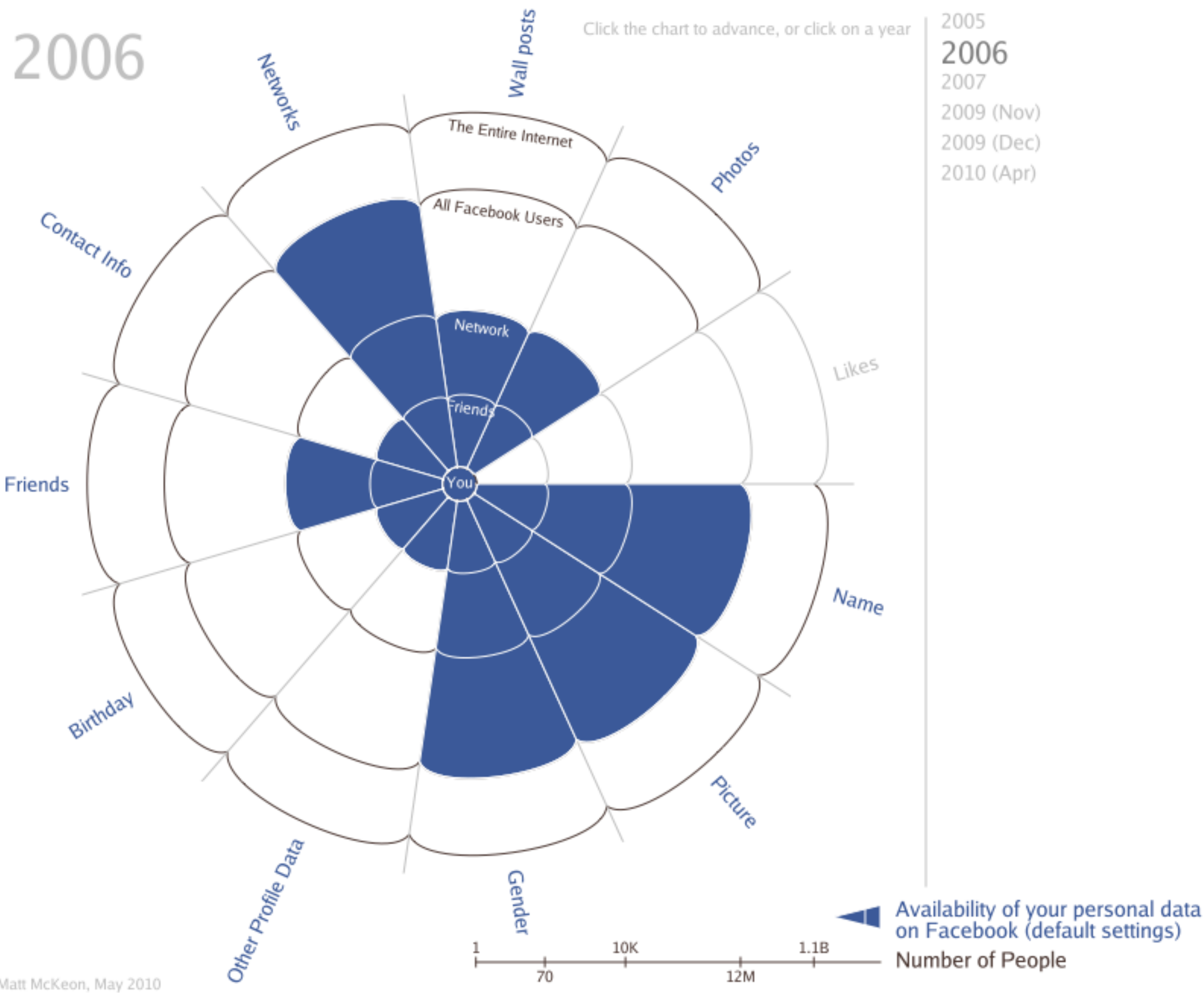
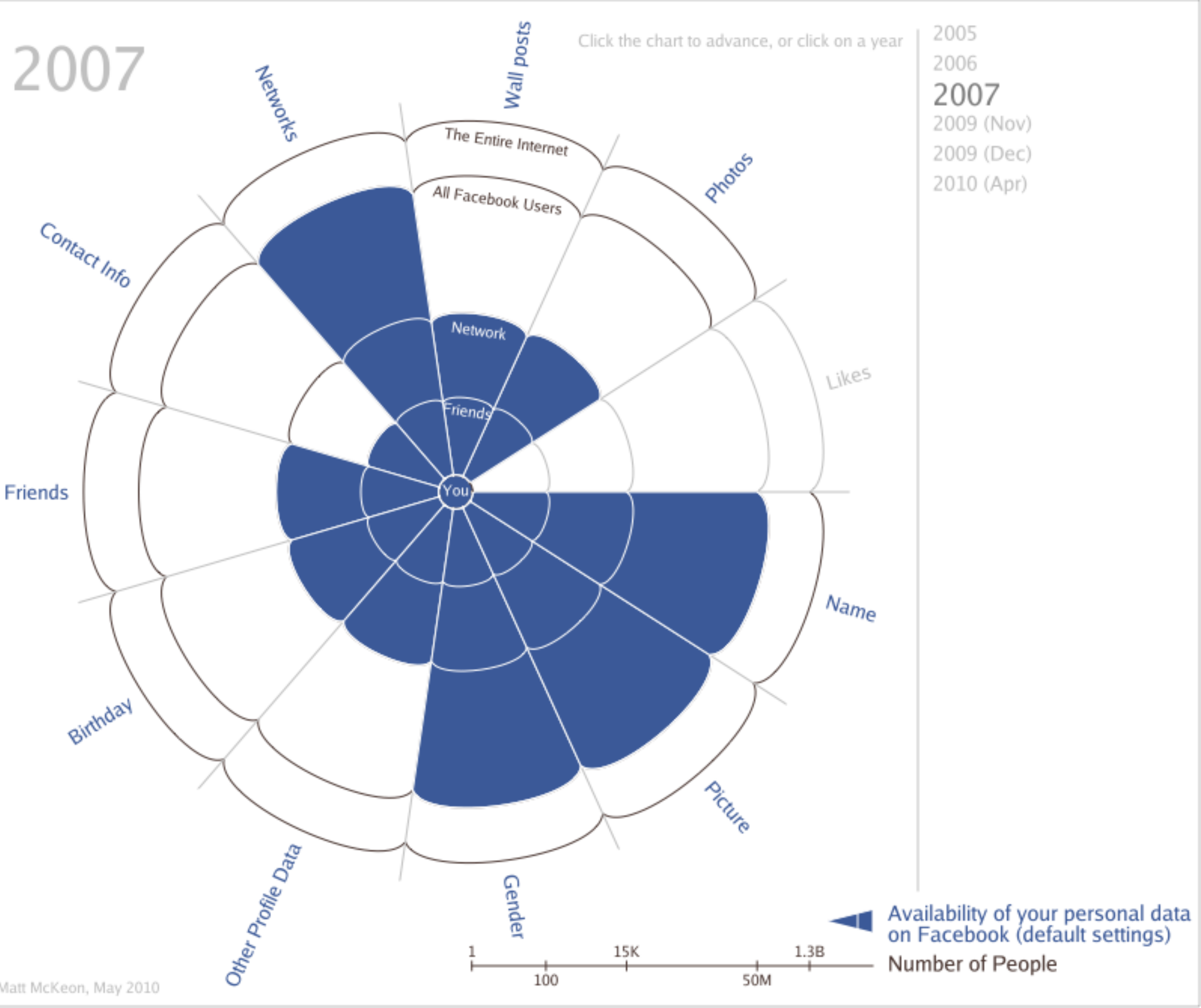
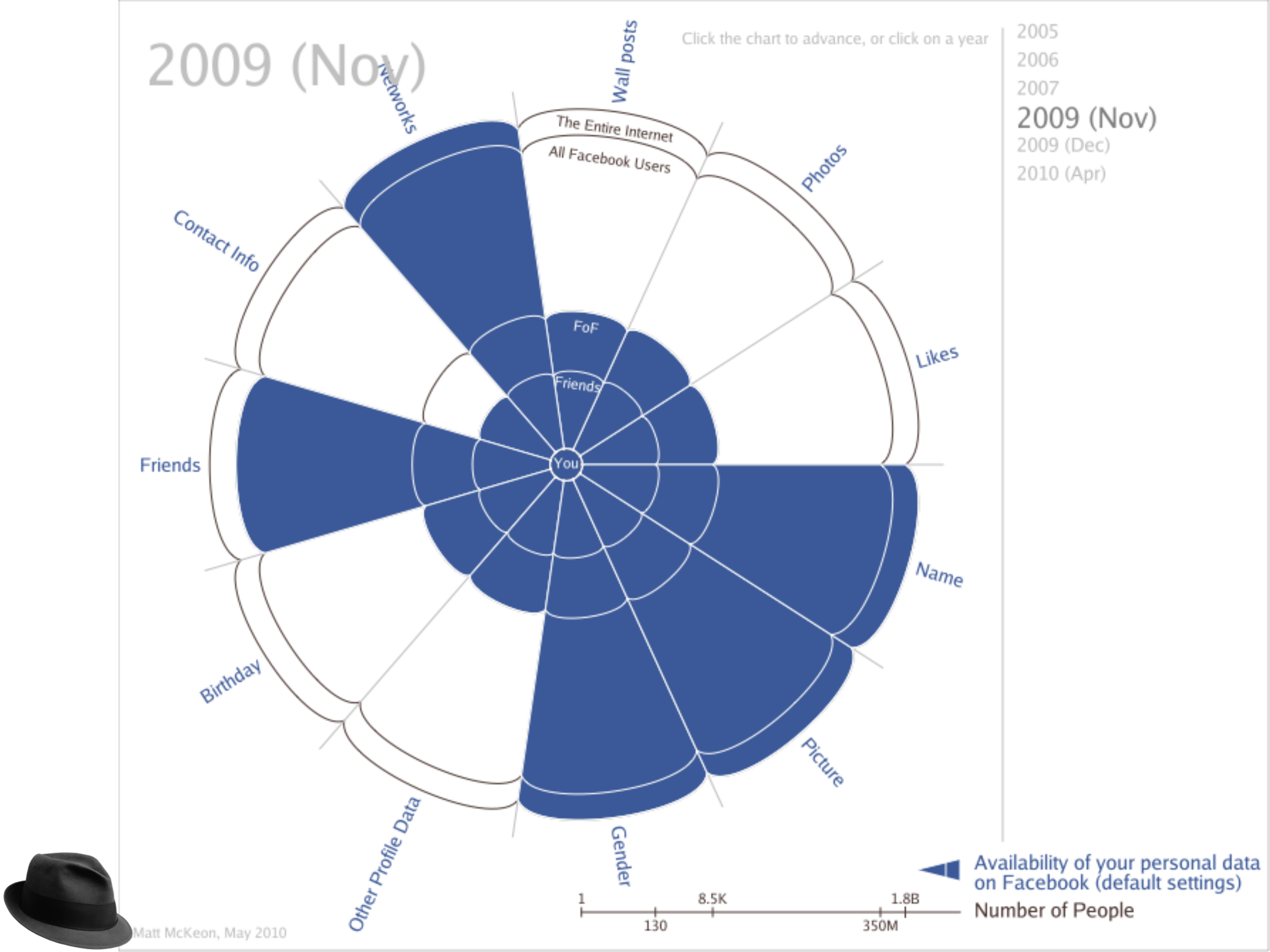

2005
Click the chart to advance, or click on a year
2005
2006
2007
2009 (Nov)
2009 (Dec)
2010 (Apr)
Wall posts
Photos
Likes
Name
Picture
Gender
Other Profile Data
Birthday
Friends
Contact Info
Networks
The Entire Internet
All Facebook Users
Network
Friends
You
Availability of your personal data on Facebook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


2006
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
70
10K
12M
1.1B
Number of People
Matt McKeon, May 2010



Matt McKeon, May 2010



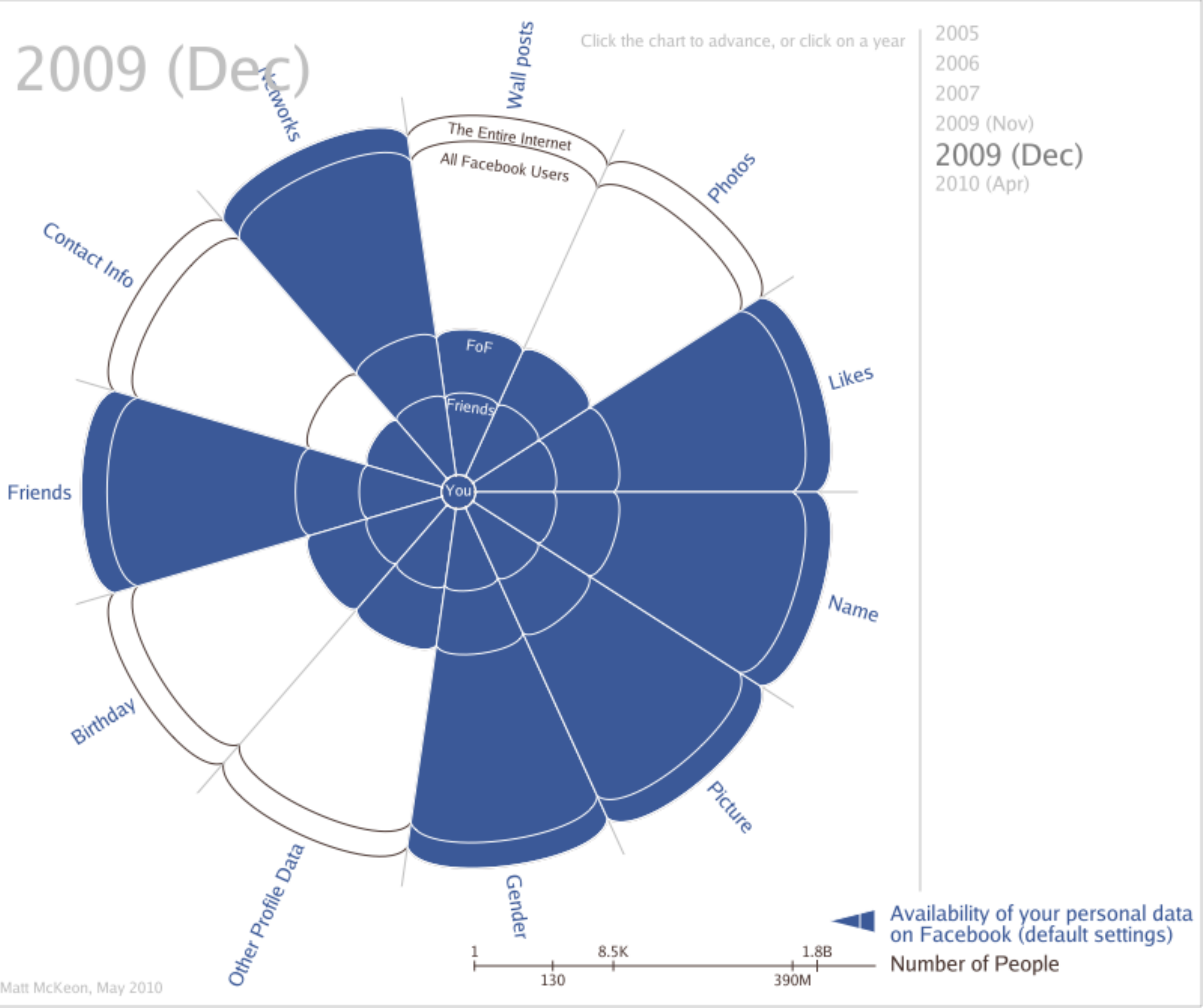
2009 (Nov)

Click the chart to advance, or click on a year

Availability of your personal data on Facebook (default settings)

Number of People

Matt McKeon, May 2010

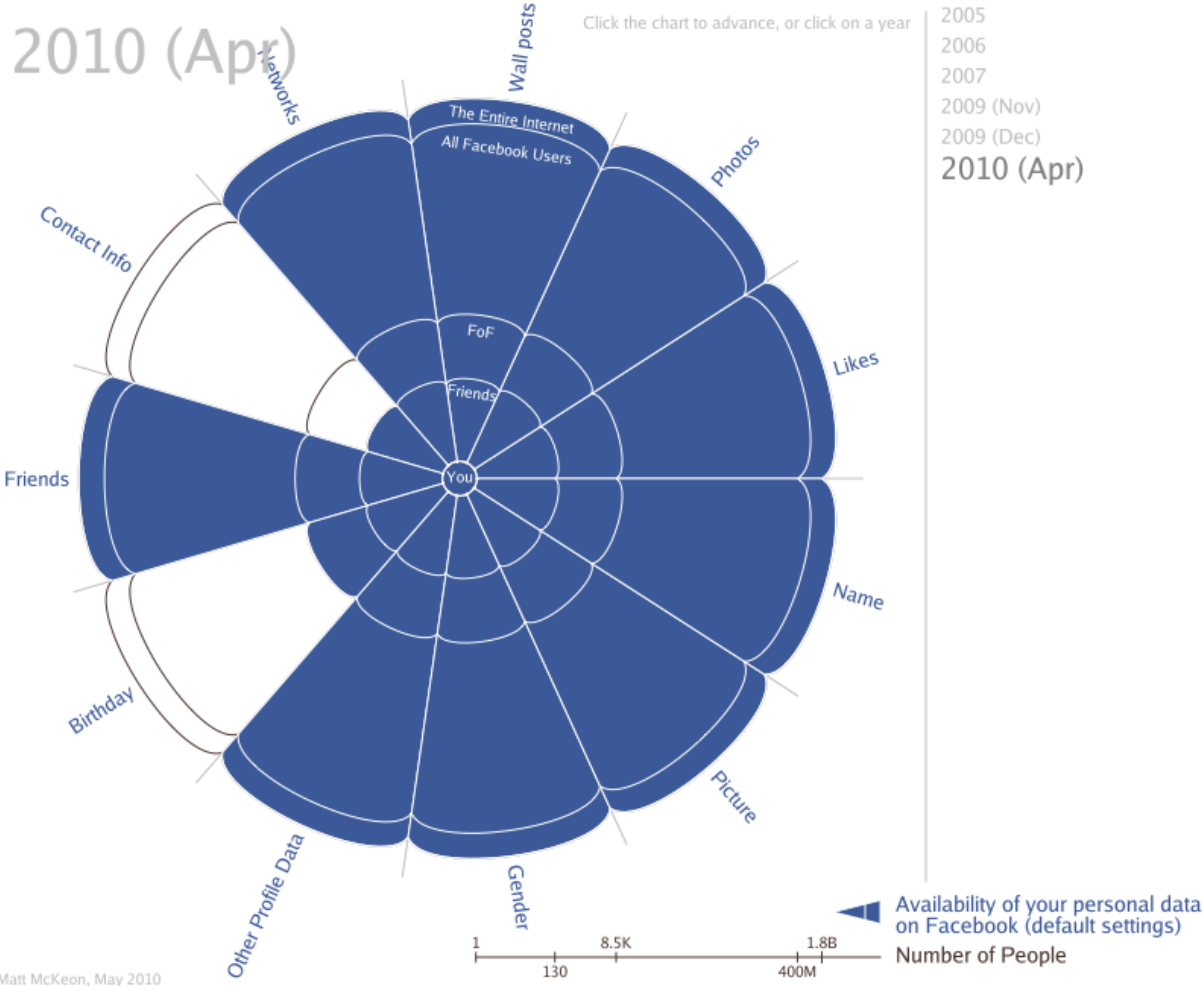


Matt McKeon, May 2010

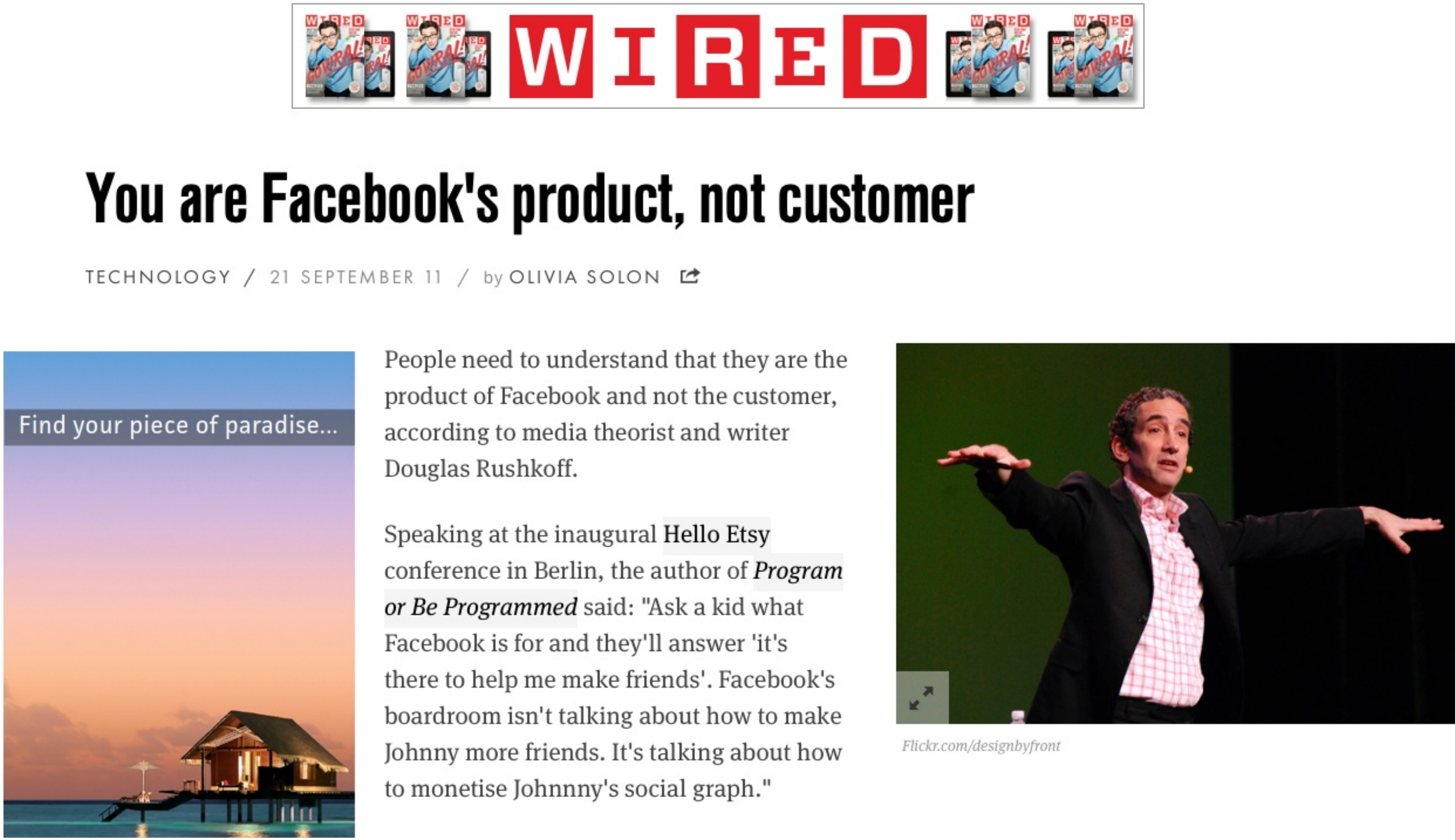
2010 (Apr)

Click the chart to advance, or click on a year

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



Matt McKeon, May 2010



WIRED

You are Facebook's product, not customer

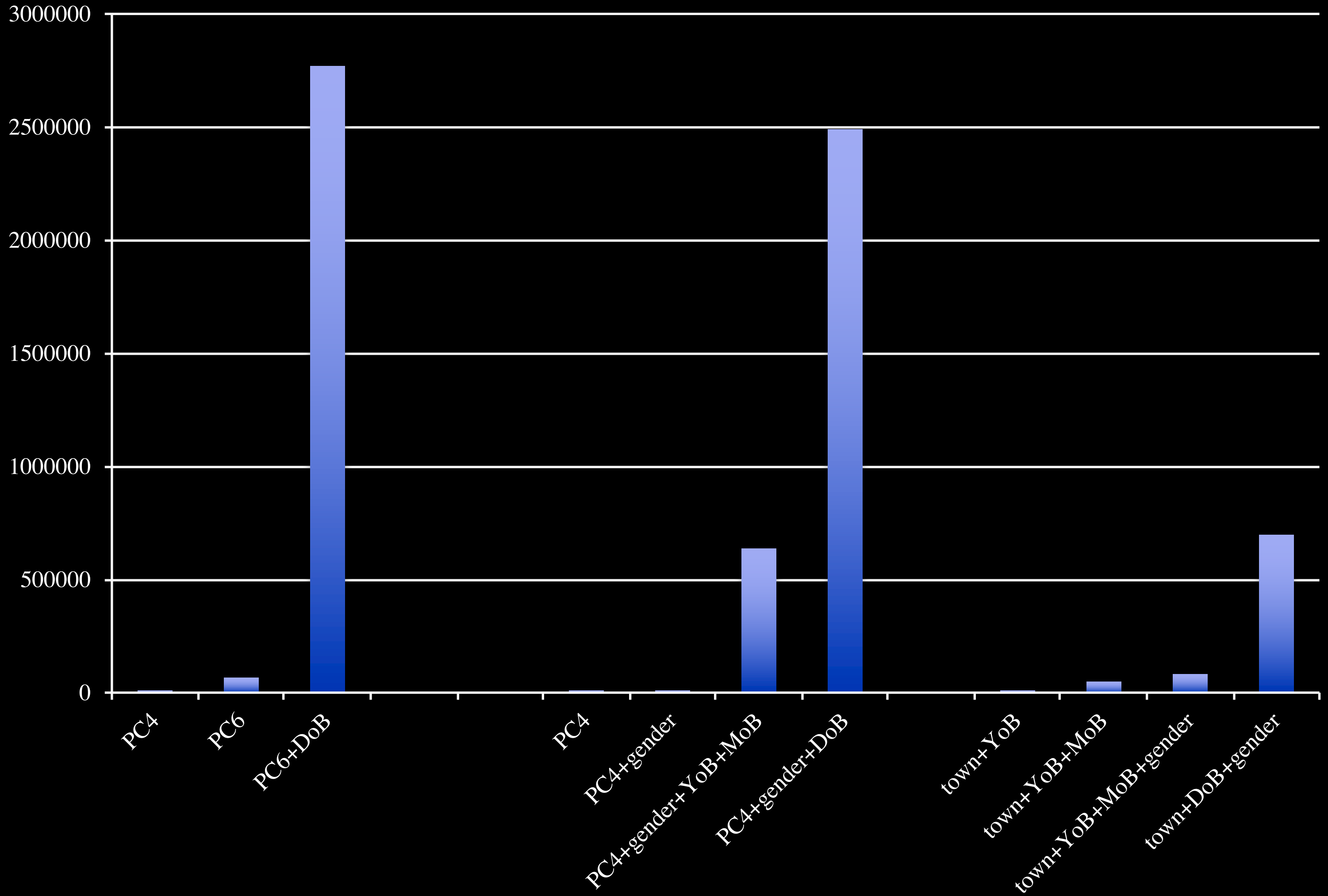
TECHNOLOGY / 21 SEPTEMBER 11 / by OLIVIA SOLON

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

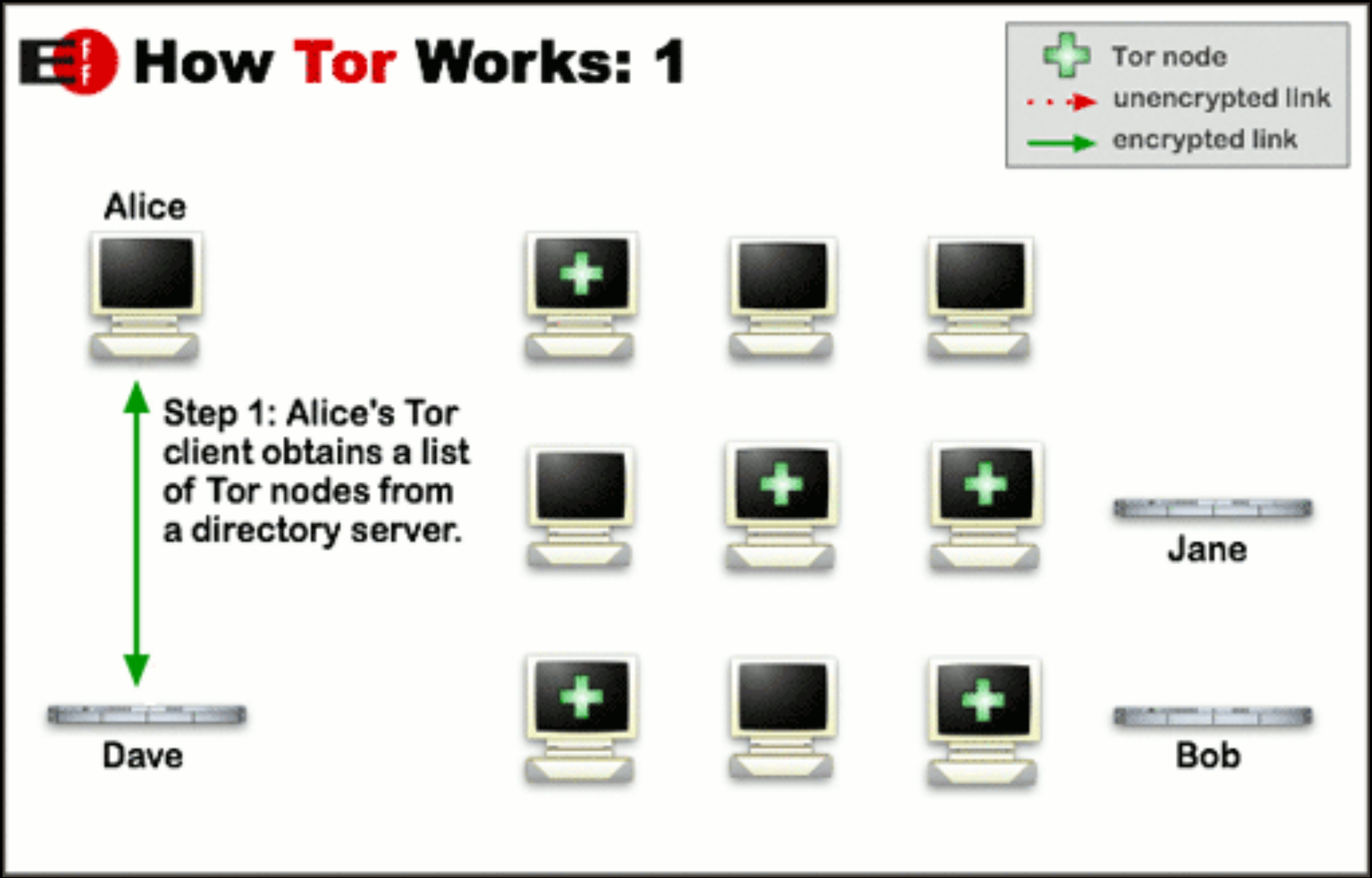
Speaking at the inaugural Hello Etsy conference in Berlin, the author of *Program or Be Programmed* said: "Ask a kid what Facebook is for and they'll answer 'it's there to help me make friends'. Facebook's boardroom isn't talking about how to make Johnny more friends. It's talking about how to monetise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

Flickr.com/designbyfront

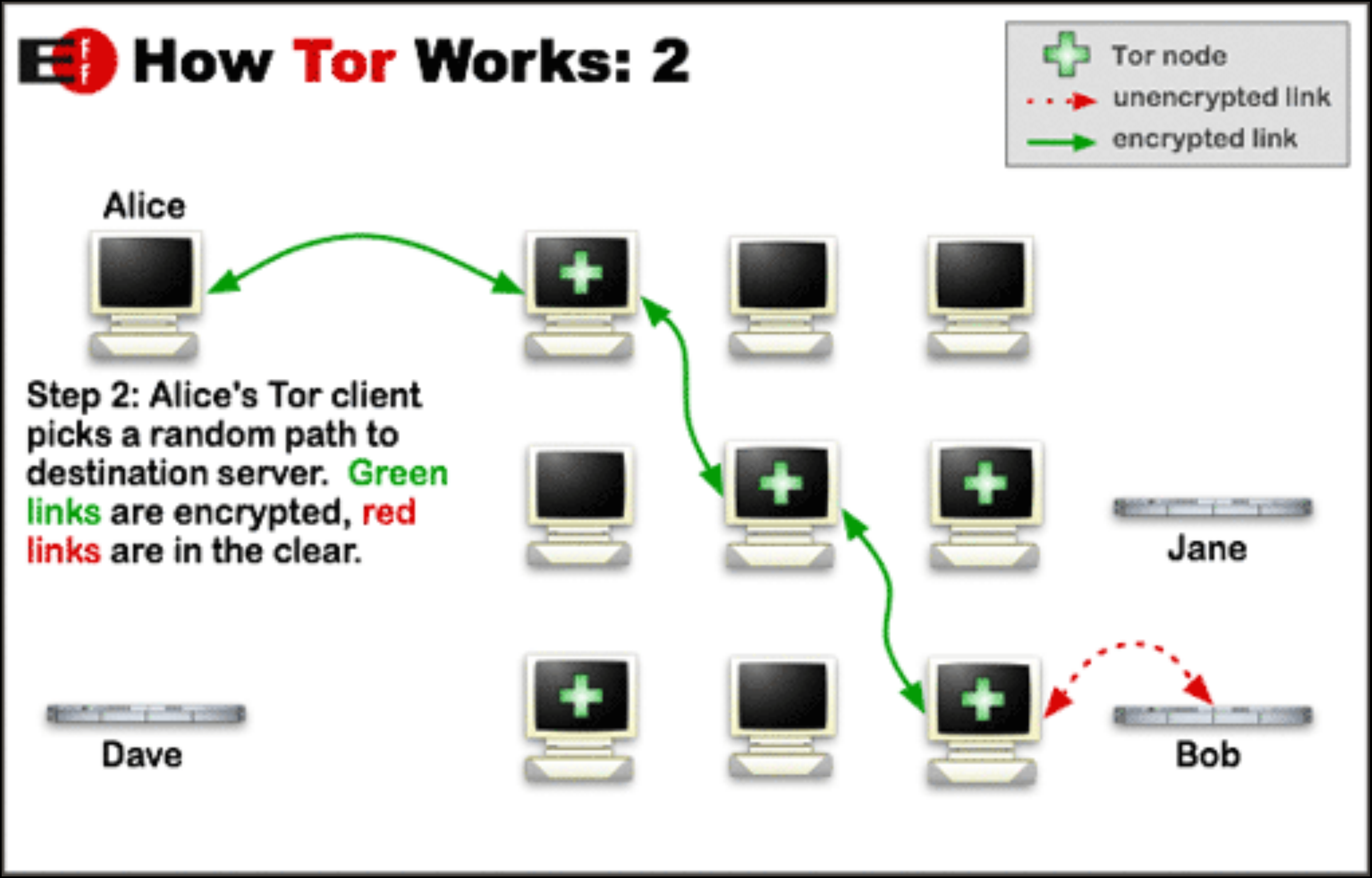
Thesis Matthijs Koot



TOR: third-generation onion routing project of the U.S. Naval Research Laboratory.


How Tor Works: 1
Tor node
unencrypted link
encrypted link
Alice
Step 1: Alice's Tor client obtains a list of Tor nodes from a directory server.
Jane
Dave
Bob

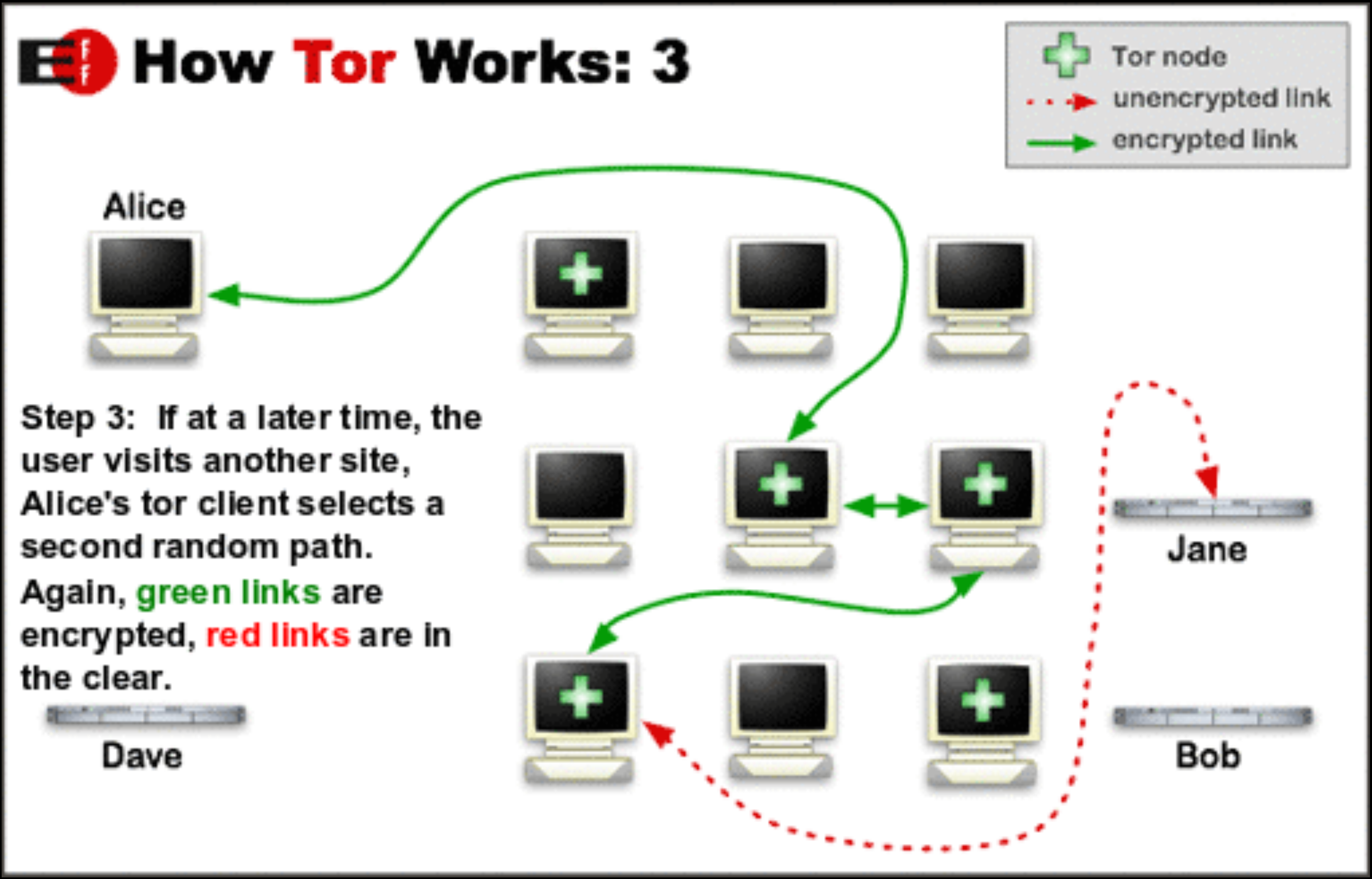
TOR: third-generation onion routing project of the U.S. Naval Research Laboratory.



How Tor Works: 2

Step 2: Alice's Tor client picks a random path to destination server. Green links are encrypted, red links are in the clear.

TOR: third-generation onion routing project of the U.S. Naval Research Laboratory.



How Tor Works: 3

Step 3: If at a later time, the user visits another site, Alice's tor client selects a second random path. Again, green links are encrypted, red links are in the clear.

Some remarks

- Not everyone is interesting
- False positives disastrous
- The Internet does not forget
- Asymtotic loss of privacy
- Trying to hide can also trigger!
- Governments may be spooky, don’t forget Industry!
- NSA candy store:
  - http://en.wikipedia.org/wiki/NSA_ANT_catalog

IETF

RFC 7258, Pervasive Monitoring Is an Attack.
Author: S. Farrell

This document states that "Pervasive monitoring is a technical attack that should be mitigated in the design of IETF protocols, where possible."

ECIS

Ethics Committee for Information Sciences

- Until very recently, ethical discussions were only relevant to fields of research in which research is conducted on humans, such as medicine and some social sciences. However, due to the increased involvement of humans as in (in)direct research objects in the Information Sciences (IS), these ethical discussions are also becoming important in our field.
- http://delaat.net/ecis

Q & A