PETs 2.0
Getting It Right the 2nd Time Around

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http://www.rogerclarke.com/DV/PET2-1611 {.html, .pdf}

Stiftung Datenschutz

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This is a PET Rescue Mission

Can we get PETs out of the Laboratory?

PITs and PETs

- **PITs** – Privacy-Invasive Technologies
- **PETs** – Privacy-Enhancing Technologies
  A long line of work since 1995
  - **Counter-PITs**, incl. protections for data in storage and in transit, authentication, ...
  - **Savage PETs**
    for Persistent Anonymity

  - **Gentle PETs**
    for Protected Pseudonymity, and hence accountability as well as freedom

http://www.rogerclarke.com/DV/PITsPETs.html
http://www.rogerclarke.com/DV/Biel15-DuD.html#P

Enormous Diversity, BUT No Cohesion

PET Catalogues

https://www.epic.org/privacy/tools.html
https://prism-break.org/en/
https://ssd.eff.org/en/index
https://www.bestvpn.com/blog/49728/ultimate-privacy-guide/
http://www.rogerclarke.com/DV/UPETs-1405.html#Cat

An Alternative Categorisation of PETs

1. Communications
2. Traffic Management
3. Data Management

Categories of PETs – 1. Communications

- **Email and Instant Messaging / Chat**
  e.g. Protonmail, Tutanota, Hushmail, Fastmail, Wickr?
- **Handsets**
  e.g. Silent Circle BlackPhone
- **Browsers**
  e.g. Stripped Chrome, WhiteHat Aviator, Opera/VPN
- **Search-Engines**
  e.g. DuckDuckGo, Ixquick/Startpage
- **Encryption**
  e.g. HTTPS Everywhere
- **Social Media Services**
  e.g. Diaspora

Categories of PETs

2. Traffic Management

- **End-Point Authentication**
  e.g. VPNs
- **End-Point Obfuscation**
  Proxy-Servers, VPNs, ToR
- **Firewalls, Malware Filters, Cleansers**
- **Meshnets**
- **Privacy-Enhancing Software Agents**

3. Data Management

- **Stored Data Encryption**
  e.g. Veracrypt
- **Secure Data Deletion**
- **Secure Dropbox**
  e.g. SecureDrop, Podzy

Impediments to Adoption

- Lack of Inter-PET Cohesion
- Lack of Comprehensiveness
- Lack of Integration with mainstream software

- Lack of Requirements Analysis and Understanding
- Challenges to Discover, Acquire, Install, Configure
  (it fails the 'plug and play' / 'it just works' test)
- Poor Learnability
- Poor Needs-Fit
- Poor Usability

PET Symposia and SOUPS
The Missing Topics

- Architecture for PETs
- Innovation (as distinct from Invention)
- Articulation
- Integration among PETs
- Integration with systems and applications software
- Relevance to people
- Feedforward into practice
- Adoption
- Impediments to adoption
- Measures to overcome impediments to adoption

https://petsymposium.org/2016/links.php
https://cups.cs.cmu.edu/soups/

Drivers for Adoption

Demand-Side

- Focus on User-Segments
- Understand Needs
- Conduct Risk Assessmt
- Design to address Needs
- Design for Usability
- Provide explanations, examples, training
- Use channels suitable for each user-segment
- Sell via opinion leaders

Architecture

- Design-In:
  - Modularity
  - Substitutability
  - Interoperability
  - Portability
  - Decentralised Control
  - FOSS
- Provide integrated Suites not standalone Tools
- Embed in Users' Working Environments

Supply-Side

- Deliver through key suppliers
  - Devices, OS
  - IAPs

Generic Needs
(1) 'Functional Requirements'

Beyond 'Confidentiality, Integrity and Availability' (CIA):

- **Accessibility** by authorised people of (a) data, (b) traffic and (c) social networks
- **Inaccessibility** by unauthorised people of (a) data, (b) traffic and (c) social networks
- **Integrity** of (a) data, (b) traffic, (c) social networks

- **Unlinkability** of sessions
- **Non-Detectability** of traffic
- **Plausible Deniability** of actions

The Key Things to Obfuscate and Falsify

Data

If a person's stored data could result in some organisation constraining their or any other person's freedom or privacy, the content of the stored data may need to be hidden

Messages

Re a person's communications

Identities

Re visibility of the identity under which a person performs acts

Locations

Re visibility of the location at which a person performs acts

Social Networks

Re the associations that a person has with others

(1) Functional Requirements
Baseline Security Safeguards

1. Physical Safeguards
2. Access Control
3. Malware Detection and Eradication
4. Patching Procedures
5. Firewalls
6. Incident Management Processes
7. Logging
8. Backup and Recovery Plans, Procedures
9. Training
10. Responsibility

Generic Needs
(2) 'Non-Functional' Requirements

- **Awareness** Why would I need one of those?
- **Comprehensibility** It does what?
- **Ease of Discovery, Acquisition, Installation, Config and Familiarisation** How do I get it on my device(s)?
- **Cohesiveness** Do the elements work together?
- **Integration** Is it compatible with what I use?
- **Usability** Can I utilise its features easily?
- **Adaptability** Can I get it to fit to my needs?
- **Convenience** Does it interfere with my activities?

Diverse Categories of 'Persons-at-Risk'

Social Contexts

- Celebrities and notorieties at risk of extortion, kidnap, burglary
- Short-term celebrities such as lottery-winners, victims of crime
- Victims of domestic violence
- Victims of harassment, stalking
- Individuals subject to significant discriminatory behaviour
- People seeking to leave a former association, e.g. ex-gang-members

Political Contexts

- Whistleblowers
- Dissidents
- Human Rights Activists

Organisational Contexts

- Corporate executives
- Government executives
- Undercover operatives
- Law enforcement and prison staff
- Mental health care prof'ls, counsellors

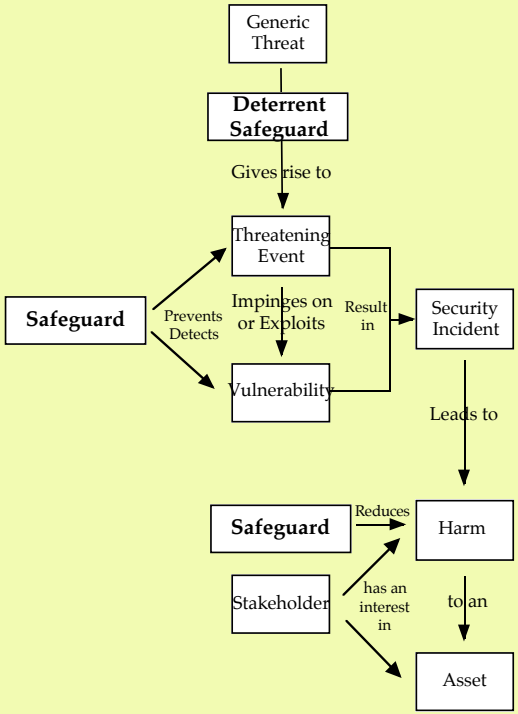
Legal Contexts

- Judges, lawyers and jurors, particularly in highly-charged cases
- Witnesses, especially people in protected witness programs
- Ex-prisoners re-integrating with society

http://www.rogerclarke.com/EC/eHlthRes.html#PAR

http://geekfeminism.wikia.com/wiki/Who_is_harmed_by_a_%22Real_Names%22_policy%3F

The Conventional Security Model



http://www.rogerclarke.com/EC/PBAR.html#App1

4. Risk Assessment (RA)

Analyse

(1) Define the Objectives and Constraints

(2) Identify the relevant Stakeholders, Assets, Values and categories of Harm

(3) Analyse Threats and Vulnerabilities

(4) Identify existing Safeguards

(5) Identify and Prioritise the Residual Risks

http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-30r1.pdf

Indicative Risk Assessment for a Whistleblower

Asset – Freedom

Harm – Denial of Freedom

Threats – Discovery of:

- Disclosure of suppressed information / documents
- Identities of persons involved in the disclosure
- Their Location
- Sufficient grounds to act

Vulnerabilities – Exposure of:

- Disclosure
- Identities
- Human entities underlying the relevant Identities
- Location of those persons

Security Safeguards re:

- Disclosures
- Actions, dates and times, physical and net locations,
- Identities
- Entities
- Locations

http://www.rogerclarke.com/DV/UPETs-1405.html#Tab3
https://freedom.press/encryption-works (Lee 2013)

4. Risk Assessment (RA) then Risk Mngt Planning

Analyse

(1) Define the Objectives and Constraints
(2) Identify the relevant Stakeholders, Assets, Values and categories of Harm
(3) Analyse Threats and Vulnerabilities
(4) Identify existing Safeguards
(5) Identify and Prioritise the Residual Risks

Design

(1) Postulate / articulate alternative Designs
(2) Evaluate the alternatives against the Objectives and Constraints
(3) Select a Design (or adapt / refine the alternatives to achieve an acceptable Design)

Do

(1) Plan the implementation
(2) Implement
(3) Review the implementation

http://csrc.nist.gov/publications/nistpubs/800-39/SP800-39-final.pdf

Beyond Baseline Security for Persons-at-Risk

Risk Asssessment will point to at least some of:

11. Data Communications Encryption
12. Data Storage Encryption
13. Vulnerability Testing
14. Standard Operating Environments
15. Application Whitelisting
16. Device Authentication and Authorisation
17. Use of Virtual Private Networks
18. Intrusion Detection and Prevention
19. User Authentication
20. Firewall Configurations, Outbound

http://www.xamax.com.au/EC/ISInfo.pdf

Architectural Features

- **Layering**
  Common, underlying services for all tools
- **Modularity**
  For Tool Substitutability
- **Interface Definitions**
  Protocols for processes, Standards for data
- **Free and Open Source Software (FOSS)**
  'Many hands', 'many eyes'
- **Interoperability**
  Open Protocols, Standards, for cross-device use
- **Portability**
  For use across hardware and systems software
- **Security**
  Features, Settings, Defaults
- **Decentralised Control**
  To avoid ceding power to service-providers

http://www.rogerclarke.com/SOS/OAA-1990.html#MM
http://primelife.ercim.eu/images/stories/deliverables/h1.3.5-requirements_and_concepts_for_idm_throughout_life-public.pdf
http://www.rogerclarke.com/II/COSM-1402.html#COSMF

A Key Element of PETs 2.0
A Less-Insecure Web-Browser

1. Install Chromium (not Chrome!!)
2. Strip the following features: ...
3. Set the following Preferences: ...
4. Install the following:
   - CookieMonster
   - BetterPrivacy
   - Ghostery
   - PrivacyBadger
   - ....

Why haven't relevant organisations made this available for one-click download and install??

STIFTUNG DATENSCHUTZ DatenTag

"Ich stimme {nicht} zu"

Another Key Element of PETs 2.0
An e-Consent Object

Access to	<data>
by	<one or more entities or identities, or categories thereof>
for	<one or more purposes>
in	<a context>
is	[consented to | denied]
by	<an identity>

Characteristics of a Successful Innovation

Relative Advantage
- Perceived to be better than what it supersedes

Compatibility
- Consistent with values, experiences, needs

Complexity
- Not difficult to understand and use

Trialability
- Can be experimented with on a limited basis

Observability
- Its results are visible

Rogers, e.g. http://www.rogerclarke.com/SOS/InnDiff.html

Economic Challenges

What Business Models Work?

A Business Model
is an Answer
to the Question:

Who Pays?

For What?

To Whom?

And Why?

Open ... Models for eBusiness
http://www.rogerclarke.com/EC/Bled04.html

One Shape That PET 2.0 Will Take

- Locally-installed facilities
- Seamless intermediation between user devices and the Internet Access Provider
  - End-to-end encryption
  - Pseudonymity
  - Unlinkability of sessions
- Minimal need for user expertise
- Minimal need for conscious user actions
- Compatibility with user working environments

comidio TrutzBox

mobile business | AN.ON NEXT GENERATION | Bundesministerium für Bildung und Forschung | AN.ON-next

- **Duration:** 01/2016 – 12/2018
- **Aim:** Create and integrate privacy-enhancing technologies into the internet infrastructure
- **Focus:** Establish PET in the mass market
  - Develop new or adapt existing business models
  - Standardize technologies
  - User study: How do users understand tariff and pricing models?
  - User study: What is the perceived relationship of service feature and accepted prices?
  - How can existing value creation architectures and operational models be adapted?

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Summary
How to achieve Adoption of Secure eWorking Environments by People who need them

- Focus on one or more relevant **user segments**
- Conduct **risk assessments** for those segments
- Architect and design (or adapt and integrate) **suites of tools** with the relevant features
- **Integrate** those features within targeted user segments' working environments
- Provide clear **explanations, examples, training**
- Identify, and **sell** to, opinion leaders, change agents and change aids

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