Intuitive and Sensible Access Control Policies

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Early days of automobile safety

- UK Locomotives and Highways Act (1856) to assure safe driving
  - Man with a red flag or lantern 55 m in front of the car to warn
  - Max. speed in towns: 3.2 km/h
- Revised in 1878
  - Red flag man only 18 m in front
  - Widely ignored
- Repealed in 1896

Courtesy:
http://www.scienceandsociety.co.uk/results.asp?image=10326966&wwwflag=2&imagepos=4
http://en.wikipedia.org/wiki/Locomotives_and_Highways_Act

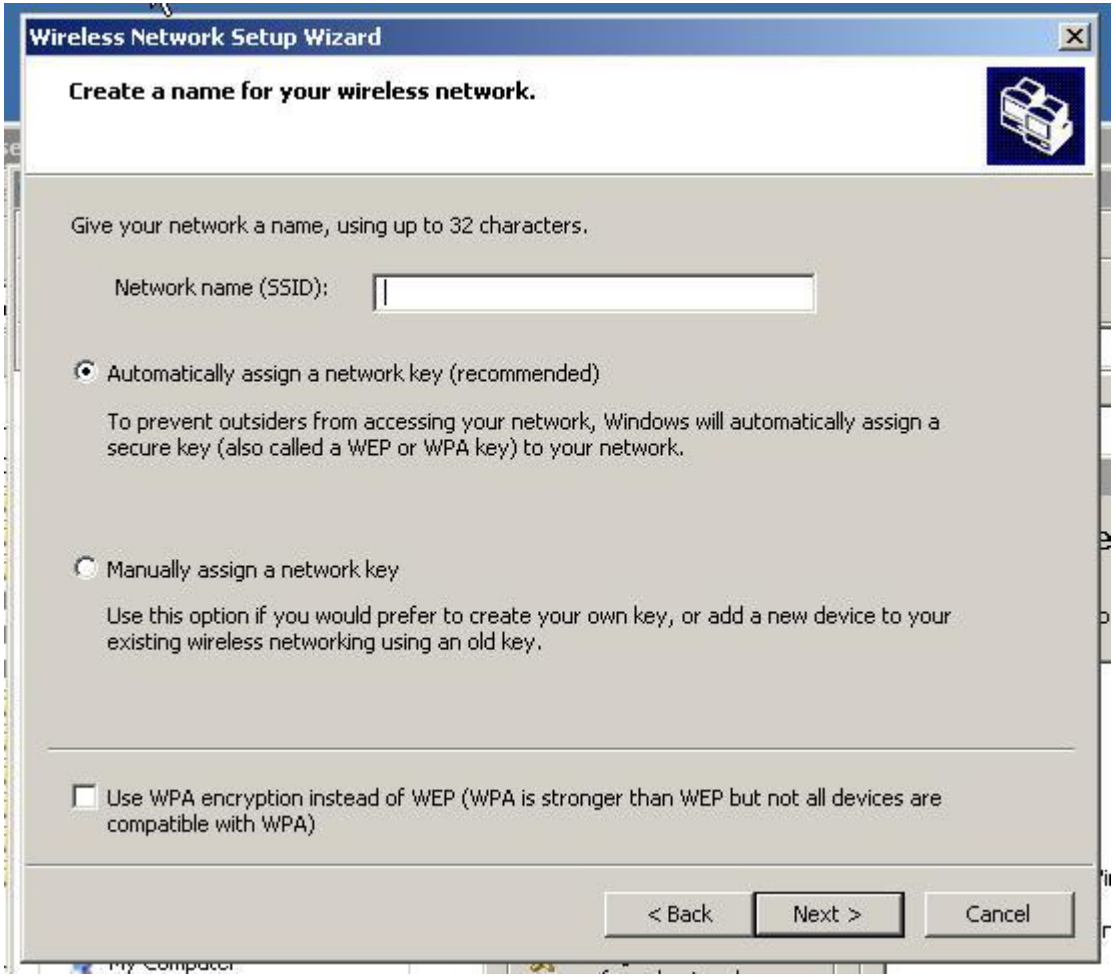
Automobile safety today

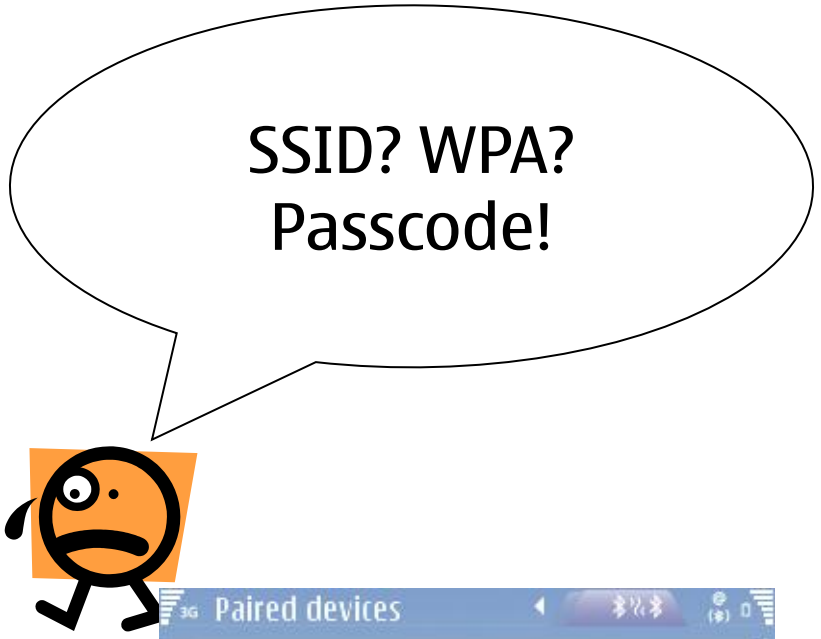
- The human is still in control
- Not just better “user interaction”
- But several underlying new technologies are in use
  - Traffic lights
  - Air bags
  - Anti-lock breaks

"People are still doing dumb things. But the fact is, the cars are now much safer and are more likely to save them. A crash that might have killed you 20 years ago is probably very survivable now."

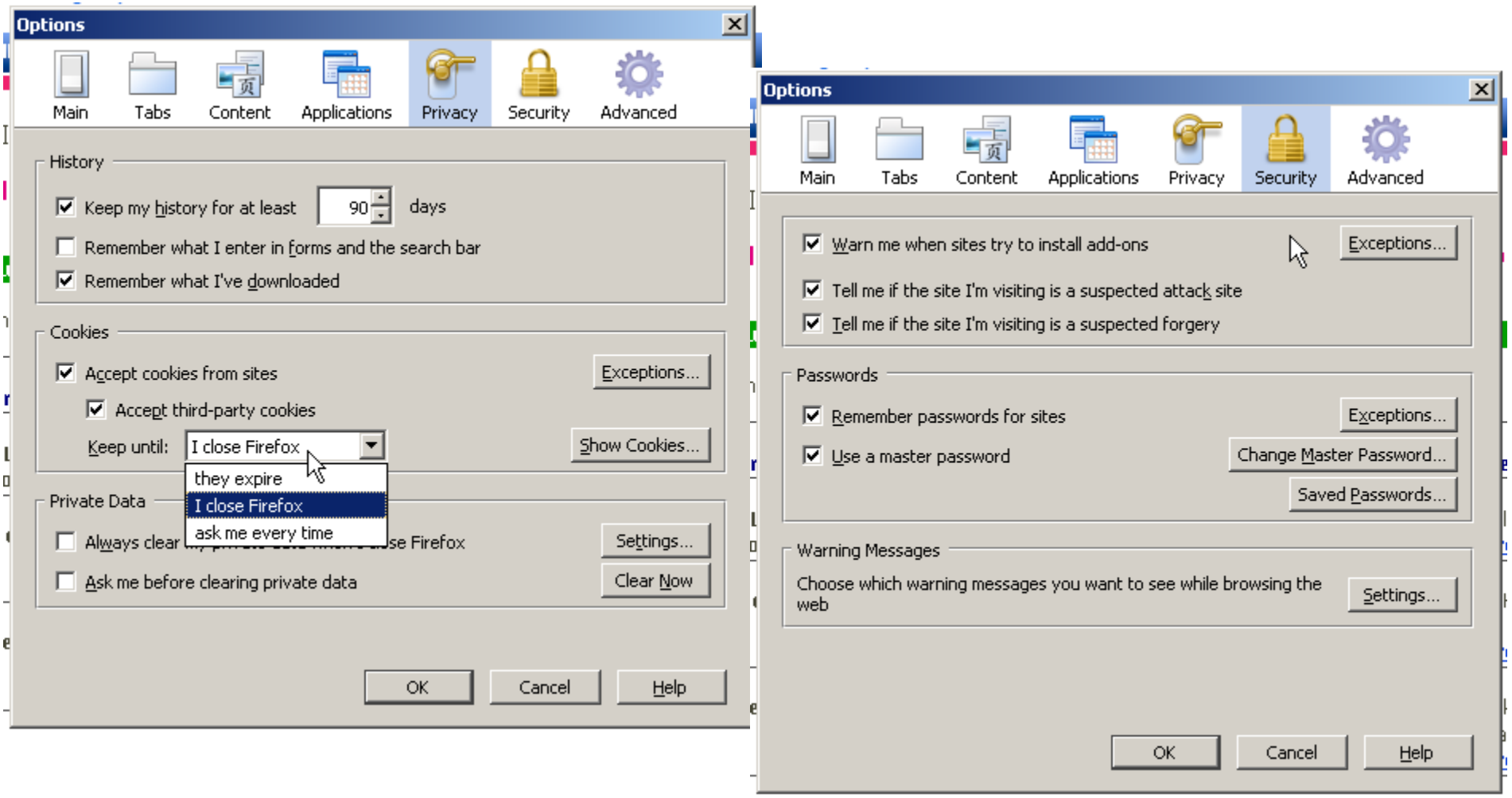
Courtesy:
http://research.cars.com/go/advice/Story.jsp?section=safe&subject=safe_tech&story=techIntro
http://research.cars.com/go/advice/Story.jsp?section=safe&subject=safe_tech&story=techOther&referer=advice&aff=national

Early days of secure communication ~~(today!)~~

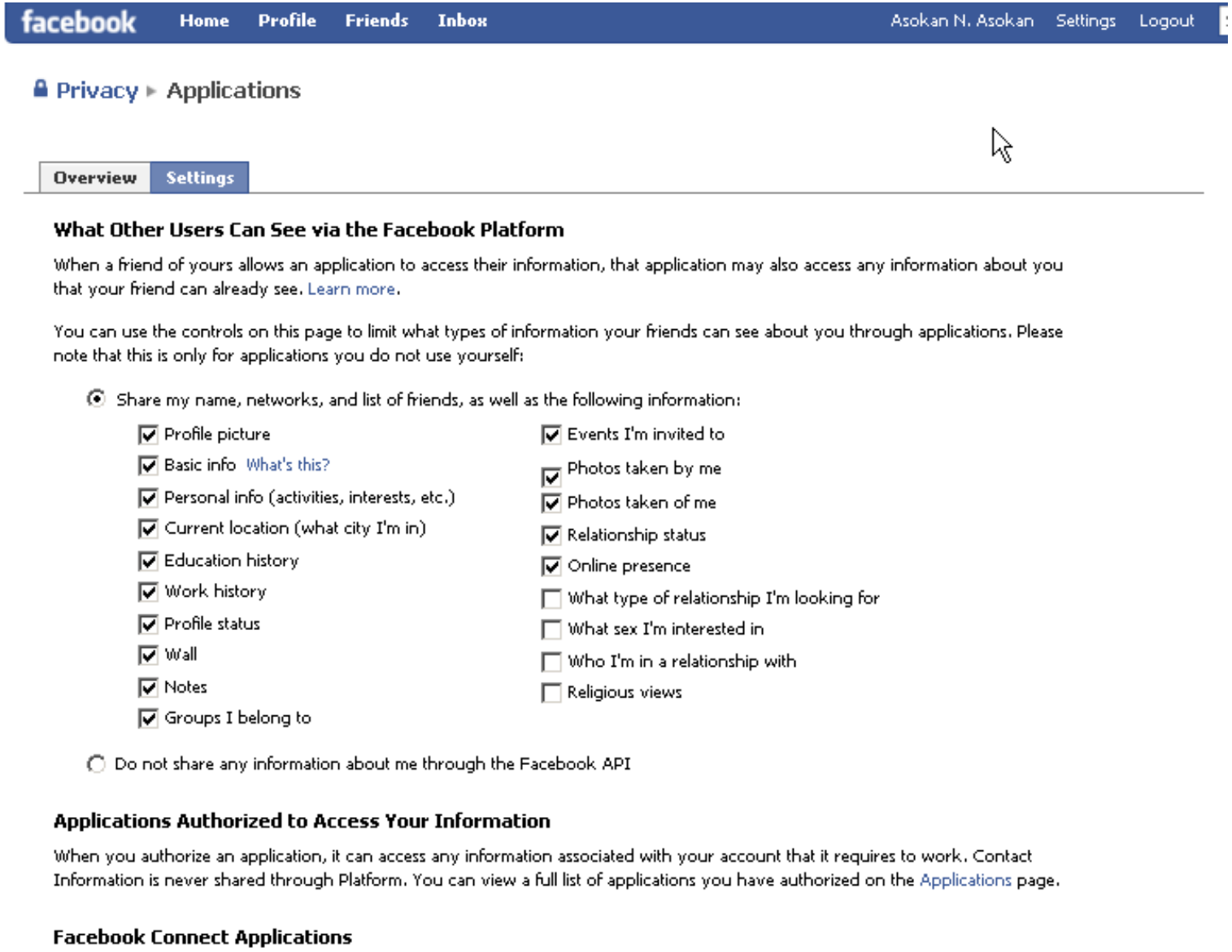




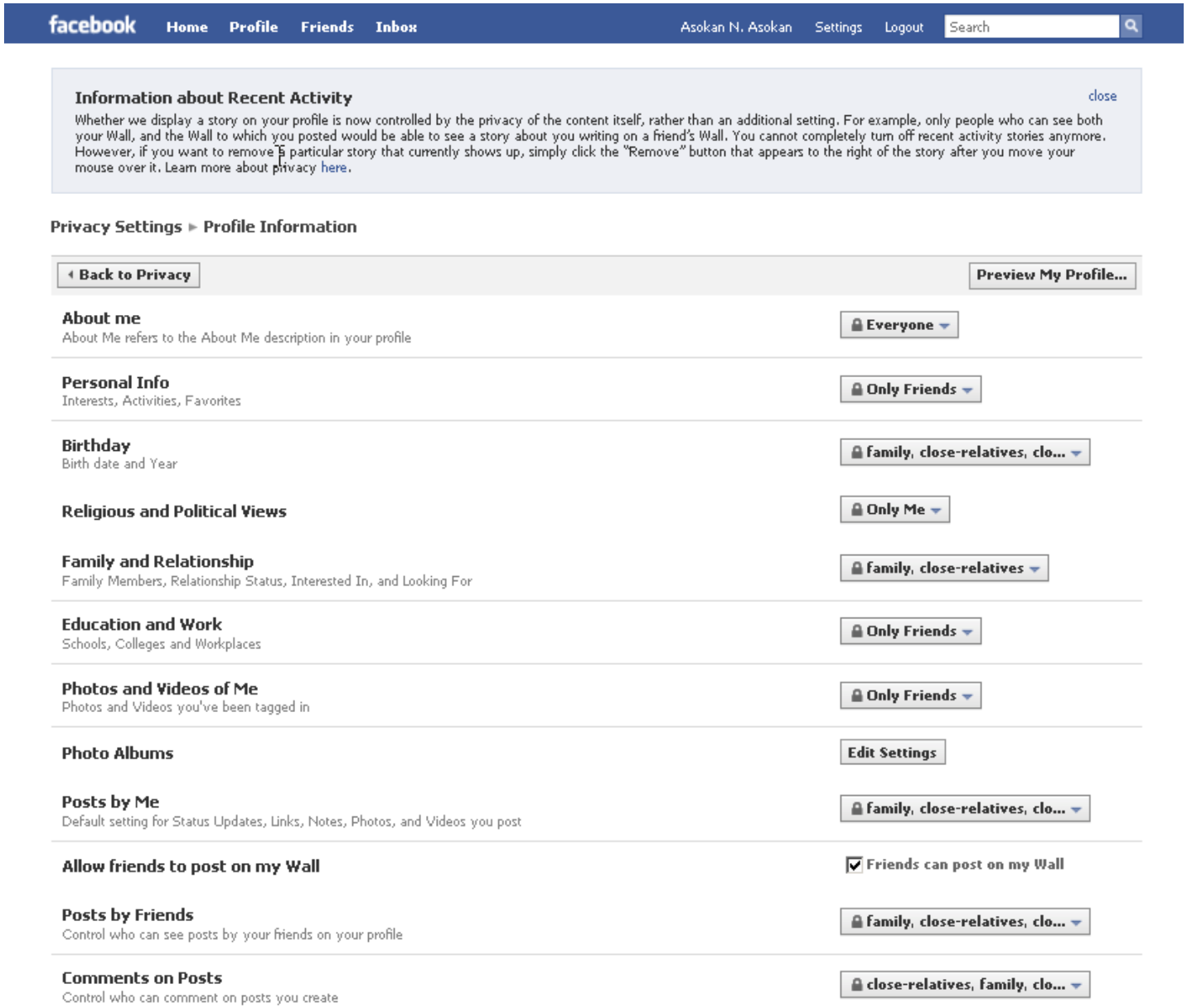
Early days security policies for the masses (today!)



Policy-by-drudgery: set precise and detailed policies manually



Policy-by-drudgery: set precise and detailed policies manually



Policy-by-drudgery: set precise and detailed policies manually

Policy-by-fiat: No choice - defaults specified by developer/administrator

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Current state of access control policies

Today the choice for ordinary users is *between* "sensible" and "intuitive"

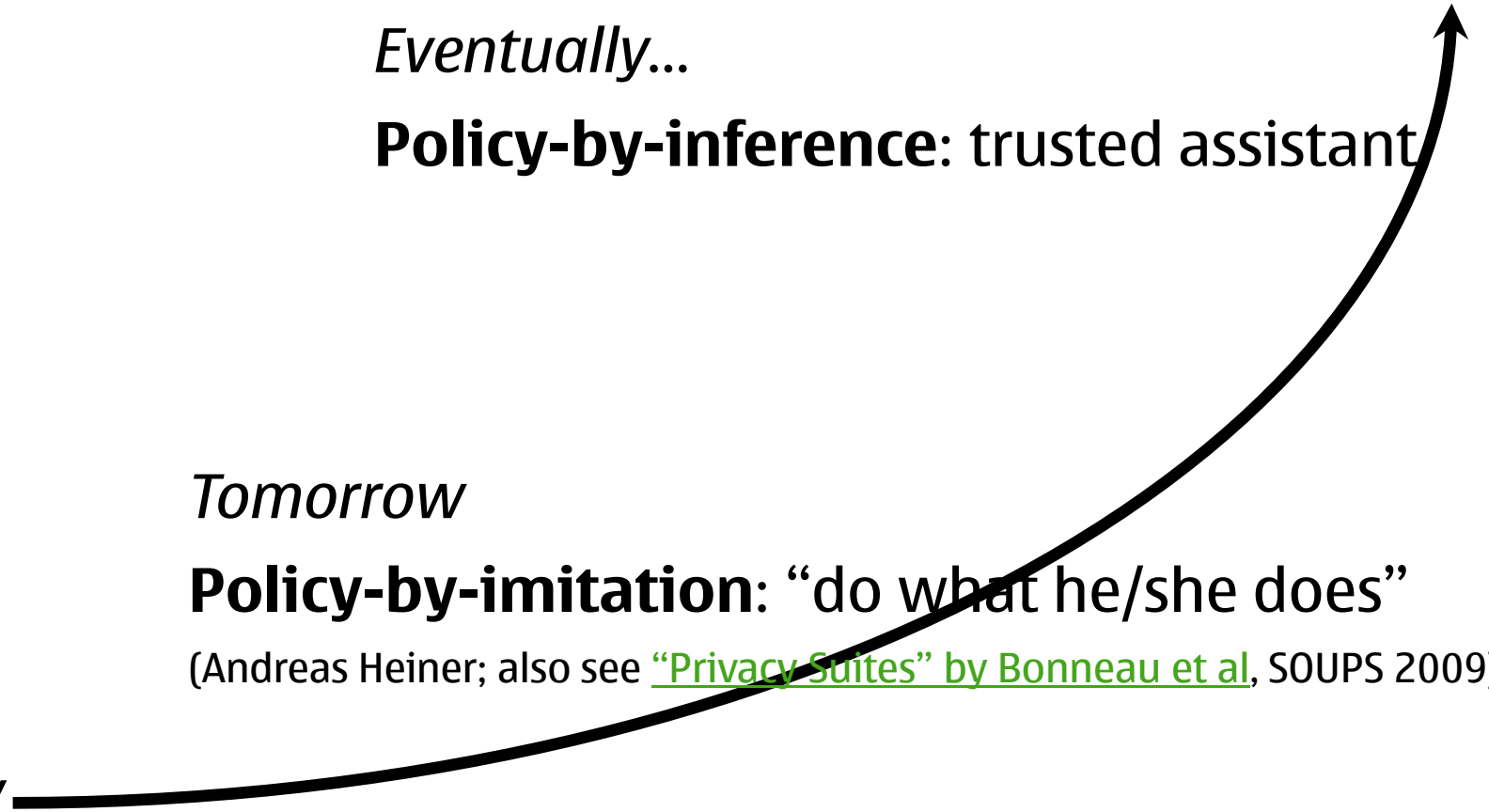
Problem:

How can ordinary users set
and manage access control policies?

Objective:

Intuitive means to set/manage
sensible access control policies

How do users set access control policies?



Eventually…

Policy-by-inference: trusted assistant

Tomorrow

Policy-by-imitation: "do what he/she does"

(Andreas Heiner; also see "Privacy Suites" by Bonneau et al, SOUPS 2009)

Today

Policy-by-fiat: developer/administrator-set defaults

Policy-by-drudgery: user suffers through fine-grained policies

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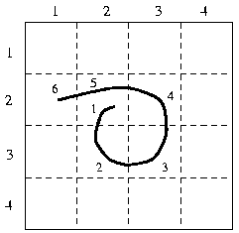
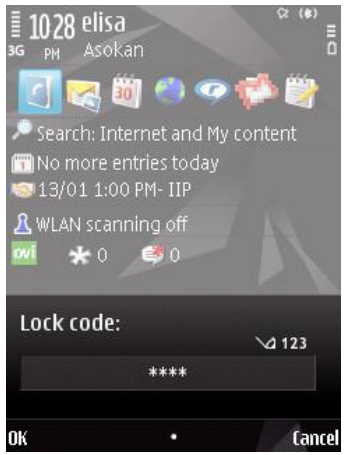
Example 1: privacy settings for photo channels

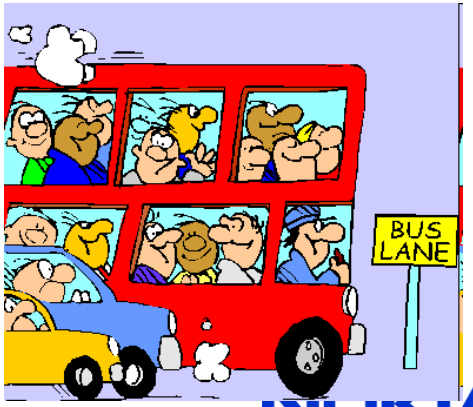
Can we select a sensible default channel based on the data and metadata to be uploaded?

Example 2: authentication for screensaver unlocking





What local authentication method to use when?



Work-in-progress with Markus Miettinen et al

Questions

- What applications and what kinds of access control policies?
  - Device lock policy, application privileges
  - Privacy policies for sharing data with others
  - ...?
- How do we set initial policy?
  - User-chosen cluster, Segmentation-by-querying-user, Policy-by-imitation, ...
  - Clustering users based on initial user behaviour and other context information?
- How do we evolve policies?
  - Clustering objects (data), user feedback (e.g., using non-modal dialogs – "OmbudsKey")
- How to get the data for clustering?
  - Clustering for policy initialization requires access to other people's policies
  - Access control policy not as sensitive as personal data: users more willing to share them?
- What is so special about security/privacy policies?
  - Cost of incorrect inferences
  - ...?

What happened to the first problem?

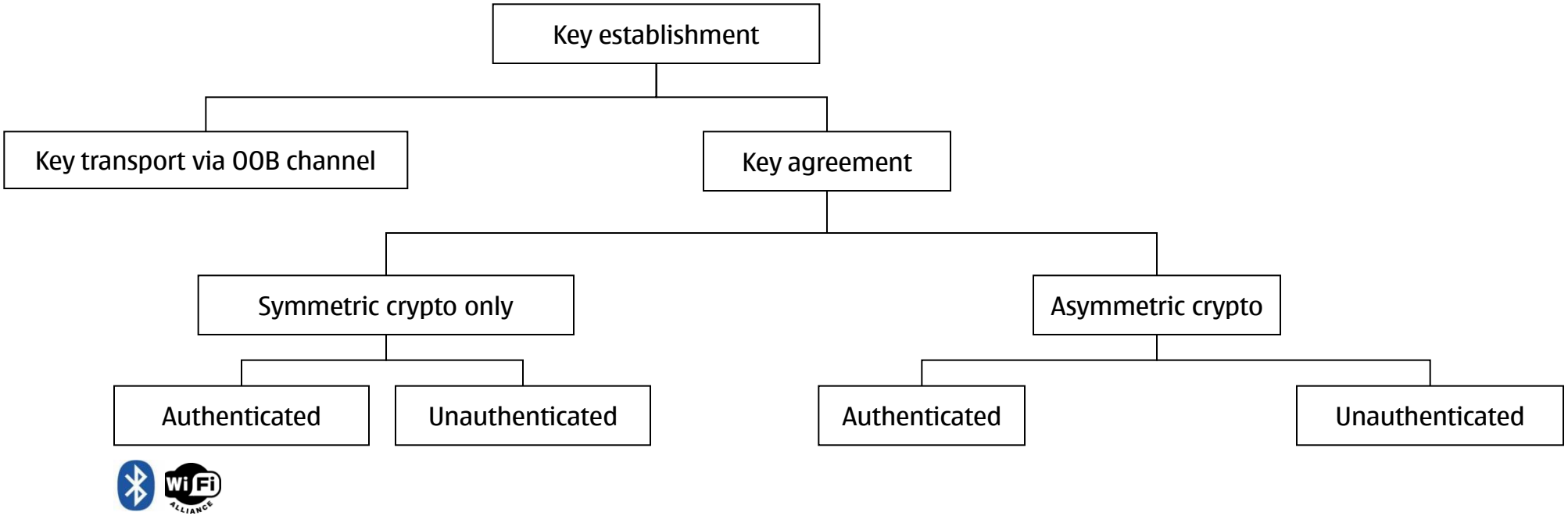
- Several research papers by various researchers
- Several new standards specifications (2005-2007)
- Deployment in progress: products hitting the market now

Wanted: Secure, intuitive, inexpensive first connect

- Two (initial) problems to solve
  - Peer discovery: finding the other device
  - **Authenticated key establishment**: setting up a security association

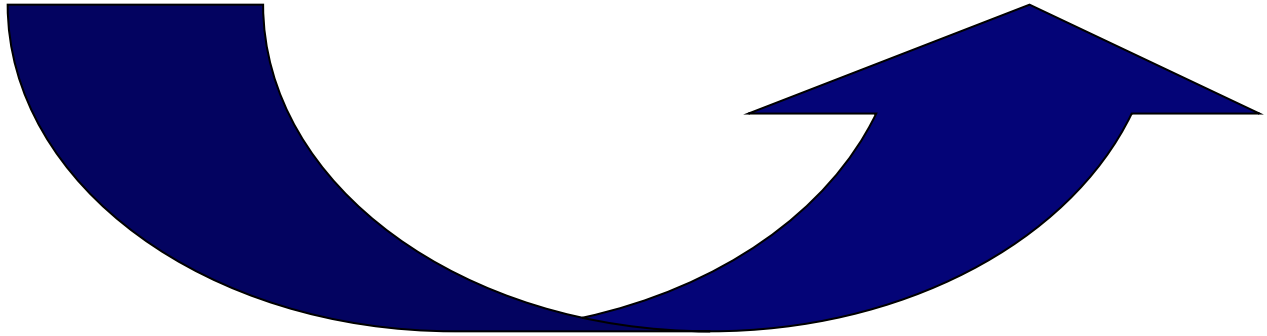
- Assumption: Peer devices are physically identifiable

Key establishment protocols for first connect (1)



Short keys vulnerable to passive attackers

Secure against passive attackers

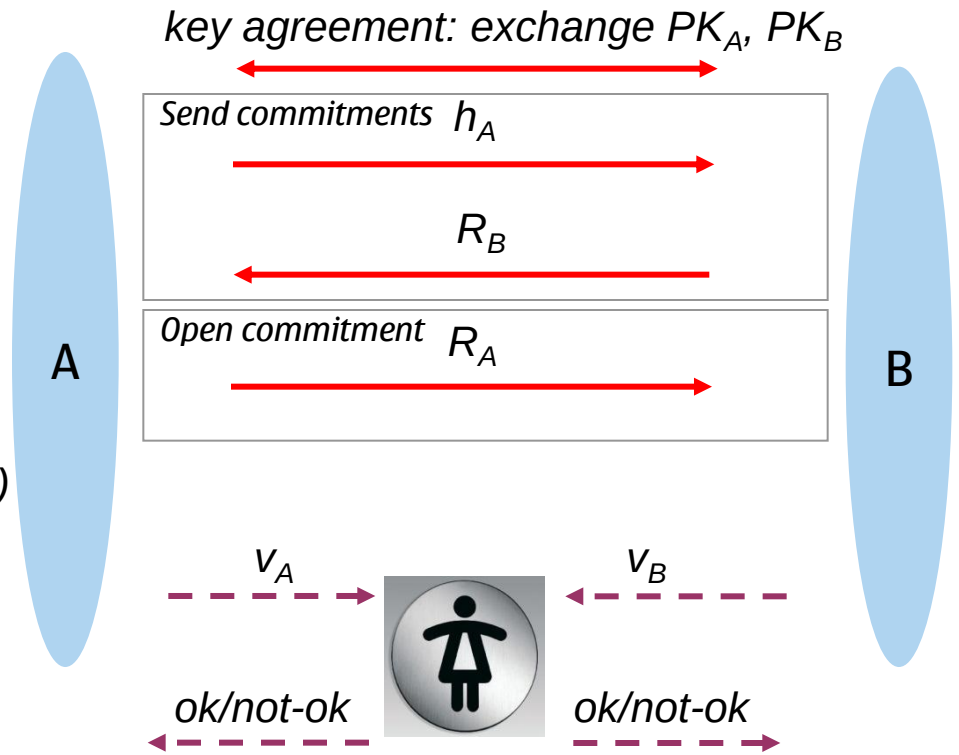


Authentication by comparing short strings

Choose long random R_A

Calculate commitment

$h_A \leftarrow h(A, R_A)$



Choose long random R_B

Verify commitment

$h'_A \stackrel{?}{=} h(A, R'_A)$

Abort on mismatch

$v_B \leftarrow H(A,B,PK'_A|PK_B,R'_A,R_B)$

$v_A \leftarrow H(A,B,PK_A|PK'_B,R_A,R'_B)$

User approves acceptance if v_A and v_B match

2^{-l} ("unconditional") security against man-in-the-middle (l is the length of v_A and v_B)

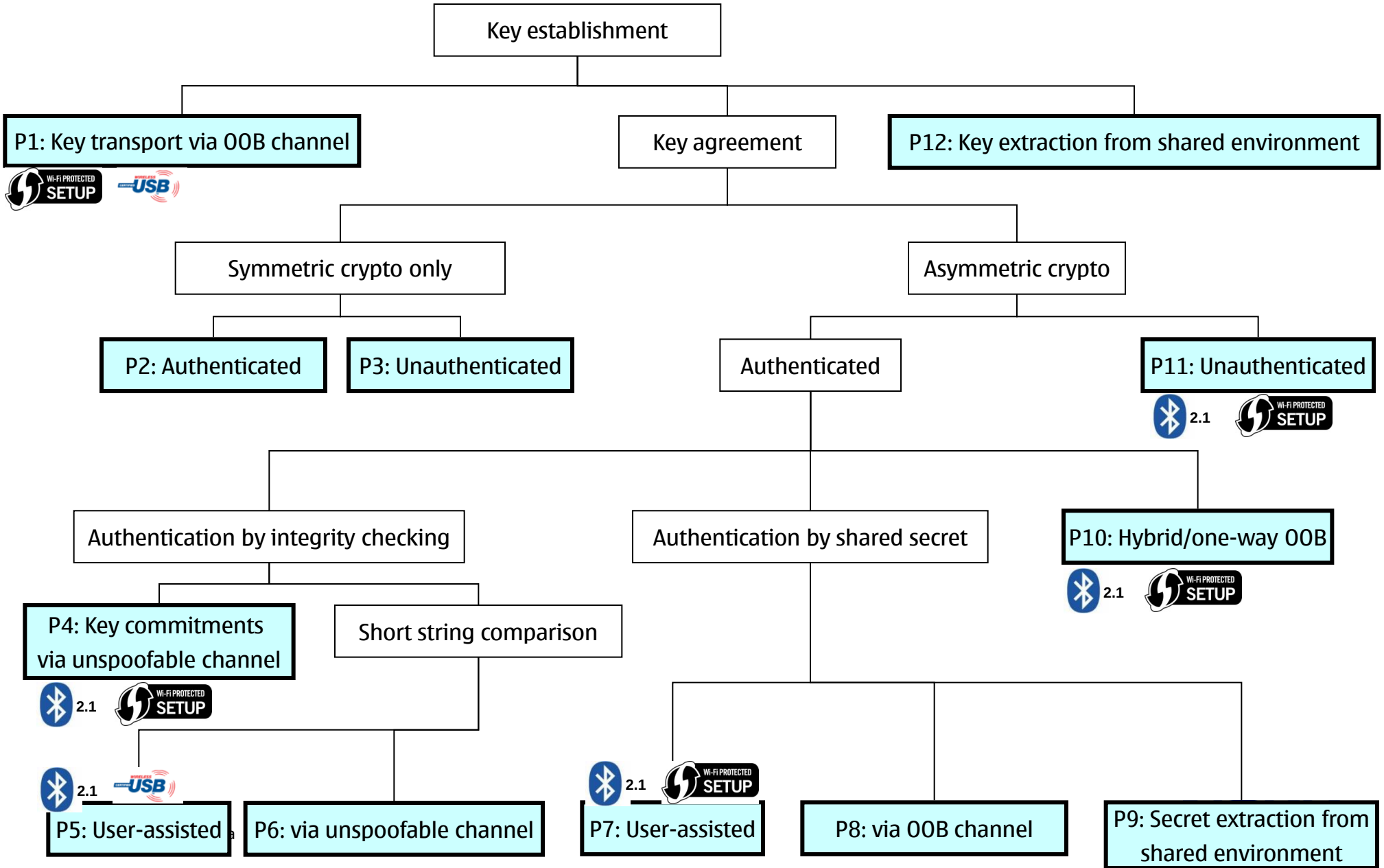
h() is a hiding commitment; in practice SHA-256

MANA IV by Laur, Asokan, Nyberg [IACR report] Laur, Nyberg [CANS 2006]

Comparative analysis by Suomalainen, Valkonen and Asokan [IJSN 2009].

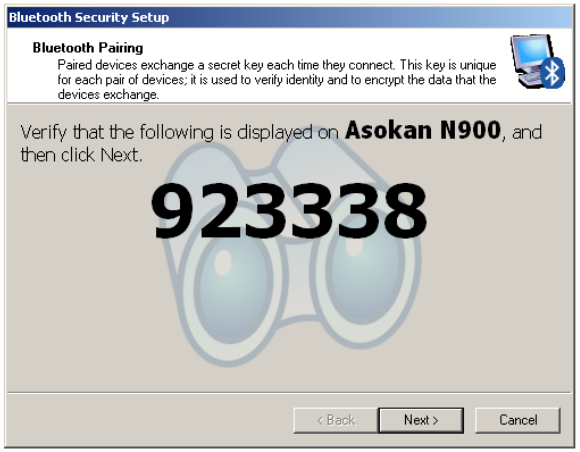
Flash back

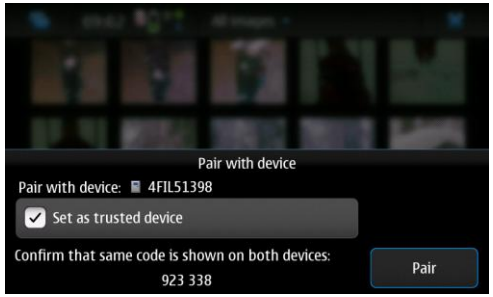
New Standards for first connect



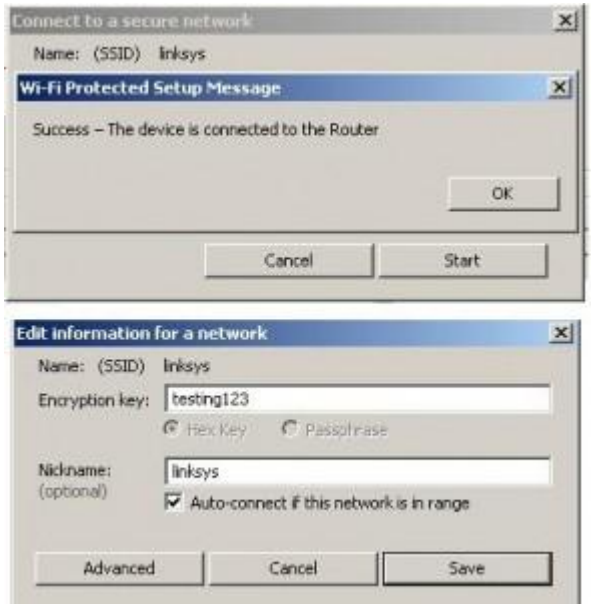
Deployment in progress

- Secure Simple Pairing 2.1





- WiFi Protected Setup



Outlook for the future

- Need to revisit Secure First Connect?
  - Unauthenticated key agreement may be the winner: cost and usability
  - But some scenarios would require authentication: input devices, medical devices?
  - “Wanted: inexpensive, intuitive, secure techniques for first connect”?

- Extending First Connect
  - Beyond security associations
    - How can users easily specify access control policies?
  - Group first connect