Security and Privacy Issues of Wireless Technologies

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Agenda

- Introduction
- Issues
- Technology specific issues
  - Wi-Fi
  - Bluetooth
  - RFID
  - Misc.
- Conclusions

Introduction

- Wireless technologies are part of our daily lives
- They already influence our social interaction
  - and will even more in the future
- We trust that they just work
  - and maybe you already have a bad day if they don't
- Are we aware that we use them all day long?
  - maybe most of the non-techy people aren't

The Wireless Medium

- The wireless medium is a shared resource
  - anyone, with the right equipment, can access it
    - walls, doors, security guards don't stop the radio waves
- You can see when other people are access it
  - other people see you
- Data send over wireless is public
  - anyone can see what you are doing
    - (we save encryption for later)

Where Wireless is used

- Home and Office
  - wireless access points for laptops or handhelds
- Commercial applications
  - infrastructure, hotspots, cash registers, etc...
- Personal usage
  - cell or smart phones, PDAs, cars, etc...

Personal Data

- What is personal
  - CC, SSN, phonebook, calendar, password, etc...
  - your daily routine
    - where do you go, what do you do, who do you know
- Where do you keep your personal data
  - PC, laptop, PDA, cellphone
- What data is somebody else keeping about you
  - where do they keep it?

Now Combine

- Your valuable data is wirelessly access able
- *Anyone* can access it, this means:
  - data theft / financial harm
  - privacy invasion
    - reading your email or Amazon orders
  - identity theft, your...
    - social security number
    - internet connection
    - phone number

Relax

Its not that bad!

Issues

- Wireless technology is
  - design for EaseOfUse
  - changing fast and continuously evolving
  - hard getting it right
- The average user just doesn't know
  - how and why

Safety

- Would you drive a car that is known for harming it's passengers?
  - its really easy to use, you don't have to walk
  - no need to adjust to the bus schedule
- Would you use a technology that is known for...
  - its really easy to use, you don't need to plug-in
  - no need to buy 100 cables and adapters
- You do both, just need to watch out for yourself

Technology Specifics

- Theory is done ... lets checkout the specifics
- Also the different technologies are somehow similar, they all have their own special problems
- The next slides cover
  - Wi-Fi
  - Bluetooth
  - RFID
  - and very briefly mobile com. systems and Clickers

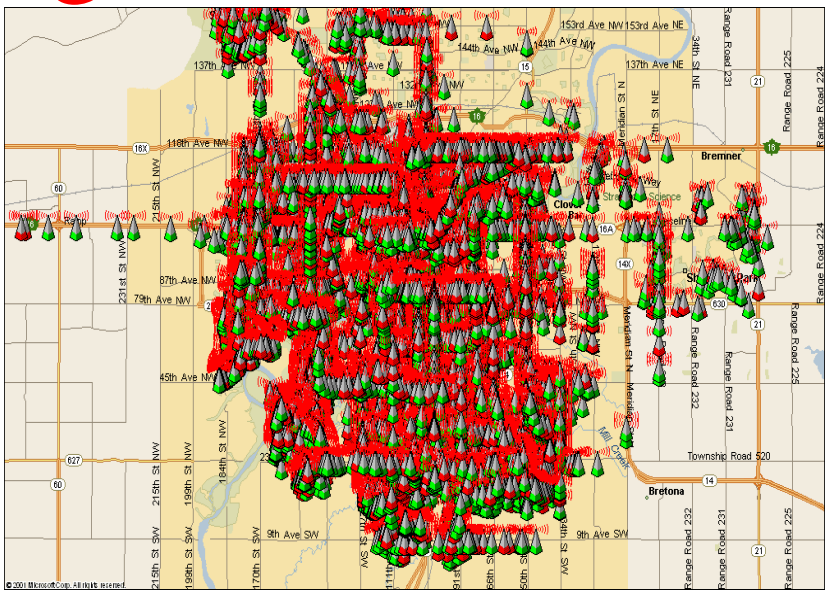
Wireless Lan/Wi-Fi (802.11)

- Most popular wireless technology
  - not counting mobile phone technologies like GSM!
- Its been around for quite some time now
  - basically replaces wired networks
  - widely adopted for all kinds of things
- EaseOfUse principal
  - access points announce them self's to help the user
  - plug 'n play auto-configuration, it just works

Wi-Fi cont.

- You're not the only one to see the access point announcing itself
  - everybody in range can use it (sometimes by accident)
- The whole EaseOfUse thing created a new sport or hobby called **WarDriving**
  - basically you drive around with a car packed with a laptop and a pile of wireless equipment to find and catalog access points

WarDriving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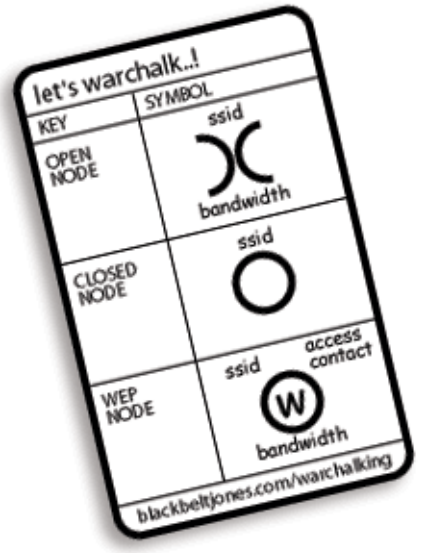
let's warchalk..!
KEY
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OPEN NODE
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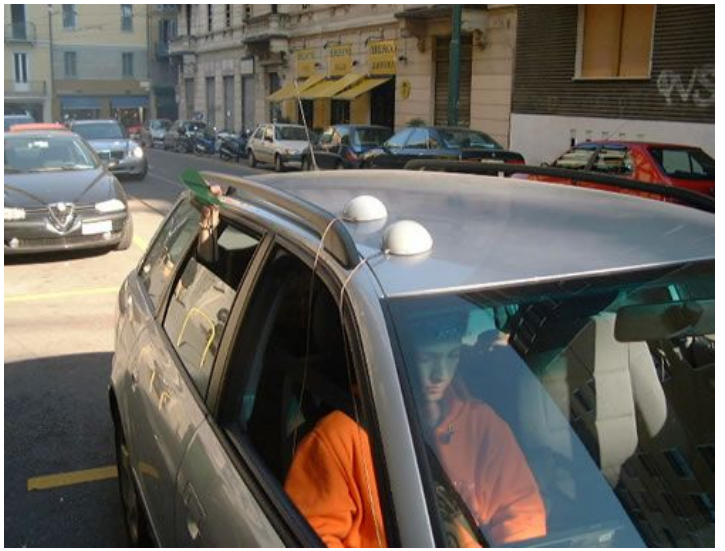


WarDriving cont.

- Most wardrivers are friendly, they just want to
  - explore their neighborhood
  - have non-destructive/harmful fun
  - read *their* email
- Wardriving mostly not necessary anymore
  - way to many people run access points these days
  - just switch on wireless and you're connected

Wi-Fi Abuse

- *Open* access points can cause all sorts of problems and easily get you in to trouble
  - data theft
    - CC, SSN, other valuable data on your network
  - identity theft (committing crimes in your name)
    - fraud (eBay, etc...)
    - SPAM
  - privacy invasion
    - read your email or instant messages

Wi-Fi Abuse cont.

- Public hotspots are equally dangerous
  - profiling individuals using their hardware
  - directed attacks, you and your laptop are visible
    - executive lounge at airports, hotel lobbies, $tarBucks...
  - security is up to the user since lowlevel security mechanisms mostly don't work here
    - (more on the next slide)

Secure Wi-Fi

- Many protection mechanisms (thru encryption)
  - the *secure* versions of POP/SMTP/HTTP/...
  - for closed networks
    - WEP - Wired Equivalent Privacy (broken)
    - WPA - Wi-Fi Protected Access
  - for public networks
    - VPN - Virtual Privat Network (a cooperate thing)
- All in all its not that bad, but...
  - you're still track-able

Bluetooth

- Short range wireless technology
  - replaces cables and infrared
- Mostly used by *small* mobile devices
  - cell and smart phones, PDAs and laptops, etc...
- Typical applications are
  - dial-up networking using a cellphone
  - business card exchange using a cellphone or PDA
  - wireless headsets

Bluetooth cont.

- Point-to-point semantic other then Wi-Fi which is basically broadcasting
  - therefore sniffing Bluetooth is much harder and in fact can't be done with consumer equipment
- More secure by design, some features are:
  - can be set to a non visible mode
  - only respond to known devices
  - traffic encryption

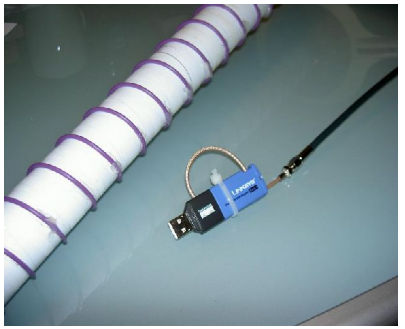
Bluetooth Bugs

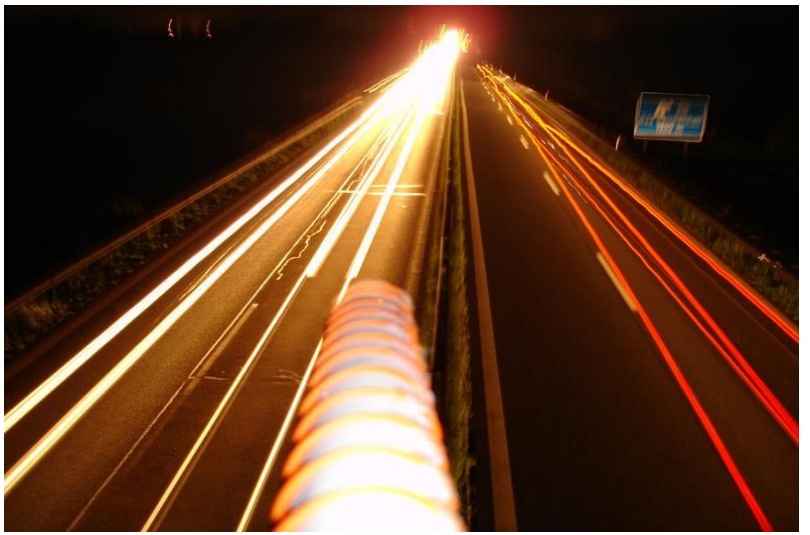
- Many implementation bugs in various devices
- Especially cellphones are affected
  - some bugs allow:
    - copying phonebook and calendar entries
    - initiating calls and sending text-messages
    - Denial of Service (DoS) attacks (phone becomes unusable)
    - special kind of wiretapping
      - using a phone or a hands-free car kit as a bug

Bluetooth WarDriving

- Apply what you have learned from WarDriving
  - not drive but walk or have a coffee and wait
- Supposed to be short range (10-100m)
  - same frequency as Wi-Fi, reuse Wi-Fi antennas
- A new hobby...

Bluetooth WarWaiting





Bluetooth Examples

- Copy phonebook at interesting events
  - Capitol Hill press conference
    - done in germany, got secret service internal phone numbers
- Social engineering
  - use names from copied phonebook to gain trust
- Tap wireless headsets of cars driving >80mph
  - you can also talk to the driver

Bluetooth Abuse

- Most Bluetooth devices are very personal
  - cellphone or PDA
- Can be abused to track and profile individuals
  - tracking done to proof feasibility (where is person X)
  - companies sell products to do this
- BlueSpam, spam via Bluetooth to your phone
  - again, companies sell products to do this

RFID

- RadioFrequencyIDentification
  - small tags/transponders which can be read wirelessly
    - by small we actually mean very small (post stamp or rice)
  - many different types
    - powerless/self powered
    - non/authenticated (encrypted) data transfer
    - readonly/writeonce-readmany/read-write
- Works just like anti-theft system stores have
  - electromagnetic field powers tag, tag responds

RFID cont.

- RFID is meant to be very short range (cm)
  - magnetic field strength, security, etc...
- Data stored on tags
  - GUID – Globally Unique Identifier (128bit number)
    - most common for very small passive tags
  - Anything else possible
    - cost, size and power consumption are the main constraints

RFID Usage

- Access Control / Authentication
  - security badge
  - passport / ID
- Item identification
  - customer cards
  - goods in warehouses (GUID)
    - not only pallets, every single item!
  - basically everything you can possibly think of

RFID Abuse Risks

- Tracking and spying
  - open system, readers are cheap and public available
  - tags are mostly not visible and unmarked
  - reading range can be extended using antennas
- Identity theft – tag duplication
  - low security applications (customer cards)

RFID / Proximity Card Cloner

Mobile Communication Systems

- Systems like: GSM, PCS, CDMA, UMTS, etc...
  - mostly secure against *cheap attacks*
  - a while ago some issues with GPRS, got fixed
- Maybe reliability and availability...
  - too many users in a certain area
    - I.V. during Halloween or New Years Eve
  - no total coverage
    - trip to the mountains or desert...

Classroom Clickers
(what I found on the net)

- Infrared based
  - tool found that claims to:
    - easily sniff and display *clicks*
    - spoof feedback (right/wrong)
- RF based
  - some interfere with Wi-Fi/Bluetooth (2.4Ghz band?)
    - maybe easy to DoS the classroom

Conclusions

- All the different technologies haven common security and privacy problems
  - each having it's special impact for the users
- New technologies are by nature more vulnerable
  - like wine, they need to age to become good
- In general its worse then you think it is
  - at the same time its not as bad as it sounds

End

Questions?