SKYPE & TYPE

Keystroke Leakage over VoIP

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#BHUSA / @BLACKHATEVENTS
Meet our monkey.
Meet our monkey.

Our monkey is a scoundrel.
Meet our monkey.

Our monkey is a scoundrel.

Monkey likes secrets, but is very bad at crypto.

(just like me)
But monkeys have **very** good hearing
(*unlike me*)

And keyboard keys have unique sounds

So let’s listen!
Keyboard Acoustic Eavesdropping

Supervised Learning (Asonov, 2004; Halevi, 2012; 2014)
- Less input assumptions

Unsupervised Learning (Berger, 2006; Zhuang, 2009)
- More general
Keyboard Acoustic Eavesdropping

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Unsupervised Learning (Berger, 2006; Zhuang, 2009)
- More general
Spying Devices and How to Plant Them

LET’S HACK
Spying Devices and How to Plant Them

Extension Cord with Hidden GSM Microphone(with call back function) ISR-175
Spying Devices and How to Plant Them

Extension Cord with Hidden GSM Microphone(with call back function) ISR-175

4GB MINI SPY PEN CAMERA WITH VIDEO RECORDER USB DVR

Product Code: BL-01
Availability: In Stock
Price: $75.00
Spying Devices and How to Plant Them

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4GB Calculator Hidden Pinhole Spy Camera DVR

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Mini Hidden Spy Pen Camera 8GB Microphone 30FPS Covert Surveillance Wireless Video Recorder

4GB MINI SPY PEN CAMERA WITH VIDEO RECORDER USB DVR

Price: $75.00
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Mini Hidden Spy Pen Camera 8GB Microphone 30FPS Covert Surveillance Wireless Video Recorder

Price: US $15.1 - 18.86 / Piece

Optical Mouse With Hidden Surveillance Monitor GSM Listening Device Microphone Audio Surveillance in Mouse, Mini GSM Transmitter

4GB Calculator Hidden Pinhole Spy Camera DVR

Price: $75.00

4GB MINI SPY PEN CAMERA WITH VIDEO RECORDER USB DVR

Price: US $15.33

Product Code: BL-01
Availability: In Stock

Price: US $38.55

1, ships out within 2 business days
Spying Devices and How to Plant Them

- Extension Cord with Hidden GSM Microphone (with call back function) ISR-175
- 4GB Calculator Hidden Pinhole Spy Camera DVR
- Optical Mouse With Hidden Surveillance Monitor GSM Listening Device Microphone Audio Surveillance in Mouse, Mini GSM Transmitter
- 8GB Mini Hidden Spy Pen Camera 8GB Microphone 30FPS Covert Surveillance Wireless Video Recorder
- 4GB MINI SPY PEN CAMERA WITH VIDEO RECORDER USB DVR
- Spy Hidden GSM Bug/Microphone In Mobile Charger
Spying Devices and How to Plant Them

- Extension Cord with Hidden GSM Microphone (with call back function) ISR-175
- 8GB Mini Hidden Spy Pen Camera 8GB Microphone 30FPS Covert Surveillance Wireless Video Recorder
- Optical Mouse With Hidden GSM Microphone Audio Surveillance
- 4GB Calculator Hidden Spy Camera DVR
- SPY HIDDEN GSM BUG/MICROPHONE IN MOBILE CHARGER
Spying Devices and How to Plant Them

Extension Cord with Hidden GSM Microphone (with call back function) ISR-175

8GB

Mini Hidden Spy Pen Camera 8GB Microphone 30FPS Covert Surveillance Wireless Video Recorder

4GB MINI SPY PEN CAMERA WITH VIDEO RECORDER USB DVR

Price: US $15.1 - 18.86 / Piece

SPY HIDDEN GSM BUG/MICROPHONE IN MOBILE CHARGER
Hidden Microphone Plant
Hidden Microphone Plant

TO LISTEN TO KEYBOARD CLACKING
First Takeaway

If I get physical access

I will do worse than plant a bug to listen to your keyboard
Let’s go remote!

A day in life of my professors

<table>
<thead>
<tr>
<th>Day</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>Call To 0 11:31 Call To M 3:40 Call To M 11:24 Call From B 12:54p Call From M 6:28 Call From A 2:49 Call From 11:45 Call From F 11:45 Call From M</td>
</tr>
<tr>
<td>Tue</td>
<td>+11 more</td>
</tr>
<tr>
<td>Wed</td>
<td>+4 more</td>
</tr>
<tr>
<td>Thu</td>
<td></td>
</tr>
<tr>
<td>Fri</td>
<td>2:49 Call To M 11:31 Call To M 3:24 Call To M 3:39 Call To M 4:30 Call To M 5:19 Call To F 5:29 Call To M 6:20 Call To M</td>
</tr>
<tr>
<td>Sat</td>
<td>+2 more</td>
</tr>
</tbody>
</table>

My calendars:
- Tasks
- Other calendars:
  - Add a friend's calendar
  - Canadian Holidays

Google calendar:
- Create event
- Quick add

Calendar view options:
- Day
- Week
- Month
- 4 Days
- Agenda

Black Hat USA 2017
- Confcalls are *(sometimes)* long and boring

- This motivates multi-tasking
  - *Work still needs to be done*

- So we type stuff
Will it work?

- Not obvious

- VoIP transforms & downgrades audio
  - MDCT, LPC → sound is almost reconstructed, rather than just encoded

- Investigate whether key fingerprints remain
Victim

 types secret

Attack model

EXTRACT KEYPRESS & FEATURES

TRAIN MODELS

PREDICT
SEGMENTATION w/THRESHOLDS

MEL FREQUENCY CEPSTRAL COEFFICIENTS

MACHINE LEARNING

DICTIONARY or BRUTEFORCE or GUESSES
Does it work?

Yes.

5 volunteers - 3 laptops - typing letters
Does it **really** work?

vs Forbes, 1984 & the Bible

- Open Source tool: 
  
  `github.com/SPRITZ-Research-Group/Skype-Type`

- Different blocks for audio input, segmentation, learning, and output
  - Customizable and extensible
DEMO!

...What could possibly go wrong?
1. New and surprising extension to the old side-channel, larger attack surface

2. VoIP: an effective and practical means of eavesdropping on keyboard input

3. Don’t Skype & Type :-)
Thanks!

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