Privacy-Preserving Protocols for Smart Camera Systems and Other IoT Devices

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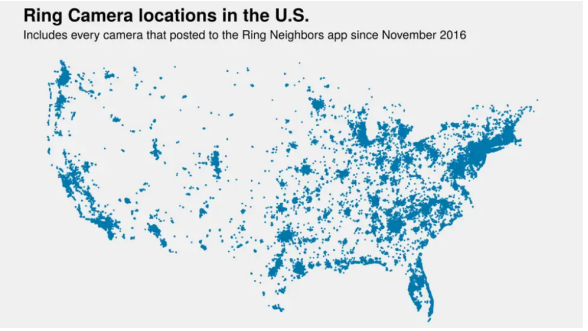
PEPR'22 - June 23rd, 2022

Building a Privacy-Preserving Smart Camera System, **Yohan Beugin**, Quinn Burke, Blaine Hoak, Ryan Sheatsley, Eric Pauley, Gang Tan, Syed Rafiul Hussain, Patrick McDaniel, Proceedings of the Privacy Enhancing Technologies Symposium (PETS), 2022

Motivation



Map from *Ring's Hidden Data Let Us Map Amazon's Sprawling Home Surveillance Network. Gizmodo, (2019).*

Motivation

Obscure providers' incentives

TECHNOLOGY

Doorbell-camera firm Ring has partnered with 400 police forces, extending surveillance concerns

By Drew Harwell

August 28, 2019 at 6:53 p.m. EDT

Senator blasts Amazon's Ring doorbell as an 'open door for privacy and civil liberty violations'

Sen. Ed Markey, D-Mass., called the lack of privacy protections "chilling."

Untrustworthy providers

Here's Anker's apology after 712 Eufy customers had camera feeds exposed to strangers

Eufy blames a software update and promises to do better

By Mitchell Clark | May 19, 2021, 3:09pm EDT

A Home Security Worker Hacked Into Surveillance Systems to Watch People Have Sex

By Lucas Ropek | 1/22/21 4:00PM | Comments (34)

Ring let employees watch customer videos, claim reports

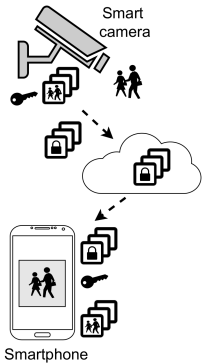
'Unfiltered, round-the-clock live feeds from some customer cameras'

By Dani Deahl | @danideahl | Jan 10, 2019, 5:19pm EST

Goals

Smart camera systems need not compromise users privacy.

Return control to users



Support commercial features

How to:

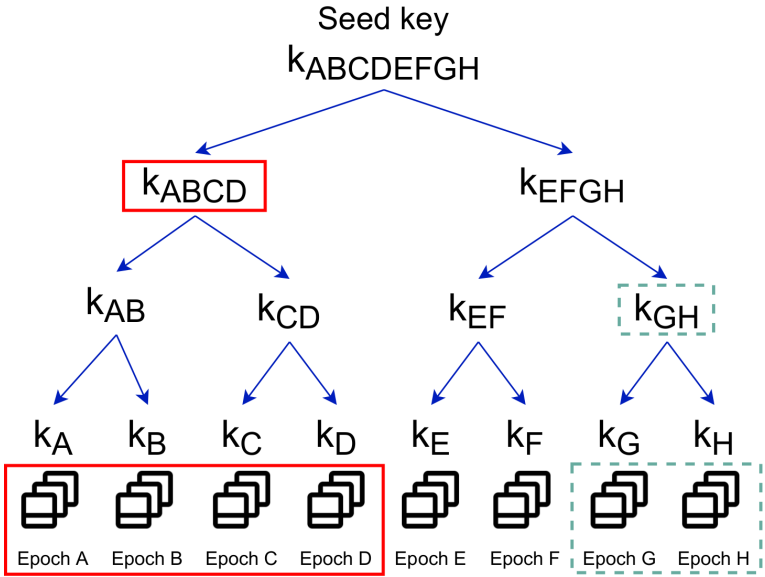
1. Establish root of trust?
2. Manage the keys?

Features:

- Configuration
- Recording and Streaming
- Delegation
- Deletion
- Recovery
- Reset

Establishing Root of Trust

Key Management



Extending to Other IoT devices

Privacy-Preserving Smart Camera

- Features: configuration, live stream, delegation, deletion, access recovery, reset
- Video stream
- Camera sensor

Conclusion

No Need to Compromise Users Privacy:

1. Return full control to users:
   - Root of trust
   - Complete mediation
2. Support commercial functionality

Paper: *Building a Privacy-Preserving Smart Camera System* (PETS 2022)

Code: https://github.com/siis/CaCTUs

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