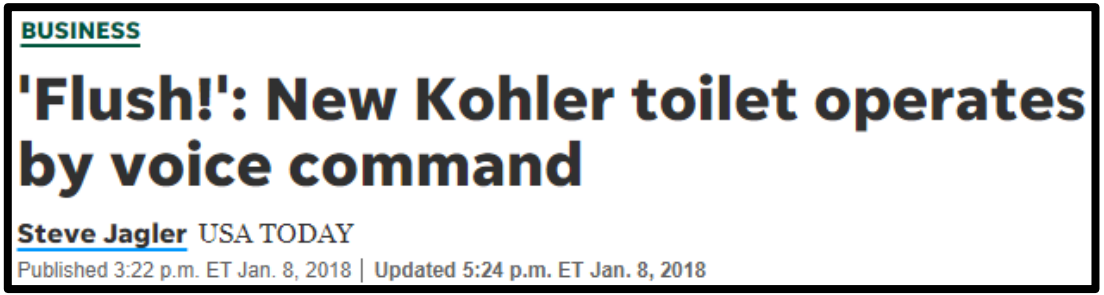
Privacy and Security Nutrition Labels to Inform IoT Consumers

Pardis Emami-Naeini

February 1, 2021

Toilets are getting smarter and more invasive



BUSINESS

'Flush!': New Kohler toilet operates by voice command

Steve Jagler USA TODAY

Published 3:22 p.m. ET Jan. 8, 2018 | **Updated 5:24 p.m. ET Jan. 8, 2018**



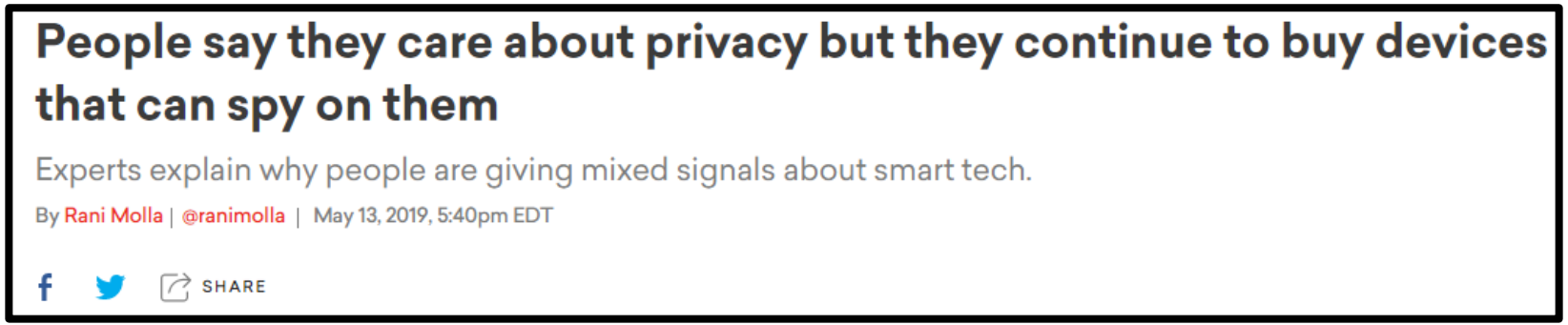
NEWSLETTER

MEDICALNEWSTODAY

'Smart toilet' recognizes users and checks for signs of disease

- www.usatoday.com/story/money/business/2018/01/08/flush-new-kohler-toilet-operates-voice-command/1014261001/
- www.medicalnewstoday.com/articles/smart-toilet-recognizes-users-and-checks-for-signs-of-disease

People are concerned about losing their privacy



People say they care about privacy but they continue to buy devices that can spy on them

Experts explain why people are giving mixed signals about smart tech.

By Rani Molla | @ranimolla | May 13, 2019, 5:40pm EDT

SHARE



Help Net Security
October 14, 2019

Share

Consumers concerned about connected home privacy, still few implement safety practices



Smart devices spark privacy concerns among consumers: study

Sibile Marcellus
Reporter
Yahoo Finance December 14, 2018

Follow

- www.vox.com/recode/2019/5/13/18547235/trust-smart-devices-privacy-security
- www.helpnetsecurity.com/2019/10/14/connected-home-consumer-attitudes/
- news.yahoo.com/smart-devices-spark-privacy-concerns-consumers-study-161851265.html

Smart devices are getting hacked





- www.wsbtv.com/news/local/dekalb-county/-wake-up-woman-says-someone-hacked-surveillance-system-yelled-at-her-dog/1017442073/
- www.nytimes.com/2019/12/15/us/Hacked-ring-home-security-cameras.html

Smart devices are getting hacked

Access Control

IoT companies are sometimes forgetful



SECURITY CAMERAS

Google calls Nest's hidden microphone an 'error'

The tech giant didn't inform customers that the home security hub had a microphone.

BY ALFRED NG, MEGAN WOLLERTON | FEBRUARY 20, 2019 10:46 AM PST

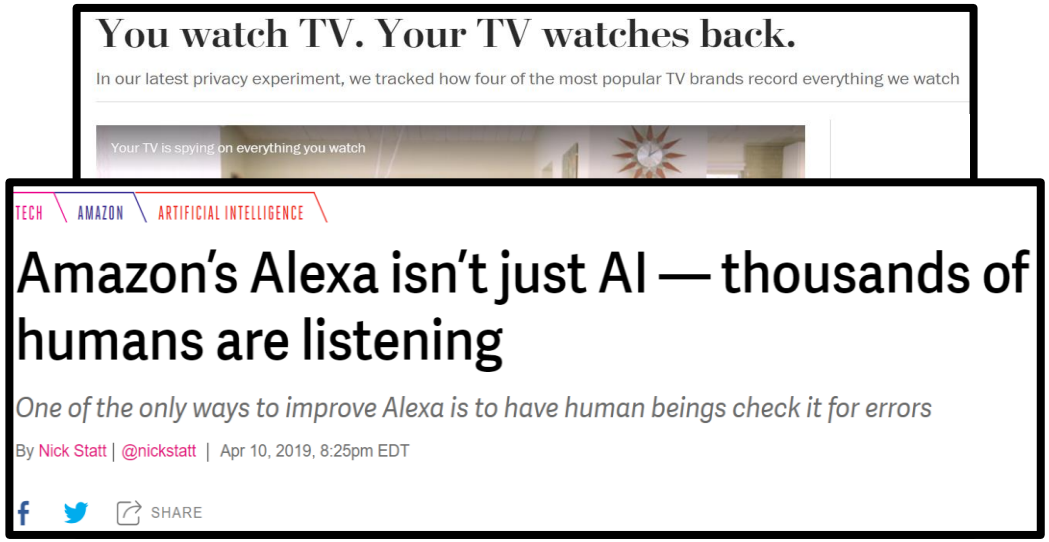
14

- www.cnet.com/news/google-calls-nests-hidden-microphone-an-error/

IoT companies are sometimes forgetful

Sensor Type

There is still a lot that we don’t know



You watch TV. Your TV watches back.

In our latest privacy experiment, we tracked how four of the most popular TV brands record everything we watch

Your TV is spying on everything you watch

TECH \ AMAZON \ ARTIFICIAL INTELLIGENCE

Amazon’s Alexa isn’t just AI — thousands of humans are listening

One of the only ways to improve Alexa is to have human beings check it for errors

By Nick Statt | @nickstatt | Apr 10, 2019, 8:25pm EDT

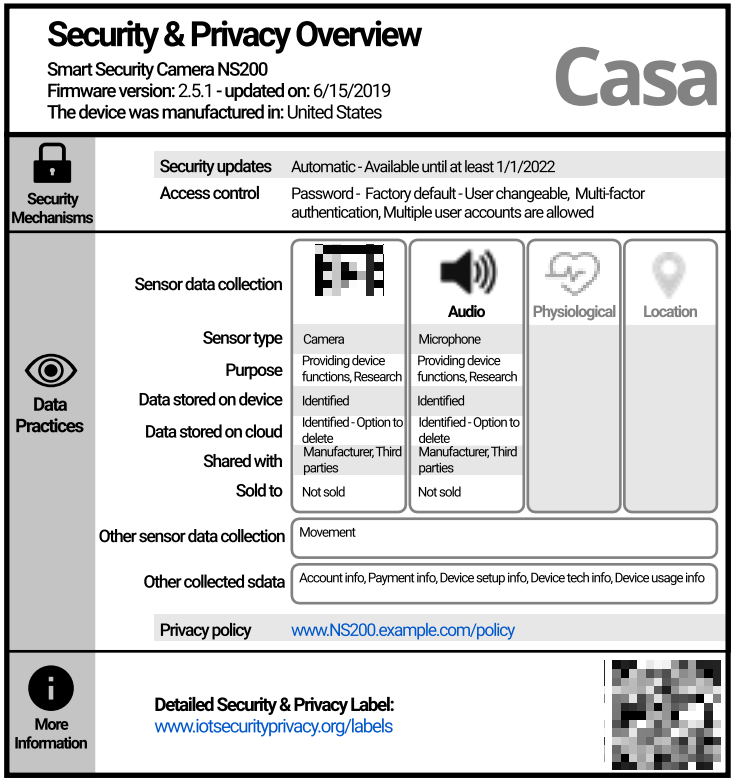
SHARE

- www.washingtonpost.com/technology/2019/09/18/you-watch-tv-your-tv-watches-back/
- www.theverge.com/2019/4/10/18305378/amazon-alexa-ai-voice-assistant-annotation-listen-private-recordings

There is still a lot that we don’t know

Data Sharing & Selling

How to effectively provide this information?



Security & Privacy Overview

Smart Security Camera NS200
Firmware version: 2.5.1 - **updated on:** 6/15/2019
The device was manufactured in: United States

Casa

Security Mechanisms

Security updates	Automatic - Available until at least 1/1/2022
Access control	Password - Factory default - User changeable, Multi-factor authentication, Multiple user accounts are allowed

Data Practices

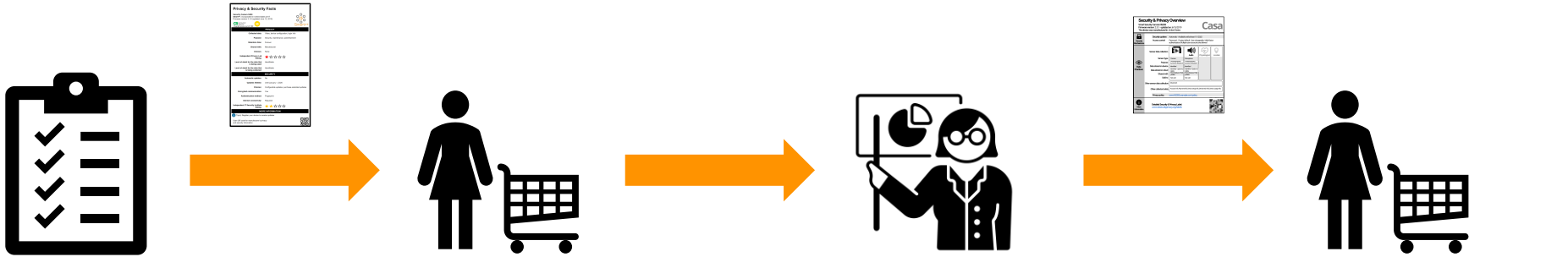
Sensor data collection	Camera	Audio	Physiological	Location
Sensor type	Camera	Microphone		
Purpose	Providing device functions, Research	Providing device functions, Research		
Data stored on device	Identified	Identified		
Data stored on cloud	Identified - Option to delete	Identified - Option to delete		
Shared with	Manufacturer, Third parties	Manufacturer, Third parties		
Sold to	Not sold	Not sold		

Other sensor data collection	Movement
Other collected sdata	Account info, Payment info, Device setup info, Device tech info, Device usage info
Privacy policy	www.NS200.example.com/policy

More Information

Detailed Security & Privacy Label:
www.iotsecurityprivacy.org/labels

Multi-step path to label design



What privacy factors are people concerned about?

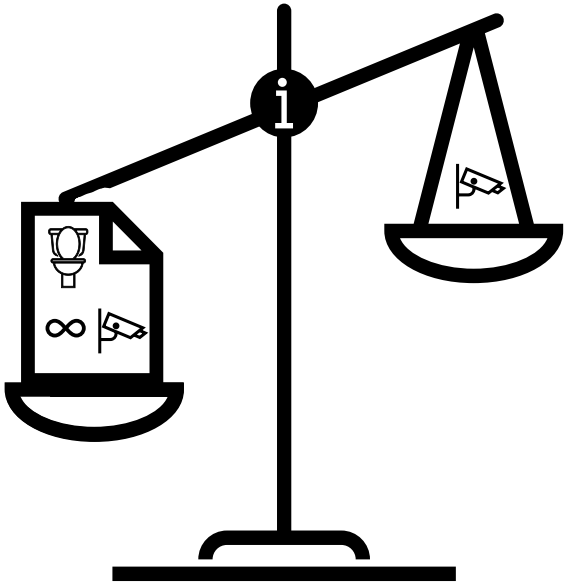




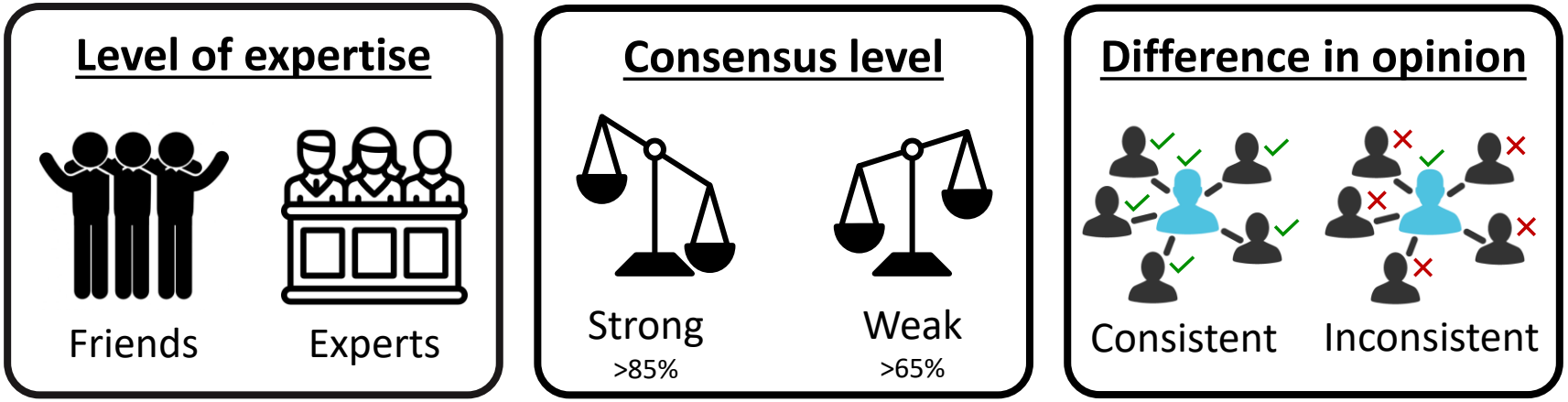


- Emami-Naeini et al., SOUPS'17

Context is more powerful than individual factors



How social influence impacts privacy decisions?



- Emami-Naeini et al., CSCW'18

We designed the first version of our IoT label

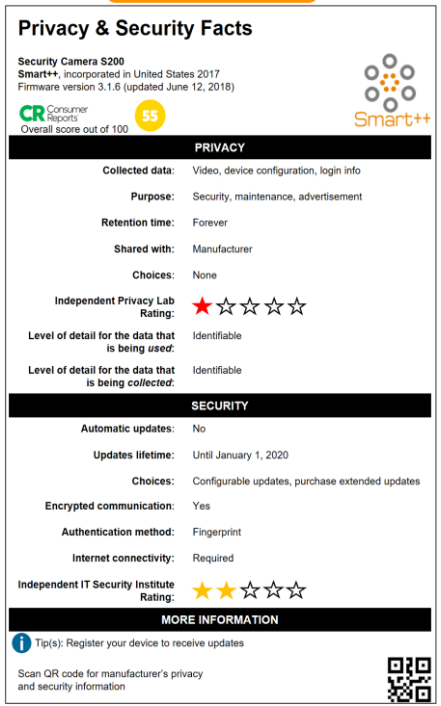
Version 1

General information

Privacy information

Security information

General information





Privacy information based on previous studies

Collected data:	Video, device configuration, login info
Purpose:	Security, maintenance, advertisement
Retention time:	Forever
Shared with:	Manufacturer
Choices:	None
Independent Privacy Lab Rating:	
Level of detail for the data that is being *used*:	Identifiable
Level of detail for the data that is being *collected*:	Identifiable

Security information based on security guidelines

Automatic updates:	No
Updates lifetime:	Until January 1, 2020
Choices:	Configurable updates, purchase extended updates
Encrypted communication:	Yes
Authentication method:	Fingerprint
Internet connectivity:	Required
Independent IT Security Institute Rating:	★★☆☆☆

Positive attitude toward IoT labels

Almost all wanted to know about privacy and security before the purchase.



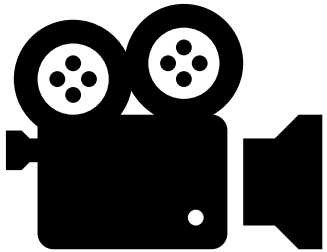
Almost all were willing to pay a premium for such information.

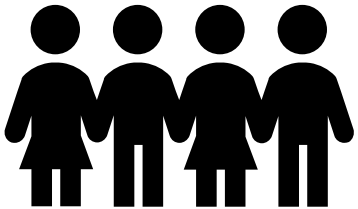




- Emami-Naeini et al., CHI'19

Privacy and security are latent concerns







Policy makers are also excited about IoT labels



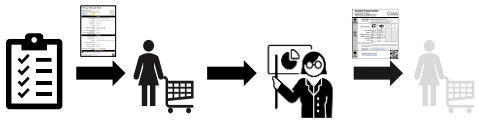
- securitytoday.com/articles/2019/10/24/cyber-shield-act.aspx
- www.govtechleaders.com/2019/05/07/regulatory-proposal-on-mandatory-iot-security-label/
- www.zdnet.com/article/singapore-to-introduce-security-label-for-smart-home-devices/
- portswigger.net/daily-swig/finland-launches-cybersecurity-label-for-iot-devices

Policy makers are also excited about IoT labels

What should be on IoT privacy and security labels?

We interviewed privacy and security experts

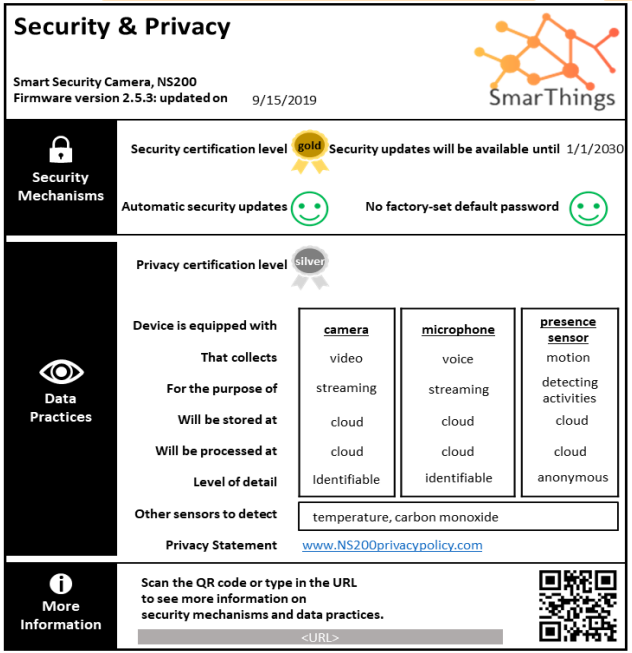
> *What's good about a label is that it empowers the consumer to make a more active decision about cybersecurity rather than just being completely helpless as to what the security of her device might be. Someone's gotta be looking out for consumers and giving the consumers this information.*



- Emami-Naeini et al., IEEE S&P'20

We designed a layered label

Primary layer - Version 2



Security & Privacy

Smart Security Camera, NS200
Firmware version 2.5.3: updated on 9/15/2019

SmarThings

Security Mechanisms

Security certification level: gold
Security updates will be available until 1/1/2030
Automatic security updates
No factory-set default password

Data Practices

Privacy certification level: silver

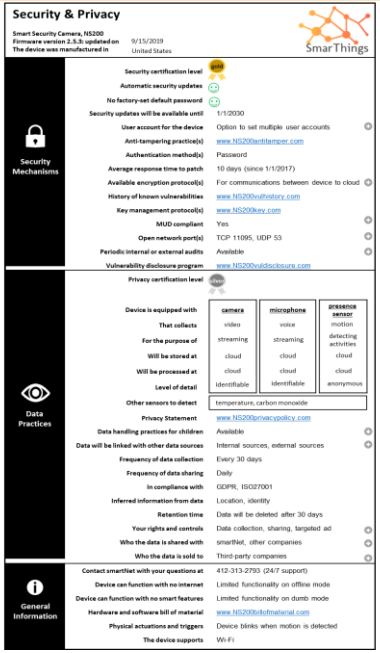
	camera	microphone	presence sensor
Device is equipped with			
That collects	video	voice	motion
For the purpose of	streaming	streaming	detecting activities
Will be stored at	cloud	cloud	cloud
Will be processed at	cloud	cloud	cloud
Level of detail	Identifiable	identifiable	anonymous

Other sensors to detect: temperature, carbon monoxide
Privacy Statement: www.NS200privacypolicy.com

More Information

Scan the QR code or type in the URL
to see more information on
security mechanisms and data practices.
<URL>

Secondary layer - Version 2



Security & Privacy

Smart Security Camera, NS200
Firmware version 2.5.3: updated on 9/15/2019
The device was manufactured in United States

SmarThings

Security Mechanisms

Security certification level	gold
Automatic security updates	☺
No factory-set default password	☺
Security updates will be available until	1/1/2030
User account for the device	Option to set multiple user accounts
Anti-tampering practice(s)	www.NS200antitamper.com
Authentication method(s)	Password
Average response time to patch	10 days (since 1/1/2017)
Available encryption protocol(s)	For communications between device to cloud
History of known vulnerabilities	www.NS200vulhistory.com
Key management protocol(s)	www.NS200key.com
MUD compliant	Yes
Open network port(s)	TCP 11095, UDP 53
Periodic internal or external audits	Available
Vulnerability disclosure program	www.NS200vuldisclosure.com

Data Practices

Privacy certification level: silver

	camera	microphone	presence sensor
Device is equipped with			
That collects	video	voice	motion
For the purpose of	streaming	streaming	detecting activities
Will be stored at	cloud	cloud	cloud
Will be processed at	cloud	cloud	cloud
Level of detail	identifiable	identifiable	anonymous

Other sensors to detect	temperature, carbon monoxide
Privacy Statement	www.NS200privacypolicy.com
Data handling practices for children	Available
Data will be linked with other data sources	Internal sources, external sources
Frequency of data collection	Every 30 days
Frequency of data sharing	Daily
In compliance with	GDPR, ISO27001
Inferred information from data	Location, identity
Retention time	Data will be deleted after 30 days
Your rights and controls	Data collection, sharing, targeted ad
Who the data is shared with	smartNet, other companies
Who the data is sold to	Third-party companies

General Information

Contact smartNet with your questions at	412-313-2793 (24/7 support)
Device can function with no internet	Limited functionality on offline mode
Device can function with no smart features	Limited functionality on dumb mode
Hardware and software bill of material	www.NS200billofmaterial.com
Physical actuations and triggers	Device blinks when motion is detected
The device supports	Wi-Fi

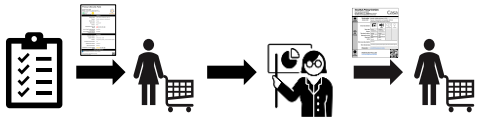
Semi-structured interviews with IoT consumers

Non-comparative



Comparative





Label to help find more information

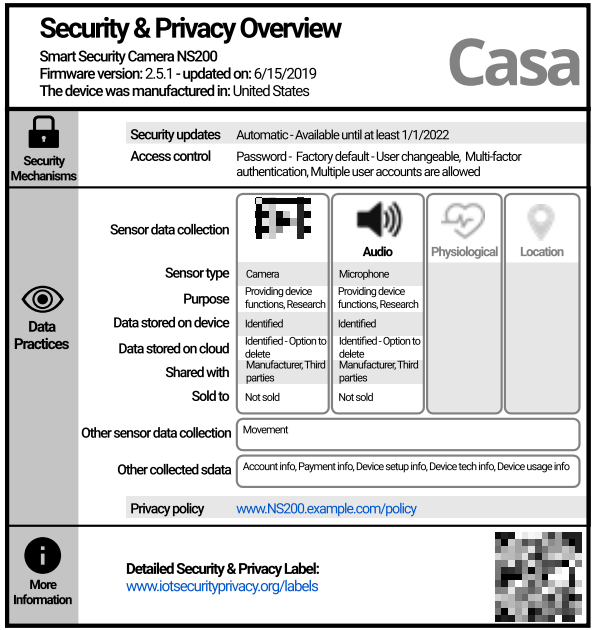
> *I don’t know what TCP and UDP are. But it’s interesting to have this here, because then I could go to Reddit and ask on there what that means and what the capabilities are.*

Label should work for both consumers and experts

Labels are both for customers and experts such as tech journalists and consumer advocacy groups. If they see something that is questionable, they will raise it in the public press or will raise it with regulatory authorities. The label is not just for the consumer, but there's another feedback process that works through experts.

Most recent version of our label

Primary layer - Version 3



Security & Privacy Overview

Smart Security Camera NS200
Firmware version: 2.5.1 - updated on: 6/15/2019
The device was manufactured in: United States

Casa

Security Mechanisms

Security updates	Automatic - Available until at least 1/1/2022
Access control	Password - Factory default - User changeable, Multi-factor authentication, Multiple user accounts are allowed

Data Practices

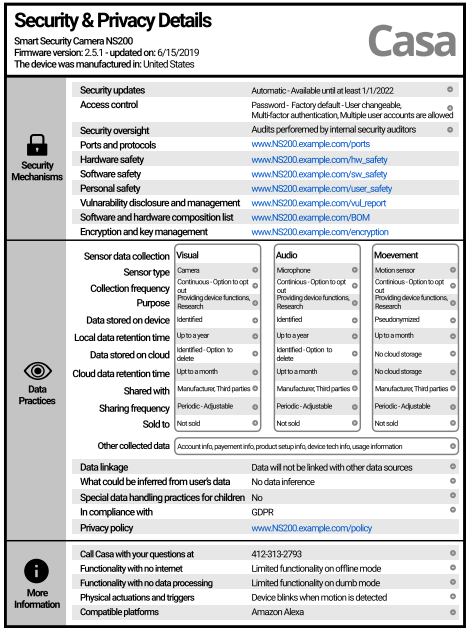
	Audio	Physiological	Location
Sensor type	Microphone		
Purpose	Providing device functions, Research		
Data stored on device	Identified		
Data stored on cloud	Identified - Option to delete		
Shared with	Manufacturer, Third parties		
Sold to	Not sold		

Other sensor data collection	Movement
Other collected sdata	Account info, Payment info, Device setup info, Device tech info, Device usage info
Privacy policy	www.NS200.example.com/policy

More Information

Detailed Security & Privacy Label:
www.iotsecurityprivacy.org/labels

Secondary layer – Version 3



Security & Privacy Details

Smart Security Camera NS200
Firmware version: 2.5.1 - updated on: 6/15/2019
The device was manufactured in: United States

Casa

Security Mechanisms

Security updates	Automatic - Available until at least 1/1/2022
Access control	Password - Factory default - User changeable, Multi-factor authentication, Multiple user accounts are allowed
Security oversight	Audits performed by internal security auditors
Ports and protocols	www.NS200.example.com/ports
Hardware safety	www.NS200.example.com/hw_safety
Software safety	www.NS200.example.com/sw_safety
Personal safety	www.NS200.example.com/user_safety
Vulnerability disclosure and management	www.NS200.example.com/vul_report
Software and hardware composition list	www.NS200.example.com/BOM
Encryption and key management	www.NS200.example.com/encryption

Data Practices

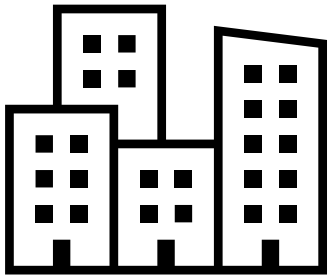
	Visual	Audio	Moevement
Sensor type	Camera	Microphone	Motion sensor
Collection frequency	Continuous - Option to opt out	Continuous - Option to opt out	Continuous - Option to opt out
Purpose	Providing device functions, Research	Providing device functions, Research	Providing device functions, Research
Data stored on device	Identified	Identified	Pseudonymized
Local data retention time	Up to a year	Up to a year	Up to a month
Data stored on cloud	Identified - Option to delete	Identified - Option to delete	No cloud storage
Cloud data retention time	Upt to a month	Upt to a month	No cloud storage
Shared with	Manufacturer, Third parties	Manufacturer, Third parties	Manufacturer, Third parties
Sharing frequency	Periodic - Adjustable	Periodic - Adjustable	Periodic - Adjustable
Sold to	Not sold	Not sold	Not sold

Other collected data	Account info, payement info, product setup info, device tech info, usage information
Data linkage	Data will not be linked with other data sources
What could be inferred from user's data	No data inference
Special data handling practices for children	No
In compliance with	GDPR
Privacy policy	www.NS200.example.com/policy

More Information

Call Casa with your questions at	412-313-2793
Functionality with no internet	Limited functionality on offline mode
Functionality with no data processing	Limited functionality on dumb mode
Physical actuations and triggers	Device blinks when motion is detected
Compatible platforms	Amazon Alexa

We need you on board!



Volunteer for label adoption

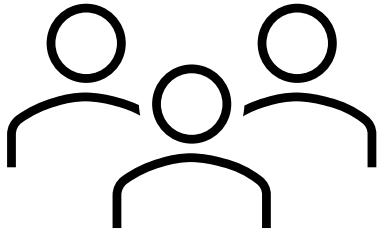
- IoT label generator: www.iotsecurityprivacy.org/generate

We need you on board!



Advocate for IoT labels

We need you on board!



Demand transparency from manufacturers

Thank you!



www.iotsecurityprivacy.org



pardis@cs.washington.edu