



Kids, Cats, and Control: Designing Privacy and Security Dashboards for IoT Home Devices

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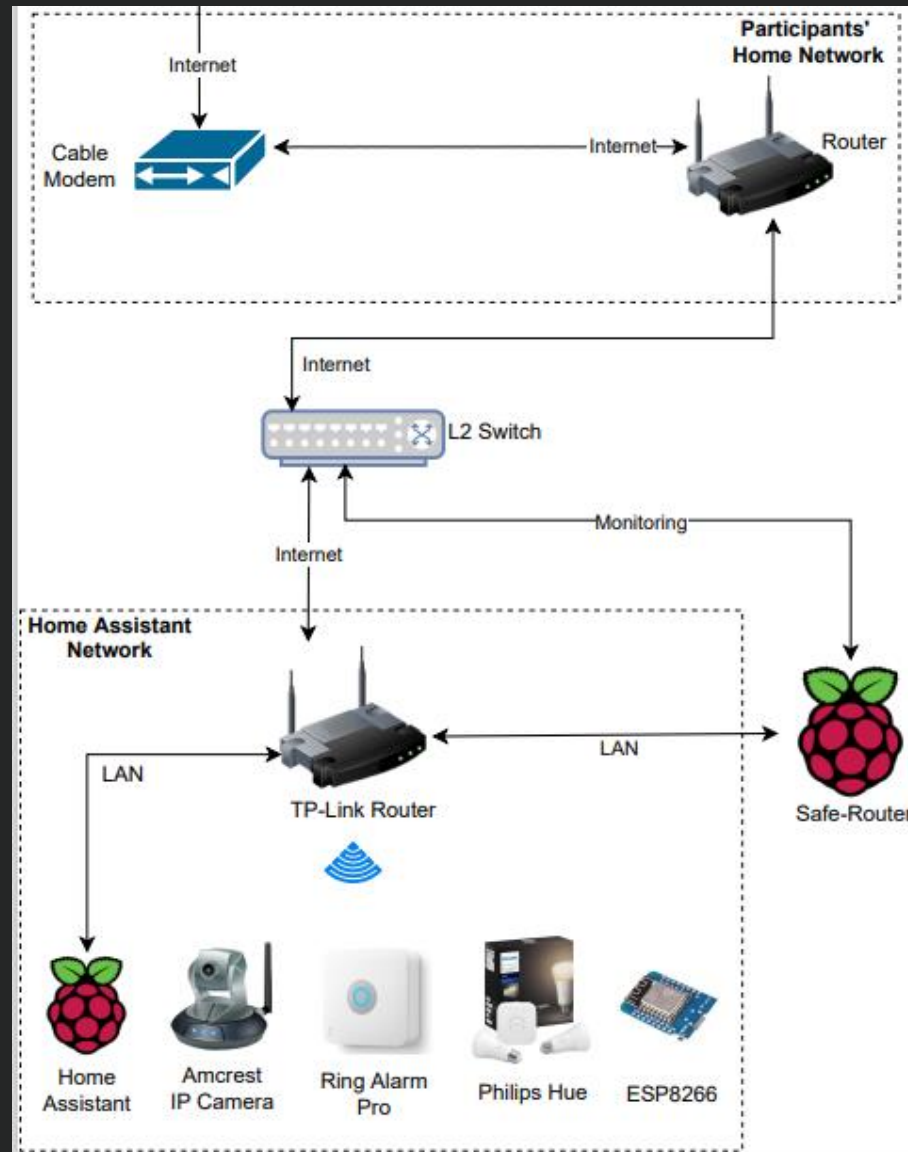
Participants recruited through NextDoor, mailing list, and university classifieds for screening survey (N=48)

21 respondents were filtered out for incomplete responses or inability to access their home router for internet access and 8 requested to not participate further (N=19)

Only 8 respondents responded as being able to participate in the in-home study







☰
2:36 pm

11

📶

💡

🔧

🏠

☀️

🔔¹

DK

Lights

- 💡 Living Room
- 💡 Kitchen
- 💡 Porch Light
- 💡 Upstairs Hallway
- 💡 Basement
- 💡 Office

Thermostat

74°F

63 - 78
Auto-Away

📅
🔥
❄️
🔌

Weather

Current
72°F

Low/High
44°-75°F

Precipitation
Chance
10%

Doorbell

- 🏠 Front Door Ding Clear
- 🚶 Door Motion Clear
- 🕒 Last Door Ding 14:24:45

Network Gate

Open to guests

Calendar

11

12:30 Lunch with Maria
14:00 Library

User Status

Debbie

Juan

Joshua



Participant	Age	Gender	# People in House	Home Type
P1	22	Woman	2	Apartment
P2	22	Man	1	Apartment
P3	29	Man	1	Single Family Home
P4	59	Man	2	Apartment
P5	47	Woman	1	Apartment
P6	36	Man	2+2*	Apartment
P7	26	Woman	1	Apartment
P8	22	Woman	2	Apartment

All interviews lasted approximately 30 minutes

Week 1 focused on the process of setting up the IoT devices and system

Week 2 & 4 focused on design prompts and interactions

Week 5 had an exit interview with general reflections on IoT

*indicates the number of people under the age of 18 living in the household



Participant	P1	P2	P3	P4	P5	P6	P7	P8
Voice Assistant	X		X	X	X		X	
Smart TV	X		X	X	X	X	X	X
Door/Window Sensor				X				
Motion Sensor				X	X			
Smart Security System				X				
Smart Camera	X		X	X				
Smart Lights			X	X				
Smart Thermostat			X	X	X			
Smart Power Outlet			X	X	X			



What's in the IoT?

Digital voice assistants were the only technology mentioned by all participants to be used by them or someone in their social circle which they classified as IoT

6 participants also classified wearable devices such as Fitbit or Apple Watch as IoT



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Who Can Use IoT Devices?

“Just showing but no one interacted with it. So I’m just living with my wife and my daughters. So I will just show my wife about the streaming camera. And we’re showing that this camera, we have the camera here and we can see what our daughter is doing right now in the living room and that’s it. But she was not interacting or doing anything at all with the home assistant to this day.” (P6, 36, Man)



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2:36 pm

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- ☀️
- 🔔 1
- 👤 DK

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- 💡 Kitchen 🔘
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Sustainability of IoT and Strategies

“So it just kind of sitting there collecting dust. I already told you I’m moving, I am packing things away and I just found my old tablet still in the box. ‘Oh, hello. You’re brand new.’ If it’s still brand new, I mean, that would probably make it easier to like resell to somebody like it’s not even been opened. Like it’s an old tablet now. So I don’t even know if that specific brand of tablet is still supported. That seems to be one of the issues is, what do you do with the old devices when things are no longer supported?”

(P7, 26, Woman)



Sustainability of IoT and Strategies

Majority (7 of 8) participants said they would ask friends or family for help when troubleshooting a device

Only 1 participant mentioned contacting a formal third party such as an IT department for assistance

There was a slight preference for written steps over videos when troubleshooting (5 of 8)

No one mentioned contacting the device manufacturer as a potential strategy



Dashboard Interaction

Status Checks far more frequent than Changes

Landscape view preferred to Portrait

Single location for status of multiple devices overall was viewed positively

Largest criticism was limited control and customization than compared to brand specific app. (ex. Philips Hue app)



Notification Preference Based on Context

“Probably text messages and emails. If it’s really severe, maybe a phone call or different app notification, kind of what happens when there’s like a normal emergency that they put out those alerts, I don’t know what those are called. You probably know what I’m talking about. The ones that are like, buzz on everybody’s phone and everything. They’re location-based, but those would be kind of nice, especially in a real emergency situation.”
(P2, 22, Man)



IoT is Broadly Inclusive of Device Type

Users have a wide definition of what is IoT, we should take that into account when designing applications to secure them

1. Allow for altering properties of devices for specific usage scenarios (ex. Custom sounds for Ring alarm)
2. Selective inclusion of devices in network (ex. adding a new smart tv, but not a guest's Bluetooth speaker)



Sustainability of IoT Device Strategies

Provide consumers with End of Life (EoL) information for IoT devices that gives them a potential strategy to use

Ex.

1. Recycle program through manufacturing company
2. A breakdown of material components within the device so a third party might be able to repurpose the device



Dashboards – One Window with Many Views

Checking statuses does not equal to changing settings

Viewing multiple devices at once was a positive highlight, but limited customized control was viewed as a negative

Ask for notification preferences with multiple options available as content and context of messages can change the preferred method of notification



In-home deployment of IoT Ecosystem

Qualitative interviews of 8 households

Contributes recommendations for controls and dashboards for IoT

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