

PEPR '26

Designing for Civic Trust: An Infrastructure to Help Long Beach Residents Manage their CCPA Rights

Omar Moncayo (City of Long Beach), Norman Sadeh (CMU), Gwen Shaffer (CSULB)

Smart and Connected Communities
(S&CC)



Iterative Project that Began in 2019

- While chairing Long Beach's Technology & Innovation Commission, realized that residents considered the potential for federal and state agencies (e.g., Homeland Security, the DMV) to track their behavior, analyze their data, store it and potentially share it.
- However, residents often failed to consider that *local government* deploys devices and software that collects PII.
- Of course, City-deployed surveillance technologies are ubiquitous—public WiFi, traffic cameras, ALPRs, smart water meters, parking apps, 311 apps, bike and scooter shares. and more.



Gauging Resident Comfort with Civic Technologies

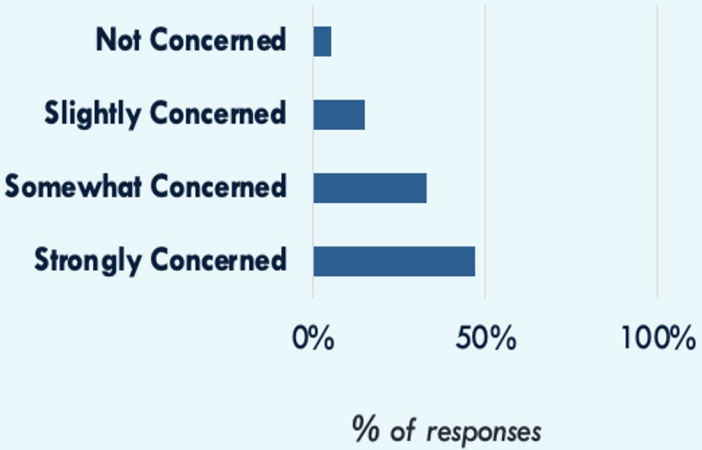
In 2019, we began using qualitative and quantitative methods to gauge Long Beach residents' comfort levels with/attitudes toward civic technologies

- Conducted focus groups with 82 residents
- Facilitated data walks with 32 residents
- Hosted community forums
- Disseminated a survey completed by more than 450 residents

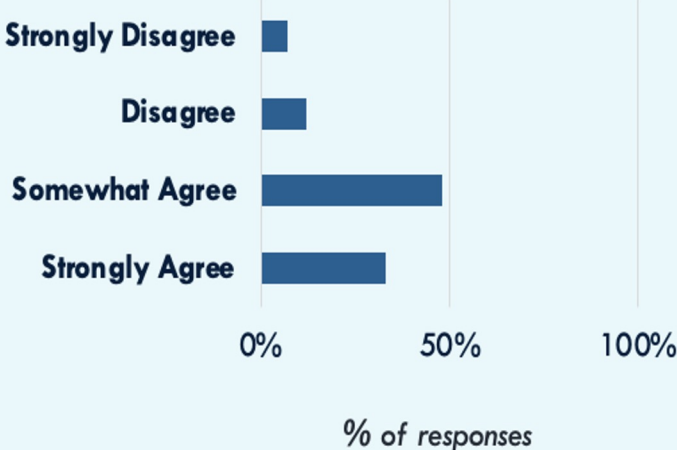


Key Finding: Tension Between Digital Technologies and Privacy

How concerned are you that the use of smart city technologies could mean less privacy for Long Beach residents?



"Smart" tools and features are essential to the future of cities, including Long Beach.



City of Long Beach's Data Privacy Policy

Data Privacy Policy (adopted in 2021 and strengthened in 2025)

- Protect resident information
- Safeguard City data & systems
- Foster resident trust

Read the City's
Privacy Policy



What this means for our research

- A City partner committed to implementing data privacy practices—but wanted to operationalize the policy.

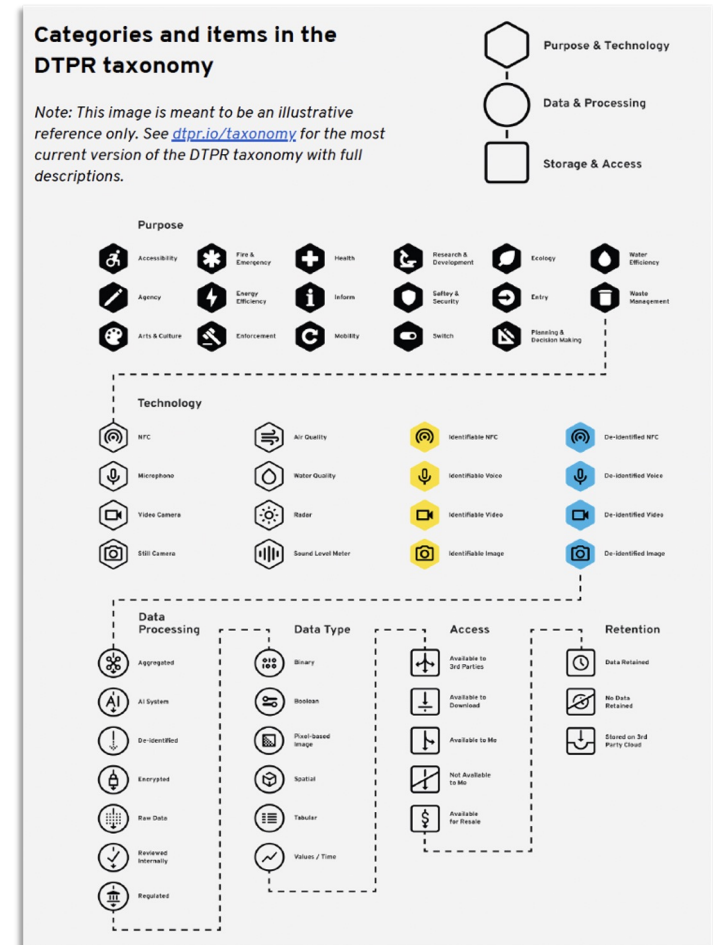
Trust, Transparency and Technology: Building digital equity through a civic digital commons

Applied for a planning grant from NSF's Smart & Connected Communities program in 2023.

- **Purpose:** Create a digital rights platform that advanced Long Beach priorities.
- **Research questions** aimed at examining both the platform's impacts on residents' behavior, and the impact on City practices when deploying technologies that collect PII.



Worked with Digital Trust for Places and Routines

- Collaborated with Helpful Places, a social impact start-up based in Toronto, that developed an open-source communication standard to increase transparency and accountability for digital technology in public places.
- It's a visual language that lays out a "data chain" for civic technologies and demystifies how they collect, store and share personal information.







Inventoried technologies in collaboration with Long Beach staff and vendors

Accountable

Icon	Accountable	Description
	Institution	The entity that is responsible and accountable for this data collection activity
	Organization	The entity that is responsible and accountable for this data collection activity

Purpose

Icon	Purpose	Description
	Accessibility	Ensures that everyone has equal access to a space or a service. Find out more about accessibility and universal design
	Agency & Interaction	Enables you to control or interact with aspects of a space or a technology. Find out more about interactive media and virtual reality
	Arts & Culture	Enables artistic and/or cultural expression. Find out more here
	Commerce	Enables the buying and selling of goods and services. Find out more here

Designed Data Privacy Labels for 24 technologies

Want to learn about your personal data flow?
Smart Water Meter
*¿Quiere conocer su flujo de datos personales?
Medidor de agua inteligente*



Cellular
Celular



For Water Efficiency
Para eficiencia de agua

Learn how Long Beach uses your data to improve City services >>

Descubra cómo Long Beach utiliza sus datos para mejorar los servicios de la ciudad.

Scan Here



CITY OF LONG BEACH

Wondering where your personal data park?
Passport Parking App
*¿Se pregunta dónde se encuentran sus datos personales?
Aplicación de estacionamiento de pasaportes*



Contactless Payment
Pagos sin contacto



For Commerce
Para el comercio

Learn how Long Beach uses your data to improve City services >>


Descubra cómo Long Beach utiliza sus datos para mejorar los servicios de la ciudad.

Scan Here



CITY OF LONG BEACH

Have you checked out your personal data story?
Self-Checkout Machine
*¿Has revisado tu historia de datos personales?
Quiosco de la Máquina de autopago*



System Screen
Pantalla del sistema




For Entry
Para la entrada

Learn how Long Beach uses your data to improve City services >>

Descubra cómo Long Beach utiliza sus datos para mejorar los servicios de la ciudad.

Scan Here



CITY OF LONG BEACH

Long Beach Digital Rights Platform

Traffic Cameras

Details FAQ

Video Detection Systems, or more commonly known as Traffic Cameras, are used to monitor and detect vehicles within a specific intersection. They use either deployed instead of loop inductors to detect vehicle traveling through or waiting at a signalized intersection. The system allows users to derive virtual scores, enabling precise identification of queues within specified approaches and lanes. This feature enhances the system's ability to discern and analyze traffic effectively. The video data is not collected or recorded, the analysis is done entirely in the field (on-prem) in real time, and not saved for future retrieval.

How does this technology make you feel?

Question 1 / 8

- WHO IS ACCOUNTABLE FOR THIS TECHNOLOGY? Long Beach Public Works Department
- WHAT IS THE PURPOSE OF THIS TECHNOLOGY? Mobility
- WHAT TYPE OF TECHNOLOGY IS THIS? Identifiable Video
- WHAT TYPE OF DATA IS BEING COLLECTED? Plateless Image
- HOW WILL THIS DATA BE PROCESSED? Computer Vision
- WHO CAN ACCESS THIS DATA? Not available to vendor
- HOW IS THIS DATA STORED? No data retained

Long Beach Digital Rights Platform
Explore other technologies at City of Long Beach

City WiFi

Details FAQ

WiFi is a networking technology that provides wireless high-speed internet access. The Technology and Innovation Department provides free public WiFi in parks, City buildings, and in some cases outdoor buildings.

How does this technology make you feel?

Question 1 / 8

- WHO IS ACCOUNTABLE FOR THIS TECHNOLOGY? Technology and Innovation Department
- WHAT IS THE PURPOSE OF THIS TECHNOLOGY? Connectivity
- WHAT TYPE OF TECHNOLOGY IS THIS? Wireless Access Point
- WHAT TYPE OF DATA IS BEING COLLECTED? None
- HOW WILL THIS DATA BE PROCESSED? Raw data
- WHO CAN ACCESS THIS DATA? Not available to the accountable organization
- HOW IS THIS DATA STORED? No data retained

Explore other technologies at City of Long Beach

Go Long Beach App

Details FAQ

Enables residents to easily report graffiti, potholes, firework, a recorer parking violation, and more. Users can track the status of requests and receive more transparent communications from City staff regarding requests.

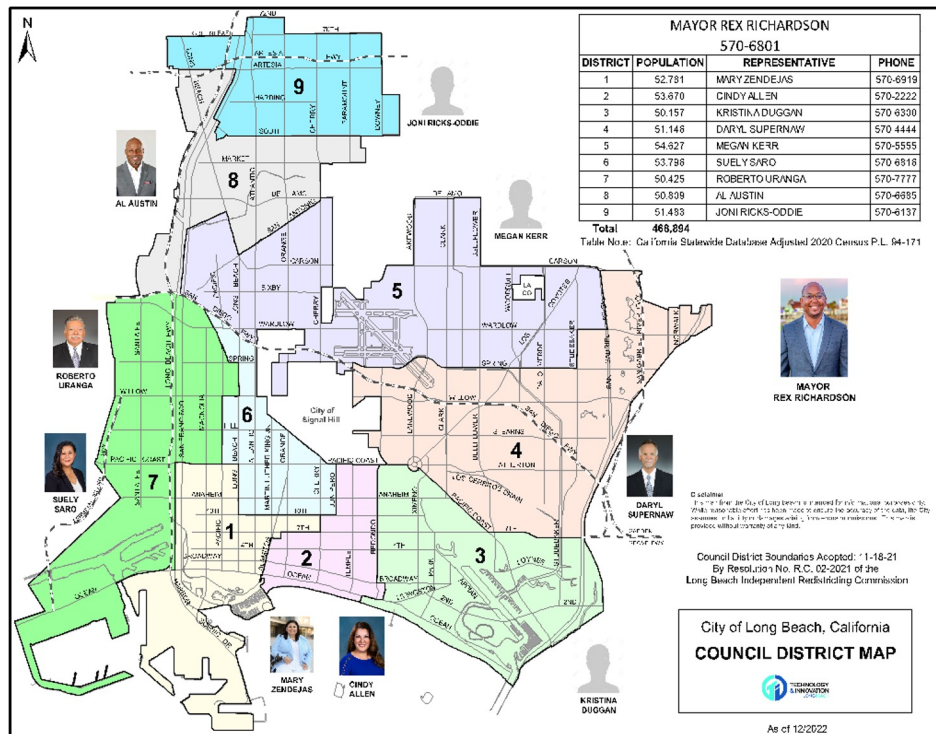
How does this technology make you feel?

Question 1 / 8

- WHO IS ACCOUNTABLE FOR THIS TECHNOLOGY? City of Long Beach
- WHAT IS THE PURPOSE OF THIS TECHNOLOGY? Inform
- WHAT TYPE OF TECHNOLOGY IS THIS? Personal Device
- WHAT TYPE OF DATA IS BEING COLLECTED? Location
- HOW WILL THIS DATA BE PROCESSED? De-identified
- WHO CAN ACCESS THIS DATA? Available to 3rd parties
- HOW IS THIS DATA STORED? Secured Individually

Long Beach Digital Rights Platform
Explore other technologies at City of Long Beach

Testing Data Privacy Labels and Platform



- In March 2024, we posted data privacy labels adjacent to dozens of civic technologies
 - Downtown (English and Spanish)
 - North Long Beach (English and Spanish)
 - Central Long Beach (English and Khmer)
- Conducted user testing with 77 residents

Key Findings From User Testing

The Digital Rights Platform labels and online portal fail to shift power to residents

- “It would just be one more thing I’d really not pay attention to, just being honest.”
- “You’re already so bombarded with cookie permissions and all this other stuff...”
- “I want to get on a bike. I don’t really have time to read all that.”
- “I’m not going to take the time to scan that QR code.”
- “I don’t go around scanning QR codes all over the place.”

And...

Residents want greater agency over city data collection

- A volunteer commented, “One thing that really struck me today is how many amazing city services I’m essentially locked out of if I choose to not sacrifice my privacy.”
- “When I go to the airport, I can opt out of facial recognition...Where’s my opt out from the City that gives me an equivalent or similar experience?”
- Another platform tester asserted that data privacy labels “should tell me about opt-out or alternatives that are reasonable.”



Empowering Long Beach Residents to Exercise their Privacy Rights

CMU's IoT Privacy Infrastructure: Uniform interface to discover data collection around you & exercise you CCPA rights - including opt-out, deletion, etc.

- **Trustworthiness** through **accountability**
- Maximizing **transparency and control/agency**
 - Information and controls **aligned with what people care about** and can **realistically be expected to do**
- **Minimizing friction:**
 - Need for QR code scanning
 - Unwanted interruptions and repetitive tasks
 - Need to authenticate with each vendor/the City

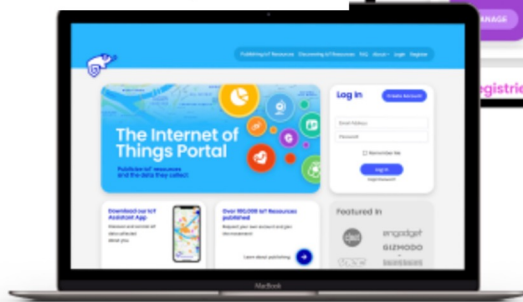
CMU's IoT Privacy Infrastructure

(launched Feb. 2020)

IoT Portal

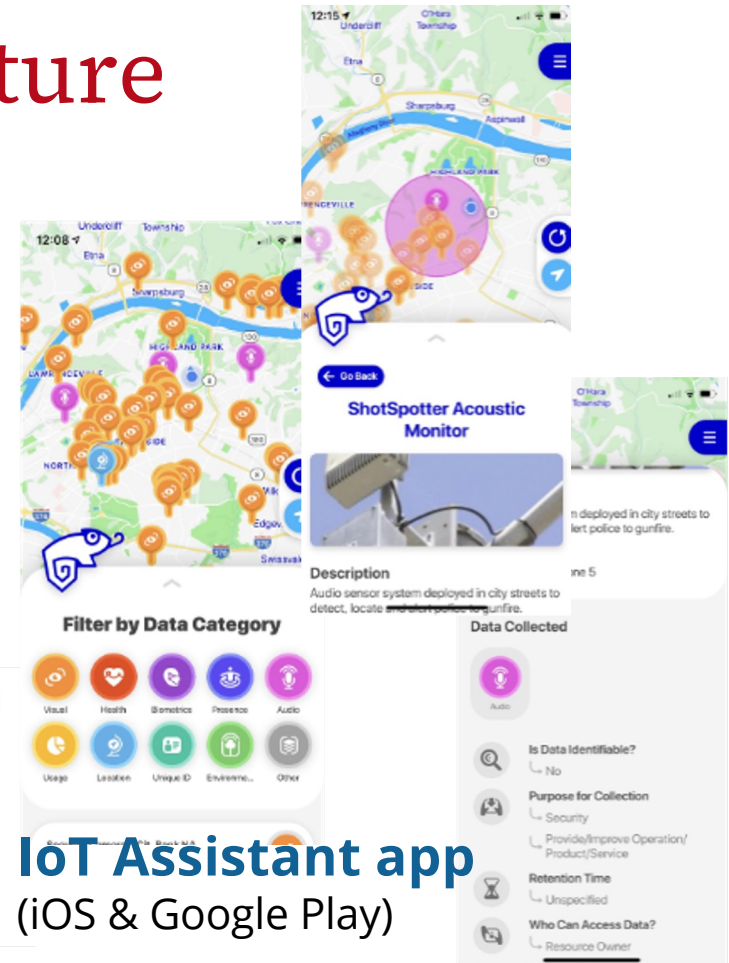
Publicize IoT Resources and their data practices

- using a wizard
- or by instantiating IoT resource templates



US Patent 11,768,949, US Patent 10,956,586 and additional USPTO and EPO patents pending

IoT device manufacturers or volunteers can also publicize IoT resource templates (e.g. ring door bell, WiFi location tracking, etc.)



IoT Assistant app (iOS & Google Play)

Das, M. Degeling, D. Smullen, and N. Sadeh, Personalized Privacy Assistants for the Internet of Things, 2018 IEEE Pervasive Computing: Special Issue - Securing the IoT, April 2018. US Patent 11,768,949, US Patent 10,956,586, US Patent 12,235,973, US Patent 12,511,409, and additional USPTO and EPO Patents Pending

Status as of 2023

10K+ app downloads

100K+ resource descriptions, incl. 1,300+ smart city sensors in Amsterdam

Registry: Amsterdam Registry
Registry ID # 23

Amsterdam registry sourced from the City of Amsterdam Sensor Registry.

EDIT SETTINGS | REGISTRY USERS (1 Member)
PUBLICATION REQUESTS (0 Pending) | TRANSFER OWNERSHIP

Resources

Name	Data Collected	Privacy Requests Management	Registries	Status	Contributor	Unpublish
VO86 Camera	Visual data	None	Amsterdam Registry	Published	eloлие	Unpublish
VO85 Camera	Visual data	None	Amsterdam Registry	Published	eloлие	Unpublish
VO83 Camera	Visual data	None	Amsterdam Registry	Published	eloлие	Unpublish
VO82 Camera	Visual data	None	Amsterdam Registry	Published	eloлие	Unpublish
VO78 Camera	Visual data	None	Amsterdam Registry	Published	eloлие	Unpublish
VO81 Camera	Visual data	None	Amsterdam Registry	Published	eloлие	Unpublish

parkeer_scan_auto Camera
Resource ID # 112899

Camera Sensor - Used for capturing license plates, car locations, and timestamp information. Contact parkeerd@amsterdam.nl for more information. Data was sourced from the City of Amsterdam Sensor Registry.

CONTRIBUTOR: elolie

Delete | Transfer Ownership | Publish

This resource is published in the following registries: Amsterdam Registry

Basic Information

Name of Resource: parkeer_scan_auto Camera

Listing Managed By: Unknown

Resource URL: <https://sensorengister.amsterdam.nl>

Description: Camera Sensor - Used for capturing license plates, car locations, and timestamp information. Contact parkeerd@amsterdam.nl for more information. Data was sourced from the City of Amsterdam Sensor Registry.

Data

This resource collects: Visual data

Measures taken to protect your privacy: Unspecified

Data Practices

Purpose: The data is collected for: Provide core operation/product/service

Cycleradar 20 Traffic Sensor
Resource ID # 113087

Traffic Sensor - Used for measuring and reporting the number of cyclists and pedestrians (if any) - aantallen fietsers en voetgangers (indien aanwezig). Contact verkeersonderzoek@amsterdam.nl for more information. Data was sourced from the City of Amsterdam Sensor Registry.

CONTRIBUTOR: elolie

Delete | Transfer Ownership | Publish

This resource is published in the following registries: Amsterdam Registry

Basic Information

Name of Resource: Cycleradar 20 Traffic Sensor

Listing Managed By: Unknown

Resource URL: <https://sensorengister.amsterdam.nl>

Description: Traffic Sensor - Used for measuring and reporting the number of cyclists and pedestrians (if any) - aantallen fietsers en voetgangers (indien aanwezig). Contact verkeersonderzoek@amsterdam.nl for more information. Data was sourced from the City of Amsterdam Sensor Registry.

Data

This resource collects: Presence data, Other: Number and speed of cyclists+pedestrians

Measures taken to protect your privacy: Aggregation - temporal, Unspecified

Data Practices

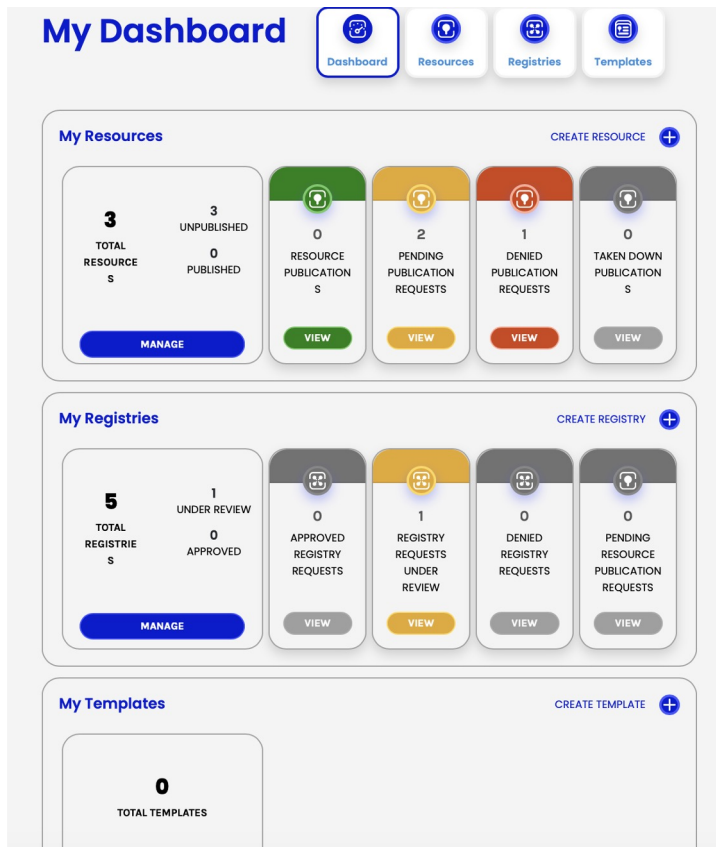
Purpose: The data is collected for: Provide core operation/product/service, Research & development

Access: Entities that have access to the data: Resource Owner, First-party service provider, Law

New Enhancements (not all implemented yet)

- **User-facing enhancements**
 - **Filtering & high-level privacy preferences/settings to minimize repetitive tasks**
 - Usable Privacy Controls - incl. **authorized agent functionality**
 - Summaries/nudges - also exploring GenAI
- **City/Vendor-facing enhancements**
 - **Registry management** - incl. new City of Long Beach Registry
 - Resource publishing and unpublishing
 - Accommodating different actors and policies
 - **Templates** for easy re-use
- **All while remaining jurisdiction agnostic**

Resource & Registry Management



- **Delegation through registries**
- Careful **workflow management** support for managing registries, resources and templates
- Submission of requests to manage registries, to publish resources, to transfer administration, to send updates, to unpublish, etc.

Acting as an Authorized Agent

Benefits:

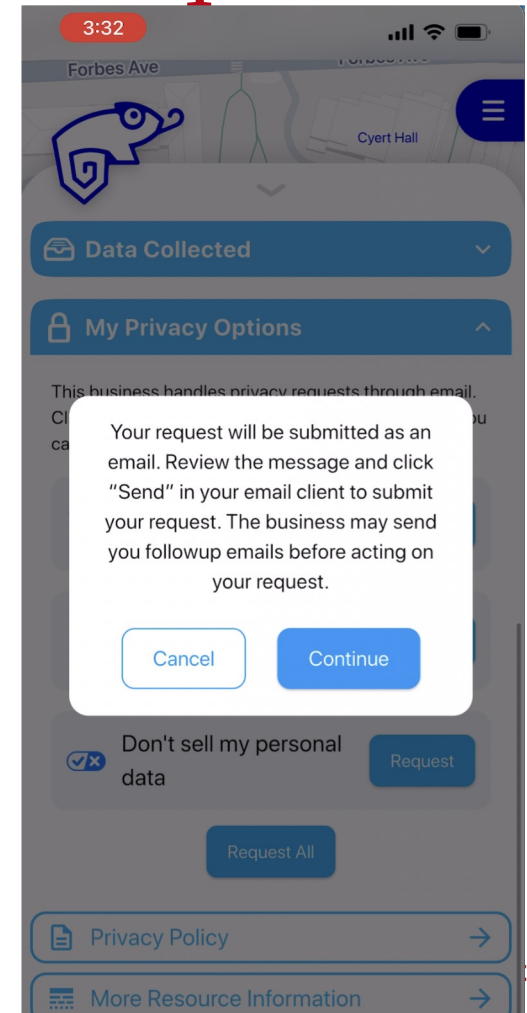
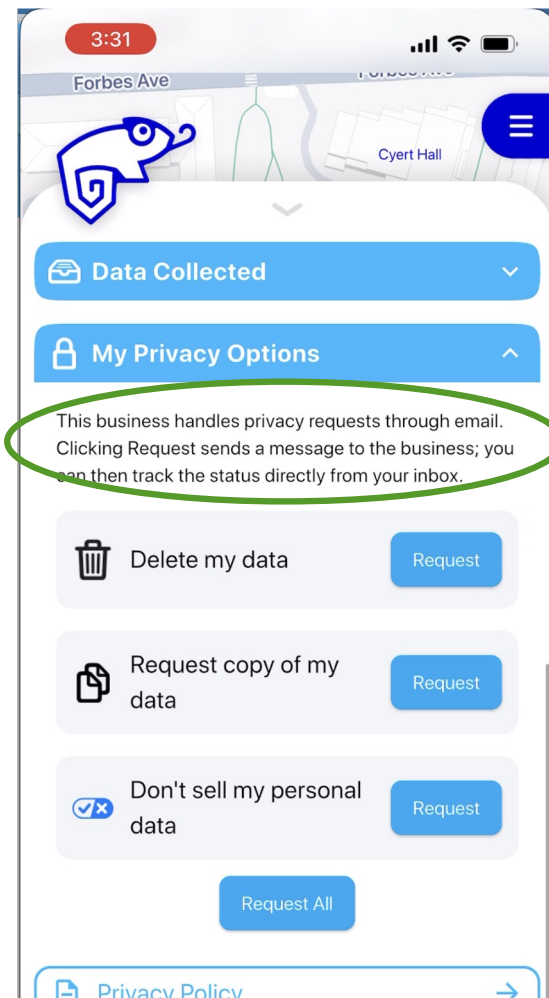
- No need for users to **authenticate** with each business: businesses recognize our IoT Privacy Infrastructure as an **agent authorized to submit privacy requests on their behalf**
- Users **submit their requests with one click**; status updates on the processing of their requests are accessible through the app
- Eventually submission done based on **privacy settings for specific scenarios** (e.g. systematically requesting an opt-out and deletion for all parking garages I visit)

Challenges:

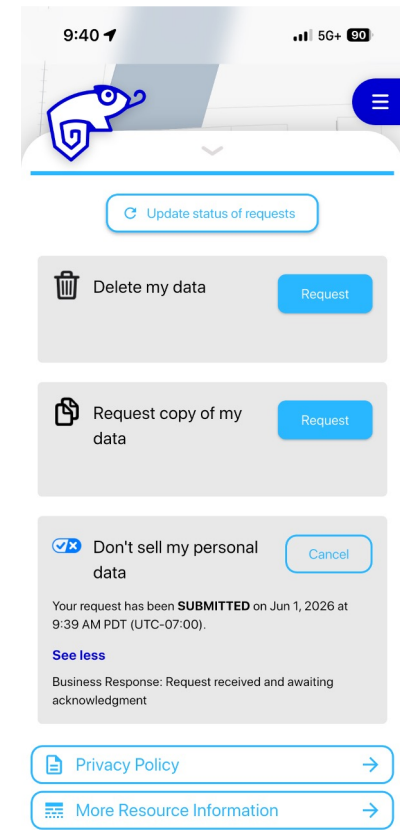
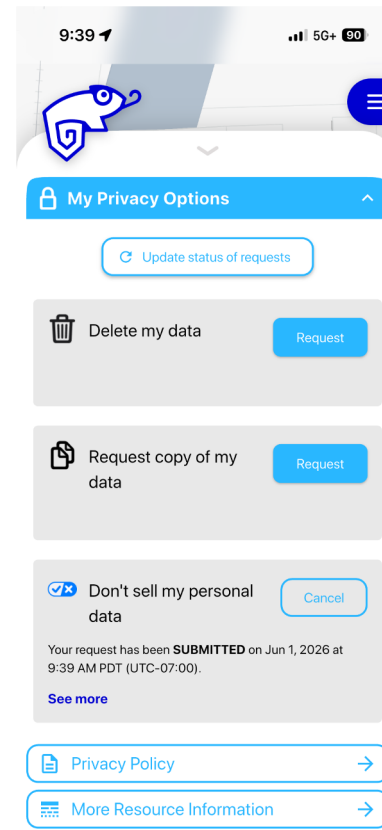
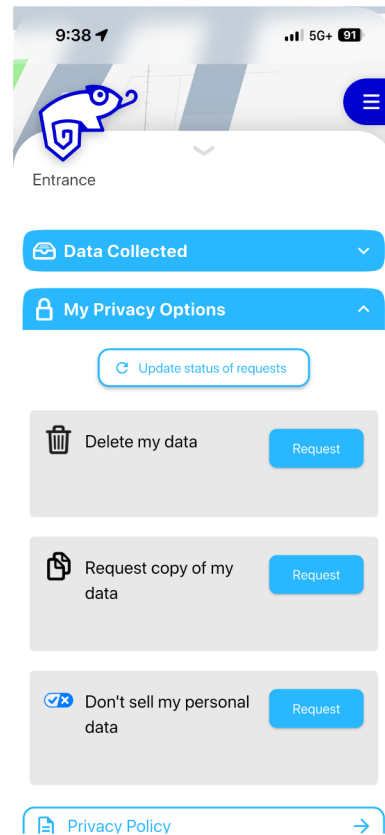
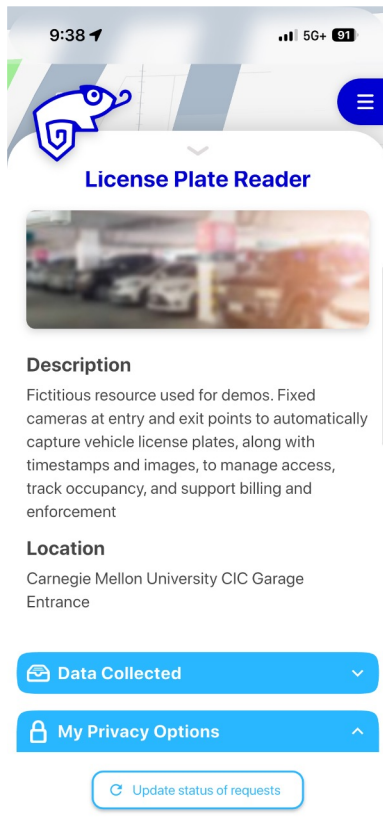
- Businesses have to **agree to participate** (e.g. DRP API)
- Businesses **still have the ability to add friction** by requesting additional evidence (e.g., proof of residence)
- Different IoT technologies need **different pieces of information** (e.g., license plate number in parking garage)

Intermediary Solution: Privacy Requests via Email

- IoT resource description includes **email address** where to submit requests
- IoT Assistant **generates draft request for user in their email client**
- User can review and submit - **one click**
- Any follow-on requests and status updates will be directed to their email account

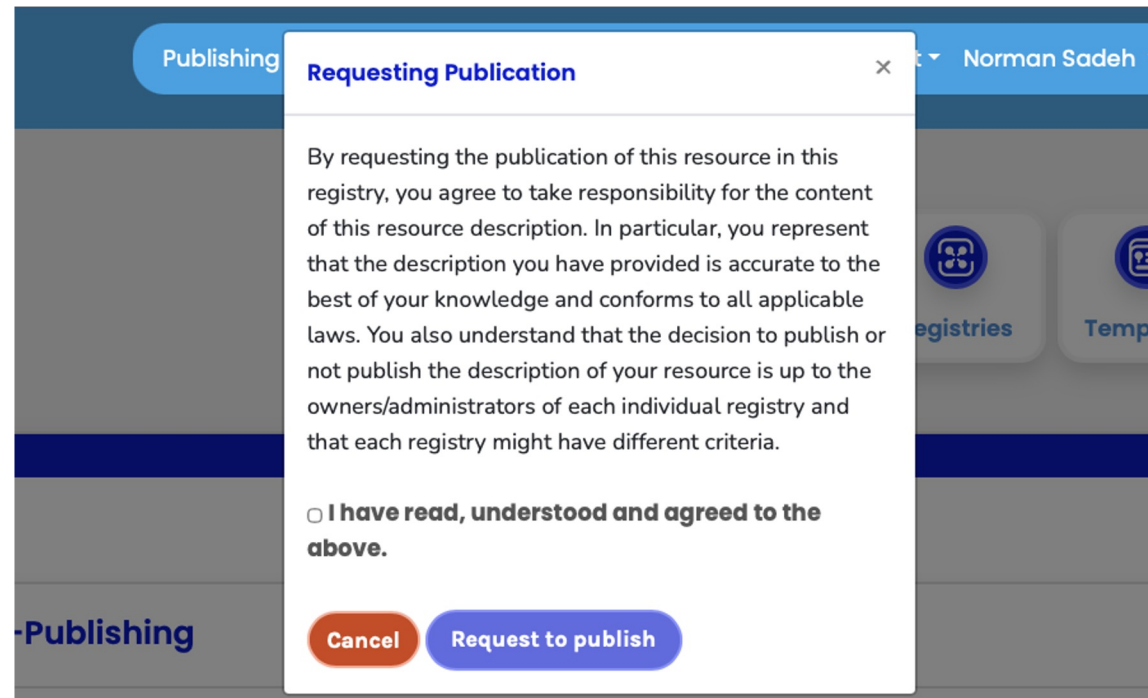


Authorized Agent Solution - Adapted DRP protocol developed by Consumer Reports



Trust through Accountability & Delegation

- **Registry owners and resource owners take responsibility for the information they publish**
- Different registries can follow different policies
- A number of other features intended to promote accountability



Dashboard
Resources
Registries
Templates

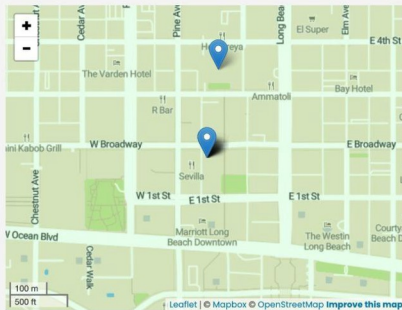
Registry: City of Long Beach Registry

Registry ID # 38

This registry is maintained by the City of Long Beach, in an effort to increase transparency around technology use and deployment. This registry is supported by a NSF grant.

EDIT SETTINGS
REGISTRY USERS
(1 Member)

PUBLICATION REQUESTS
(0 Pending)
TRANSFER OWNERSHIP



Resources

Name	Data Collected	Privacy Requests Management	Registries	Status	Contributor	Unpublish
Automated license plate reader	Visual data Location data Usage data Unique identifiers	Via Email	City of Long Beach Registry	Published	Omar Moncayo	Unpublish
Bird Rides	Environment data Payment and purchase data	Own Portal/Website	City of Long Beach Registry	Published	Omar Moncayo	Unpublish
Inductive loop		Via Email	City of Long Beach Registry	Published	Omar Moncayo	Unpublish
Passport Parking app	Payment and purchase data Unique identifiers	Via Email	City of Long Beach Registry	Published	Omar Moncayo	Unpublish
Parking Pay Station (12 pay machines)	Location data Payment and purchase data Unique identifiers	Via Email	City of Long Beach Registry	Published	Omar Moncayo	Unpublish

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Still Early Days

- Onboarding City personnel and early vendors/businesses
- Starting w. **parking garages, scooter/bike rentals, smart water readers, and more**
- Need to build critical mass before testing with City residents

Concluding Remarks

- Empowering people to exercise their privacy rights is critical, yet extremely **challenging - especially in opt-out regimes**
 - Businesses lack motivation and regulations only go so far
- It's **even more challenging in the context of IoT/Smart City technologies**, where we lack uniform interfaces to communicate the presence of resources and their data practices, **incl. access to privacy rights**
- The City of Long Beach's commitment to privacy presents us with a **unique opportunity to pilot new technologies and hopefully build momentum** that will extent to other environments (e.g., stadiums, mall, campuses, and perhaps also homes, cars, and more)

Thank you!



Team:

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CSULB: Gwen Shaffer, Tyler Reeb, Steffy Jibikilay, Ben Olson

CMU: Akansh Choudhary, Anika Jain, Shreya Kochar, Norman Sadeh, Karan Shah

Visit our portal at: iotprivacy.io

