

Discovering Indoor Environments and Positioning Systems

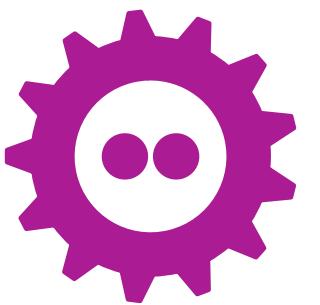
b v kv y | x
/
k w, X v h s aw
j O



VRIJE
UNIVERSITEIT
BRUSSEL



WEB & INFORMATION
SYSTEMS ENGINEERING



About me



Maxim Van de Wynckel:

E-mail: y xM w4w

Website: E55 v y 4w

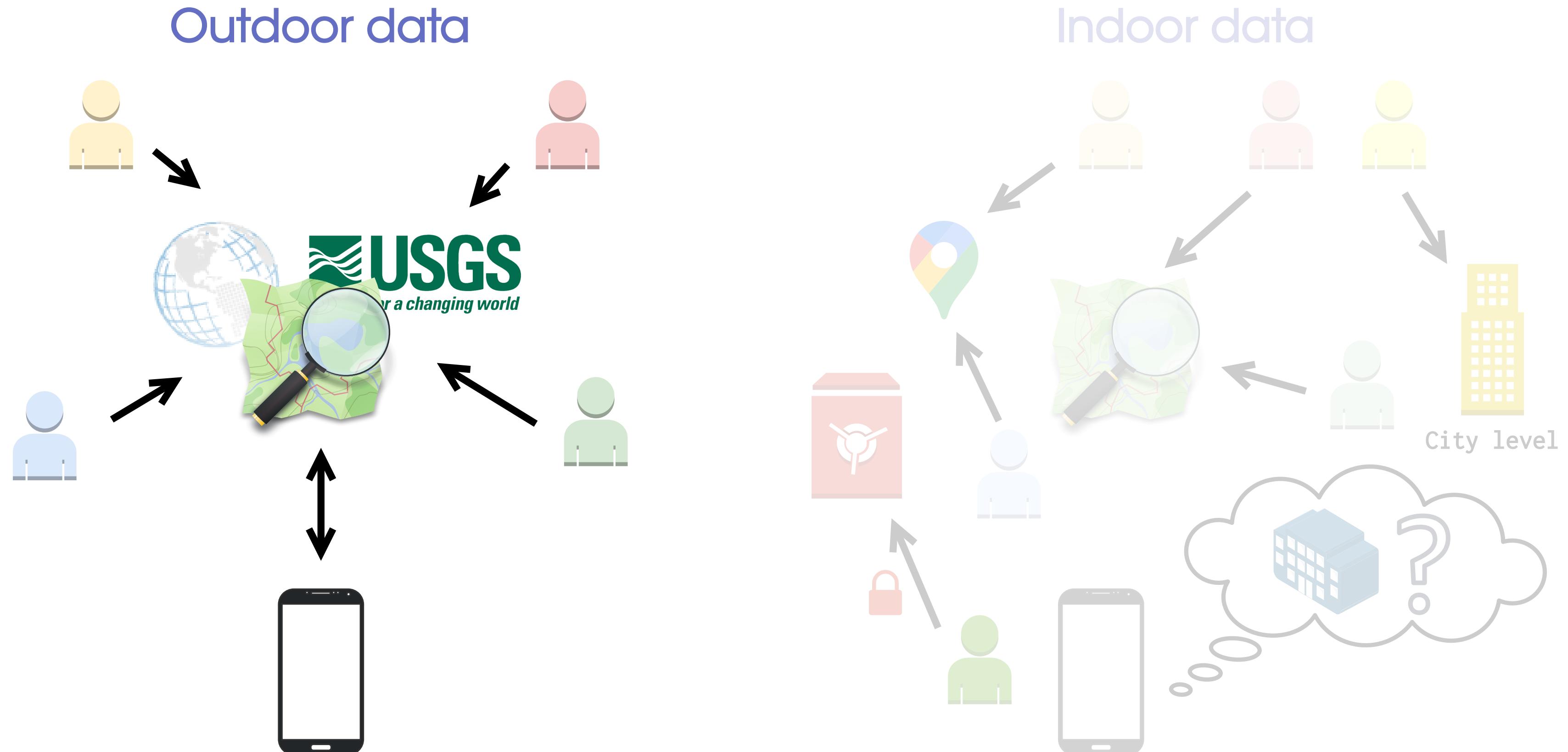
Position: g v x v k j

Interests: X y
v y vw

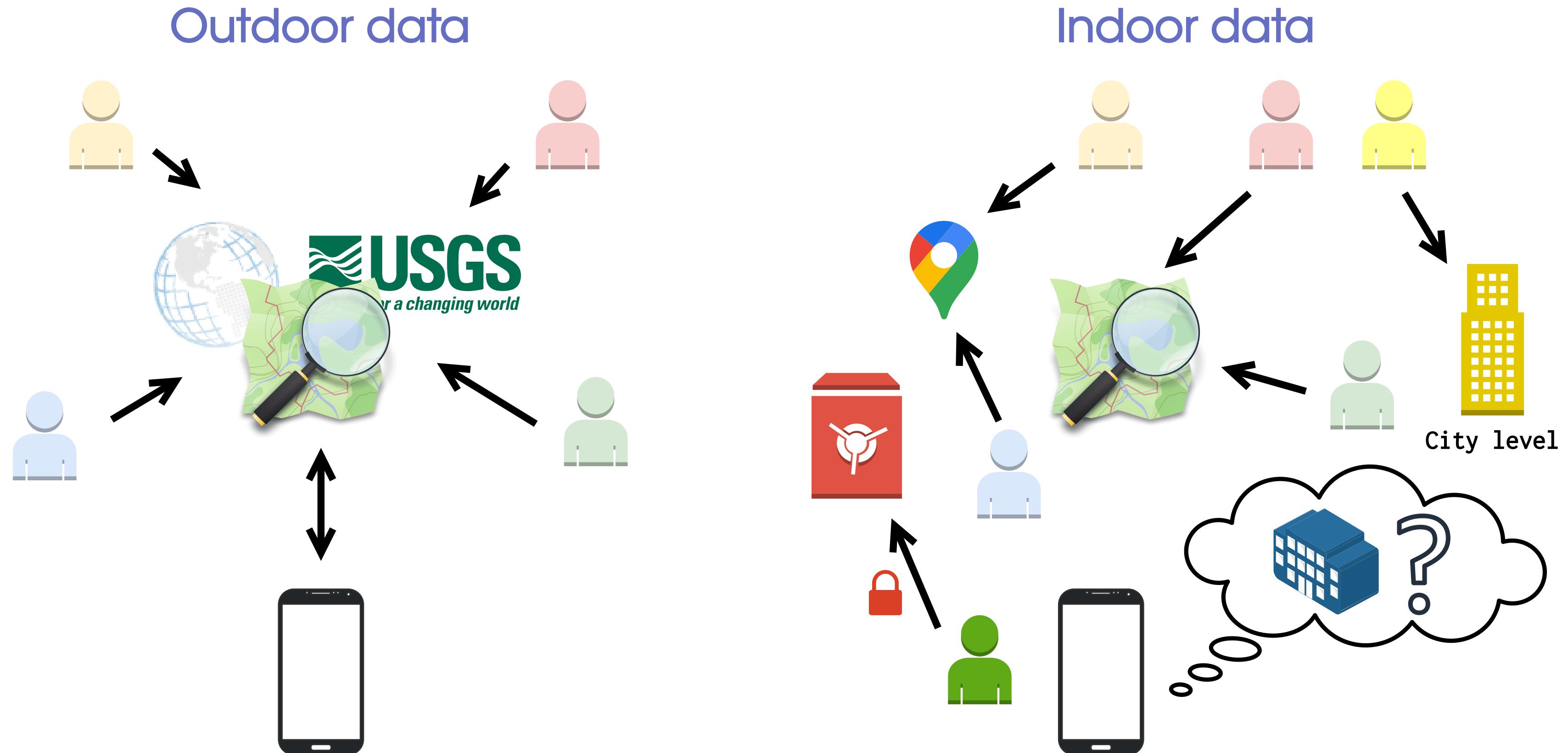
2 O
y yv v2



Current state of geospatial data

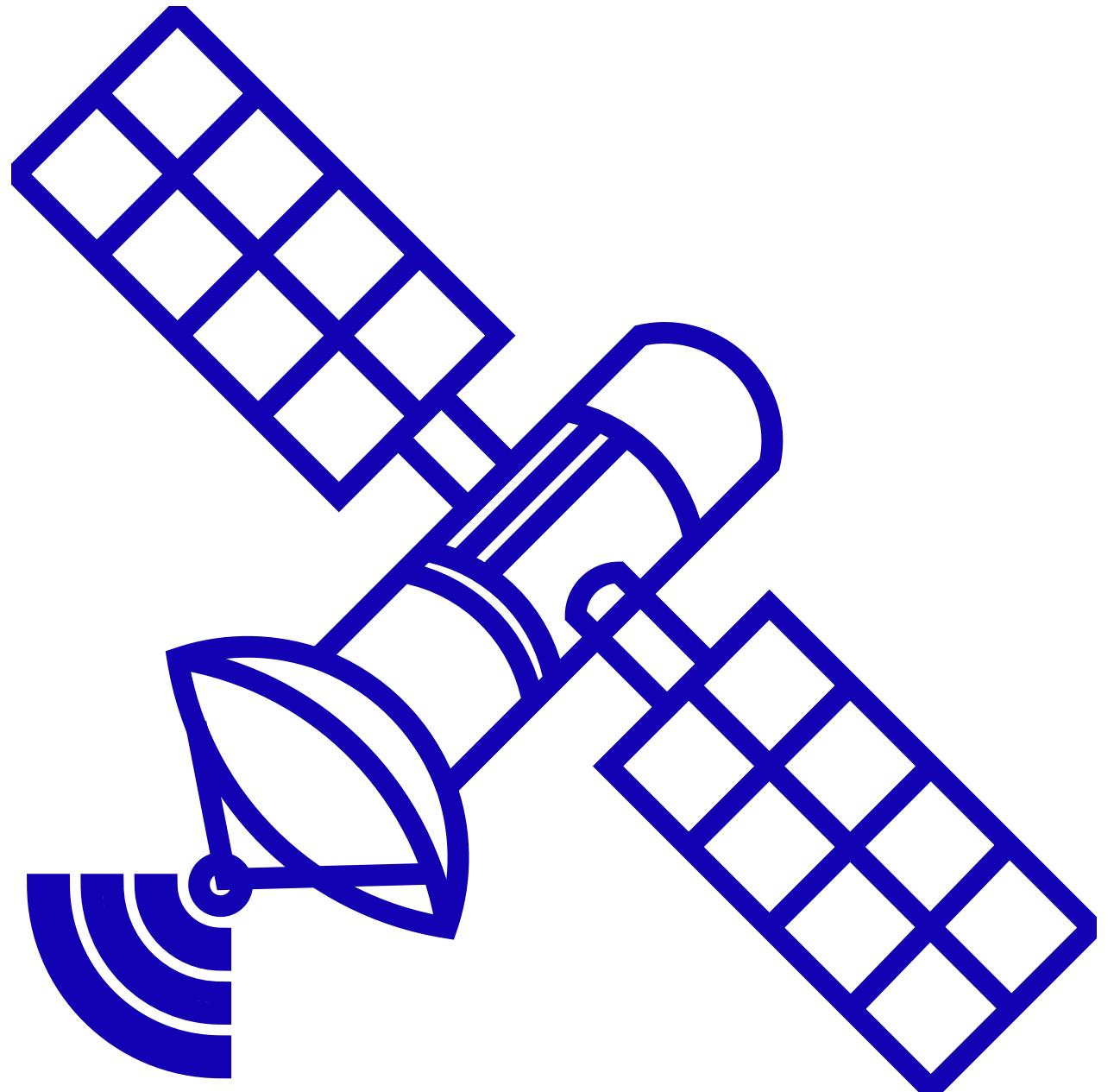


Current state of geospatial data



Current state of positioning systems

Outdoor



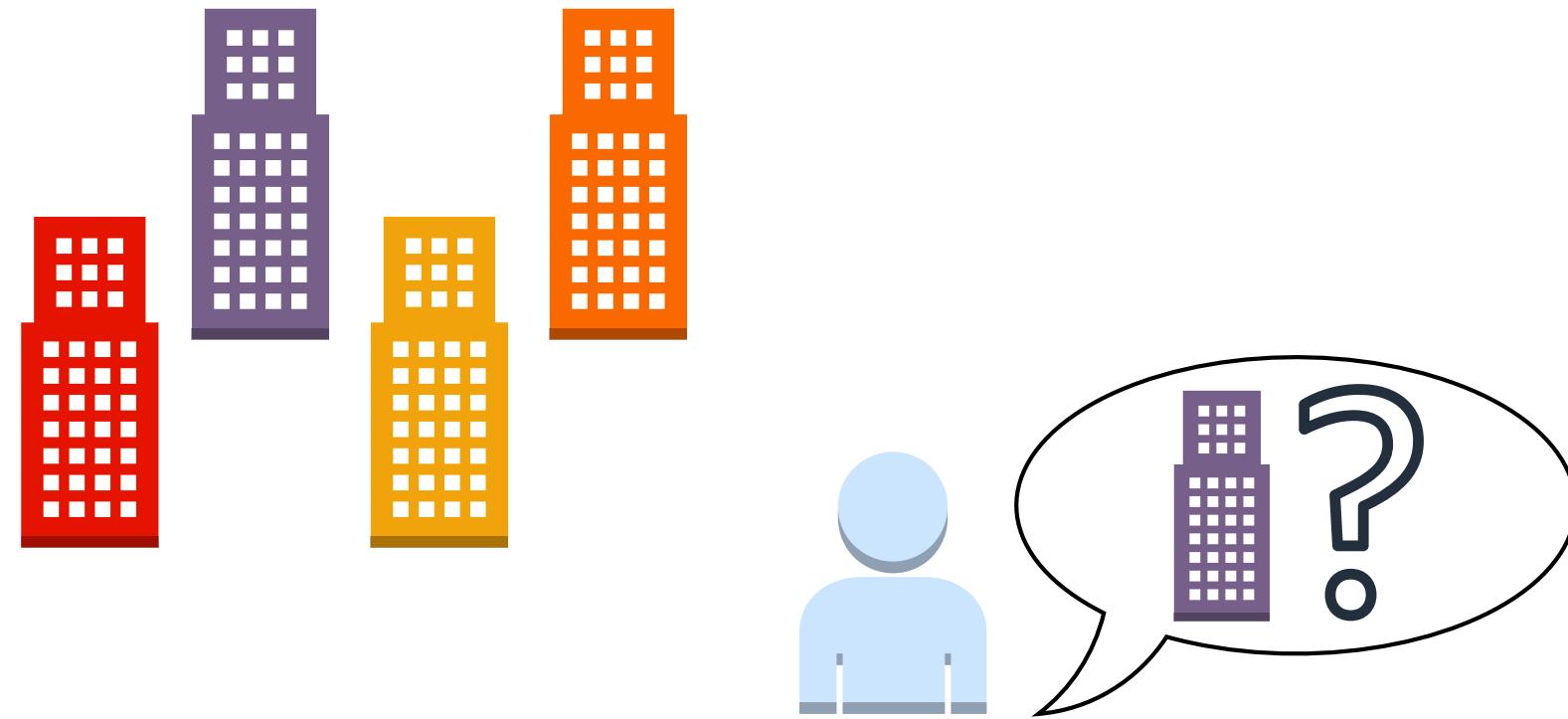
Indoor



Global and Local Geospatial Data Discovery

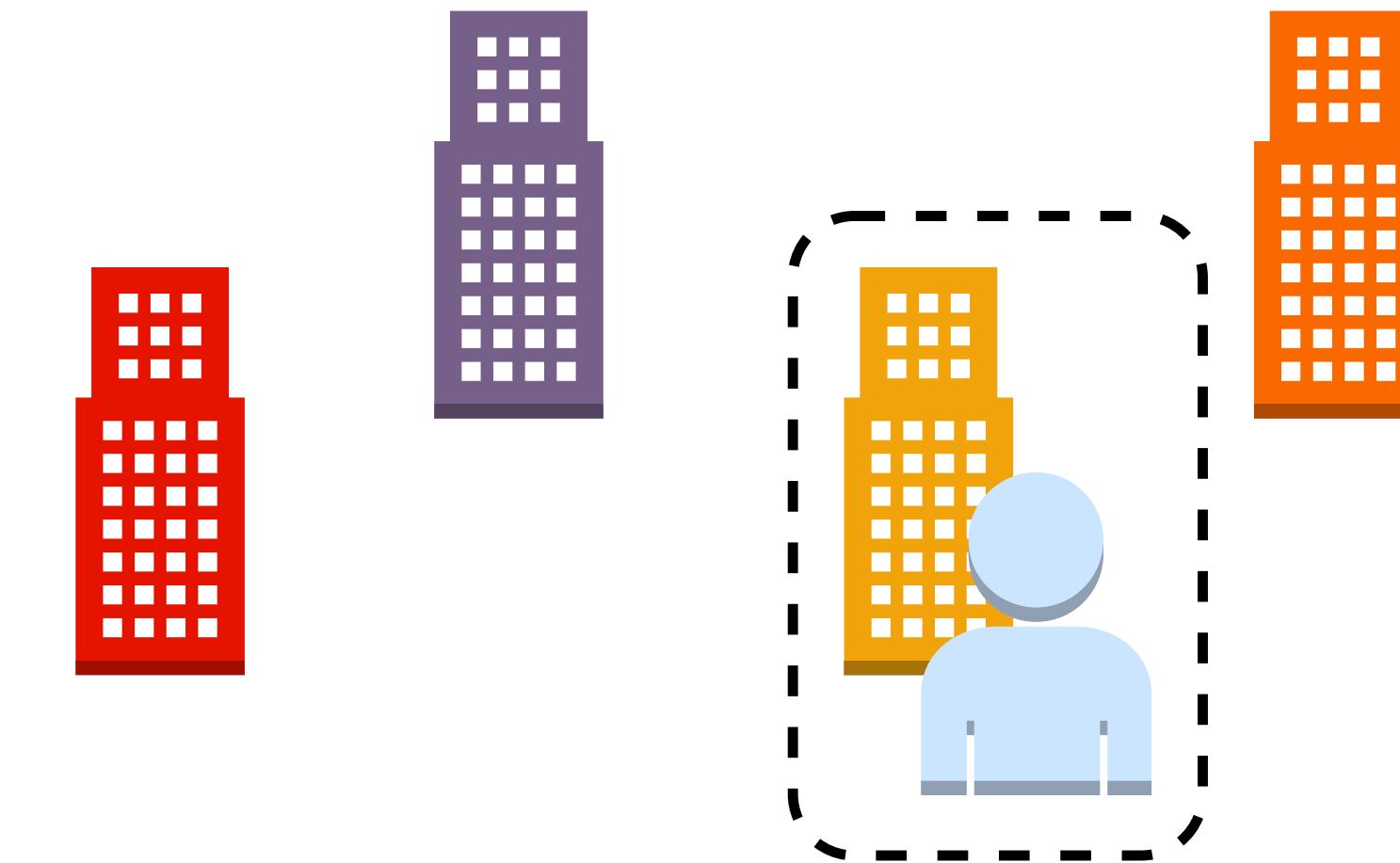
Global Discovery

U y y v v w w v w v v x v
x v



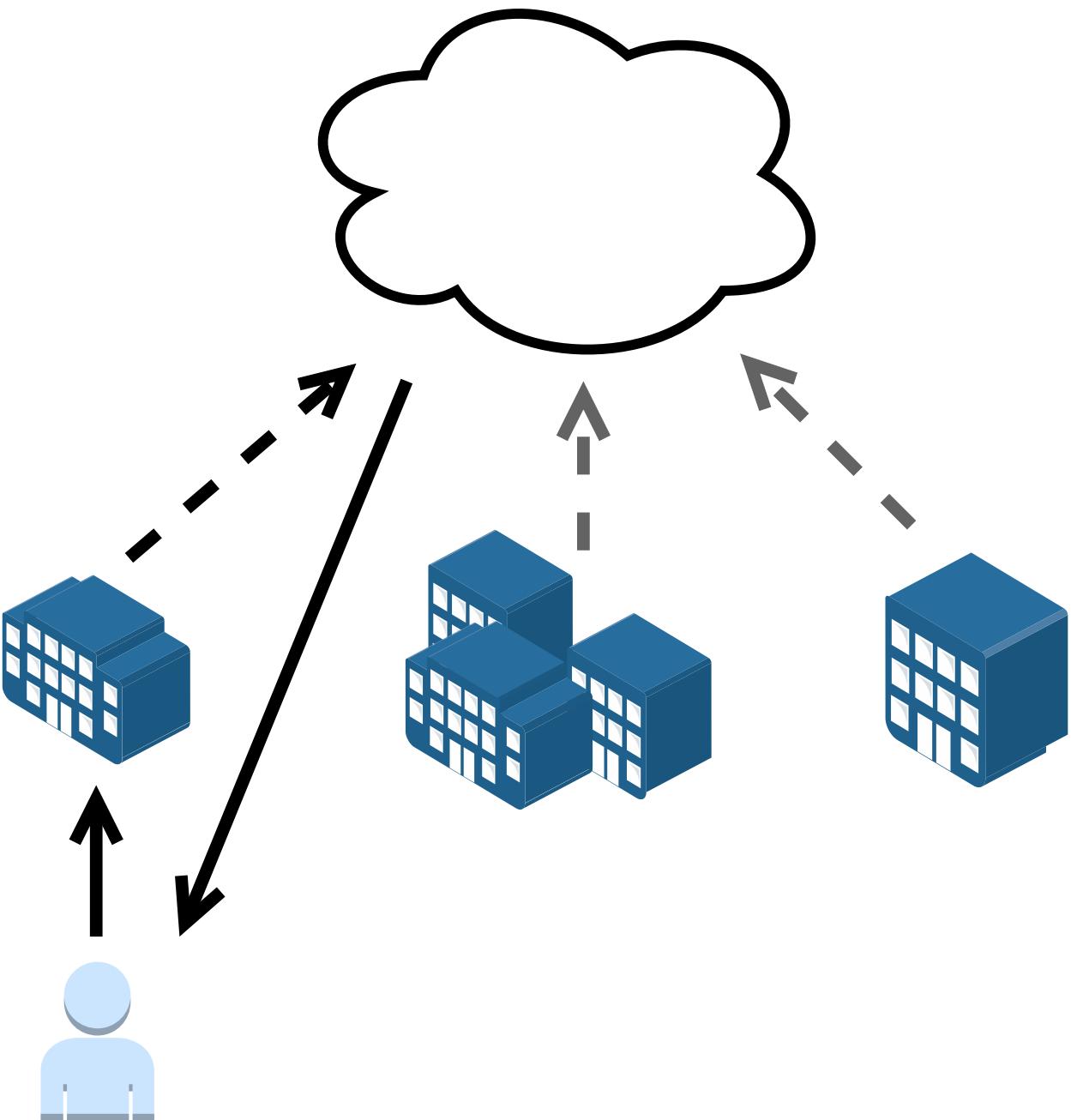
Local Discovery

U y y v v x v v v v x v x v



Geospatial-centric data discovery

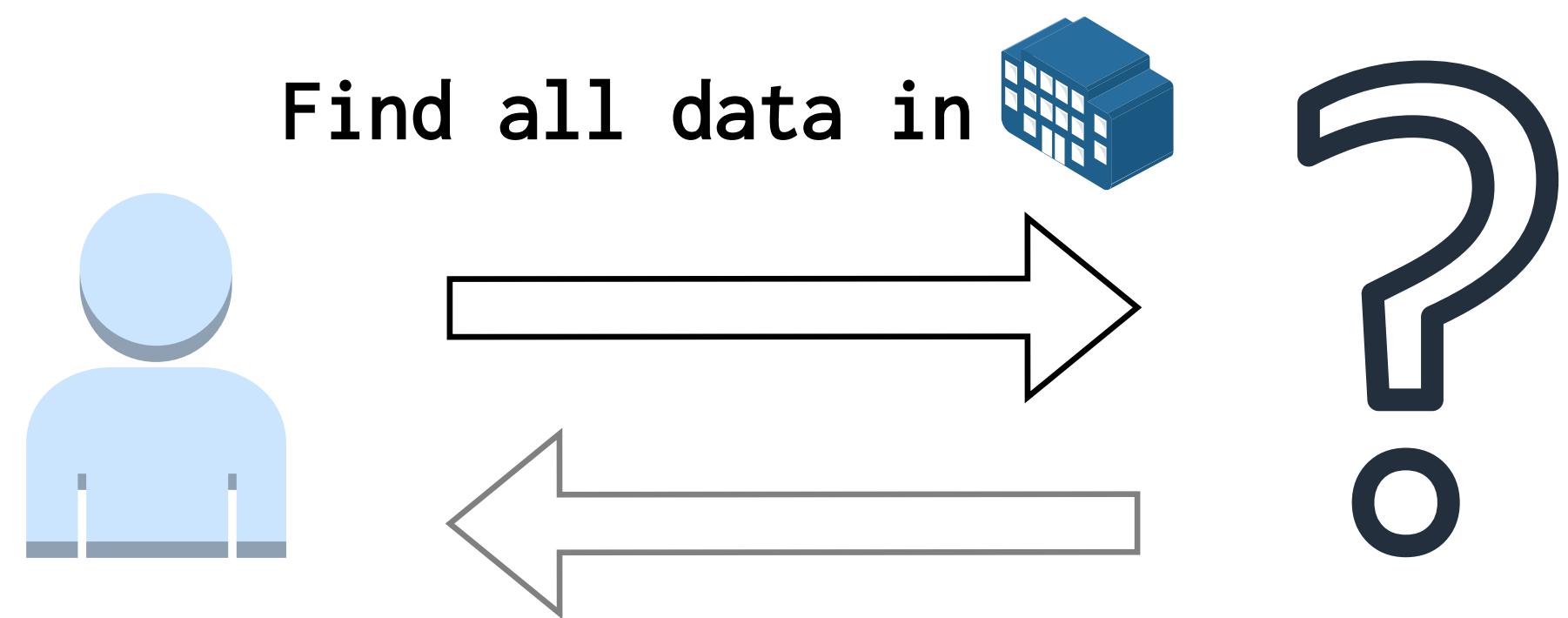
R x
v v y v y v v
v v y x 4



Geospatial-centric data discovery ...

Challenge 1

W y x y v v v y x x L



Geospatial-centric data discovery ...

Challenge 2

W

y

v

y

y

x

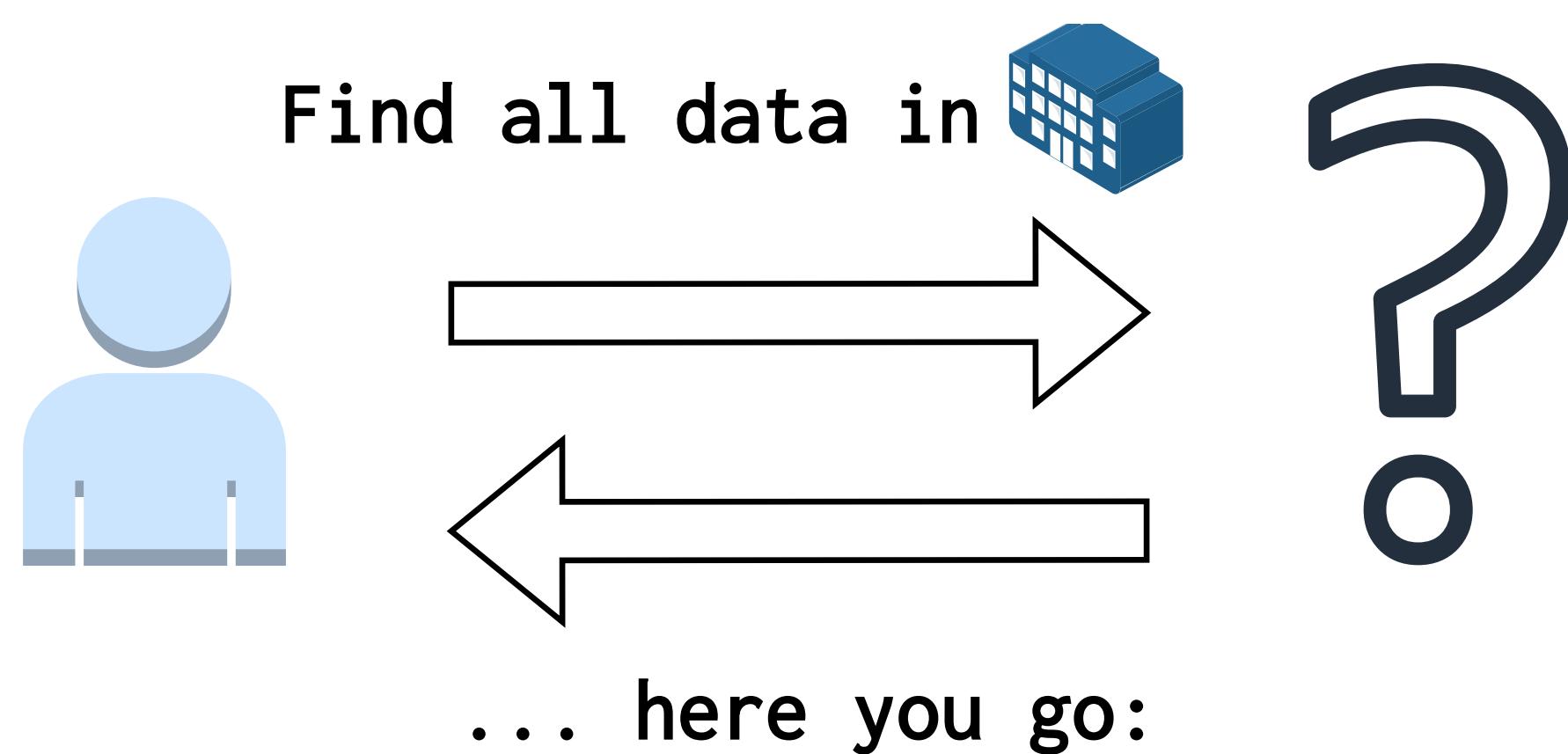
y

y

v

v

L



Geospatial-centric data discovery ...

Challenge 2

W

y

v

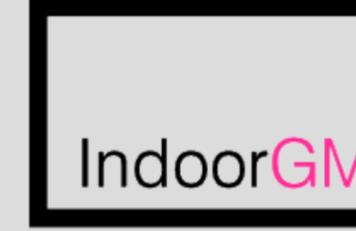
y

y

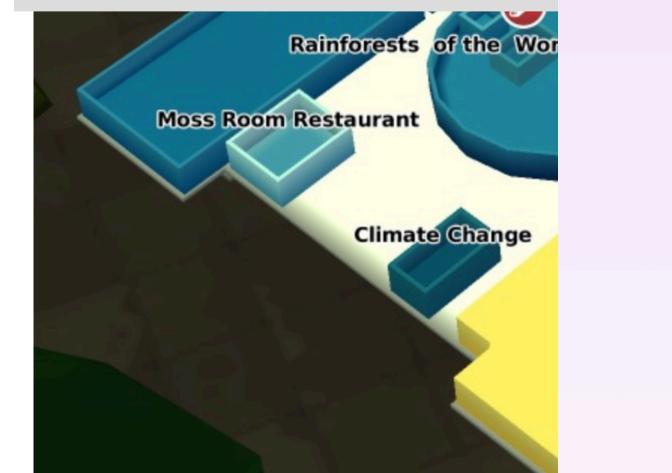
x

y y v v L

IndoorGML OGC



IndoorGML



WRLD Indoor Map Form

Page Discussion

Simple Indoor Tagging

English español français italiano polski русский 中文 (简)

Simple Indoor Tagging is a tagging schema for Indoor Map document was created in 2014 by SimonPoole, Tordanik, Pe

Contents [hide]

1 Summary
2 Use cases

MapKit / MapKit for AppKit and UIKit / Displaying an Indoor Map

Sample Code

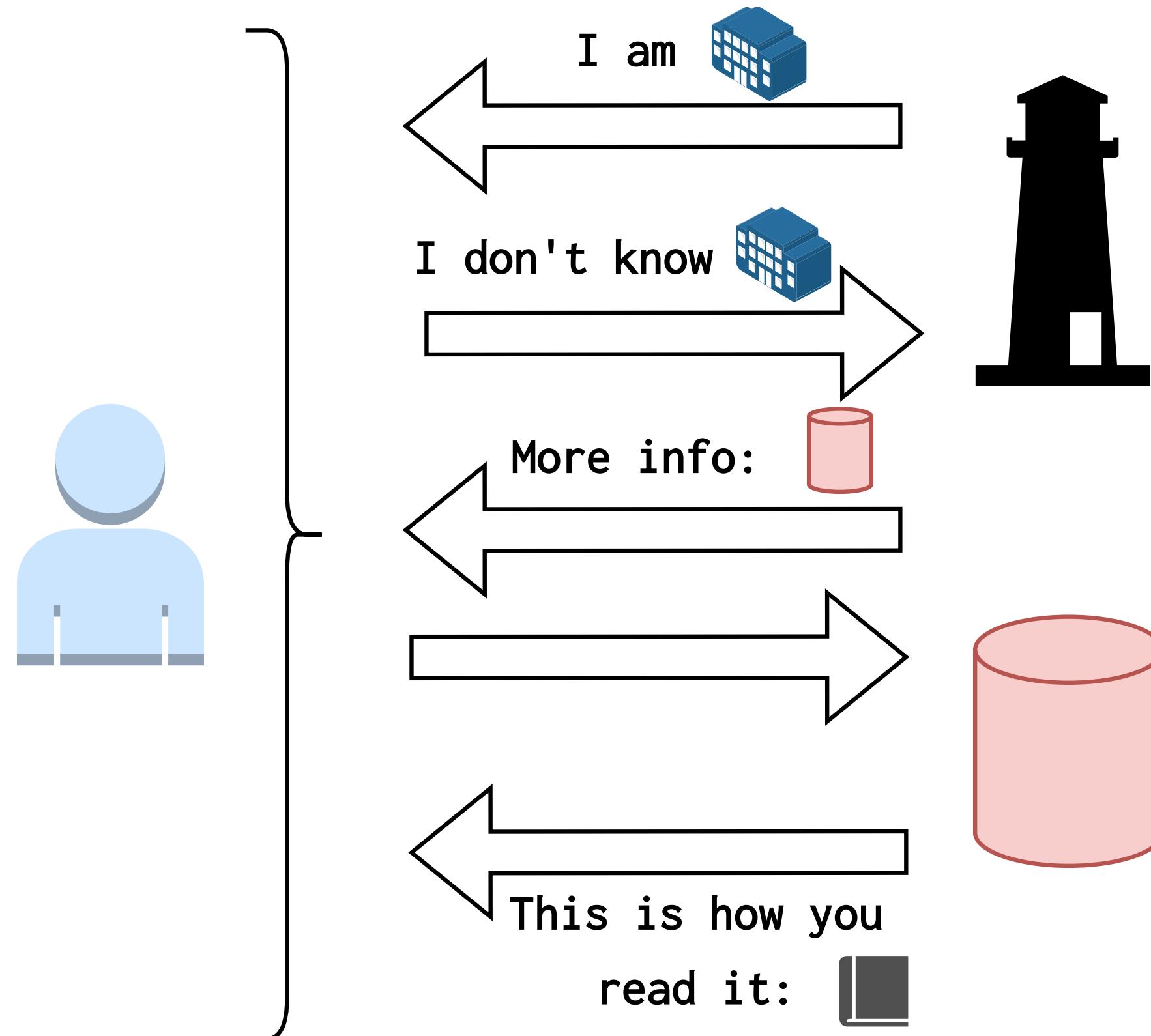
Displaying an Indoor Map

Use the Indoor Mapping Data Format (IMDF) to show an indoor points of interest.

Download

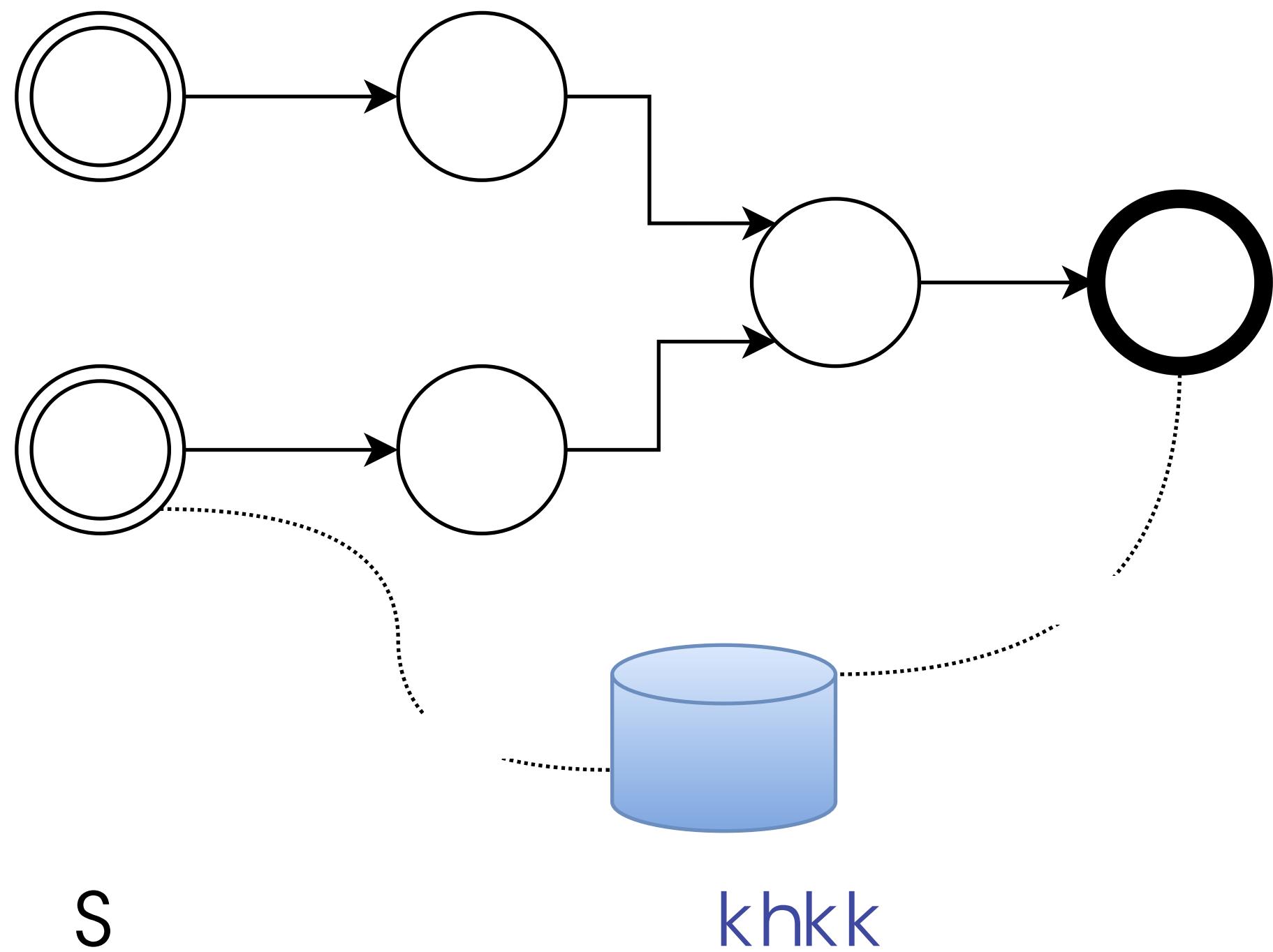
iOS 17.6+ | iPadOS 17.6+ | Xcode 16.0+

Geospatial-centric data discovery ...

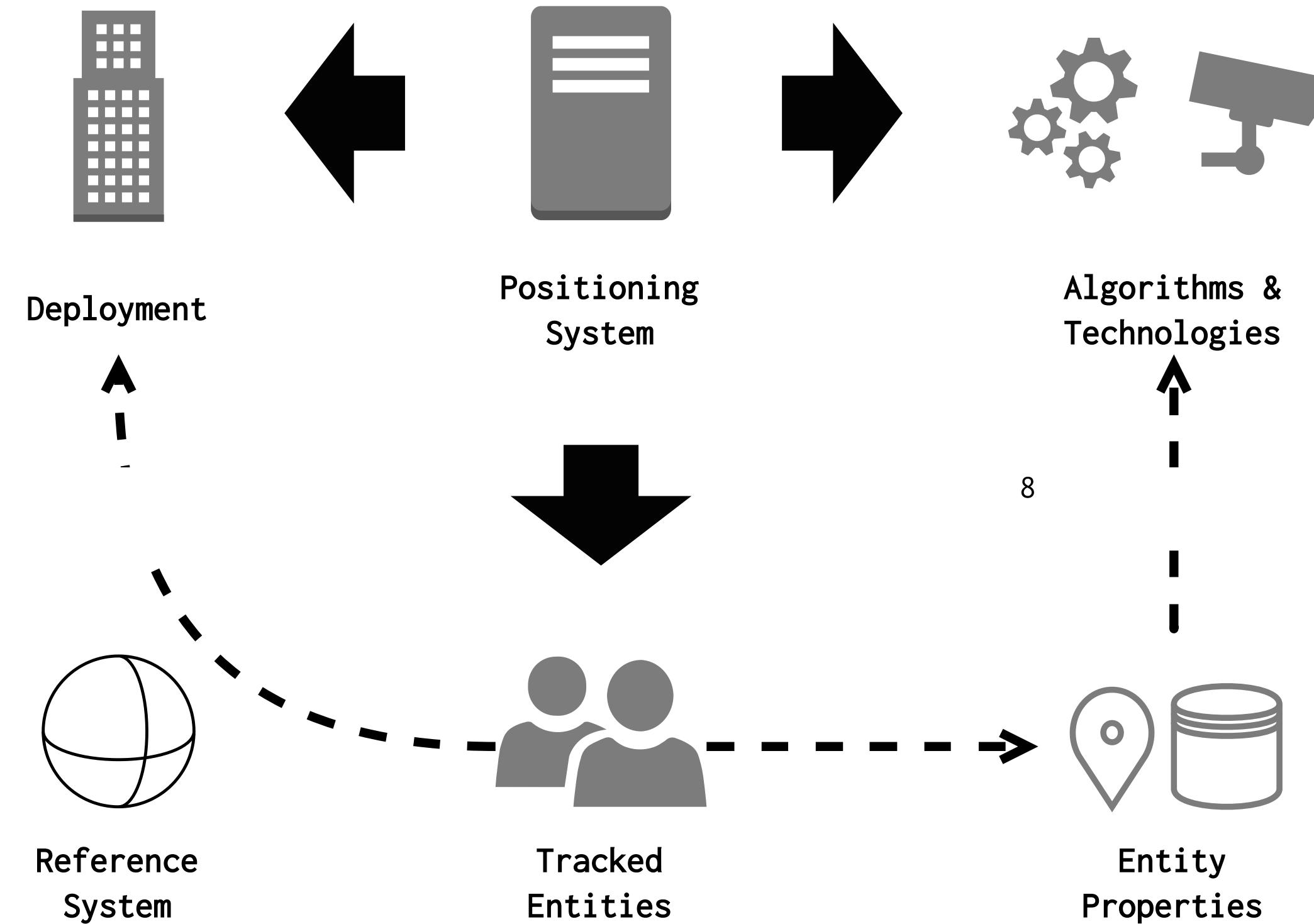




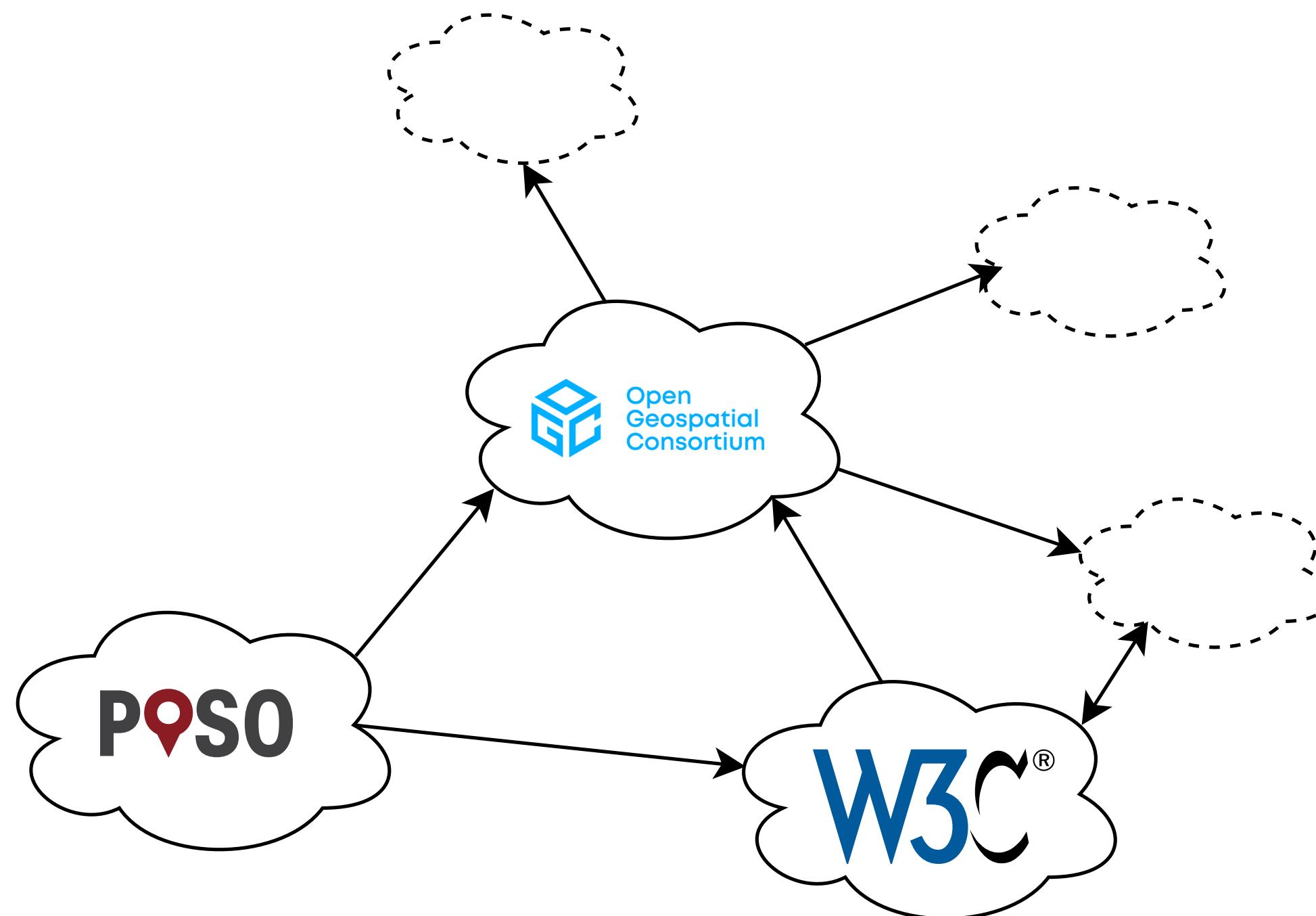
OpenHPS



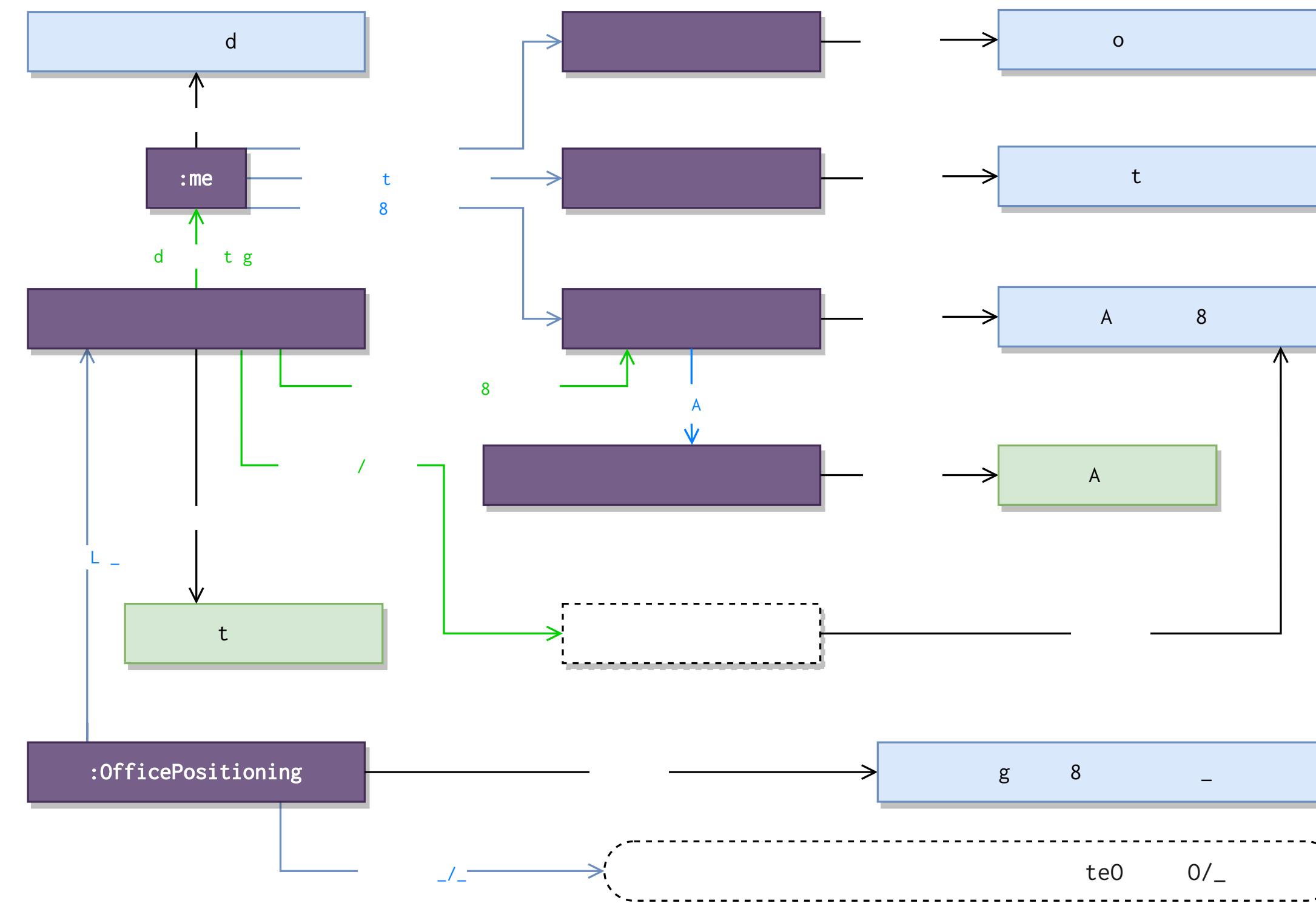
POSO



POSO

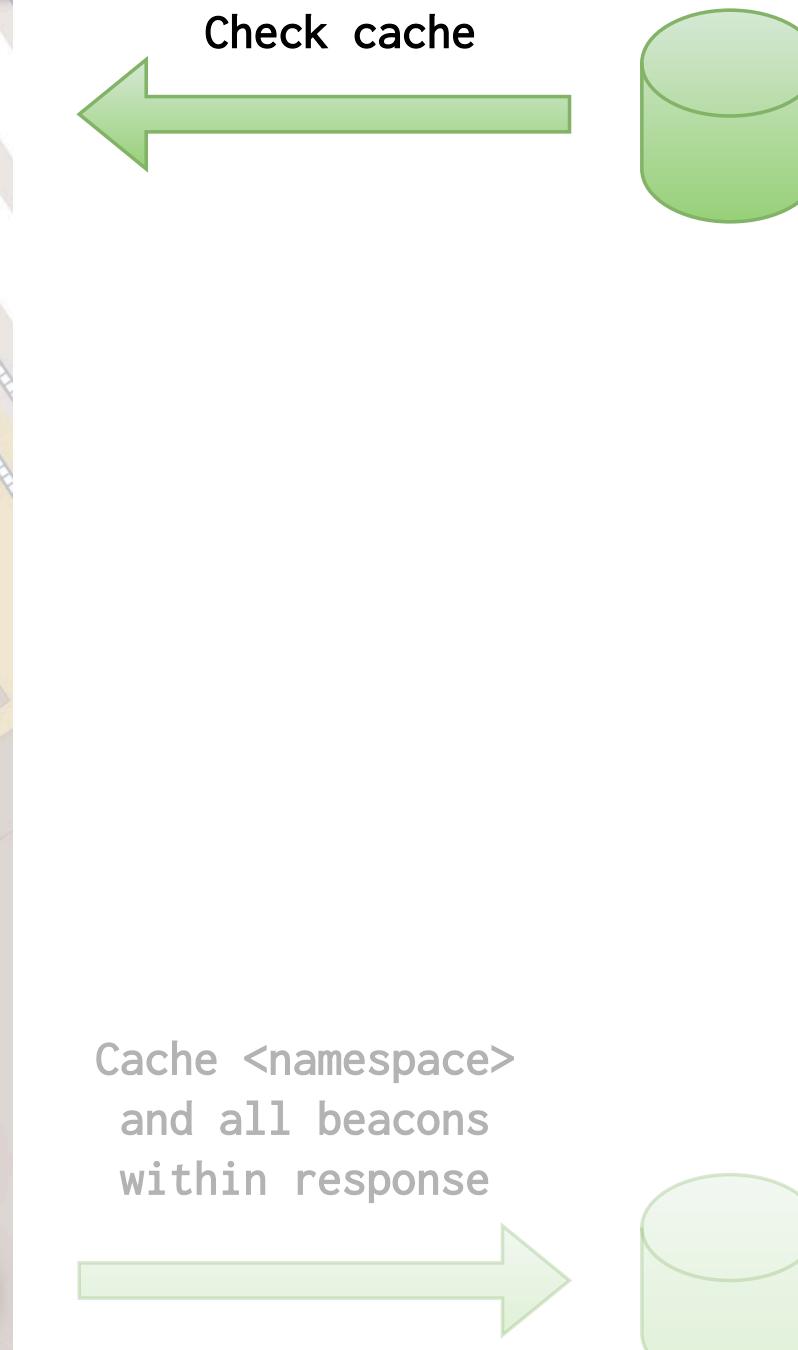
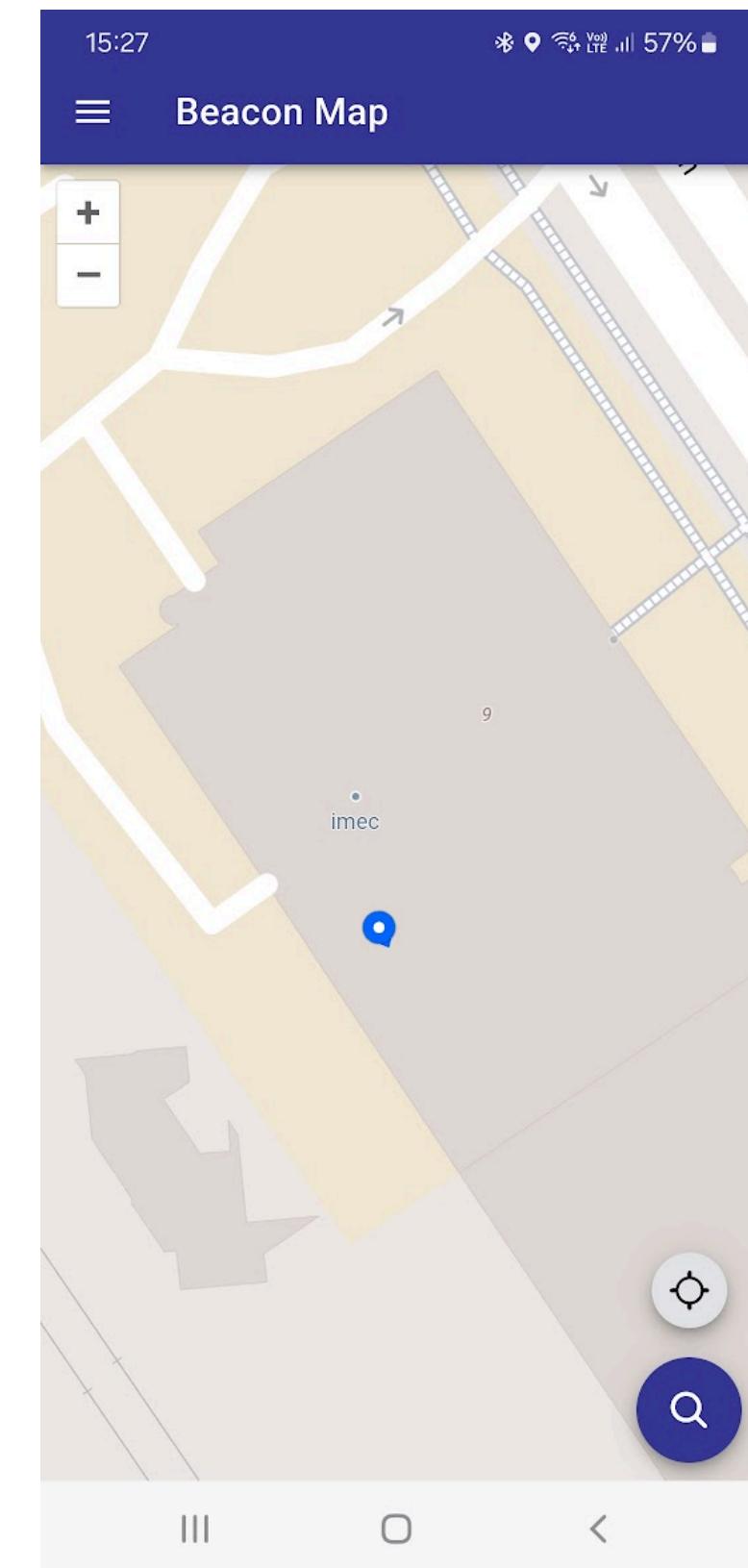
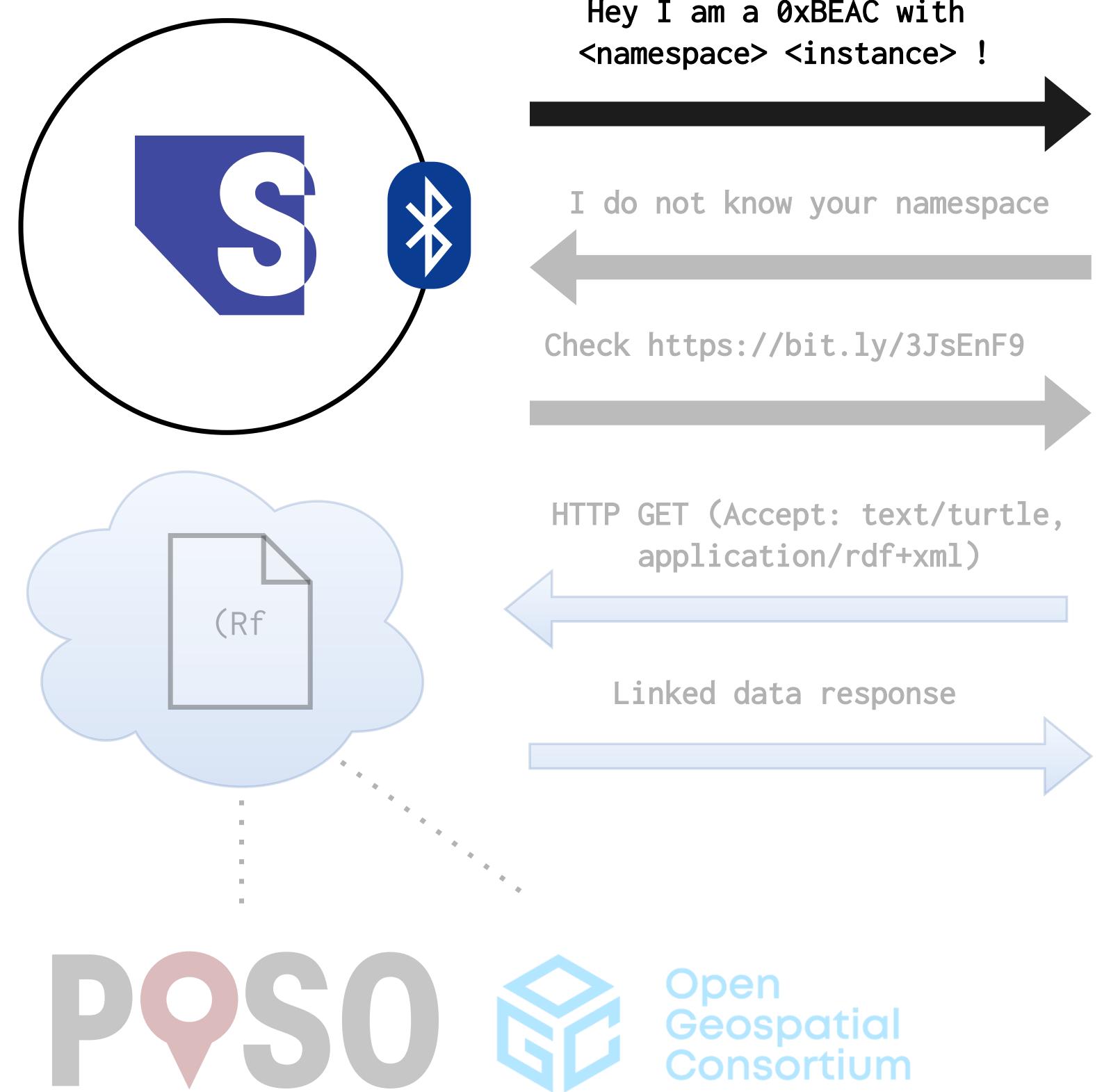


POSO



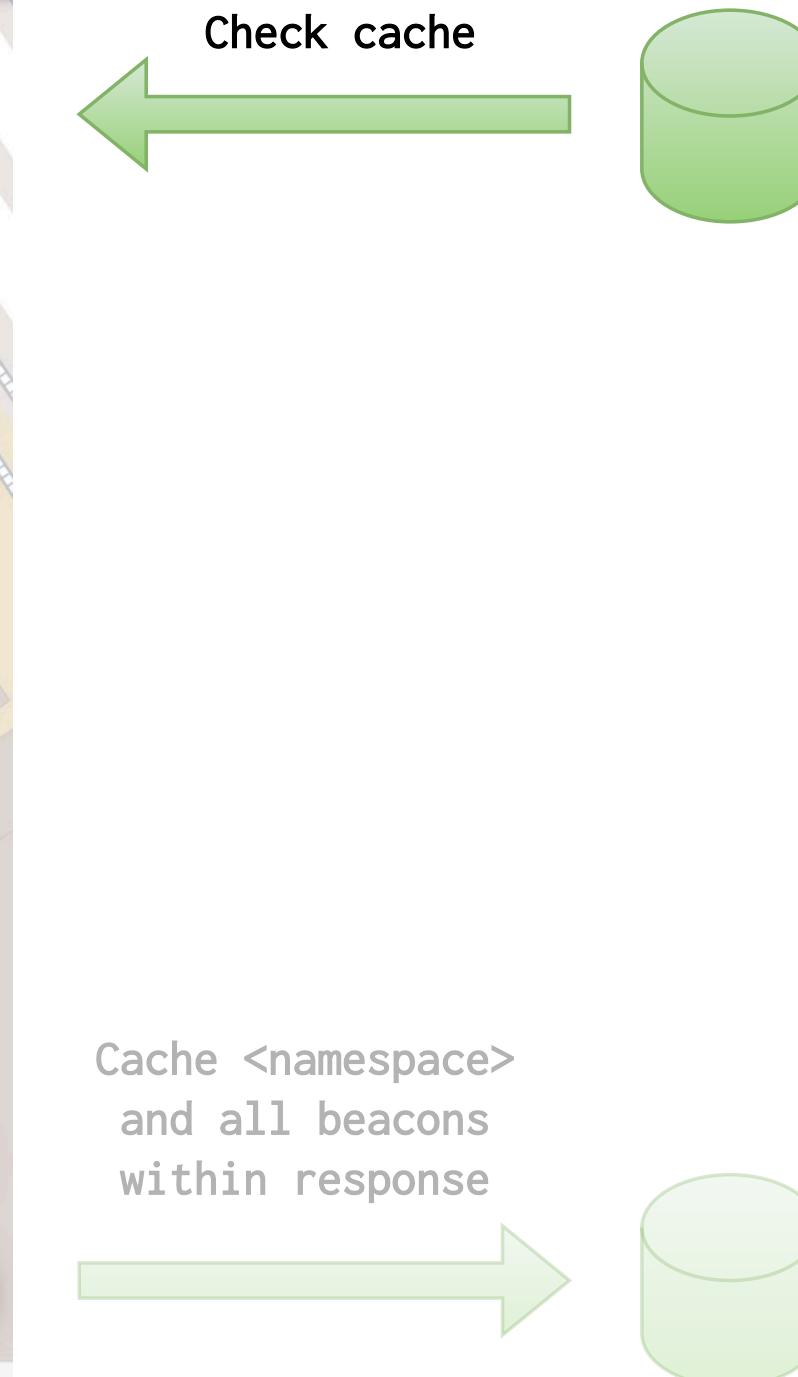
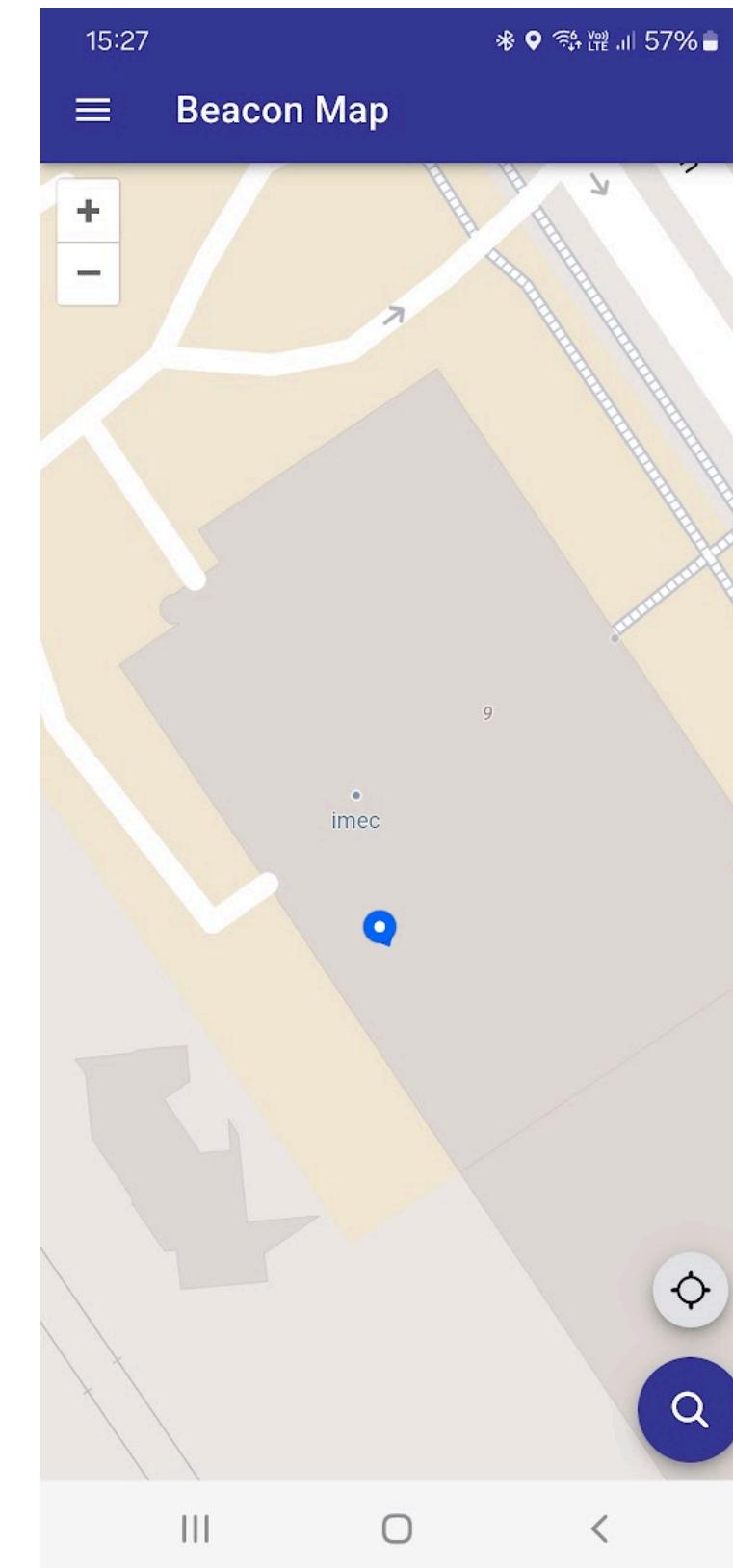
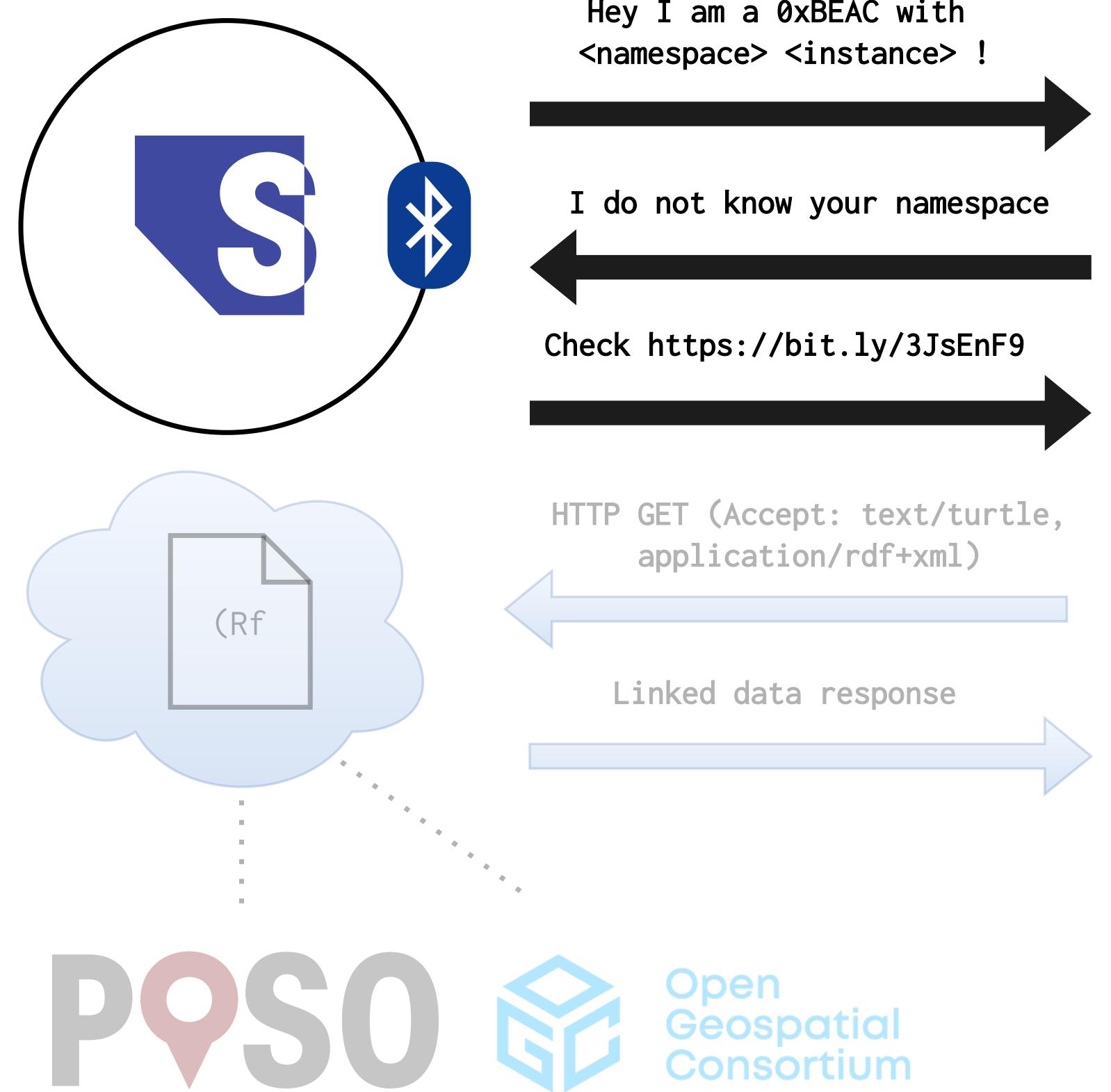
SemBeacon

0 Ip



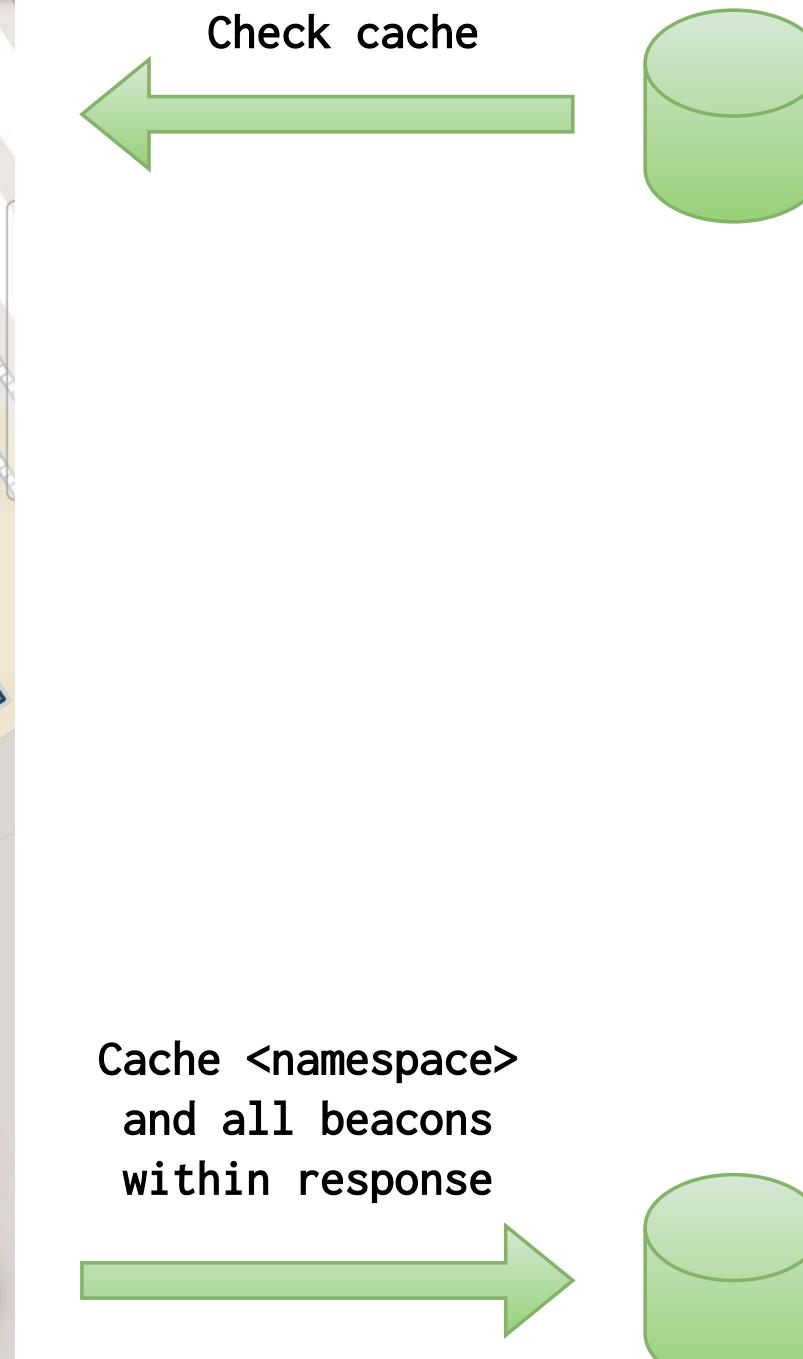
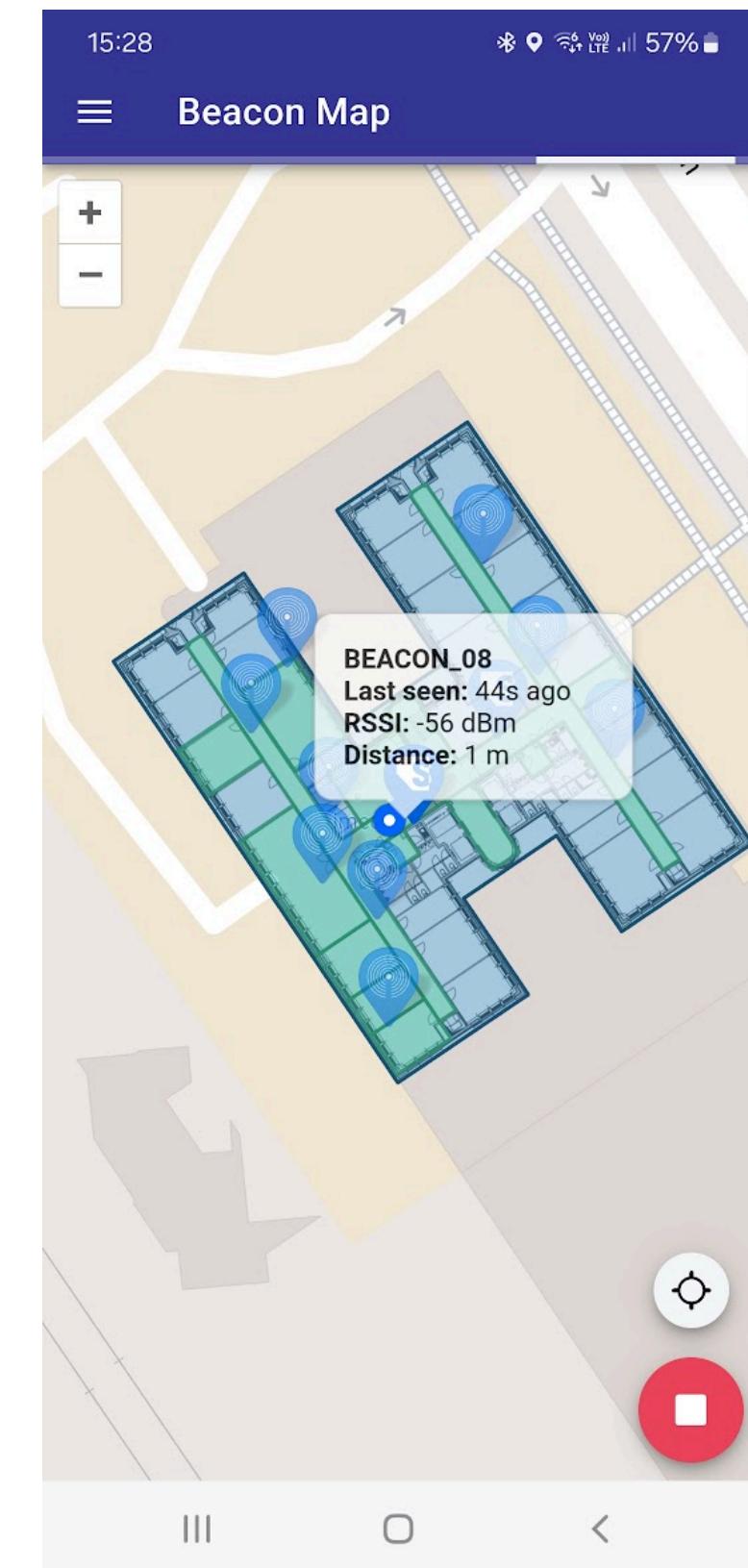
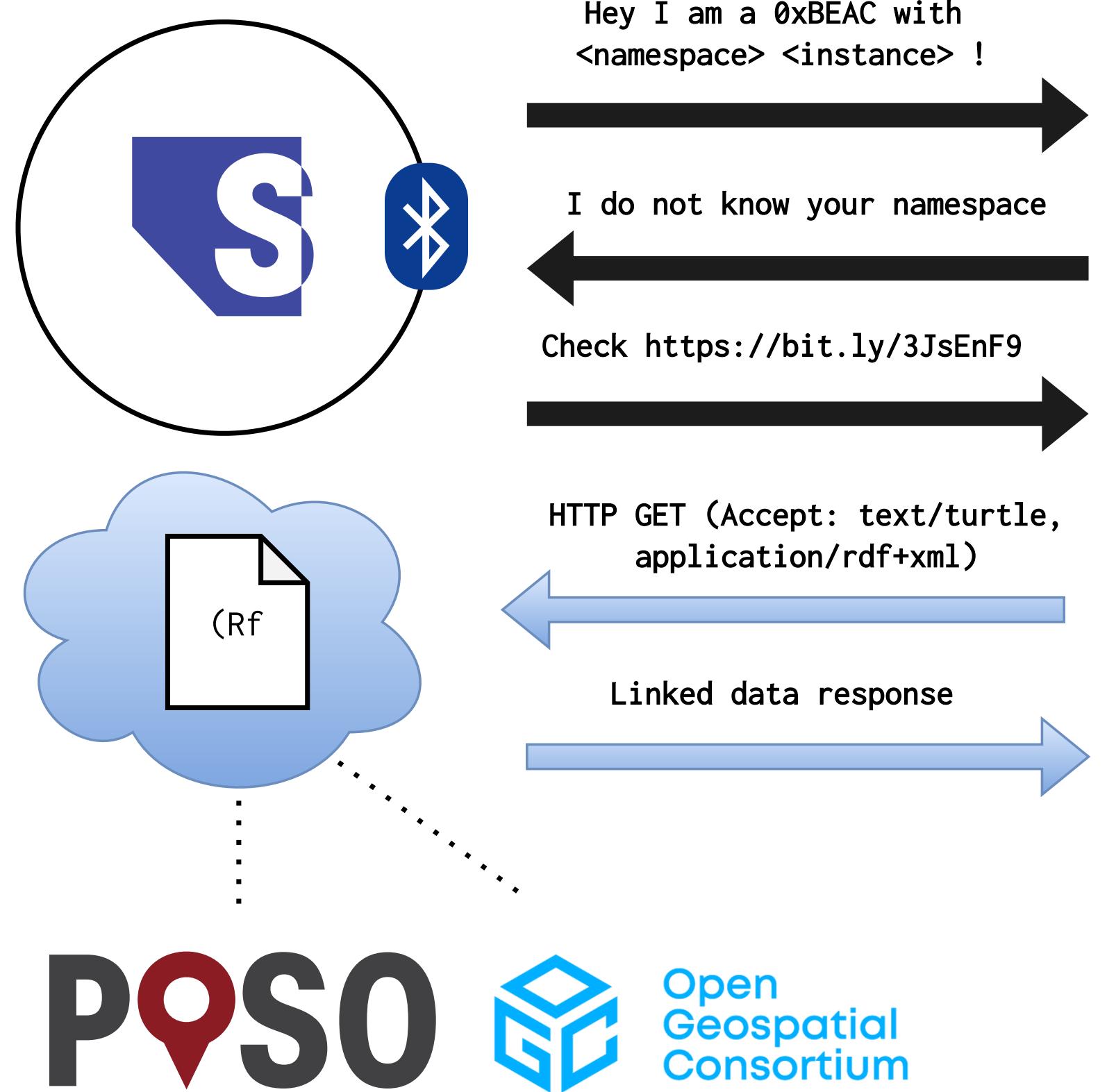
SemBeacon

0 Ip



SemBeacon

0 lp

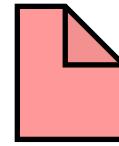


SemBeacon

Namespace and Instance



MD5("http://example.org/beacons.ttl#") = 24d72e569889db5328be761d8488688d



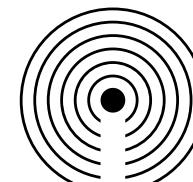
MD5("http://other.org/beacons.ttl#") = 08483bc99d448c83bff6cb9d5bccd40d



Namespace ID: [REDACTED]
Instance ID:
Resource URI:
Short Resource URI:



Namespace ID: [REDACTED]
Instance ID:
Resource URI:
Short Resource URI:



Type: T
UUID: [REDACTED]
Major:
Minor:



Type: A T
ID: [REDACTED]

SemBeacon

BLE 4.X

N O vx 1 Sy y 3 ga1 Uv

SemBeacon Advertisement Data (31 bytes) 

A 3B	e 1B	r 1B	8 1B	R 2B	hT P	R 2B	t 16B	hT 16B	h 4B	hT 1B	8[1B	e 1B
	P	ee			PXAR		99hT		99hT			

SemBeacon Scan Response Data (max 24 bytes) 

r 1B	8 1B	99hT 2B	e 1B	8[1B	96h 3 1B	X	7 0B - 17B	6 96h
		eXAA						

US-ASCII URL

X 96r

Bluetooth Specification

BLE 5.X

C XV

SemBeacon Extended Advertisement Data (max 156 bytes) 

5 N] 5 4B	p] 16B	fS f] 4B	fS 6/ 1B	? 1B	c] 1B	74f 1 1B	U 4 0B - 128B	74f
77fs	77fs							
n 6 1B 1B	77fs 4B	o] 4b	o 4b					
	NUAP							

P
S
U
C

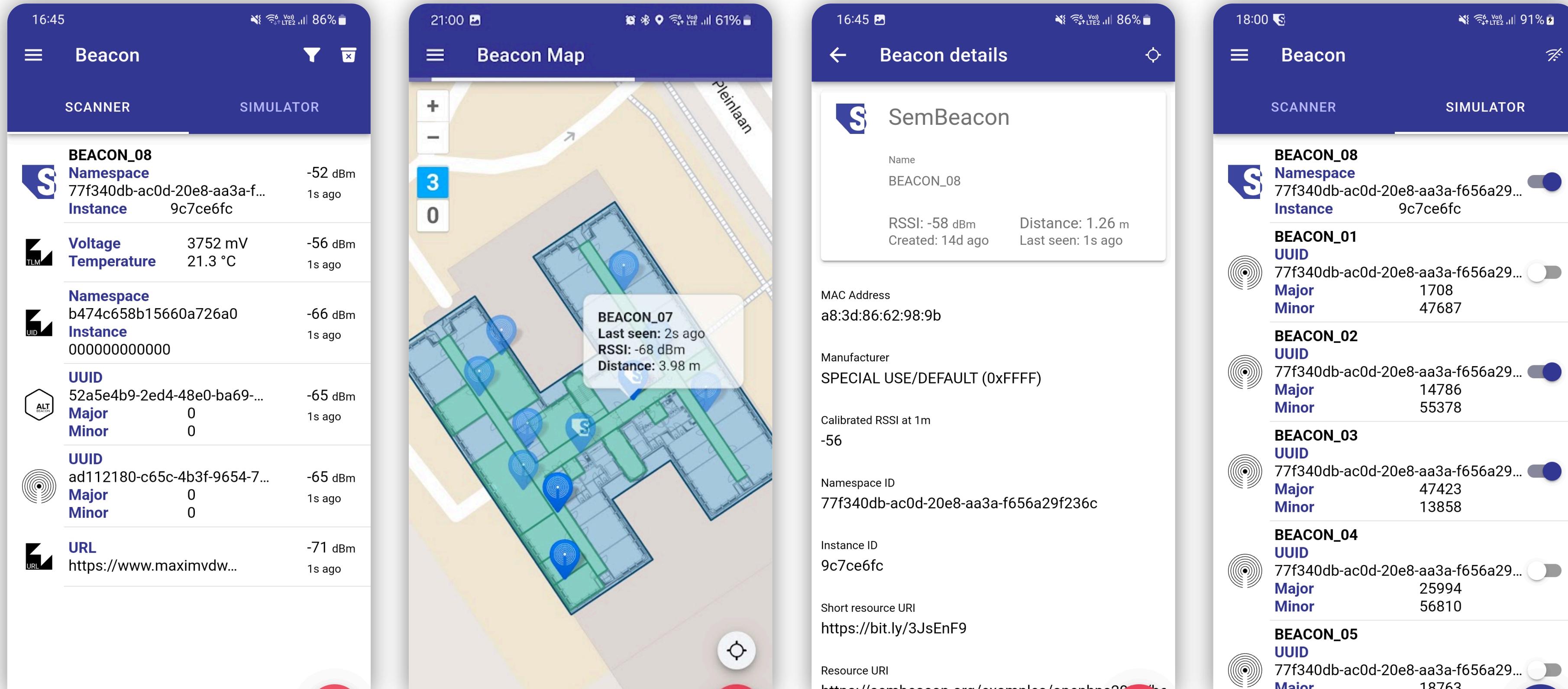
A
P

Flags

Bit (MSB)	Description								Example
6	X y xv	w	v x	v	v	4		6 Hj	27 Hn
7	X y xv	w	v x	v	xv	4	6 He	w x 27 He	v
:	X y xv	w	v x	v	v x	y	v	w x 4	6 Hc 27 Hn
=	X y xv	w	v x	v	v	4	6 Hc	27 Hn	
?	X y xv	w	v x	v	w	vw	y v v 4	6 Hc	27 Hn
@	X y xv	w	v x	y	v x	vw	4	6 Hc	27 Hn
A 3B	g	y	4						

SemBeacon Mobile Application

Scans v y Simulates h O vx 2O vx 2N O vx v y Sy y
Extracts v y v h O vx x y y v

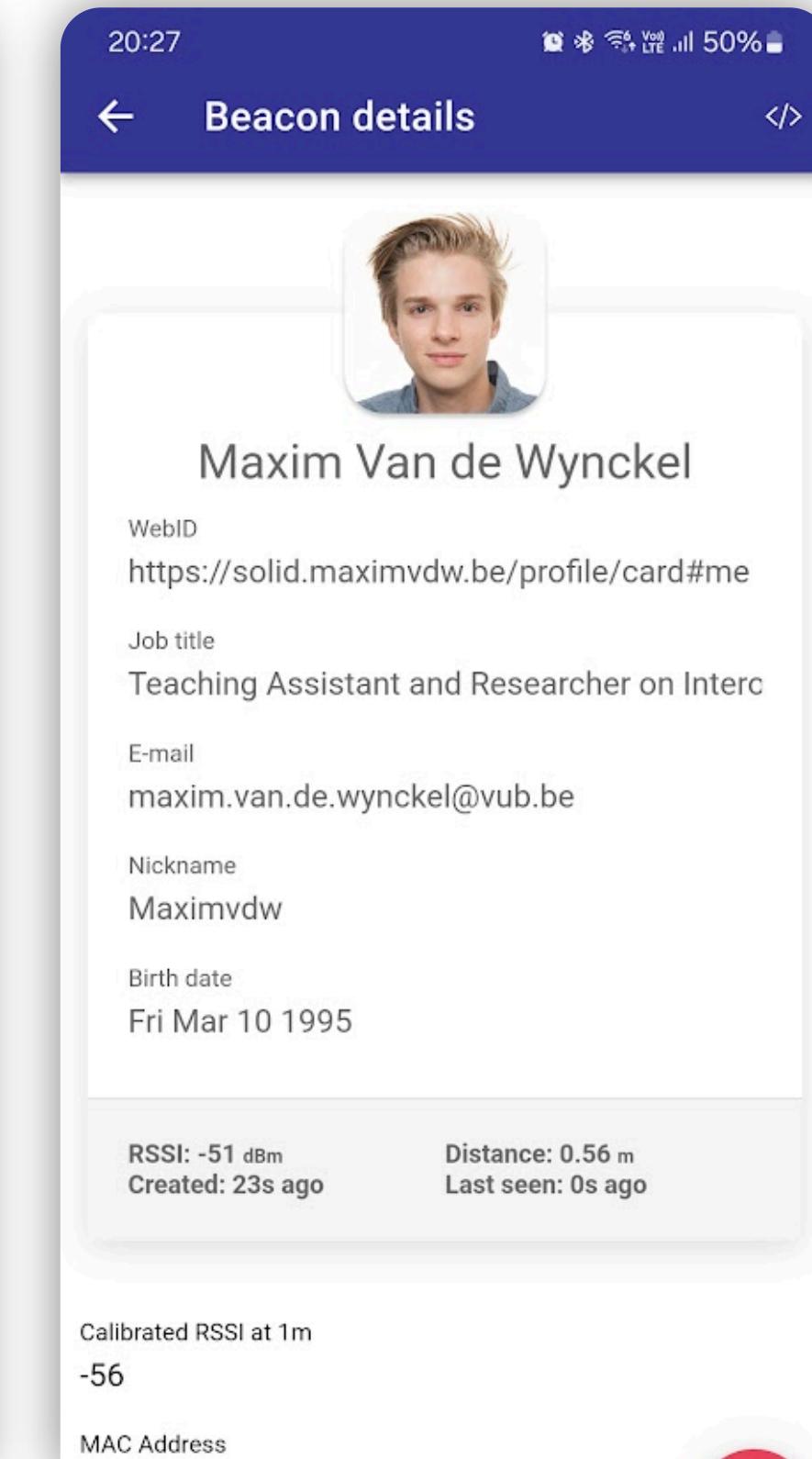
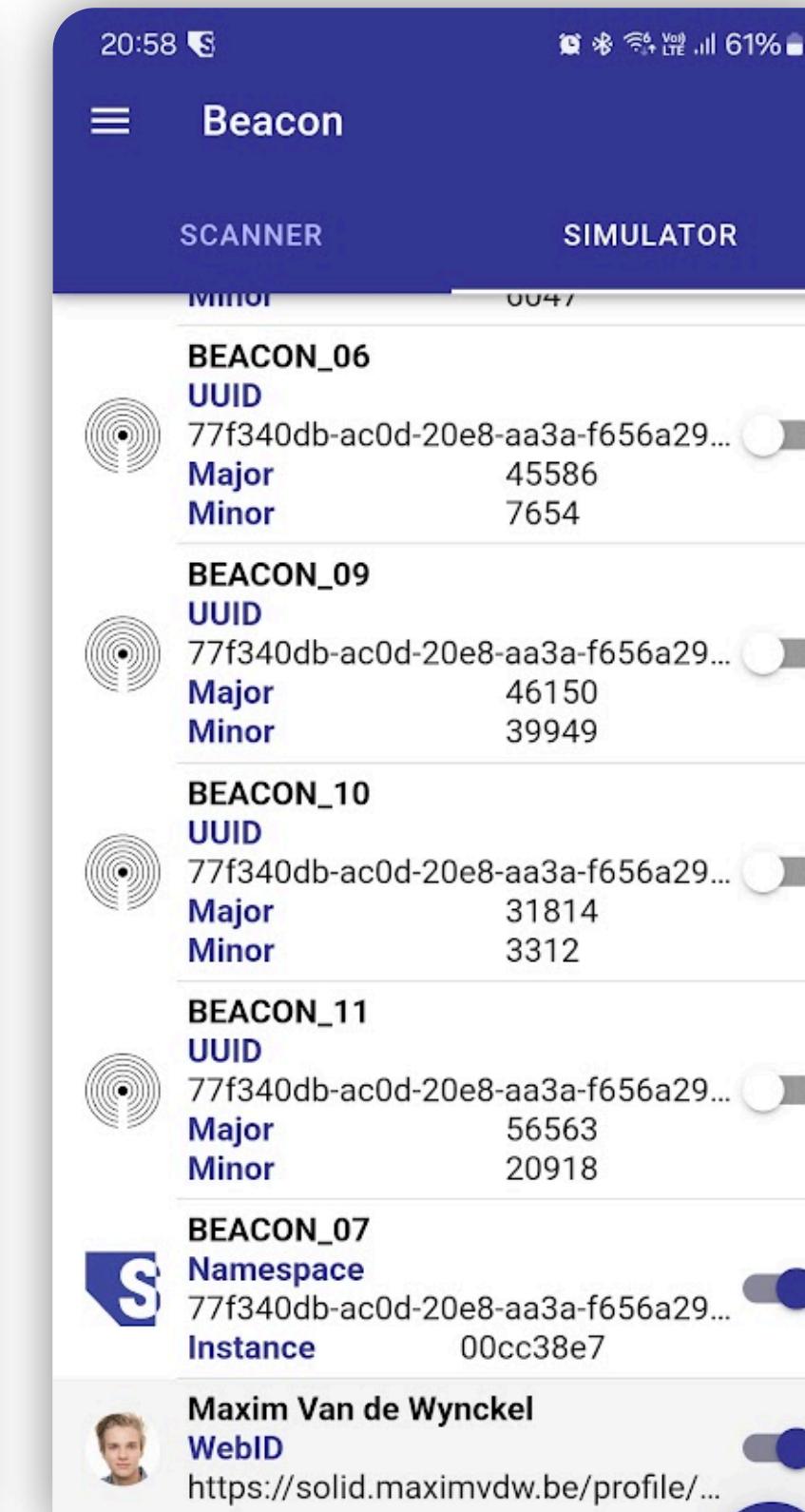
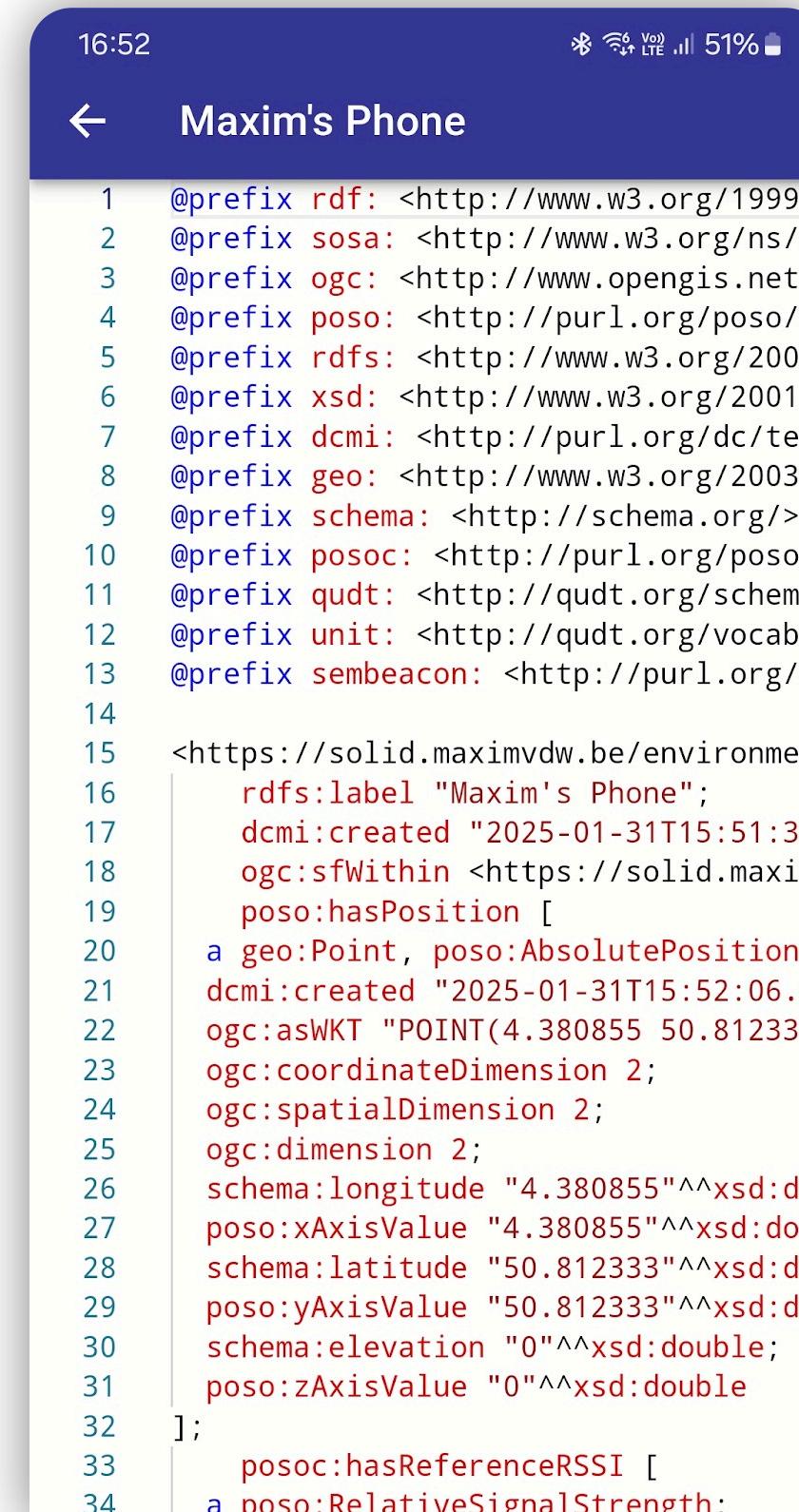
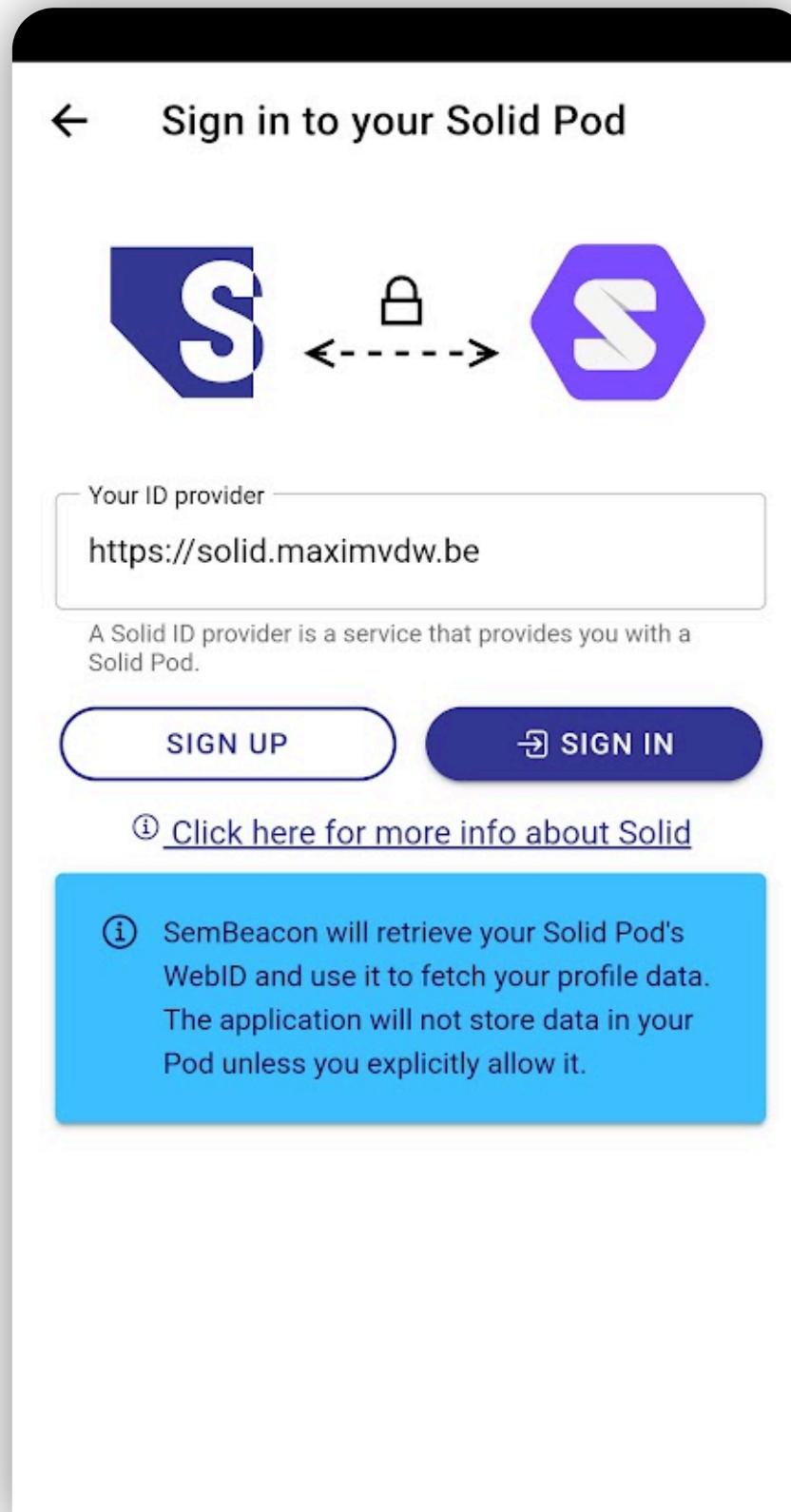


SemBeacon

Mobile Application ...

44v
x v
v y v
S v w access control

v
h y e y
y v v



SemBeacon Example

B B	G	B	K	Y N	B	C	Y	B	C	B	K
BBBB	B ZS	B	g	B							
BBBB	T B B B	T									
BBBBBBBBBB	d B	Z									
BBBBBBBBBB	B										
BBBBBBBBBB	F	B B B	Z								
BBBBBBBBBBBBBBB	L	B B B L									
BBBBBBBBBBBBBBB	gPdB	ZYSiLYWBj			B		B			B	
BBBBBBBBBBBBBBB	G	B B			G	B					
BBBBBBBBBBBBBBB	B B										
BBBBBBBB											
BBBB B											
BBBB	S B										
BBBB	L B B B L										
BBBBBBBB	gPdB	ZYSiLYWBj			B		B			B	
BBBBBBBB	G	B B			G	B					
BBBBBBBB	B B										
BBBB	N B						D				

Contributing & Roadmap POSO ontology



74j x v ed hd v
E55 w4k 5d Weh5ed hd 5
: 4S v ed hd y x w
=4U y w w x x y .74/
?4d Weh v v v gR U
E55 w4k 5d Weh5 3
y 5 5 v 5 x5 v 5 v v

Contributing & Roadmap SemBeacon



74b w v xv
E55 w4k 5h O vx 5v
744S v 5 v y y
y x
74 4dh . v v y /
: 4N y w v . She=: th O vx /
E55 w4k 5h O vx 5v y 3 =:
: 44c v . v / y v v
=4 gU@ w v . l e/
?4h x xv
E55 w4k 5h O vx 5 x xv

Demo time!

BRACE YOURSELF



Discovering Indoor Environments and Positioning Systems



55 w4k 5h O vx 5
55 w vx 4 5
55 4 5
55 4 4 5
Ny y N V ev h