

Reducing the service location mapping effort v2

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TCO ?

(By the Gartner Group in 1987,
and became much popular in the 21st century)

It's time to think about Total Cost of Mapping 😊

- Reduce the mapping effort,
- making it easier to realize Location-Based Services (LBS),
- supporting OpenRoaming as well

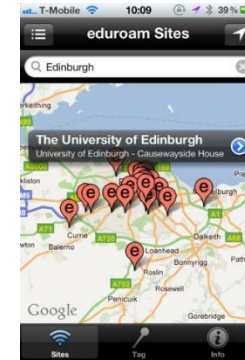
Write once, support many apps

Minimal
AP location data



How to create this? 🤔

User attributes

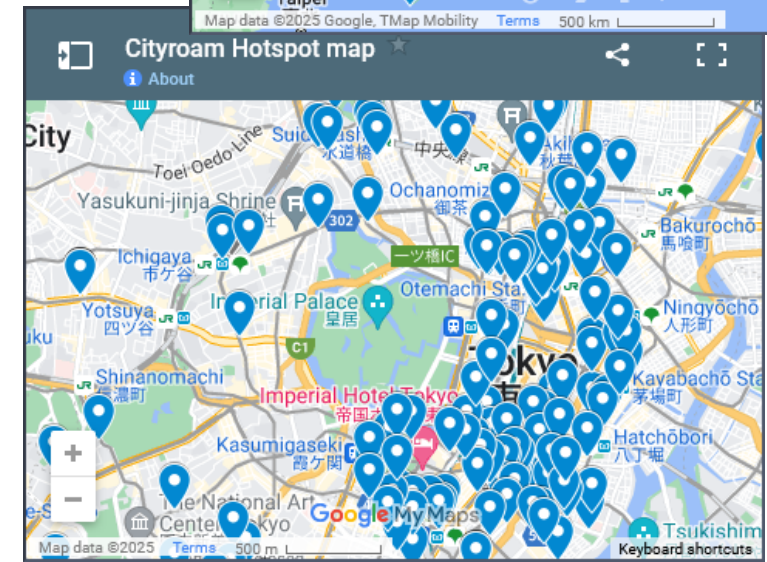
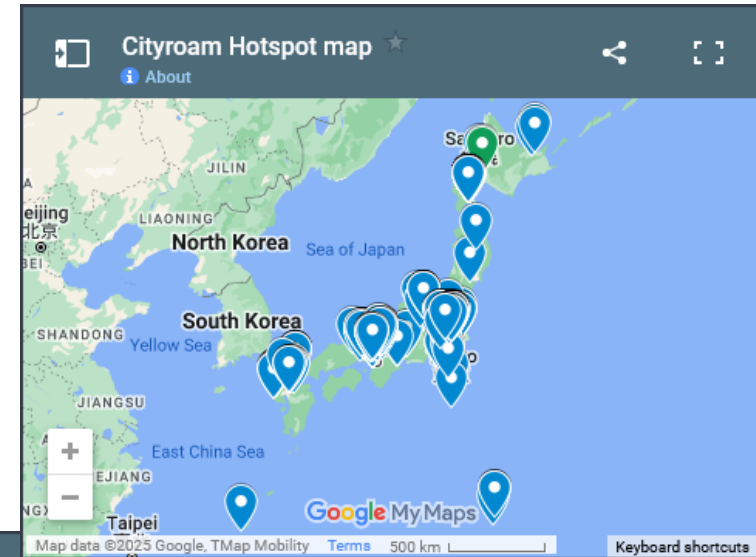


Location-Based Services



Problems

- Submission of the map data is mandatory, but **many universities are reluctant to make the map data.**
 - They think it's **cumbersome, additional work.** There's little motivation.
 - Low submission rate (55% in May 2025)
 - There are **so many fields and parameters.** (Which are useful actually?)
- “Off-campus eduroam” becomes popular
Municipalities support eduroam.
Manual mapping has become impractical.



service_loc in the eduroam database specification (ver. 2.0.1)

locationid	Unique identifier provided by the NRO
coordinates	longitude, latitude, altitude (altitude may be omitted; to define a larger (polygonal) area multiple triples/value pairs of coordinates must be provided (in order that allows to form one cohesive area))
stage	0=preproduction/test, 1=active (default value =1)
type	0=single spot; 1=area; 2=mobile (default value =0)
loc_name*	location's name
address_street*	location's address (if applicable)
address_city*	location's address: city
location_type	IEEE 802.11-2012, clause 8.4.1.34 Venue Info (note: this is a pair of numbers separated with comma (,))
contact_name**	on site contact: name
contact_email**	on site contact: e-mail
contact_phone**	on site contact: phone no.
contact_type**	0=person (default), 1=service/department
contact_privacy**	0=private (default), 1=public
SSID	SSID used
operator_name	Operator name (OperatorName attribute value, including "1")
enc_level	list of supported encryption levels separated with comma (,)
AP_no	number of APs ; put <blank> for unknown number;
wired_no	number of enabled sockets for wired access; put <blank> for unknown number
tag	specific characteristic(s); provide allowed values separated with comma (,) if a feature is enabled; allowed value(s): port_restrict, transp_proxy, IPv6, NAT, HS2.0
availability	0=default (no restrictions), 1=physical access restrictions
operation_hours	Provide info (in free text) if service is not available 24 hours per day by specifying operation hours (local time)
info_URL***	info page with additional info in case of any restrictions (port, availability, operation hours)
ts	date: last changed

Mandatory fields:

- locationid
- coordinates
- stage
- type
- SSID
- ts

*Well, it's minimal,
but not enough for LBS.*

https://monitor.eduroam.org/fact_eduroam_db.php

RFC 5580: Carrying Location Objects in RADIUS and Diameter

```
Location-Information = 0x00030000ebb777880e147ae1ebb77e900e147ae14d616e75616c
Location-Data = 0x00034a5001074f6b696e61776103044e61676f18083930352d30303137
Location-Information = 0x00040100ebb777880e147ae1ebb77e900e147ae14d616e75616c
Location-Data = 0x000480352e4dc180fff87b56148000000000
```



```
Index: 0003
Code: 00 (=civic location)
Entity: 00
Sighting Time: ebb777880e147ae1
Time-to-Live: ebb77e900e147ae1
Method: 4d616e75616c (=Manual)
```

```
Index: 0003
Location:
  Country code: 4a50
  civic address elements:
    CA type: 01 (=national subdivisions)
    CA length: 07
    CA value: 4f6b696e617761 (=Okinawa)
    CA type: 03 (=city, township, shi)
    CA length: 04
    CA value: 4e61676f (=Nago)
    CA type: 18h=24 (=ZIP)
    CA length: 08
    CA value: 3930352d30303137 (=905-0017)
```

```
Index: 0004
Code: 01 (=geospatial location)
Entity: 00
Sighting Time: ebb777880e147ae1
Time-to-Live: ebb77e900e147ae1
Method: 4d616e75616c
```

```
Index: 0004
Location:
  LaRes/Latitude: 80352e4dc1
  LoRes/Longitude: 80fff87b56
  AT/AltRes/Altitude/Datum:148000000000
```



Civic Address Components in RFC 4776

Index: 0003
 Code: 00 (=civic location)
 Entity: 00
 Sighting Time: ebb777880e147ae1
 Time-to-Live: ebb77e900e147ae1
 Method: 4d616e75616c (=Manual)

Index: 0003
 Location:
 Country code: 4a50
 civic address elements:
 CA type: 01 (=national subdivisions)
 CA length: 07
 CA value: 4f6b696e617761 (=Okinawa)
 CA type: 03 (=city, township, shi)
 CA length: 04
 CA value: 4e61676f (=Nago)
 CA type: 18h=24 (=ZIP)
 CA length: 08
 CA value: 3930352d30303137 (=905-0017)

CAtype	label	description
1	A1	national subdivisions (state, canton, region, province, prefecture)
2	A2	county, parish, gun (JP), district (IN)
3	A3	city, township, shi (JP)
4	A4	city division, borough, city district, ward, chou (JP)
5	A5	neighborhood, block
6	A6	group of streets below the neighborhood level

Table 1

23	NAM	NAM	name (residence and office occupant)	Joe's Barbershop
24	ZIP	PC	postal/zip code	10027-1234
25			building (structure)	Low Library

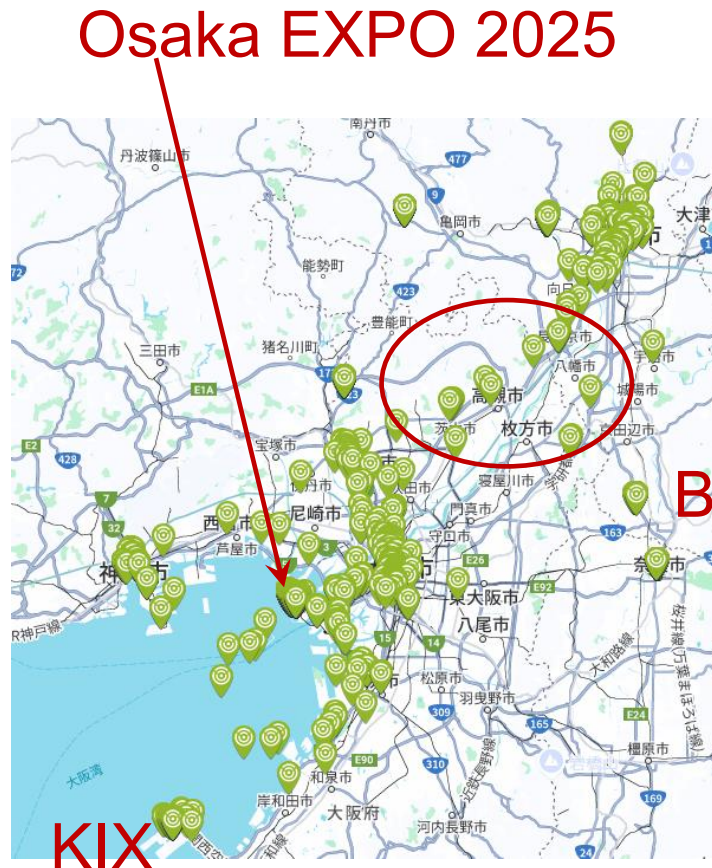
Mapping evolution

- (Semi-) automatic mapping
 - Telecom operators are using some GPS-based mapping tools.
 - Crowdsourcing such as WiGLE – WBA has adopted it.



Luxemburg

Kyoto-Osaka-Nara

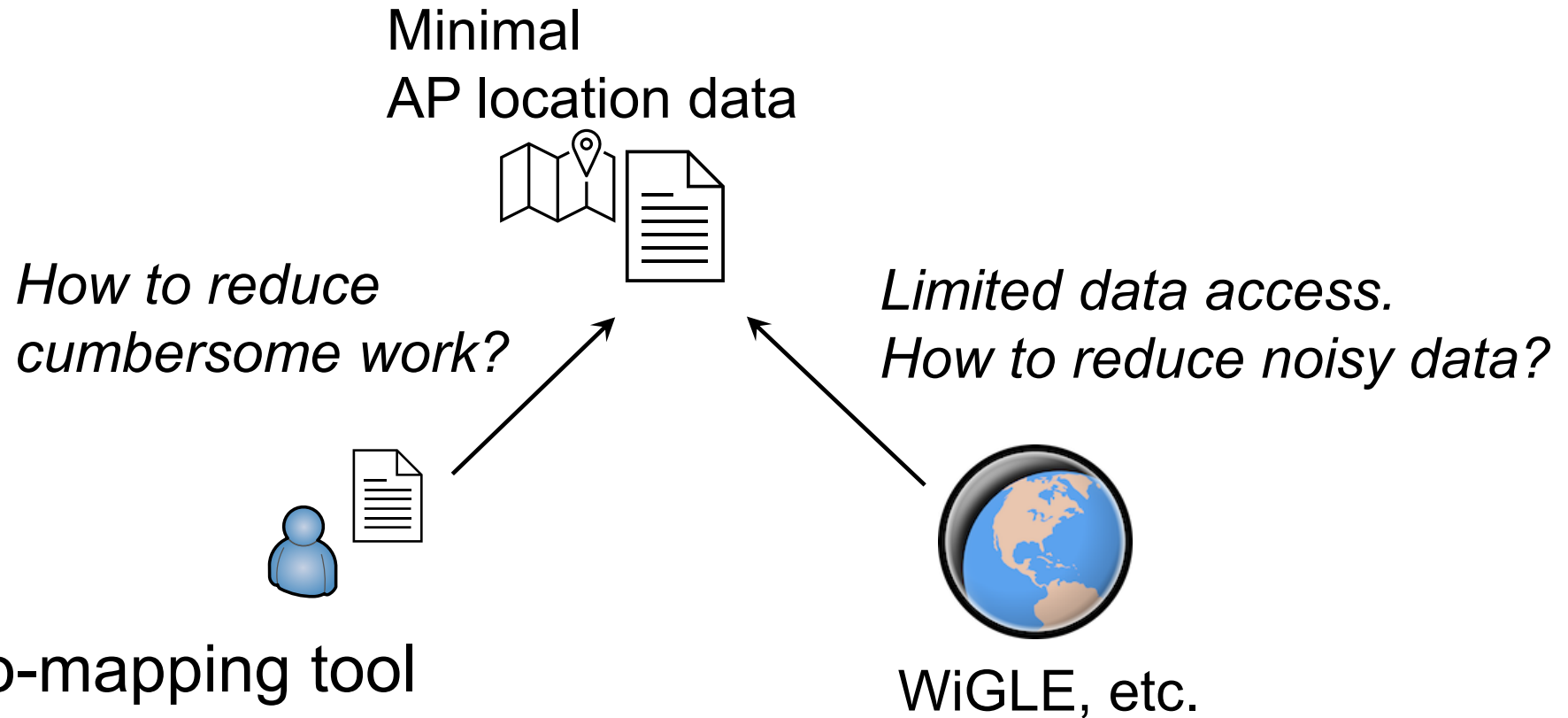


Osaka EXPO 2025

Buses?



Combining manual and crowdsourced map data



- Auto-mapping tool
- Semi-auto data filling
- Operator- and computer-friendly data format (not XML, JSON)

