Introduction of eduroam and its development as a national information infrastructure

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Identity Federation in Wireless LAN Roaming

- **Separate and interconnect
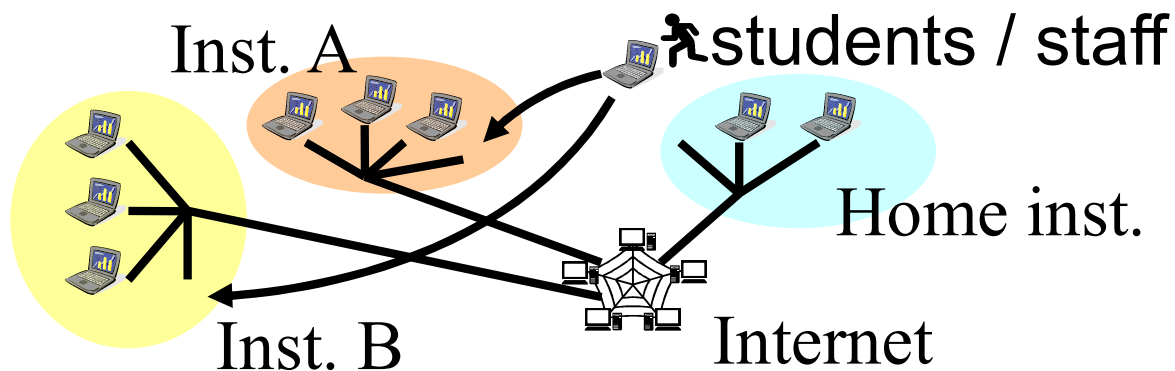 Identity Providers (IdPs) and Service Providers (SPs)**
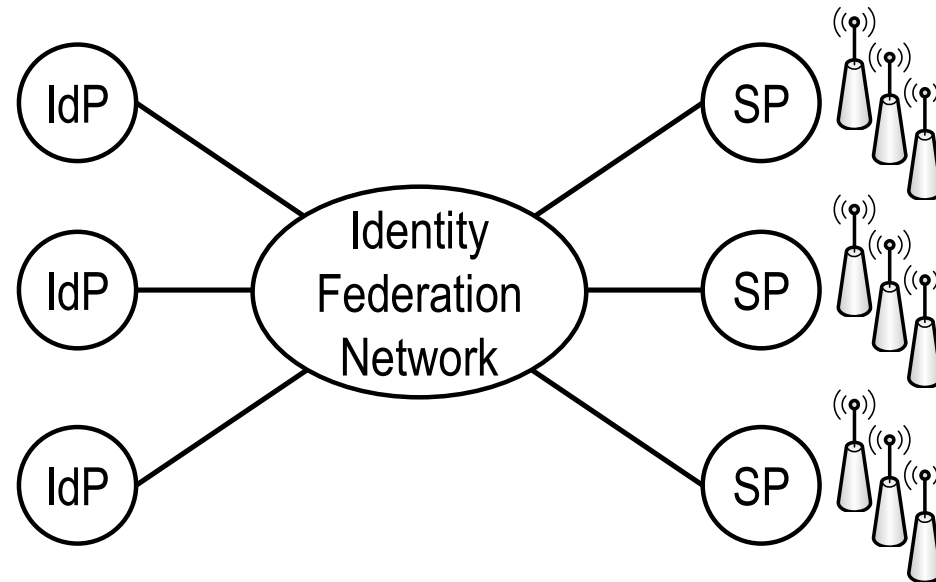
- **Not only connectivity…**
  - Quality of Service (QoS), Security, User Experience
  - Acceptable Use Policy (AUP)
  - User verification and traceability in case of incidents / abuse
  - Roaming agreements
  - Legislation and Regulations
  - Business models, settlement, … etc.

What is eduroam?

*eduroam (**edu**cation **roam**ing) is the secure, world-wide roaming access service developed for the international research and education community.*
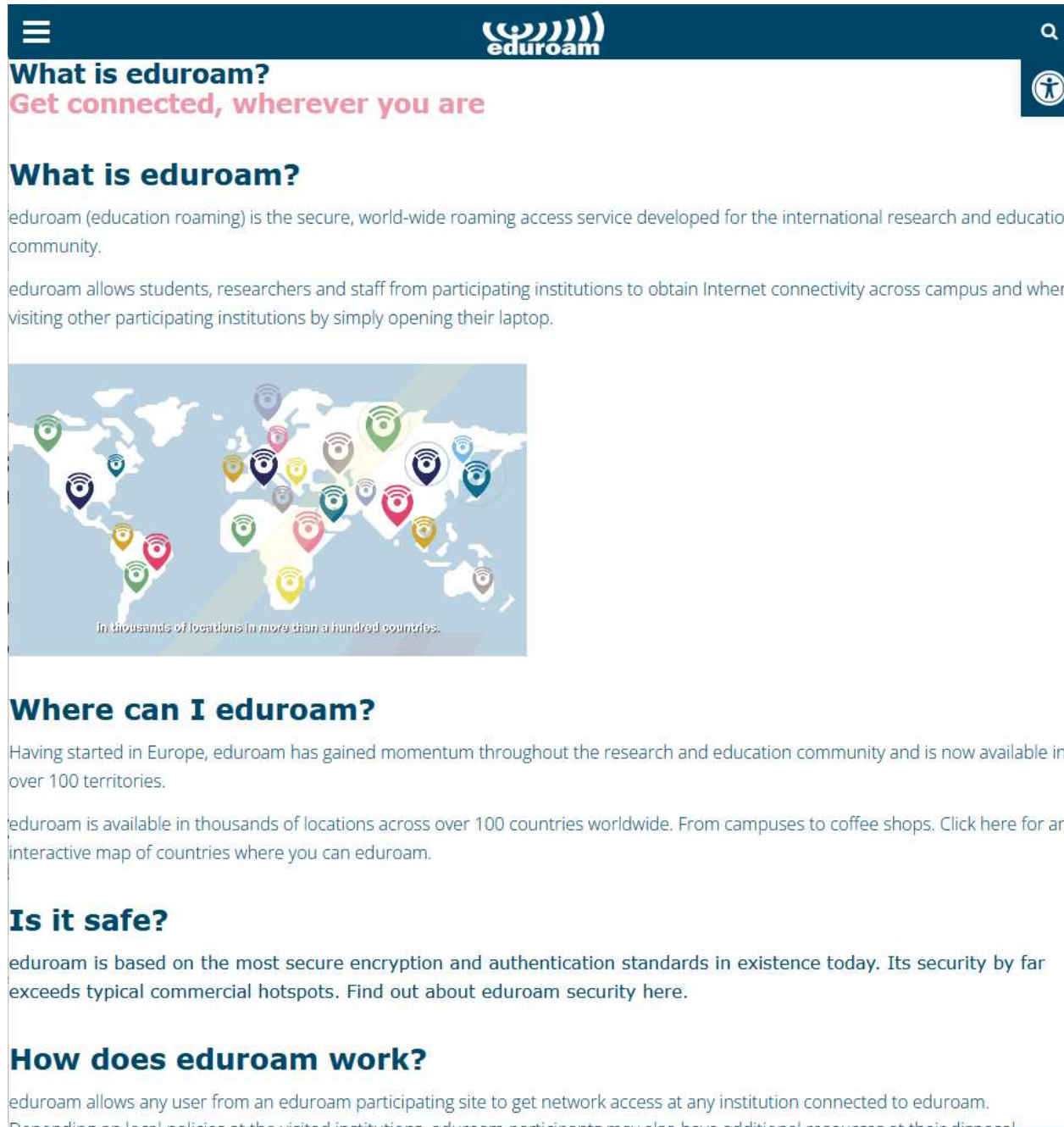
eduroam allows students, researchers and staff from participating institutions to obtain Internet connectivity across campus and when visiting other participating institutions by simply opening their laptop.

https://www.eduroam.org/

Inst. A

students / staff

Home inst.

Inst. B

Internet

eduroam promotion video by AARNet   3

What is eduroam?

https://www.eduroam.jp/about

eduroam in the world

- **The eduroam service started as a pilot under the auspices of TERENA (now GÉANT).**
- **106 countries worldwide (as of 2022)**
  - Most countries in Europe
  - Canada, USA, Russia, South Africa, Latin America, …
  - Even Svalbard and New Caledonia! (but Antarctica)

eduroam Companion by Janet, UK
Android and iOS
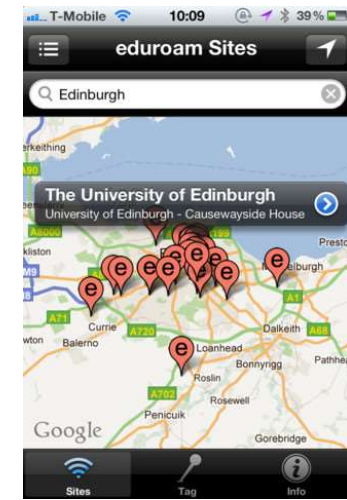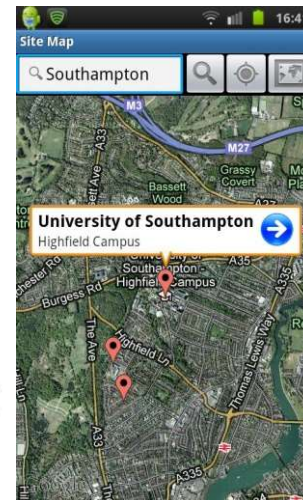
Collaboration with Public WLAN services (case in Japan)

■ Virtual expansions of campus networks!!

348 institutions in Japan (Aug. 2022)

Academic cloud

e-Journals

Library / campus LAN

Internet
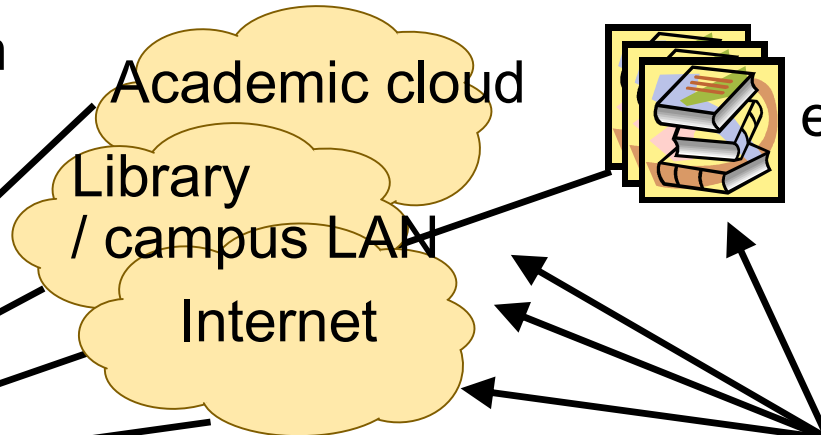
Off-campus eduroam by NHN TECHORUS

Enable accesses to academic NW and contents from downtown areas

Cityroam

eduroam

Federation

NW accesses using universities accounts

130+ in-door APs at cafes, conference sites, large shops in and around Tokyo (2011-2020)

106 countries worldwide

Created a new option for outsourcing campus WLAN system

The world becomes virtual campus!

■130+ eduroam hotspots at rental meeting rooms, cafes, etc. in the central area of Tokyo (2011-2020)

■eduroam at airports, train stations, etc. in Sweden

■eduroam on HotCity (municipal Wi-Fi) in Luxemburg

■eduroam at 18 airports in Norway

■eduroam in downtowns of York, Munich, Porto, etc.

■132 hospitals in the UK (2017)

eduroam basic architecture

- **Various EAP methods such as PEAP, EAP-TLS**
- **Based on *relaying Authentication Requests***
  - **IdPs and proxies need to be alive always!**

ID Providers

Top-level RADIUS proxy
(Europe, Asia-Pacific)

National RADIUS proxies

Institutional
RADIUS servers

WLAN AP

RADIUS IdP

user@univD.ac.jp

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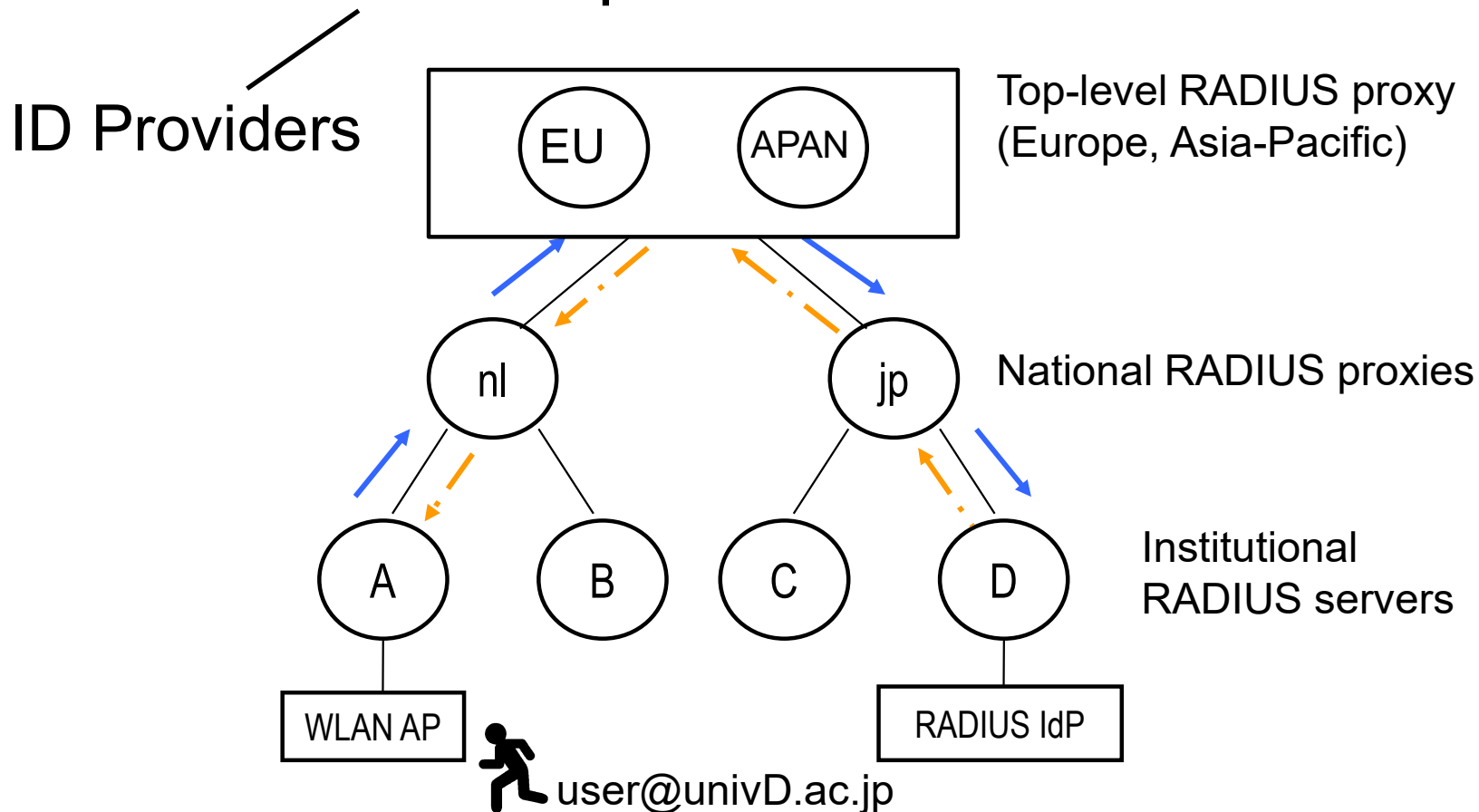
How to join and deploy eduroam?

- Establish a National Roaming Operator for eduroam operation, and inform eduroam APAN team.

APs (WPA2 Enterprise)

Institutions

eduroam

National Roaming Operator

RADIUS IdP

APAN proxies

HK CityU

RADIUS proxy

Operators

RADIUS connections

AARNet

APs (WPA2 Enterprise)

RADIUS IdP
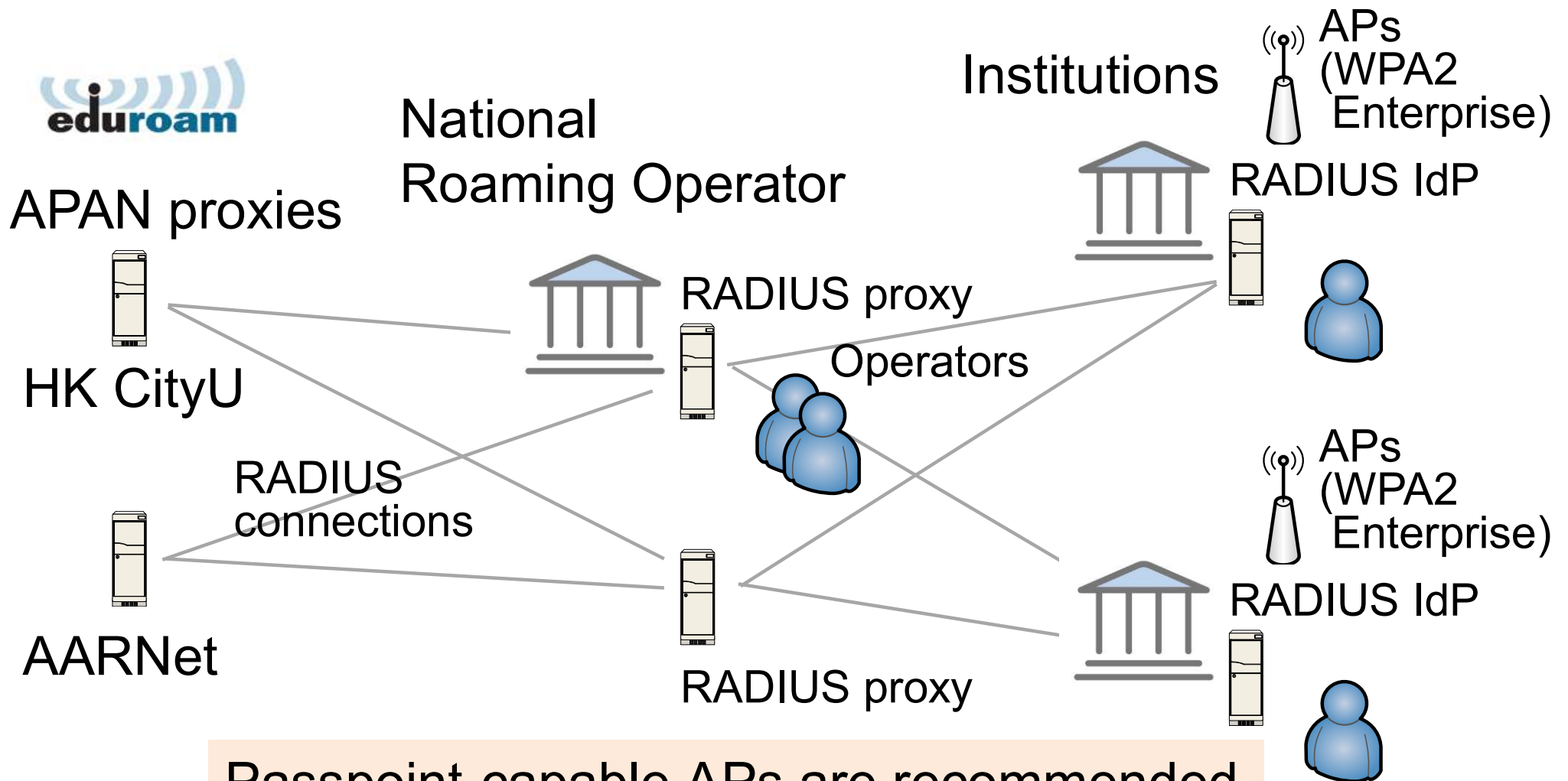
RADIUS proxy

Passpoint-capable APs are recommended for future development.

Software

- RADIUS server software
  - FreeRADIUS, Radiator, RADIUS appliances, managed/hosted service, etc.
  - radsecproxy (optional)
- Platform & tools
  - Any OS, like Linux, plus HTTP server.
  - openssl, etc.
  - eduroam database https://monitor.eduroam.org/
- Client-side software
  - OS built-in authenticator
    (Android, iOS/iPadOS/macOS, Windows, Linux, …)
  - geteduroam https://www.geteduroam.app/
  - eduroam Configuration Assistant Tool (eduroam CAT)
    https://cat.eduroam.org/

eduroam (basic)

National RO
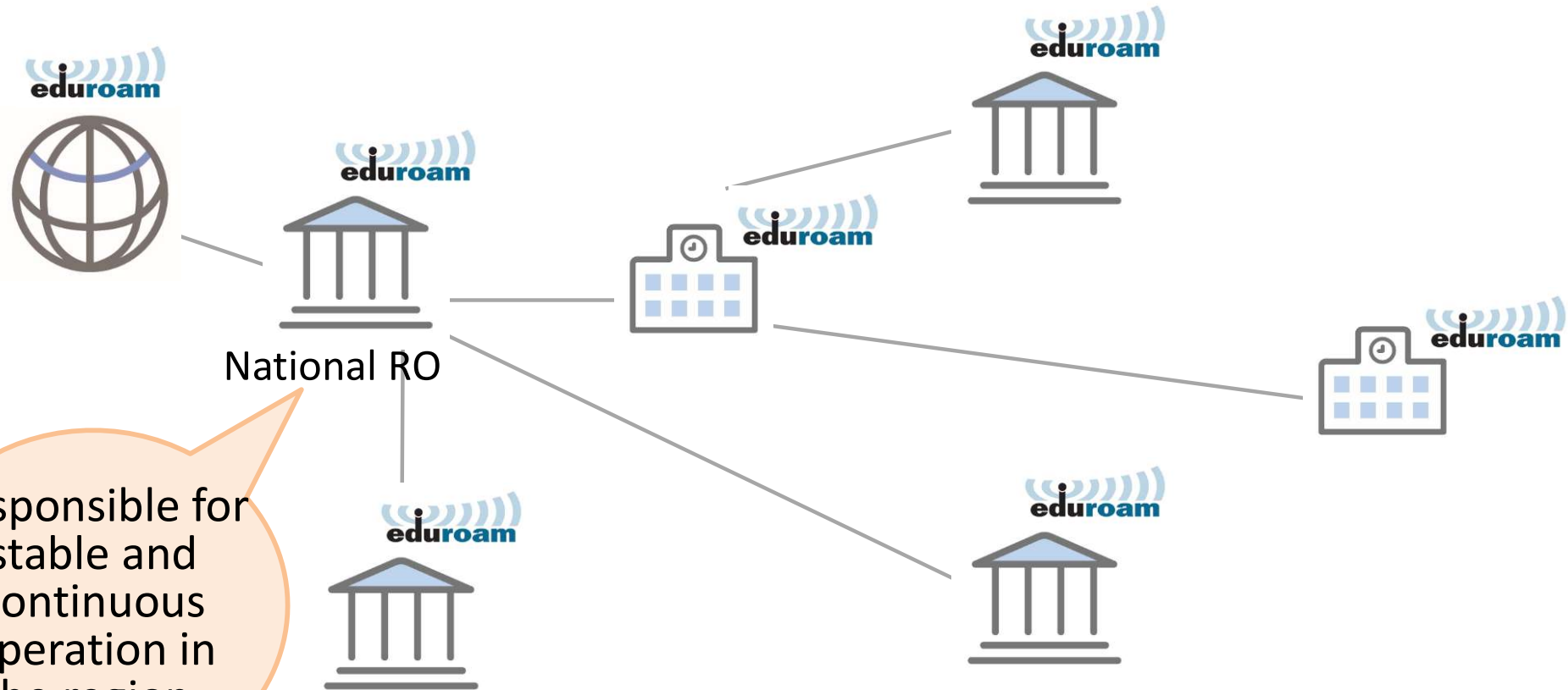
Responsible for stable and continuous operation in the region.

RO should try separating the membership from other services. eduroam is for any R&E inst.

eduroam and off-campus eduroam
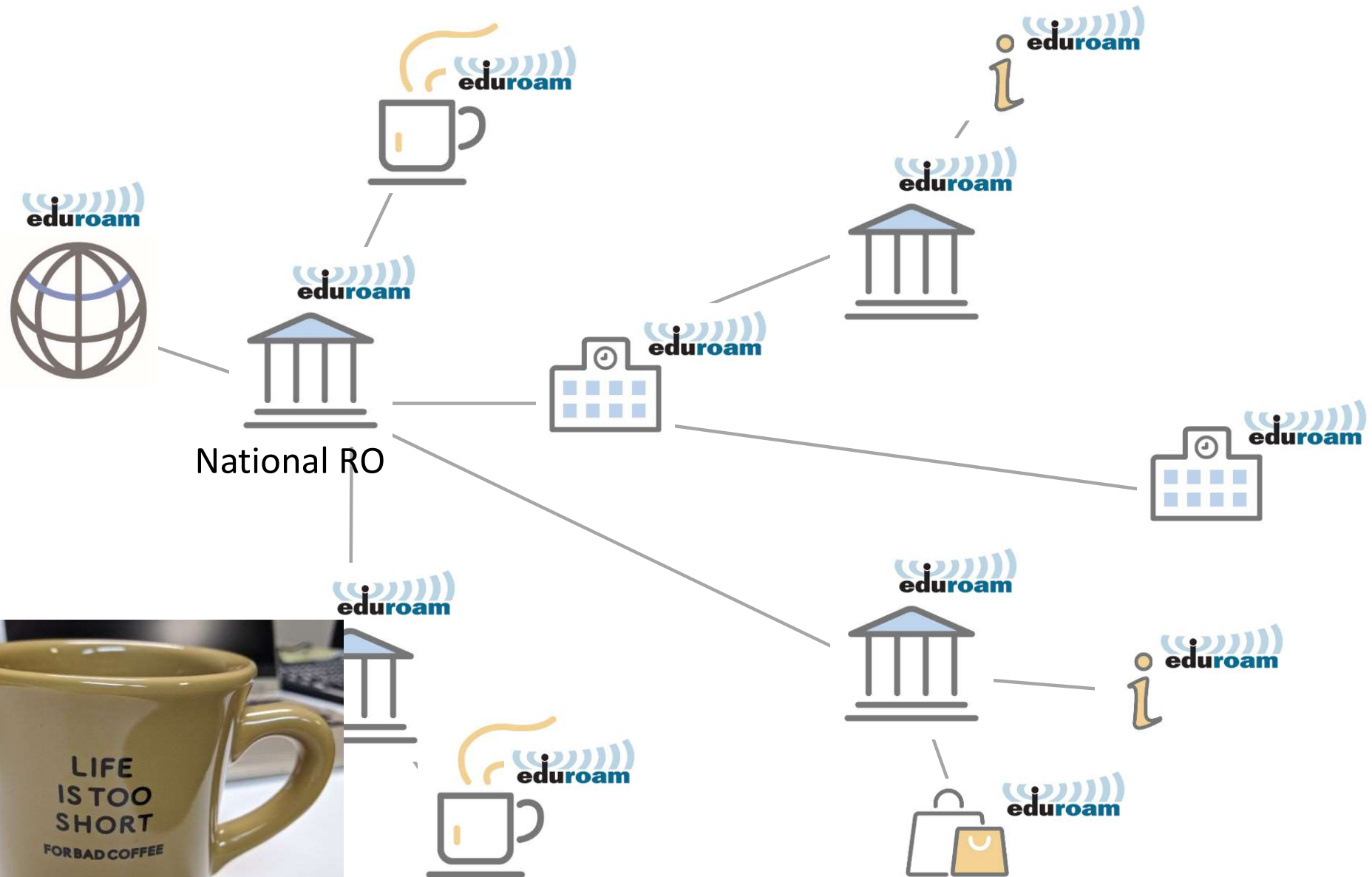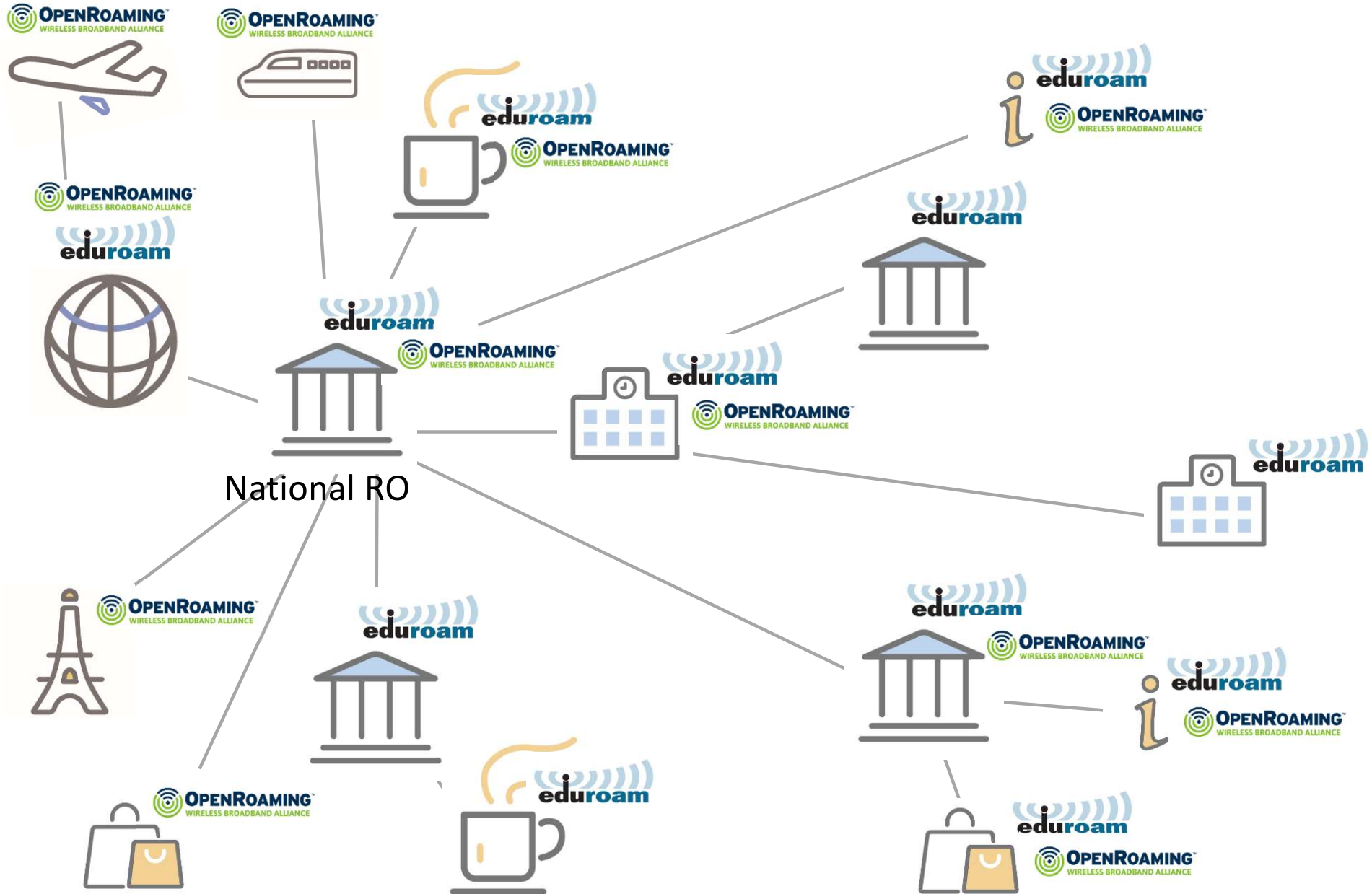
National RO

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eduroam + OpenRoaming as society infrastructure

National RO

Technologies in OpenRoaming are compatible with eduroam's. 13

WBA OpenRoaming

OPENROAMING™
WIRELESS BROADBAND ALLIANCE

- **eduroam-like, seamless connection experience for everyone,** not limited to R&E community.

- Inter-connect telcos, ISPs, City Wi-Fi, **eduroam**, etc.

- Based on Passpoint and Wireless Roaming Intermediary eXchange (WRIX) framework.

- PKI and RadSec + Dynamic Peer Discovery
  - Similar to eduroam, but in larger scale.

- Two policies using different RCOIs
  - Settled: Accounting and intermediary are required.
  - Settlement-free: No roaming fee. Easier onboarding. 👍

OpenRoaming deployment status

Nishi-Shinjuku Smart Pole project by Tokyo Met. Govt.

- PoC and pilot service in the Smart City project.
- eduroam, Cityroam, and OpenRoaming
- Two poles in Summer, 2021, **and 20 more poles in 2022**

Govt. Building

Shinjuku Station
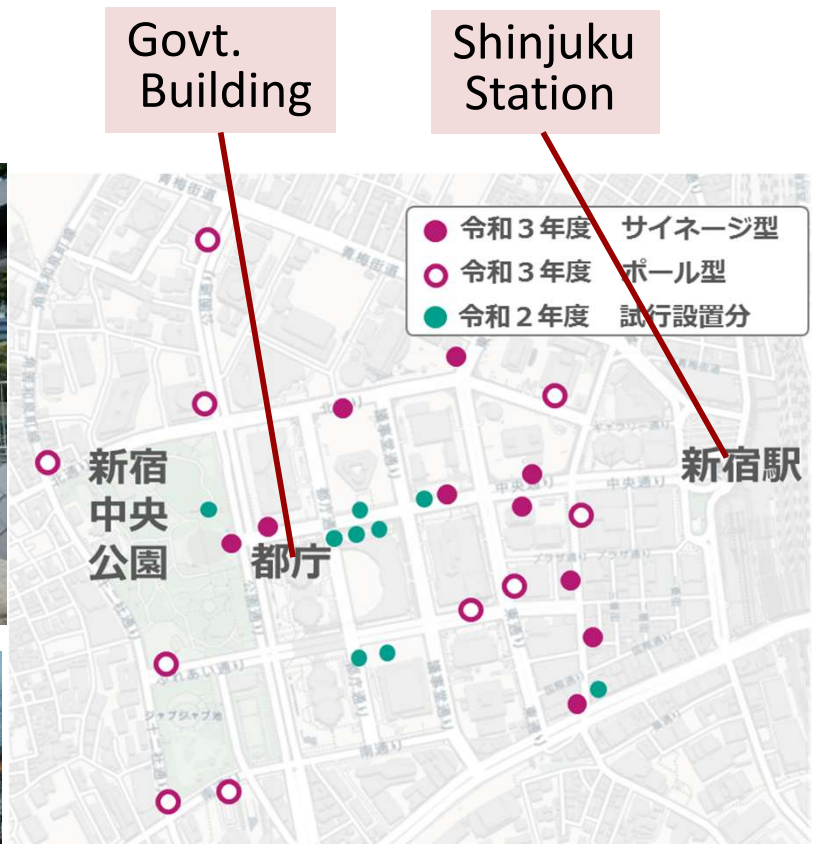
eduroam accesses: 75.4%

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Summary

- eduroam is the world standard Wi-Fi roaming system for Research and Education institutions. (now 106 territories)
- eduroam provides secure and automatic connection. Visitor access is quite easy.

- Off-campus eduroam is becoming popular.
- School (K-12) eduroam is emerging.

- To get government funding, consider adding OpenRoaming for citizens use, not limited to R&E.
  OpenRoaming will help deploying off-campus eduroam.

For more information about eduroam,

Join https://eduroam.slack.com/
and https://apan-network.slack.com/

Please call us if you want to develop an eduroam/OpenRoaming combined system.

cityroam   https://cityroam.jp/en/

- Supplementary slides

Our developments in the NICT Beyond 5G project (2022 –)

- ■ Joint project by
  Kyoto Univ., Local24 Inc., Tohoku Univ., NII, and GÉANT.
- ■ Efficient and stable 5G/Wi-Fi convergence together with QUIC multipath.
- ■ eduroam-OpenRoaming integration + SIM/eSIM AuthN.

(2) Associate SIM/eSIM issued by IIJ with the studentship through authentication at University A.

(4) Authorized to join the student network of University B using the SIM/eSIM associated with the credential of University A.

cell phone company

AAA Server

OpenRoamingAP

University A

University B

(1) Sign up for SIM/eSIM.

LTE(HSS) / 5GC(UDC)
HSS: Home Subscriber Server
UDC: User Data Convergence

(5) Automatically connected to OpenRoaming APs using SIM authentication.

Mobile terminal

Student at University A

(3) Visit University B