

June 9, 2023
Mobility Day at TNC23

eduroam/OpenRoaming combined deployment in Cityroam

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Nationwide Cityroam deployment in Japan

- **Cityroam is a roaming federation** providing secure roaming system for Public Wi-Fi since 2018.
- All venues provide both **eduroam and OpenRoaming** (2020-).
- Multi-operator, multi-vendor
- **Unique venues** across the nation. (90+ spots)



 (as of Apr. 2023)

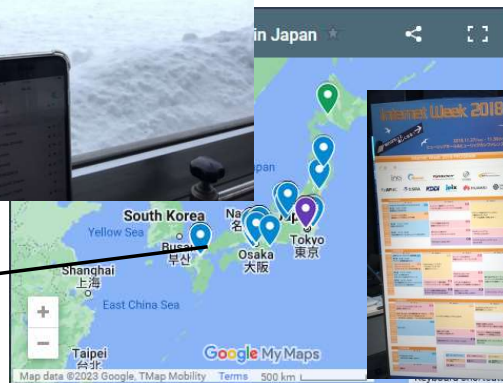


Cityroam venues

- Cafes, hotels, shopping malls, etc.
- Sapporo Gakuin University (for better services for residents)
- Ski resorts (Hakuba47)
- Kita-Kyushu Monorail stations
- Conference venues (temporary deployment)
Internet Week 2018 & 2019, AXIES 2018, 2021, 2022,
Comic Market 95th-97th, 99th-101st, etc.

New direction:
Univ.&Schools
should provide
Public Wi-Fi, too.

Cityroam supports quick
deployment of eduroam
+ Public Wi-Fi.



Mobile eduroam
/OpenRoaming AP
(over 4G & VPN)

Cityroam venues



Co-working space in Morioka
(OpenRoaming was added
in 2020)



Conference Center in Nagano
(May 2021)



Hot Spring facility in Nagano
(May 2021)

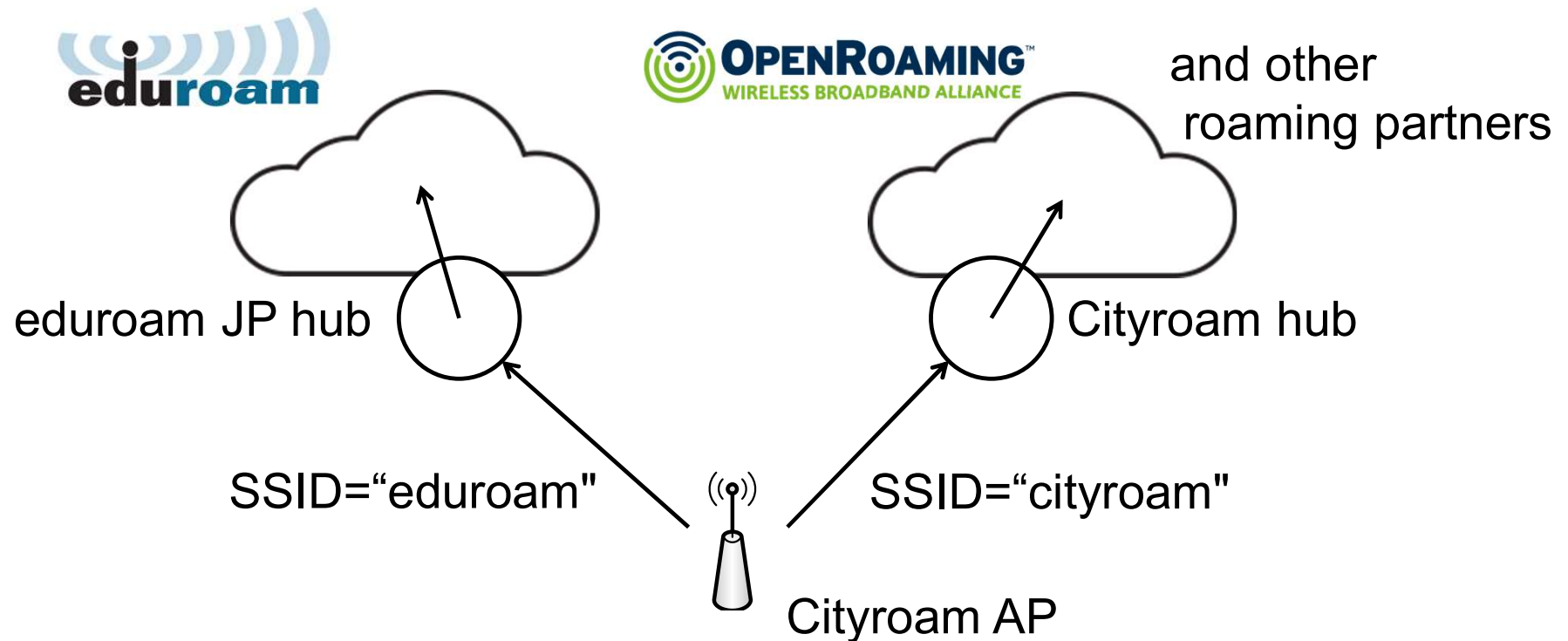


Resort Hotel & Complex in Ise
(Feb. 2022)



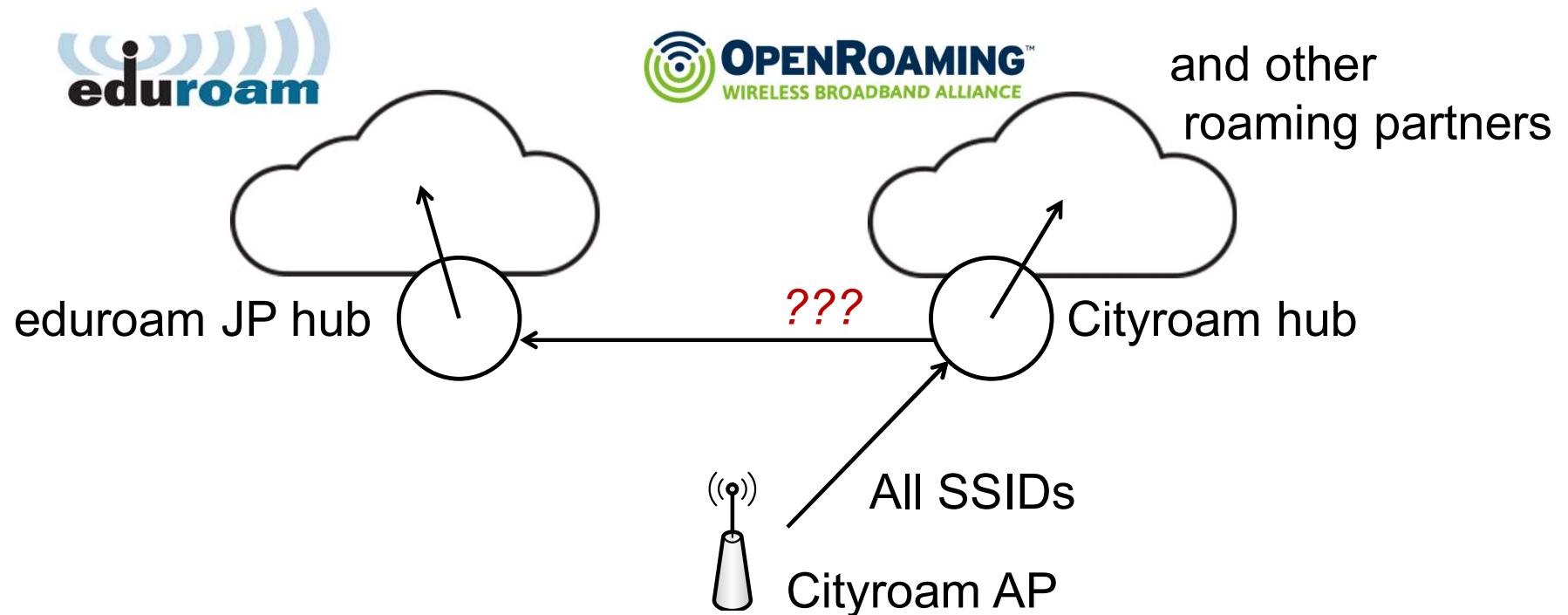
Vending machines in
Kyoto City Parks
(May 2020)

eduroam traffic separation – basic (but complex) implementation



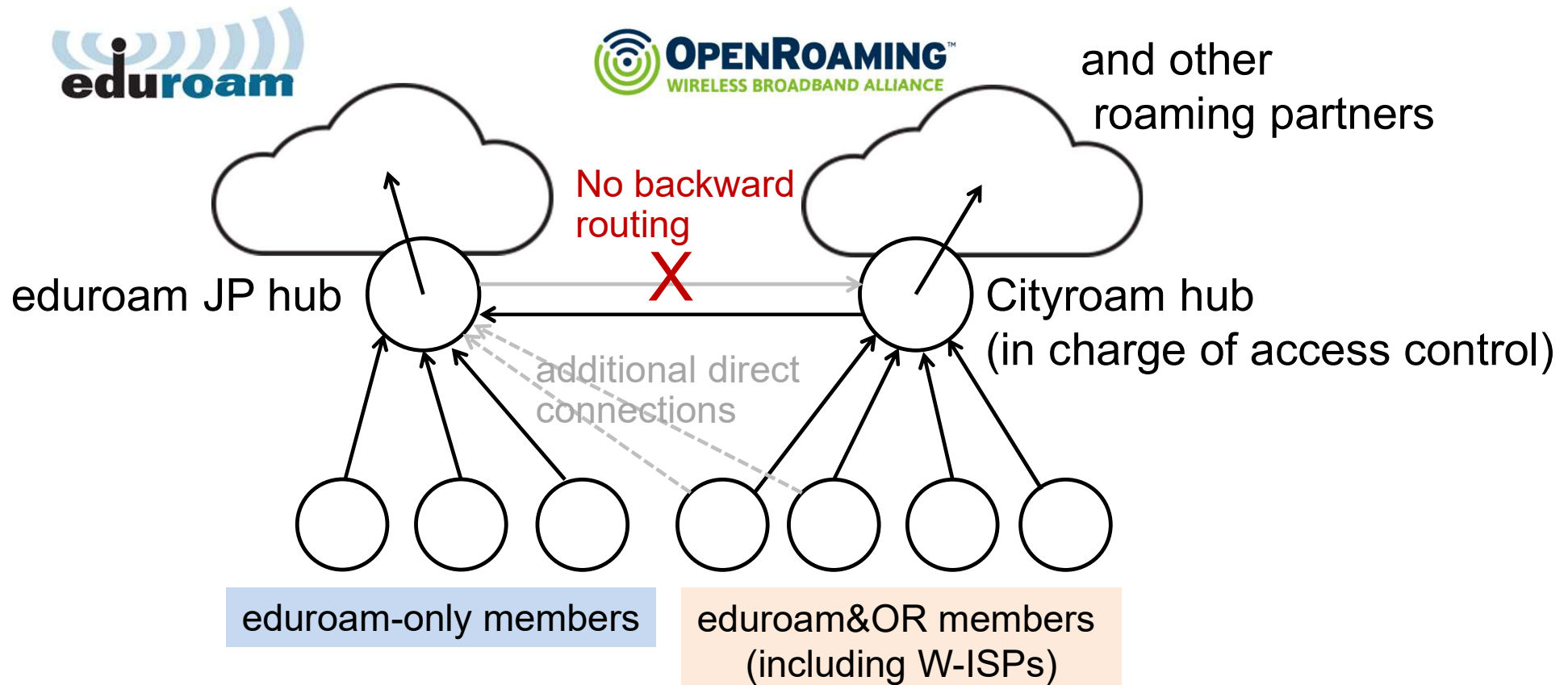
- Require multiple RADIUS connections
- Complex AP configuration

eduroam traffic separation – This doesn't work!



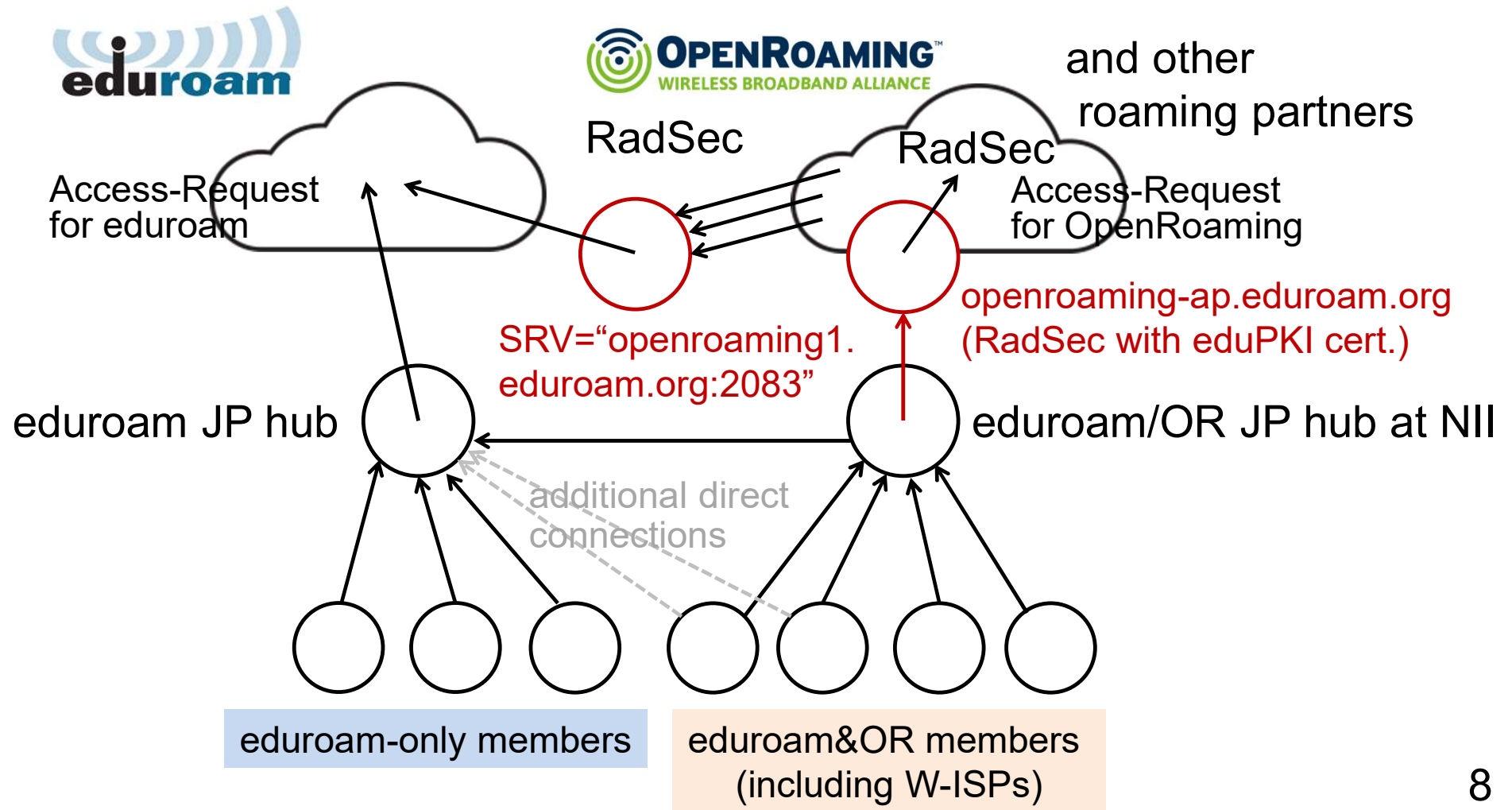
- You cannot see whether the access request is for eduroam or not by just looking at the realm.
For example, `anonymous@example.jp`

Access request routing in eduroam/OpenRoaming combined architecture



Forward to eduroam if (" $\%{\text{Called-Station-Id}}$ " = ~ /:eduroam/)

Using the eduroam.org OpenRoaming proxy (under dev.)



Renewed “TOKYO FREE Wi-Fi” supports OpenRoaming

- Released on Apr. 1, 2023
- Tokyo Metropolitan Government + KDDI / Wire & Wireless (Wi2)
- Enhanced security, safety, and usability. 😊



<https://wi-fi.metro.tokyo.lg.jp/en/>

OpenRoaming hotspots provided by the Tokyo Met. Govt.

- 4 new sites in Apr. 2023
- 600+ sites planned in 2023



Tokyo Metropolitan
Government Second Main
Building 3rd floor

Wi-Fi6 eduroam



Basta Shinjuku 3F (Tokyo
Tourist Information Center)

Wi-Fi6E eduroam



Shinjuku Metropolitan
Taxation Office (Main Bldg.
4F, Main Bldg. 6F)

Wi-Fi6 eduroam



Ohkubo Hospital (3rd floor
Waiting room)*示范

Wi-Fi6 eduroam

Smart Poles and Digital Signages
in Nishi-Shinjuku Area (2021-2022)



Rough access statistics in the eduroam/OpenRoaming combined deployment

- **eduroam accesses account for 75%**
- Details of the others cannot be disclosed...,
 - **SIM-based authentication is popular.**
The authentication is stable.
 - **Samsung's built-in OSU** produces high access counts.
The number of authentication failures is relatively high for unknown reasons.
 - Cisco OpenRoaming app is popular, but the percentage is not so high.

Embedded profiles win!

It is quite important to lower onboarding hurdles.

Outcome

- High access number from the beginning thanks to the eduroam users (although it's not actually OpenRoaming).

- eduroam has clearer value proposition.
 - Many municipalities take eduroam as a valuable application.
 - Some potential operators become interested in eduroam, while others like the “secure Wi-Fi for everyone,” i.e., OpenRoaming.

- Existing profiles (SIM) and built-in OSU work quite well.

Private 5G experimental AP

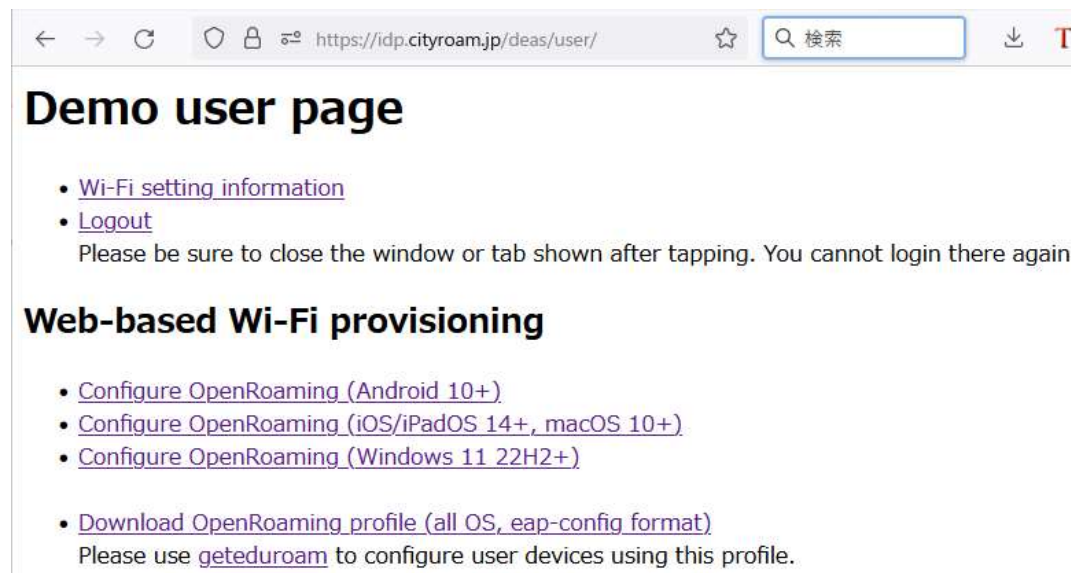
- A part of the NICT Beyond 5G program
 - Towards 5G / Wi-Fi convergence
 - In-door 5G AP with omnidirectional antenna (CU/DU/RU all-in-one)
 - SIM-based AuthN to be added.



- Supplementary slides

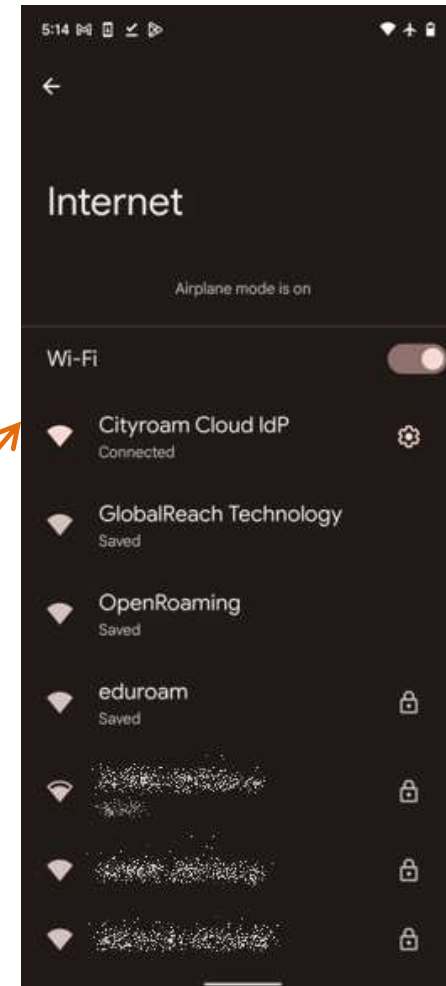
Passpoint Provisioning Tools

- Tools and codes that help operators develop their own Passpoint profile provisioning systems.
- The CGI perl scripts allow end users to download Passpoint profiles and configure Wi-Fi **without typing in Wi-Fi ID/password** or certificate.



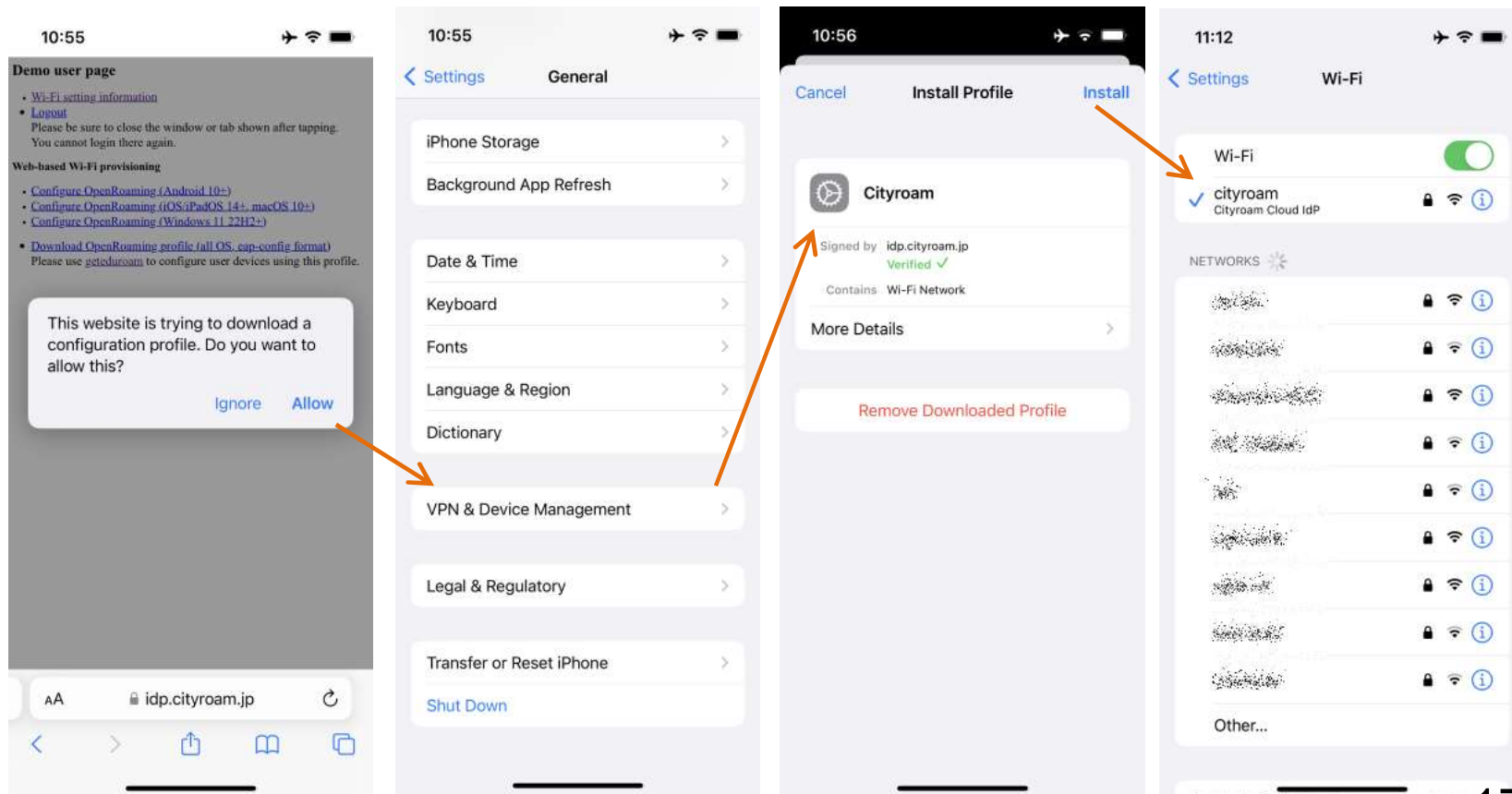
Profile Provisioning for Android

■ Profile in PPS MO format (w/o signing)



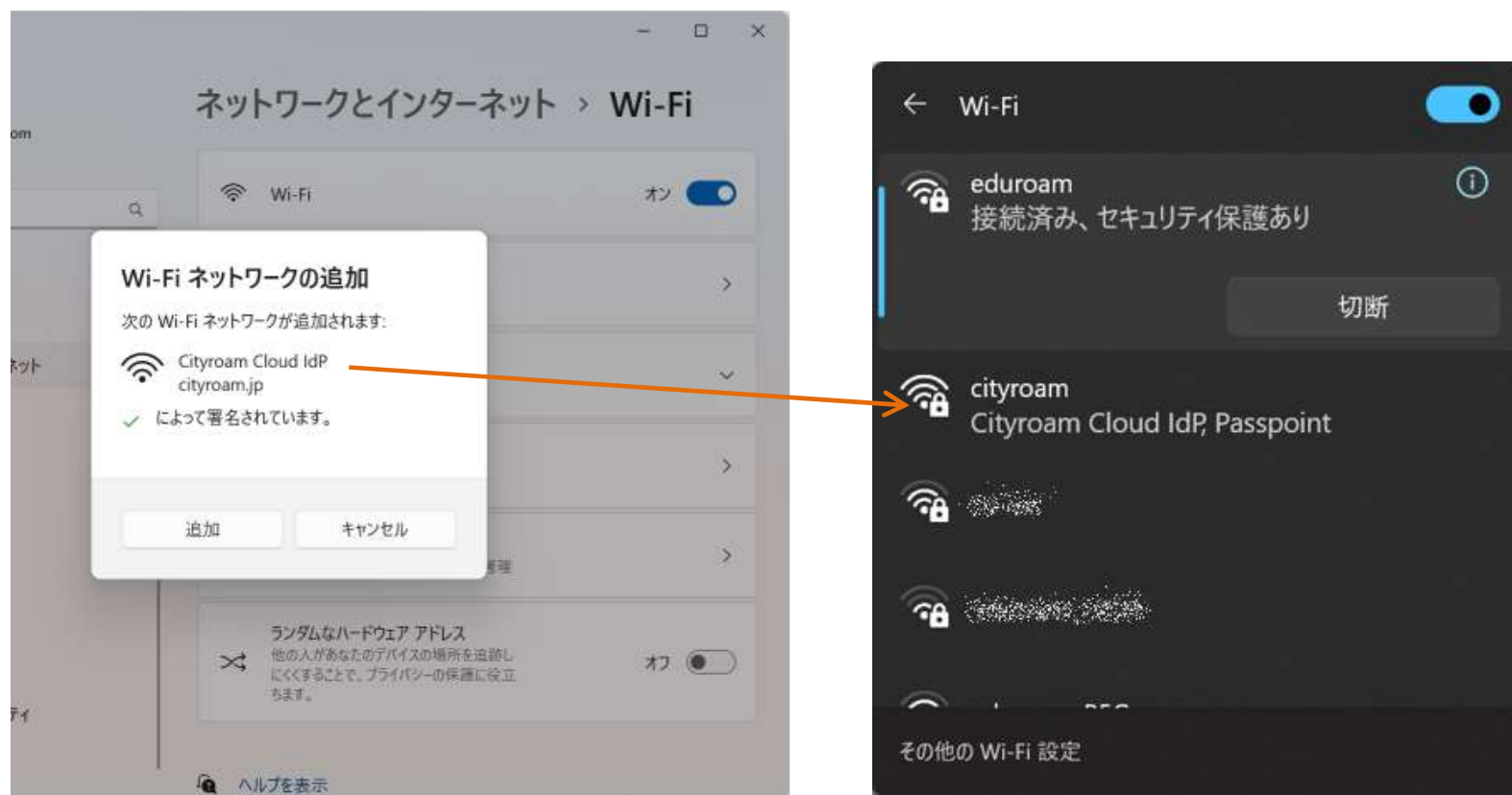
Profile Provisioning for iOS/iPadOS/macOS

- MDM using .mobileconfig
- Signing is optional.



Profile Provisioning for Windows 10/11

- ms-settings: URI scheme (EAP-TTLS only)
- Signing is required.
(Windows 11 21H2 and older require EV cert.)



Towards OpenWiFi

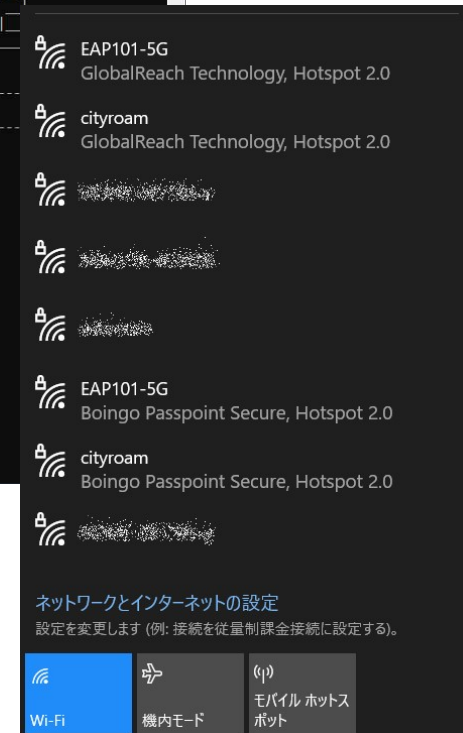
OpenWrt-based APs (Edgecore EAP101, EAP102)



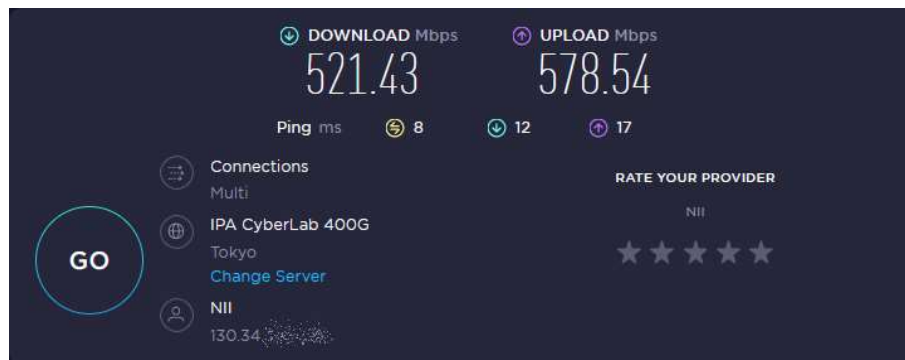
```
option iw_enabled '1'  
option iw_interworking '1'  
option iw_access_network_type '3'  
option iw_internet '1'  
option iw_disable_dgaf '1'  
option iw_asra '0'  
option iw_esr '0'  
option iw_uesa '0'  
option iw_osen '0'  
option iw_venue_group '2'  
option iw_venue_type '8'  
option iw_hessid '00:00:00:02:02:02'  
list iw_roaming_consorrtium 'xyyz0000'  
list iw_nai_realm '0,example.com,13[5:6],21[2:4][5:7]  
list iw_nai_realm '0,example.org,13[5:6],21[2:4][5:7]  
list iw_venue_name 'P'eng.testSite'  
list iw_venue_url '1:http://www.example.com/info-eng'  
option iw_network_auth_type '00'  
option iw_ipaddr_type_availability '0c'  
list iw_domain_name 'example.com'  
option hs20 '1'  
option hs20_oper_friendly_name 'eng.testSite'  
option hs20_operating_class '5179'
```

```
admin@EAP101: ~  
C:\Users\admin>ssh admin@192.168.2.1  
admin@192.168.2.1's password:  
  
BusyBox v1.30.1 () built-in shell (ash)  
  
Edge-core  
-----  
TRANSFORMING THE WAY THE WORLD CONNECTS (11.6.4, 1333)  
  
admin@EAP101:~# cat /etc/os-release  
NAME="Edgecore"  
VERSION="11.6.4"  
ID="edgecore"  
ID_LIKE="lede openwrt"  
PRETTY_NAME="Edgecore 11.6.4"  
VERSION_ID="11.6.4"  
HOME_URL="https://openwrt.org/"  
BUG_URL="https://bugs.openwrt.org/"  
SUPPORT_URL="https://forum.openwrt.org/"  
BUILD_ID="r11142-8c19171255"  
OPENWRT_BOARD="ipq807x/ipq60xx"  
OPENWRT_ARCH="arm_cortex-a7"  
OPENWRT_TAINTS="no-all busybox override"  
OPENWRT_DEVICE_MANUFACTURER="Edgecore"  
OPENWRT_DEVICE_MANUFACTURER_URL="https://openwrt.org/"  
OPENWRT_DEVICE_PRODUCT="EAP101"  
OPENWRT_DEVICE_REVISION="v0"  
OPENWRT_RELEASE="Edgecore 11.6.4 r11142-8c19171255"  
admin@EAP101:~#
```

Hotspot 2.0 configuration is the same as in OpenWrt.



Inexpensive Wi-Fi 6 AP for Managed OpenRoaming ?



Fantastic performance using WireGuard VPN. 😊

eduroam over OpenRoaming

- eduroam supports three wireless association methods.
 - SSID-based, legacy 802.1X (eduroam's standard)
 - Passpoint using eduroam's own RCOI.
 - Passpoint using RCOI(s) defined in OpenRoaming.

- Fixed SSID is preferred so far. Why?
 - Widely adopted.
 - Simple and monolithic service.
 - Passpoint support on user equipment has not been matured.
High QoS is required in R&E.