Cityroam, Providing Secure Public Wireless LAN Services with International Roaming

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Security threats in the current Public Wi-Fi

- No doubt, open Wi-Fi is *unsecure*!
- Vulnerable to Eavesdropping, MITM attacks.
- Anyone can set up *Evil Twin Access Points*. (Even with WPA-PSK)
- Malicious scripts may be screwed in by the Captive Portal and/or AP itself.
- No means to check if the AP is genuine or not.

Who is the actual user?

Hey, use dot1X or Passpoint!
Next Gen Public Wi-Fi with Passpoint (Hotspot 2.0)

- Some operators provide secure Wi-Fi option:
  - San Francisco & San Jose Wi-Fi (2014)
  - Orange Romania (2014)
  - LinkNYC (2016), InLinkUK (2017)
  - Boingo provides Passpoint Secure at >27+ airports in US, Brazil, Portugal
  - US phones come with built-in Passpoint, enabling automatic connection to Wi-Fi

Wi-Fi Alliance and Wireless Broadband Alliance (WBA) are promoting Passpoint/NGH.
What is eduroam?

eduroam (education roaming) 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/
eduroam promotion video by AARNet

Inst. A  students / staff  Inst. B
Internet  Home inst.
The world becomes a virtual campus!

- 130+ eduroam hotspots at rental meeting rooms, cafes, etc. in the central area of Tokyo since 2011
- eduroam at airports, train stations, etc. in Sweden
- eduroam on HotCity (municipal Wi-Fi) in Luxemburg
- eduroam at 19 airports in Norway
- eduroam in downtowns of York, Munich, Porto, etc.
- 132 hospitals in the UK (as of 2017)
Why City/Free Wi-Fi & off-campus eduroam?

- Tourism
- Smart Cities
- Provide citizens with access means for various electronic services.
- Wi-Fi for all. (WiFi4EU by European Commission) (resolving digital divide)
- Community supports for Research & Education.

What do we need?

- Secure connection means with high usability
- Roaming
- User’s identity verification and traceability (for security, trust between operators, and compliance)
Roaming System for City/Free Wi-Fi

- Conventional roaming systems are not scalable as they are often based on bilateral agreements.
- No large-scale roaming system for City/Free Wi-Fi yet.
- eduroam is the largest, but only for R&E use.
Routing problem in DNS-based realms

- Service Providers (SPs) cannot find which Roaming Consortium to send the authn request by looking at the realm only.
  - eduroam/govroam use realms like:
    - <UserName>@<InstName>.ac.jp
    - <UserName>@<InstName>.jp
    - <UserName>@<InstName>.org

[Diagram showing DNS-based realms and OpName-based realms]
NGH Special Interest Group (NGHSIG) Since Jan. 2017

- Push forward dot1X adoption and Hotspot 2.0 deployment to make Public Wi-Fi secure.
- Exchange and accumulate technical info. about RADIUS, roaming, and HS2.0.
- Provide NGH testbed for development and pilot service (now as Cityroam).
- Develop an inter-roaming architecture, “eduroam/govroam on NGH”
- Survey on legal aspects and compile rules.

https://nghsig.jp/en/
Cityroam, the secure roaming system for Public Wi-Fi

- Passpoint/NGH as well as dot1X
- Affordable roaming platform for various RCs and operators including small ones and cities.
  - IdP: eduroam, ANYROAM, NGHSIG Cloud IdP, etc. (planned: telcos/ISPs and cities via NGH hub)
  - SP: Free Wi-Fi operators supporting 1X/Passpoint

Strategies:

No roaming fee settlement. (Each City/Free Wi-Fi has its own local ecosystem.)

Utilize existing accounts as much as possible. (roaming with operators)
NGH testbed system in Japan

- DNS-based realms: eduroam, ANYROAM, WBA/City Wi-Fi, etc.
- OpName-based realms: Tohoku University, Shopping Mall Wi-Fi, Seaport Wi-Fi, etc.

Basic connections: Solid lines
Optional/example connections (bilateral): Dashed lines
Inter-roaming Hub layer for connecting Roaming Consortia

All AuthN requests with .jp realms except the known operators'.

NGH hub operators

Inter-roaming Hub layer

XXroam govroam
City Wi-Fi Roaming 2017

- NGH trial program by WBA
  - Period: World Wi-Fi Day (June 20) – Aug. 20
  - 40 carriers, some Wireless ISPs, and about 20 cities
  - Tohoku University became the first academic institution participating in the trial. (NGHSIG as the first NGH operator in Japan)

Five spots in the country.

Eduroam/NGH-ready hotel in Kyoto.
eduroam on NGH

- Roaming tests during the City Wi-Fi Roaming trial, enabling eduroam service on City Wi-Fi.
- Connected the eduroam JP proxy to the NGH infrastructure.
- RADIUS test from ER Telecom in Russia.
- Connection tests in Birmingham and Leeds in the UK.

It works!

😊 😊 😊

Successful connection using eduroam credentials on the Briggate Street, Leeds.
Conclusions

- Established the NGH Special Interest Group.
- Developed an inter-roaming architecture for large-scale roaming and an NGH testbed,
- Started a pilot service “Cityroam”, combined with eduroam.

Future Current development work

- Passpoint Onboarding System for guests.
- World-wide roaming system for secured Public Wi-Fi.