



eduroam and RIPE Atlas

SIG-PMV – Wednesday 29th November 2017

Brook Schofield, GÉANT Association

brook.schofield@geant.org

Promotional video



Promo video: Visit <http://youtu.be/TVCmcMZS3uA>₂

Where is eduroam?



What is eduroam?



- **eduroam is a global wireless roaming network, based on:**
 - WPA2 & 802.1X (network access control)
 - RADIUS (infrastructure to transport credentials)
 - Trust fabric (RADIUS hierarchy and policy)
 - No web splash screen portal or shared passwords
- **Started in the TERENA Task Force “Mobility”**
- **eduroam = education roaming**

What else is like eduroam?



- eduroam is similar to other wireless hotspots



WiFi Powered by
The Cloud
A BSKyB company

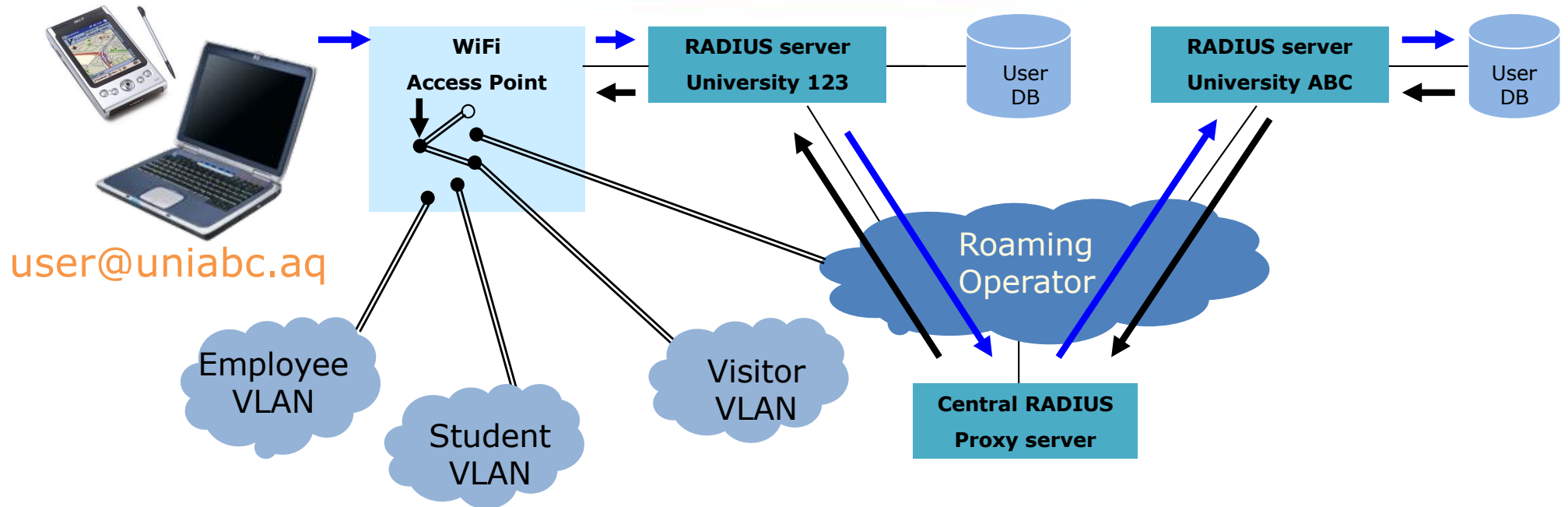
xfinity



- ...but eduroam is a service via an overlay
 - We don't run our own hotspot infrastructure



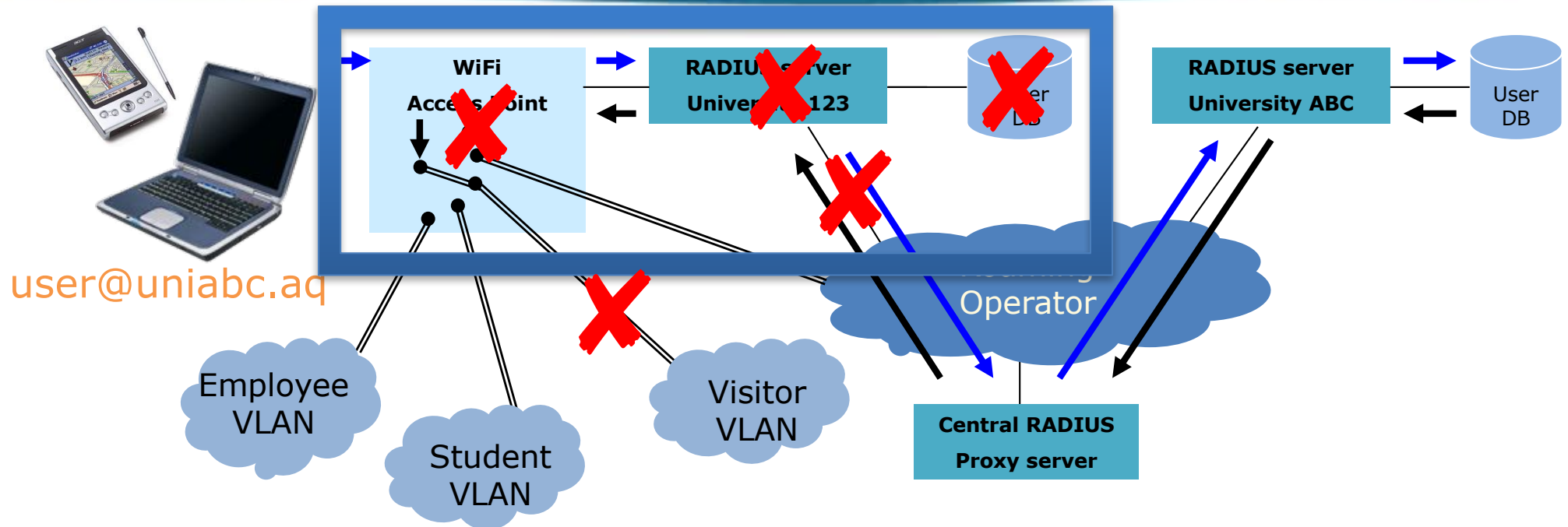
How it works...



→ signaling
== data

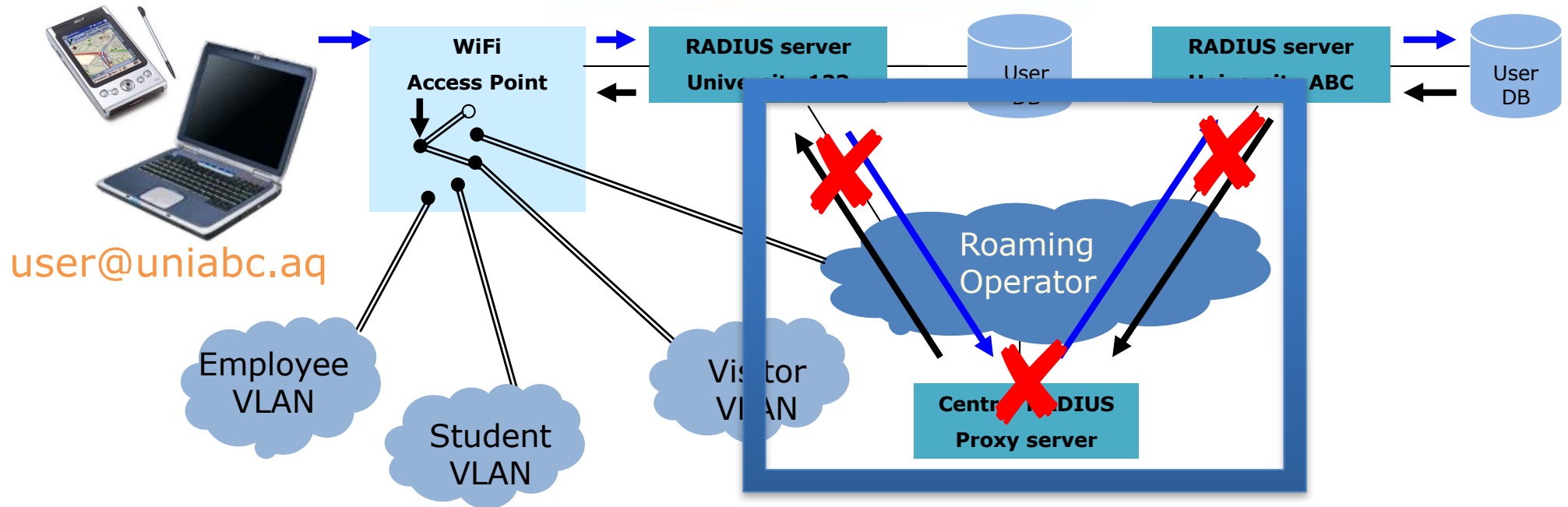
- Trust based on national policy
- Security based on 802.1X/RADIUS
- VLAN assignment to separate users

How it works... ..and where it breaks



- On the campus: User DB, RADIUS server, Link to Upstream Roaming Operator, Access Points or Controller, VLAN/DHCP/IP Addressing
- Always the Users Fault!

How it works... ..and where it breaks



- Roaming Operators: Upstream/Downstream, Firewalls, Top-Level Servers, RadSec + Dynamic Discovery
- We can still blame the user!

The user blames eduroam!



- **Users offer feedback...**



Joanna Williams @JoannaWills · Mar 12

@94ellenb you remind me of **eduroam**, because you're **unreliable** and I often find it difficult to connect to you



Eric Wilson @eeeDubs · Mar 30

30 minutes attempting to **connect** to **eduroam** and uwosecure-v2, I think I set a new record. [#ShittyCampusWifiProblems](#)



Steve White @stevewhite94 · Mar 19

Eduroam makes me want to break down and cry.



Tom Murray @tomarsemurray · Mar 18

fuck **eduroam**



Why a configuration assistant tool?



- **Solve the user confusion problem**
 - Institutional flexibility causes a documentation problem... ..installation is the hardest part.



UoB Library @uobllibrary

20h

iOS 6 devices unable to connect to UoB wifi after upgrade. Try using **eduroam** with un: regno@beds.ac.uk and normal pw.

tinyurl.com/bvep9wb



Jules @Jurasikk

26 Sep

has anyone even figured out **#UI eduroam** on mac's yet? I am still lost and confused....



Chris Painter @chrisfornow

26 Sep

Could anybody **@CiCS** tell me what CA certificate I need to specify when connecting to the **eduroam** WiFi network on a BlackBerry? **#Confused!**

Why a configuration assistant tool?



	Clear-text	NT hash (ntlm_auth)	MD5 hash	Salted MD5 hash	SHA1 hash	Salted SHA1 hash	Unix Crypt
PAP	✓	✓	✓	✓	✓	✓	✓
CHAP	✓	✗	✗	✗	✗	✗	✗
Digest	✓	✗	✗	✗	✗	✗	✗
MS-CHAP	✓	✓	✗	✗	✗	✗	✗
PEAP	✓	✓	✗	✗	✗	✗	✗
EAP-MSCHAPv2	✓	✓	✗	✗	✗	✗	✗
Cisco LEAP	✓	✓	✗	✗	✗	✗	✗
EAP-GTC	✓	✓	✓	✓	✓	✓	✓
EAP-MD5	✓	✗	✗	✗	✗	✗	✗
EAP-SIM	✓	✗	✗	✗	✗	✗	✗

- <http://deployingradius.com/documents/protocols/compatibility.html>

Why a configuration assistant tool?



- **Institution choose Authentication Type**
 - PEAP-MSCHAPv2 popular for Microsoft Platforms
 - TTLS-PAP popular for sites with encrypted LDAP
 - TTLS-* is only supported in Wi-Fi Passpoint
- **Multiple Device Platforms**
 - MacOS X and iOS devices (iPod, iPhone, iPad)
 - Microsoft Windows
 - Android Phone and Tablets (and Chrome OS)
 - Other laptops/phones/tablets less popular (but need support) and new devices appear...

- 2009 - RIP
- AARNet
- SheevaPlug
- \cong €100
- Didn't Scale
- Not a community



Active Monitoring eduroam Node (AMeN)



- **2009 – 2018 (being shutdown)**
- **Alix System**
- **SURFnet**
- **≈€100**
- **Deployed at >20 sites**
- **Replacement service?**



Srcce Raspberry Pi (“Frankenprobe”)

- **2012 → Current**
- **Raspberry Pi**
- **Srcce**
- **≅€100**
- **Not a solution**
- **Scanning for SSIDs
& Signal Quality**



- 2014 → Current
- Raspberry Pi
- UNINETT
- \cong €120
- Trouble shooting,
continuous
quality
measurments



- **2012 – 2017 (still running)**
- **TP-Link MR3020**
- **≈ Atlas v3**
- **wpa_supplicant & scripts**
- **> 200 probes deployed**

lboro.ac.uk
▫ General
▫ eduroam UK NAGI
▫ eduroam UK config
▫ eduroam UK probe
▫ my account
▫ log out

Home



We've tried and tried...



- **eduroam “pulse” – AARNet**
 - dead
- **AMeN – SURFnet**
 - deprecated
- **Raspberry Pi “frankenprobe” – Srce**
 - work in progress
- **Trådløs Probe – UNINETT**
 - campus quality measurements
- **Loughborough Uni Probe – Jisc**
 - best hope?!?

Why WLAN measurements on Atlas?

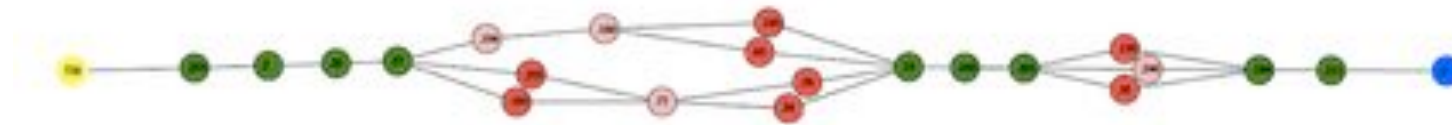


- **Janet/Loughborough Uni as PoC**
 - Proof that it can work...
 - ...previous solutions show utility – but not scale.
- **eduroam \cong Hotspot 2.0**
 - Hotspot 2.0 + Next Generation Hotspot both 802.1X
 - WLAN hotspot providers might be interested in sponsoring
- **Atlas has the footprint + infrastructure**
 - Can scale to >10k probes
 - Datasets can be public + available over time

- **v1 & v2 hardware**
 - Lantronix
 - Lots of €£\$
 - No wireless
- **v3 hardware**
 - TP-Link hardware
 - Very cheap ¢
 - 2.4GHz wireless



- **Is IPv4 and IPv6 traceroute consistent?**



- **Amsterdam power outage**

- **Visit labs.ripe.net**



- **v3 Hardware has WiFi chips**
 - V4 hardware plans have been delayed due to probe failure.
 - **Almost 10k probes**
 - 8093 are v3 and connected (as of this morning)
 - <https://atlas.ripe.net/api/v2/probes/?tags=system-v3&status=1>
 - 12 have WiFi firmware
 - <https://atlas.ripe.net/api/v2/probes/?tags=system-wifi&status=1>

RIPE Atlas: Production Environment



RIPE NCC
RIPE NETWORK COORDINATION CENTRE

RIPE Database (Whois) Website

Search IP Address or ASN

Manage IPs and ASNs > **Analyse** > Participate > Get Support > Publications > About Us >

You are here: Home > Analyse > Internet Measurements > RIPE Atlas

- RIPE Atlas <<
- About RIPE Atlas >
- Get Involved >
- Probes and Anchors >
- Measurements, Maps and Tools >
- Resources >
- RIPE NCC Members

Welcome to RIPE Atlas!

With your help, the RIPE NCC is building the largest Internet measurement network ever made. RIPE Atlas employs a global network of probes that measure Internet connectivity and reachability, providing an unprecedented understanding of the state of the Internet in real time.

Get Involved

Statistics

Probes connected	10332
Anchors connected	293
Measurements running	17789
Results per second	5474

<https://atlas.ripe.net/>

RIPE Atlas: Wireless Probe



You are here: Home > Analyse > Internet Measurements > RIPE Atlas > Probes > Probe #17616

- RIPE Atlas <<
- About RIPE Atlas >
- Get Involved >
- Probes and Anchors >
- Measurements, Maps and Tools >
- Resources >
- RIPE NCC Members

GÉANT Amsterdam v3

General Network Built-ins UDMs

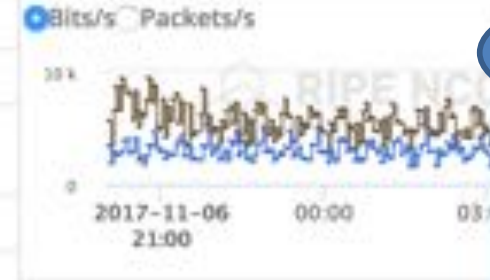
General Information

Id 17616
Architecture **tl-mr3020-wifi**

Firmware Version
Router Type
Shared Publicly Yes

User Tags
Fibre, Datacentre, Academic, No NAT, Native IPv6, IPv4, IPv6, WLAN, Native IPv4
System Tags
V3, IPv4 Capable, IPv6 Capable, WIFI, Main drive filesystem corrupted

Connection & Traffic



Connected Time



3 weeks, 1 day
#17616
Firmware 4785
tl-mr3020-wifi
The displayed location is approximated to protect the probe host's privacy.



<https://atlas.ripe.net/probes/17616/>

GÉANT Amsterdam

General Network Built-ins **UDMs** Status (beta)

Search here Started Stopped Running

Measurement	Target	Start (UTC)	Stop (UTC)	Status
1093177		2016-06-15 08:06:33		▶
1093174		2016-06-15 07:57:41		▶
1093172		2016-06-15 07:37:12		▶
1093170		2016-06-15 07:28:07		▶
* ⁴ 1092800	www.ietf.org.	2016-06-07 13:22:33		▶
1092799		2016-06-07 13:22:33		▶
* ⁶ 1092094	stereo.hq.phicoh.net	2016-05-24 09:57:06		▶
1092093		2016-05-24 09:57:06		▶

WiFi measurement

General Information

Probes

Results

General Information

Stop

ID	#1093177
Type	WiFi
Owner	Brook Schofield
Charge credits to	Brook Schofield
Public measurement?	Yes
Resolve on Probe	No
Interval / spread	300 seconds / default
Timing	2016-06-15 08:06 No stop time defined
Anonymous identity	certok@guest.showcase.surfnet.nl
Phase2	auth=EAP-MSCHAPV2
Ssid	eduroam

Probe Allocations



Allocated
Requested but not allocated

Responses



Responding
Not responding

Costs



This measurement's daily costs
Other daily costs

WiFi measurement

General Information

Probes

Results

Time Travel

Probe	ASN (IPv4)	ASN (IPv6)			Time (UTC)
203	1103	1103			2016-06-16 09:59
204	1103	1103			2016-06-16 09:59

RIPE Atlas: A measurement



```
"anonymous_identity": "certok@guest.showcase.surfnet.nl",
"cert": null,
"creation_time": 1465977993,
"description": "WiFi measurement",
"eap": "TTLS",
"extra_wait": null,
"group": "https://weir-test.atlas.ripe.net/api/v2/measurements/groups/1093177",
"group_id": 1093177,
"id": 1093177,
"identity": "brook@guest.showcase.surfnet.nl",
"in_wifi_group": true,
"interval": 300,
"ipv4": true,
"ipv6": true,
"is_all_scheduled": true,
"is_oneoff": false,
"is_public": true,
"key_mgmt": "WPA-EAP",
"participant_count": 2,
"phase2": "auth=EAP-MSCHAPV2",
"probes_requested": 2,
"probes_scheduled": 2,
"resolve_on_probe": false,
"resolved_ips": null,
"result": "https://weir-test.atlas.ripe.net/api/v2/measurements/1093177/results",
"rssi": true,
"spread": null,
"ssid": "eduroam",
"start_time": 1465977993,
"status": {
  "id": 2,
  "name": "Ongoing"
},
```

RIPE Atlas: Failure Result



```
{
  bundle: 1465978255,
  error: "wpa timeout",
  from: "2001:610:514:116:eade:27ff:fe69:adc0",
  fw: "4735",
  group_id: 1093177,
  msm_id: 1093177,
  msm_name: "WiFi",
  prb_id: 204,
  timestamp: 1465978255,
  type: "wifi",
  wpa_supPLICANT: {
    EAP: "state",
    SupPLICANT: "PAE",
    address: "ea:de:27:69:ad:c0",
    bssid: "d8:54:a2:51:dd:d4",
    connect-time: "11",
    group_cipher: "CCMP",
    id: "0",
    ip_address: "192.87.161.78",
    key_mgmt: "WPA2/IEEE",
    mode: "station",
    pairwise_cipher: "CCMP",
    ssid: "eduroam",
    suppPortStatus: "Unauthorized",
    wpa_state: "ASSOCIATED"
  }
},
```

RIPE Atlas: Success Result (partial)



```
{
  bundle: 1465306249,
  error: "IPv6 RA timeout",
  from: "2001:610:148:f00d:ea94:f6ff:fee3:74a0",
  fw: "4735",
  group_id: 1092799,
  msm_id: 1092799,
  msm_name: "WiFi",
  prb_id: 203,
  timestamp: 1465306249,
  type: "wifi",
  wpa_supplicant: {
    EAP: "TLS",
    EAP-TTLSv0: "Phase2",
    Supplicant: "PAE",
    address: "ea:94:f6:e3:74:a0",
    bssid: "00:26:3e:8c:ad:04",
    connect-time: "7",
    group_cipher: "CCMP",
    id: "0",
    ip_address: "192.87.38.53",
    key_mgmt: "WPA2/IEEE",
    mode: "station",
    pairwise_cipher: "CCMP",
    selectedMethod: "21",
    ssid: "eduroam",
    suppPortStatus: "Authorized",
    wpa_state: "COMPLETED"
  }
},
```

- **API currently available for measurement creation**
 - **Only supports:**
 - TTLS-EAP-MSCHAPV2
 - TTLS-MSCHAPV2
 - TTLS-PAP
 - PEAP-MSCHAPV2
 - **Uses wpa_supplicant in OpenWRT**
 - New features need to be in wpa_supplicant (such as PWD)
 - **Nested tests**
 - Ping, Traceroute, TLS Cert Check, DNS, NTP
 - **Web UI**

Create a New Measurement

Step 1 Definitions

+ Ping + Traceroute + DNS + SSL + HTTP + NTP + WiFi

Step 2 Probe Selection


Worldwide 10 x


+ New Set - wizard + New Set - manual + IDs List

+ Reuse a set from a measurement

Step 3 Timing

This is a One-off:

Start time (UTC): 

Stop time (UTC): 

> Measurement API Compatible Specification

Create a New Measurement

Step 1 Definitions

WiFi measurement to eduroam

SSID*:
eduroam

Key management:
WPA-EAP

Certificate:

Base64 encoded certificate

Password:

Description:
WiFi measurement to eduroam

Interval:
900
How often this should be done (seconds between samples). Note that this value is ignored for one-off measurements.

Identity:

Anonymous Identity:

Check IPv4:

Check IPv6:

- **Dev/Test aren't publicly accessible**
 - 4 dev probes in our control
 - There are 8 probes – 4 are ours
 - SURFnet, 2 x Loughborough and GÉANT
- **Production**
 - There are 12 probes available (6 online)
 - <https://atlas.ripe.net/api/v2/probes/?tags=system-wifi&status=1>

- **How to roll out WLAN capability?**

- **User Tag + Opt-in**
 - Unable to Opt-out
- **Check ASNs + preload**
 - Ask the probe hosts
- **Additional probes will be made available**



- **An API for WLAN measurements**
 - ~~Scan~~
 - Associate
 - Authenticate
 - Measurement (dns, ping, traceroute, SSL cert)
 - Report
- **Orchestration + Visualisation of eduroam Tests**
 - Still a responsibility of eduroam Ops (or SIG-PMV)
 - Community can built on this infrastructure

Let's Discuss...





Brook Schofield

brook.schofield@terena.org