RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Using RIPE Atlas

HOW-TO GUIDE

Webinar

RIPE NCC Learning & Development

This session is being recorded

Take the poll!

How do you use **RIPE Atlas**?

1 min.

Agenda

RIPE Atlas: A measurement tool

Getting started

Viewing measurements in RIPE Atlas

Demo: View a measurement

Creating measurements in RIPE Atlas

Demo: Create a measurement

The REST API

Using the CLI tool

Advanced data access and analysis

RIPE Atlas use cases

RIPE Atlas

An Internet Measurement Tool

An Introduction

- RIPE Atlas is a **global active measurements platform**
- **Goal**: Measure the performance, connectivity, and stability of the Internet
- Probes (our vantage points) are hosted by **volunteers**
- Data **publicly available**
- **Users**: Network operators, researchers, etc.
- **Applications**: Route monitoring, DNS performance analysis, Latency mapping, Outage detection, Peering analysis, IPv6 deployment monitoring, DDoS attack analysis and more!

https://atlas.ripe.net

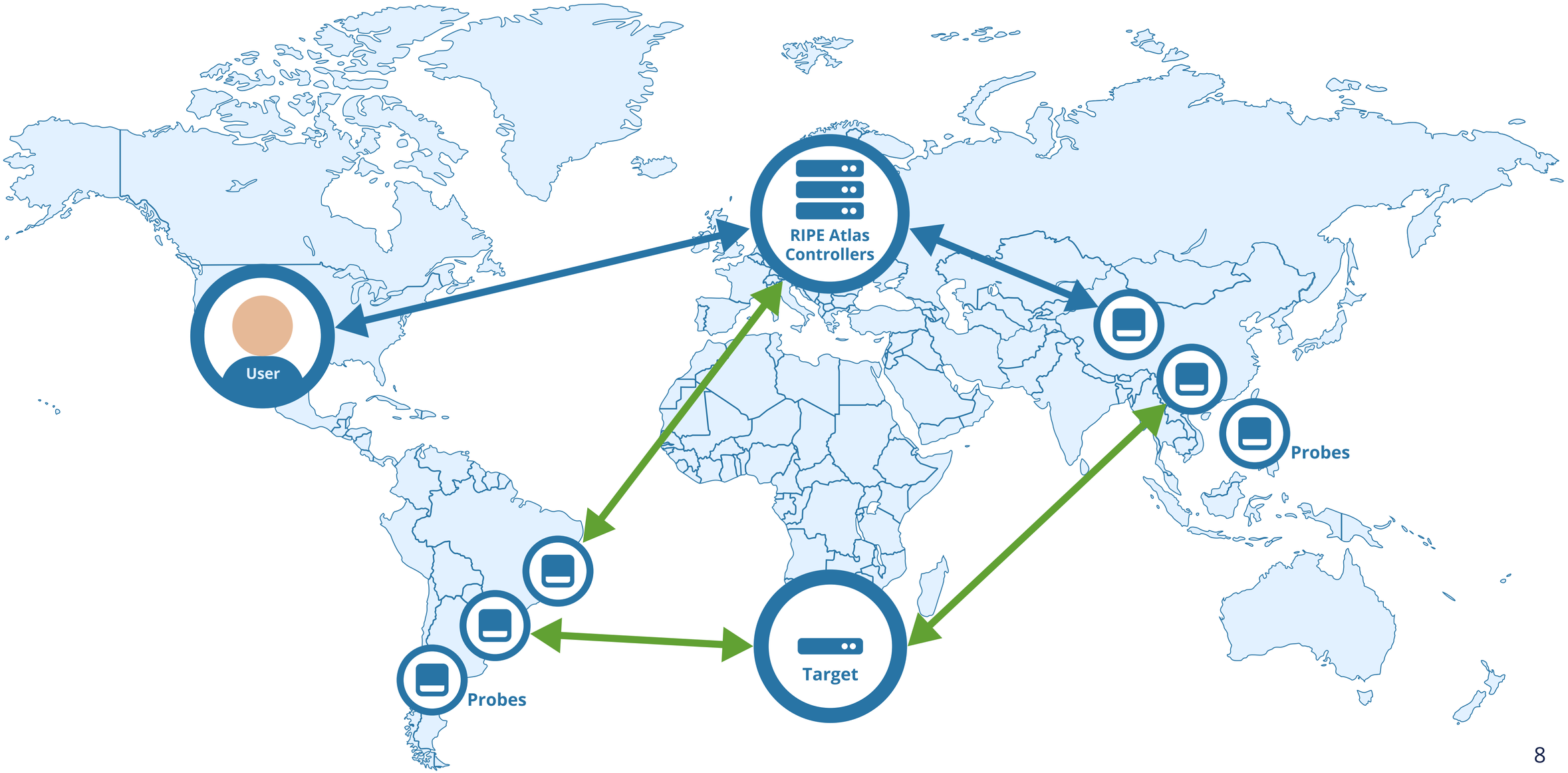
Probes and Anchors

- **Hardware probes**: Small, USB-powered devices connected to routers
- **Software probes**: Can be installed on VMs, containers, or routers
- **Probe functionality**: Conduct measurements, relay data to the RIPE NCC
- **Security**: Probes don't access local network traffic and can’t measure local network devices (e.g. RFC1918)

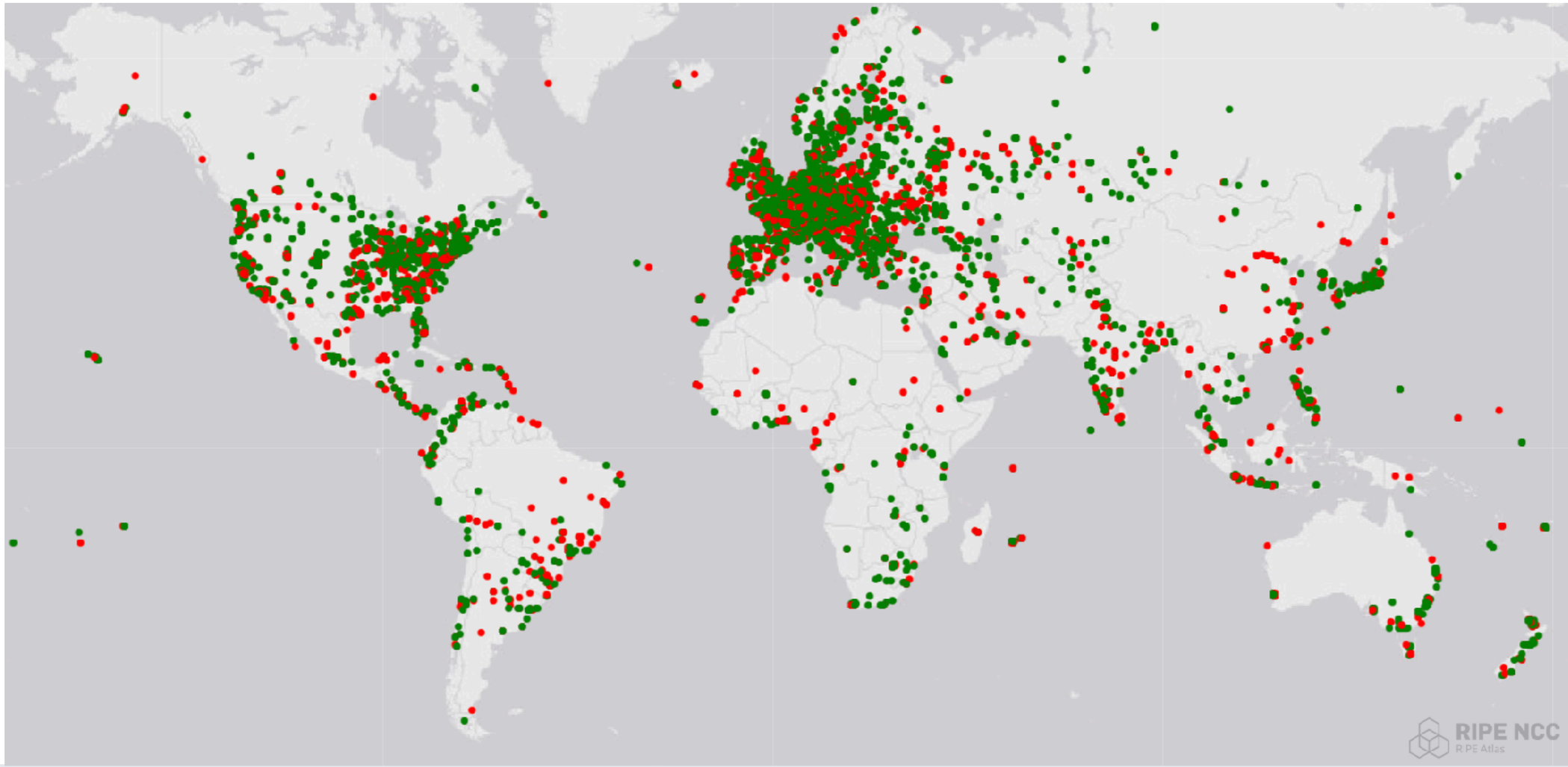
RIPE Atlas probe V5

RIPE Atlas anchor V3

RIPE Atlas Concept



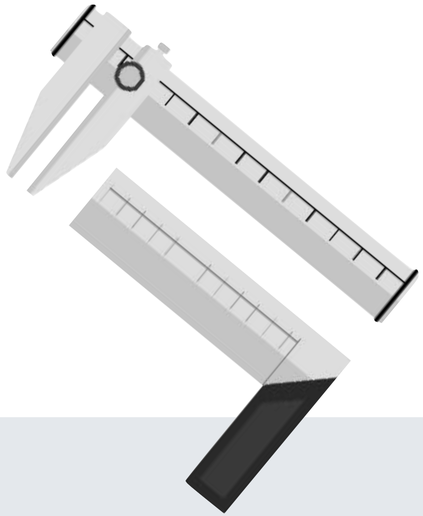
RIPE Atlas Coverage



https://atlas.ripe.net/coverage/

Measurements

- **RIPE Atlas** performs **built-in** and **user-defined** measurements
- **Built-in measurements**: ping, traceroute, DNS, SSL/TLS, HTTP
- **User-defined measurements**: Six types available (ping, traceroute, DNS, SSL/TLS, NTP, HTTP*)
- **Targets**: Root DNS servers, RIPE Atlas anchors, user-defined targets



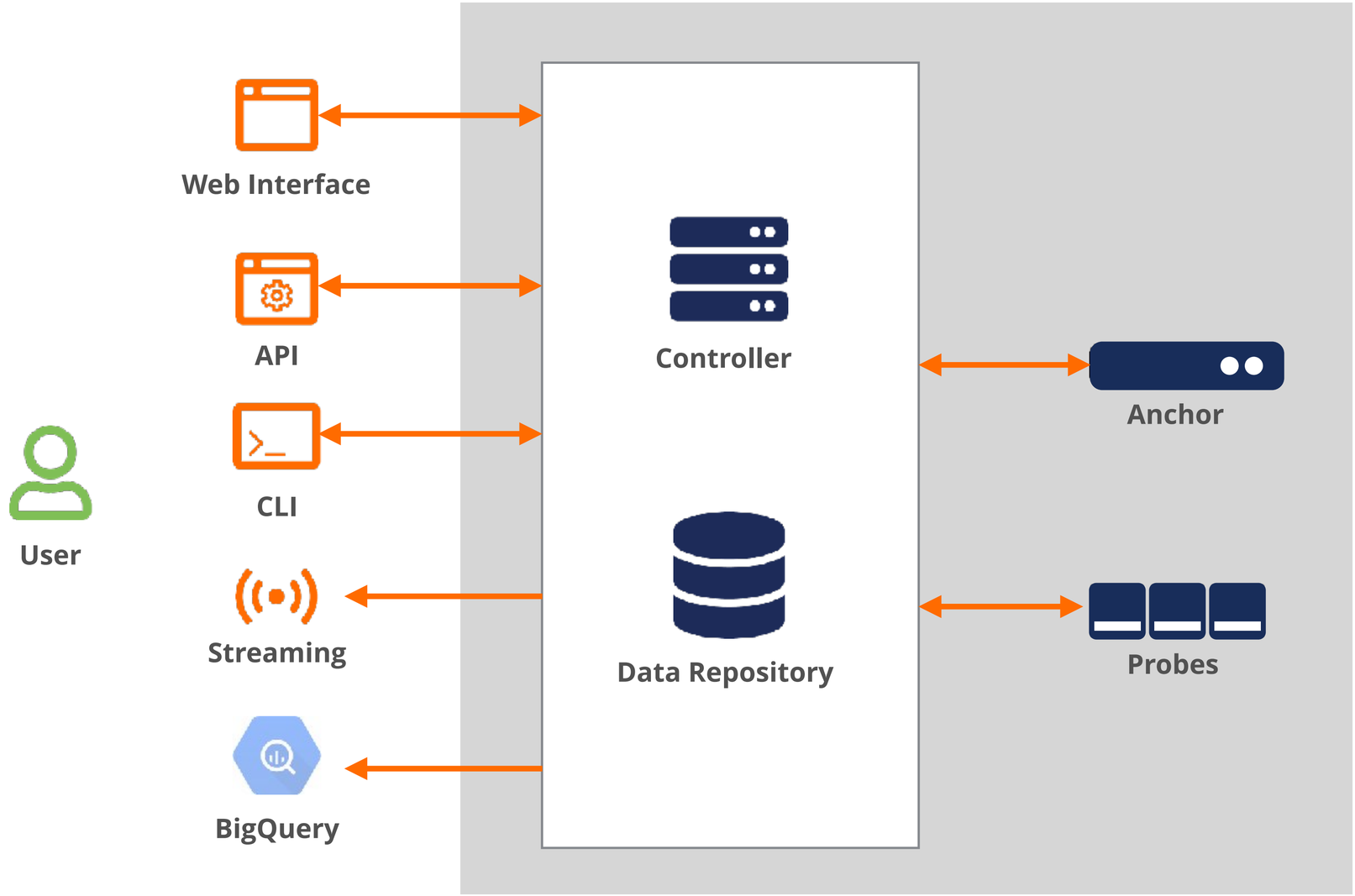
https://atlas.ripe.net/docs/built-in-measurements/

Credits System

- **Purpose of credits**: Ensure fairness and prevent system overload
- **Credit costs**: For different measurement types (e.g., ping = 10 credits, traceroute = 20)
- **Credit limits**: Spending limit and max number of measurements
- **Ways to earn credits**:
  - Hosting a RIPE Atlas probe
  - Being a RIPE Atlas sponsor
  - Being a RIPE NCC member
  - Through credit transfer

https://atlas.ripe.net/docs/getting-started/credits.html

RIPE Atlas Interfaces

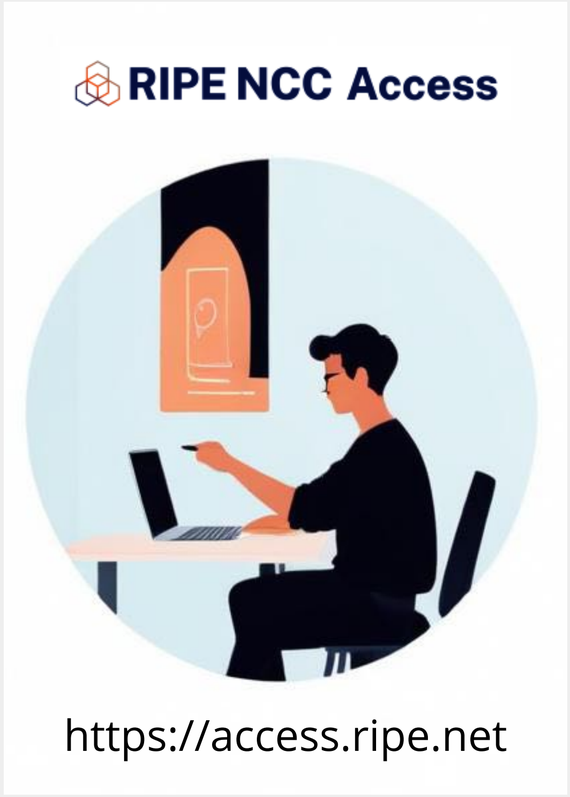


Questions

Getting Started

Getting Started with RIPE Atlas

Create Access account

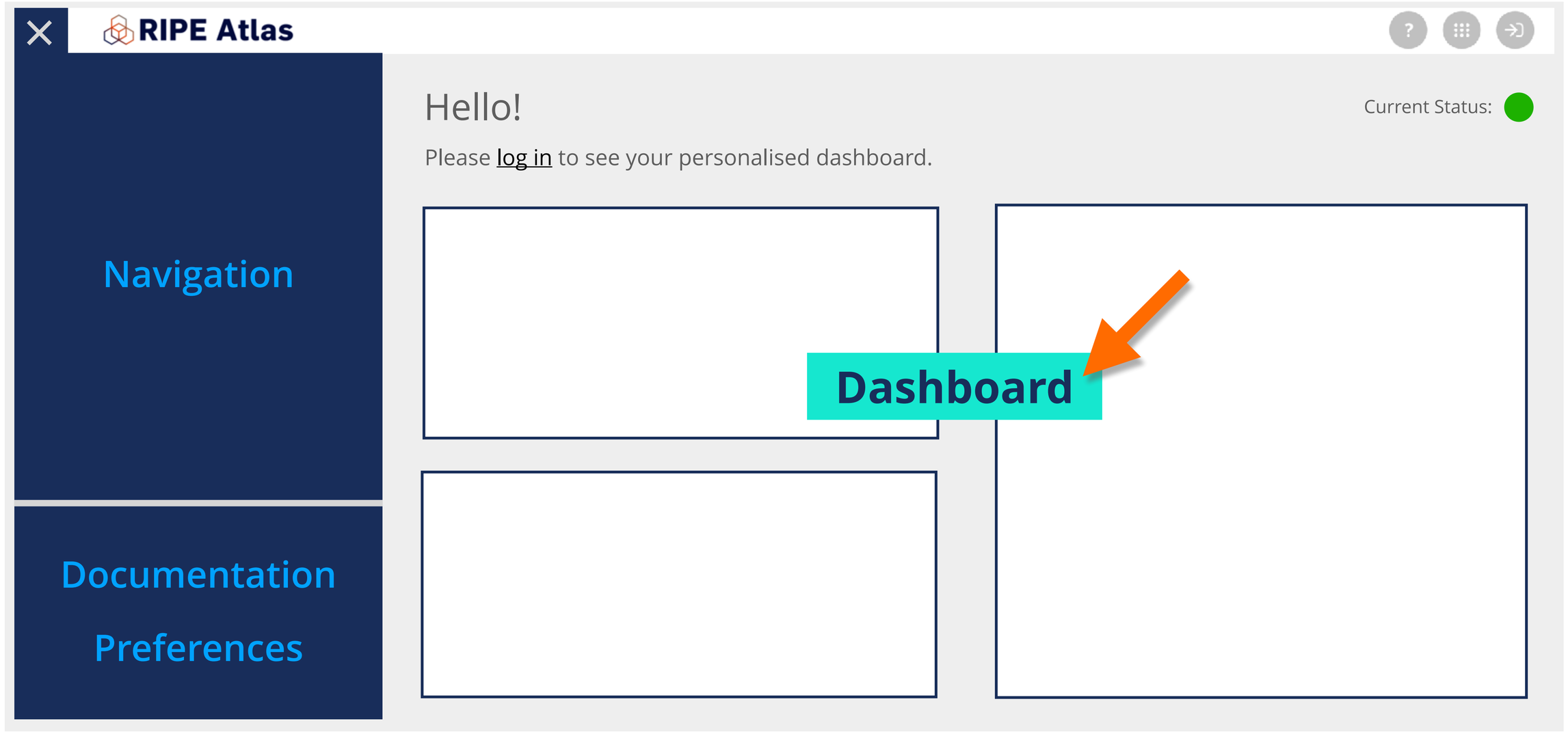


https://access.ripe.net

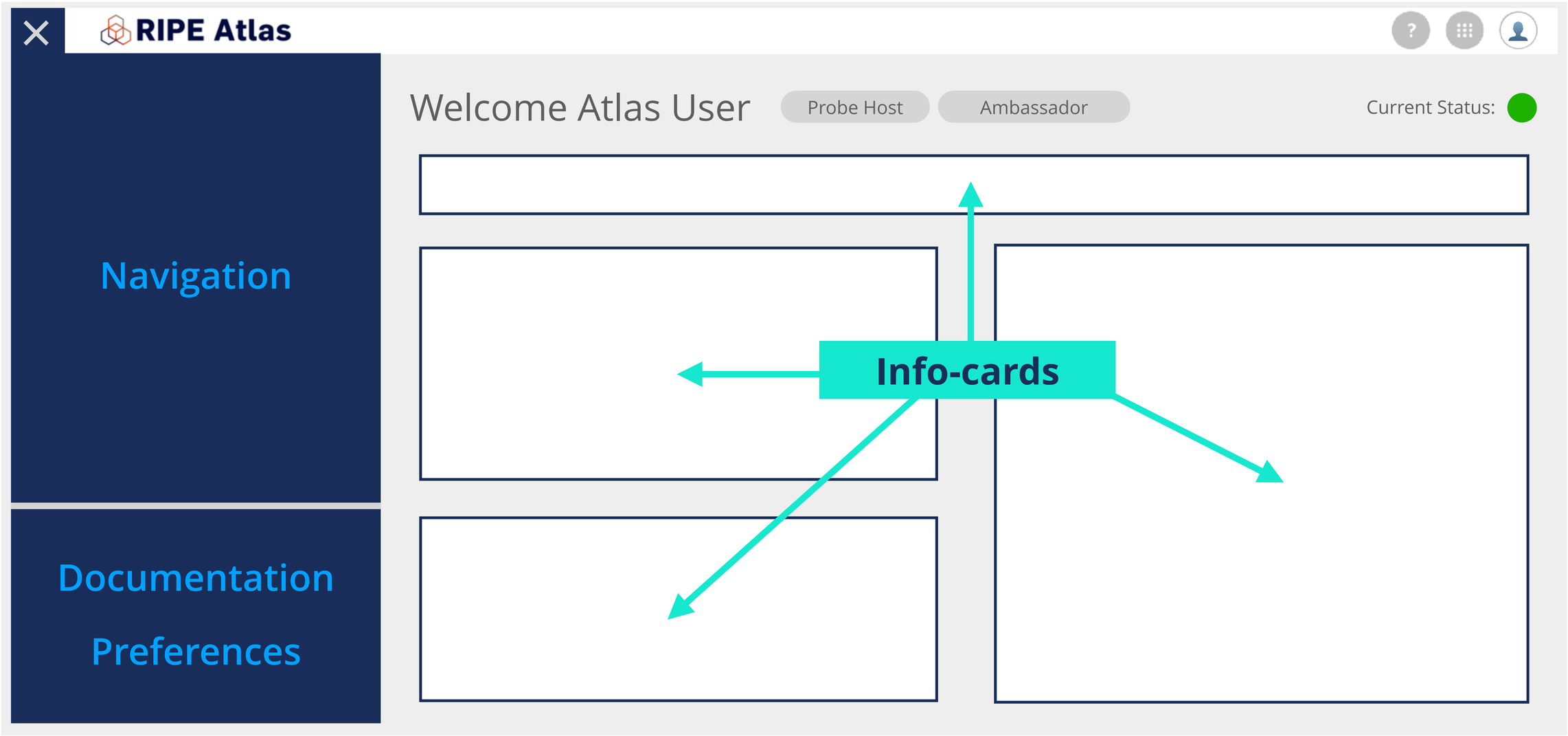
Get enough credits

Use RIPE Atlas

RIPE Atlas Web UI - Not Logged In



RIPE Atlas Web UI - Logged In



Viewing Measurements

In RIPE Atlas

Measurements Page

PUBLIC | MINE

Search Measurements

All | Built-In | Anchoring

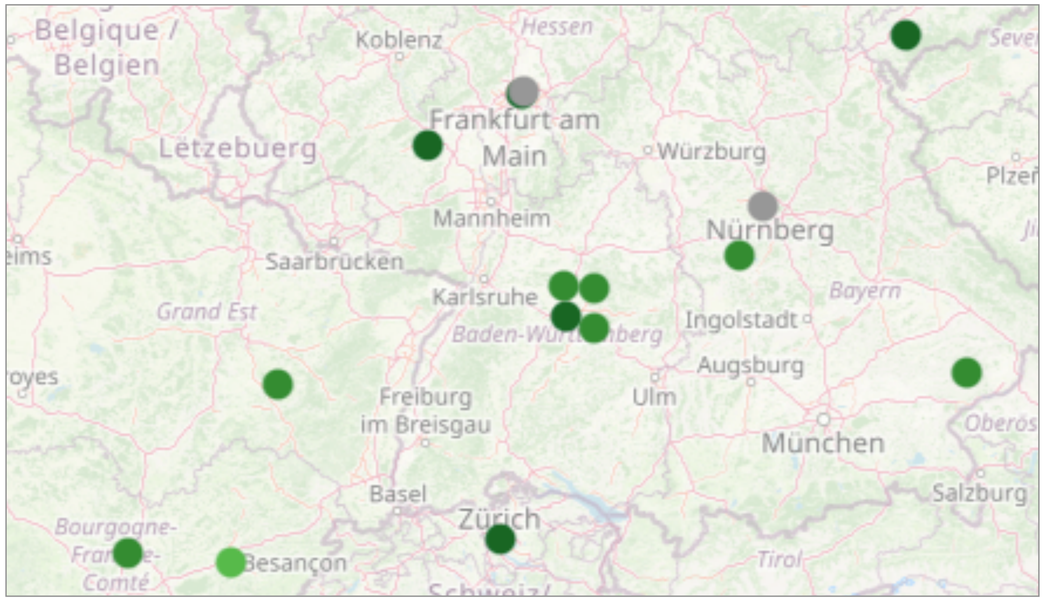
ID	Type All	IPv4/v6 All	Target	Description	Probes	Interval All	Time (UTC)
######	Which type	Protocol	IP or hostname	Some text to make it unique	###	one-off or ms	▷When it started
978321	ping	6	www.ripe.net	Ping test to RIPE web server	75	one-off	▷2023-07-01 10:05
978321	trace	4	203.0.113.0	Some host with reachability issues	250	900	▷2023-02-18 12:30

Measurement Overview

Measurement

Description of the measurement

OVERVIEW | RESULTS | DETAILS



Result summary (latest, as of 2024-05-22 11:50 UTC):

43 probes reached their target.

7 probes did not.

Min RTT: 0.666

Mean RTT: 9.167

Measurement Results

OVERVIEW | RESULTS | DETAILS

🔍 Search Results

DOWNLOAD RESULTS

Probe	ASN	Country All ∨	Time (UTC)	Min RTT	Packet Loss
#####	#####	**Where probe is located**	**When probe did it**	**RTT in milliseconds**	**Percent of packets lost**
6025	8839	🇫🇷	2024-05-28 09:42:13	13.309 ms	0.00%
6352	13041	🇪🇸	2024-05-28 09:42:13	39.749 ms	0.00%

Measurement Details

OVERVIEW | RESULTS | **DETAILS**

OVERVIEW

SETTINGS

STATUS & TIMING

OWNERSHIP

COSTS

PROBES

Measurement Management

OVERVIEW | RESULTS | DETAILS | **MANAGE**

STOP MEASUREMENT | REMOVE PROBES ∨ | ADD PROBES

Participation Requests

ID	Created	Action	Type	Value

CHANGES TO THE PROBES

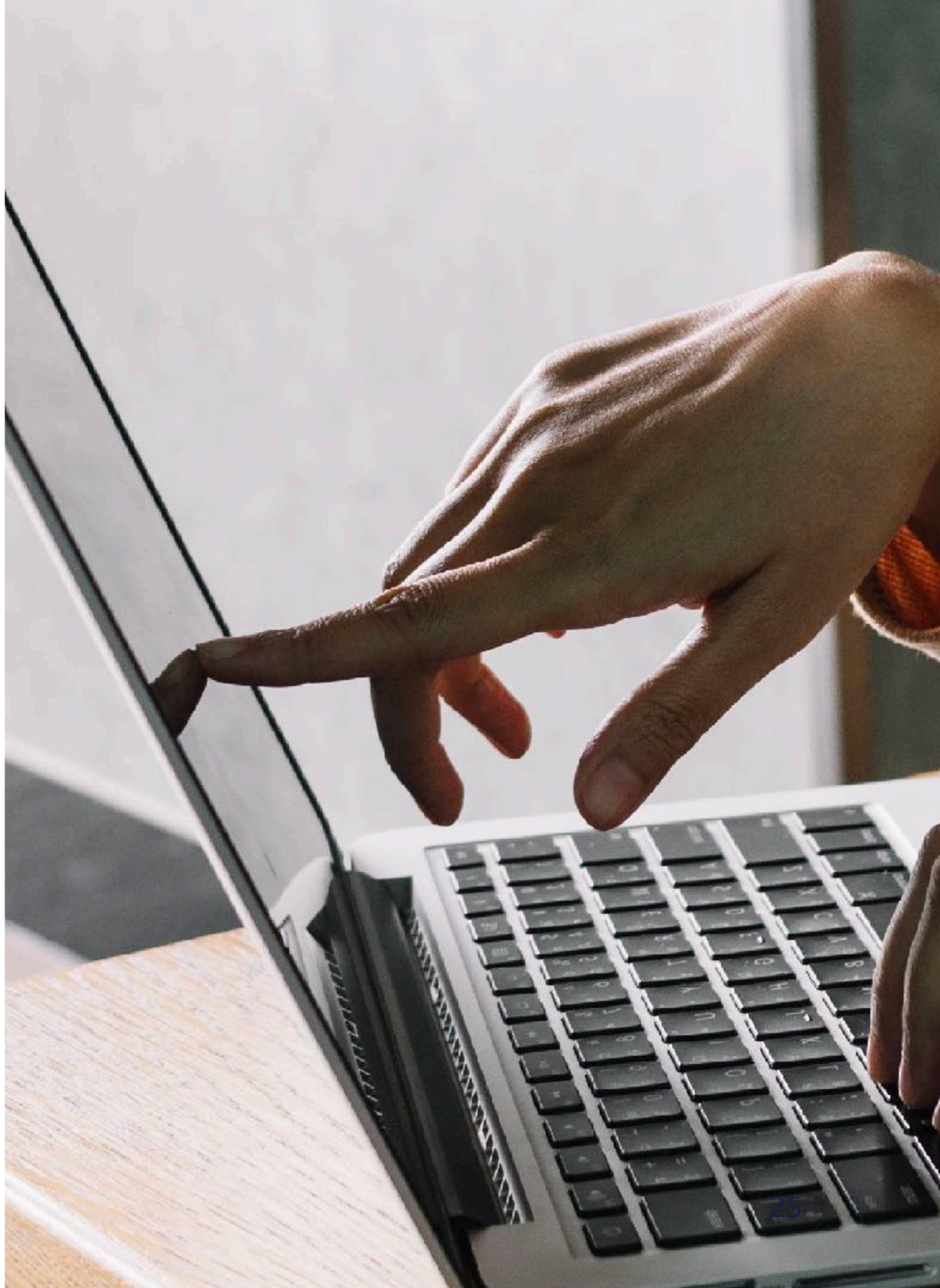
Viewing Measurements

Demo

Demo time!

Let’s look at a measurement…

We will look at the results of measurement **64393469**



Questions

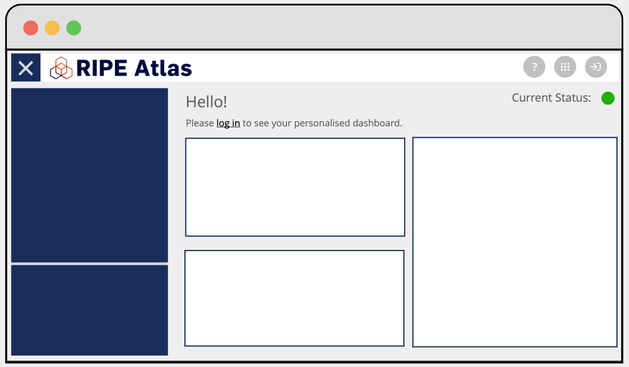
Creating Measurements

In RIPE Atlas

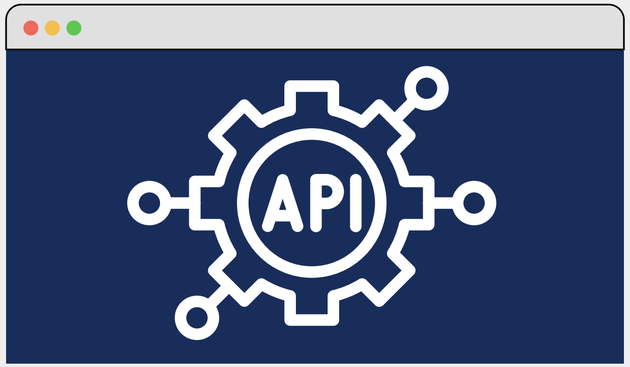
Scheduling Measurements

- Three main ways to **create measurements**

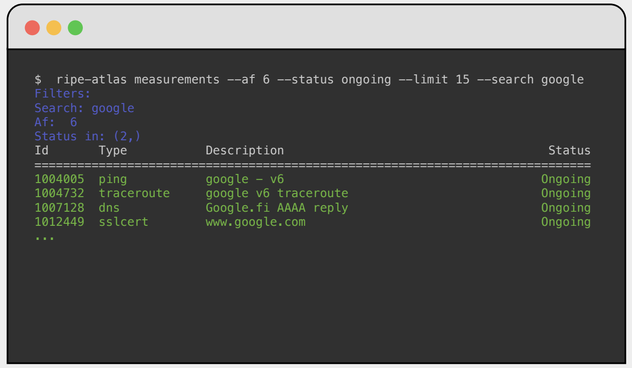
Web Interface (GUI)



Application Programming Interface (API)

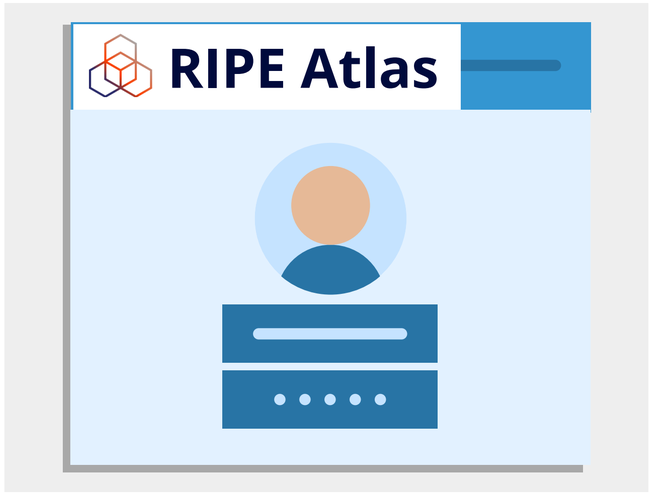


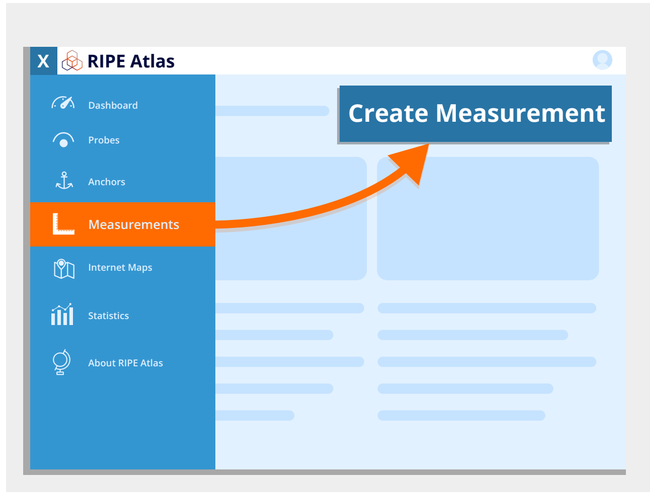
Command-line Interface (CLI)

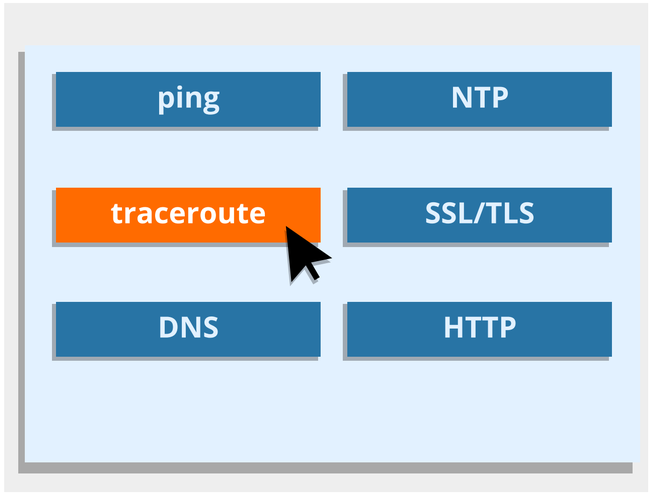


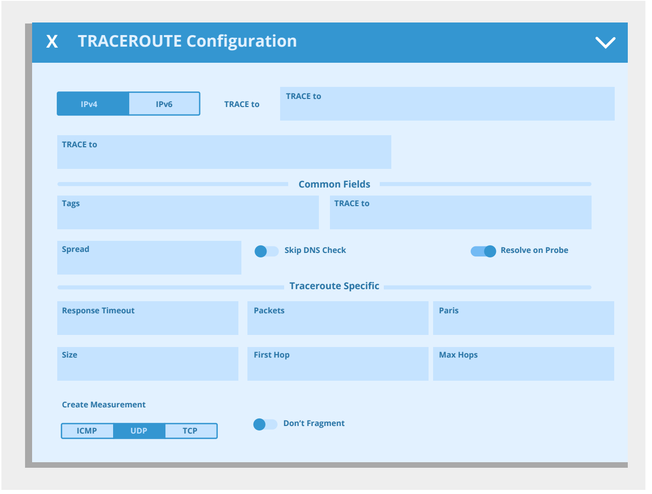
```
$  ripe-atlas measurements --af 6 --status ongoing --limit 15 --search google
Filters:
Search: google
Af:  6
Status in: (2,)
Id       Type           Description                                    Status
=============================================================================
1004005  ping           google - v6                                    Ongoing
1004732  traceroute     google v6 traceroute                           Ongoing
1007128  dns            Google.fi AAAA reply                           Ongoing
1012449  sslcert        www.google.com                                 Ongoing
...
```

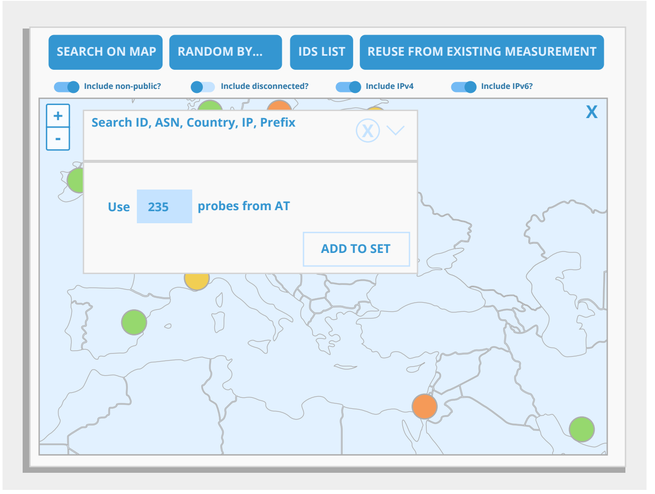
Using the Web Interface (GUI)

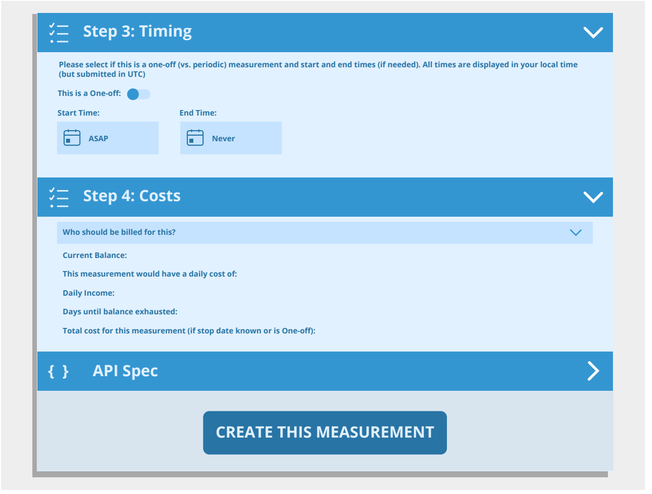












Take the poll!

Which method do you **primarily** use for creating/scheduling RIPE Atlas measurements?

1 min.

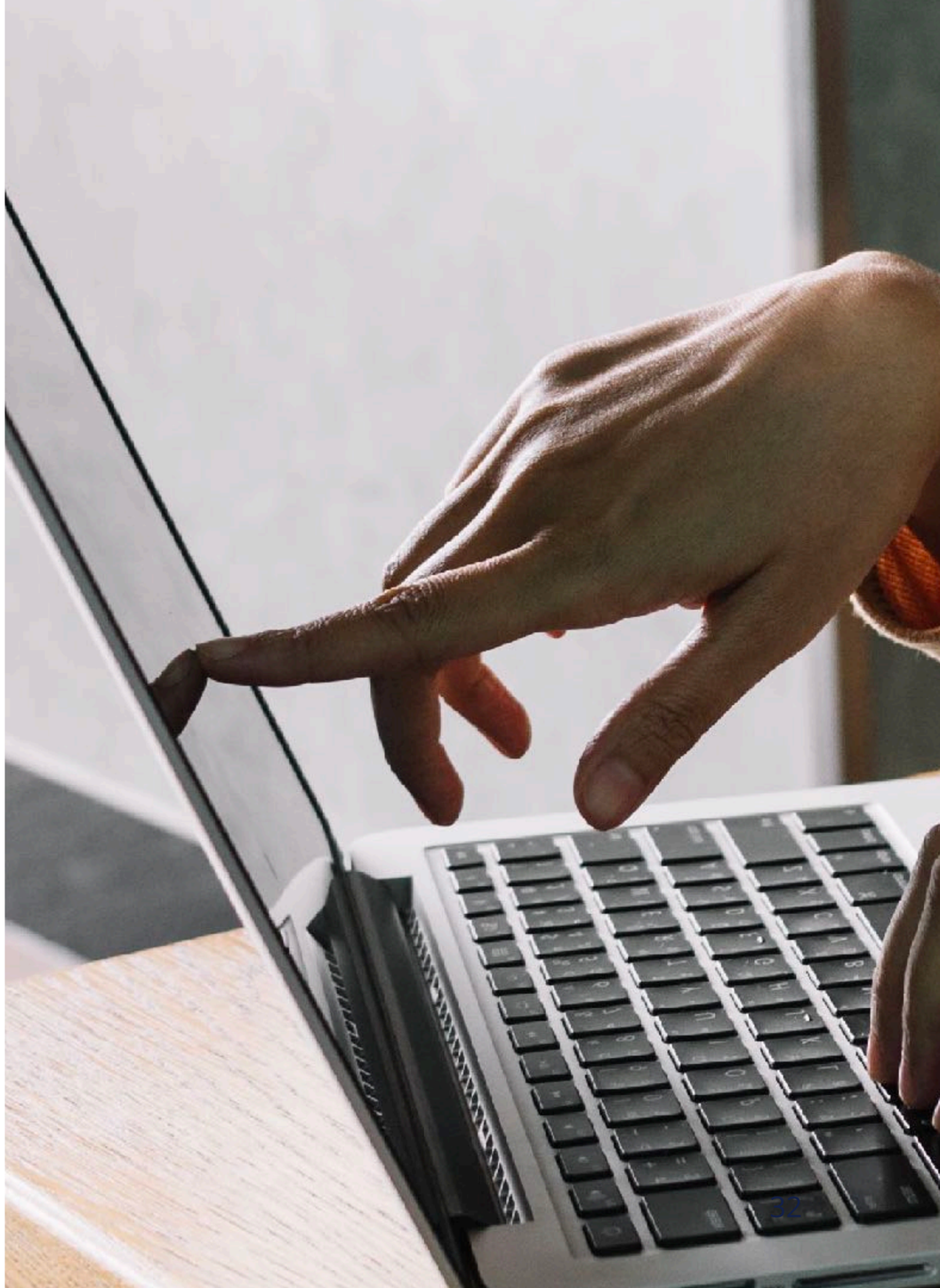
Creating a Measurement

Demo

Demo time!

Let’s create a measurement for this scenario:

- How is the server performing where **www.ripe.net** is hosted?
- How reachable is it from **ten** major networks in Europe?
- How is the connectivity from these networks over a period of **24 hours**?



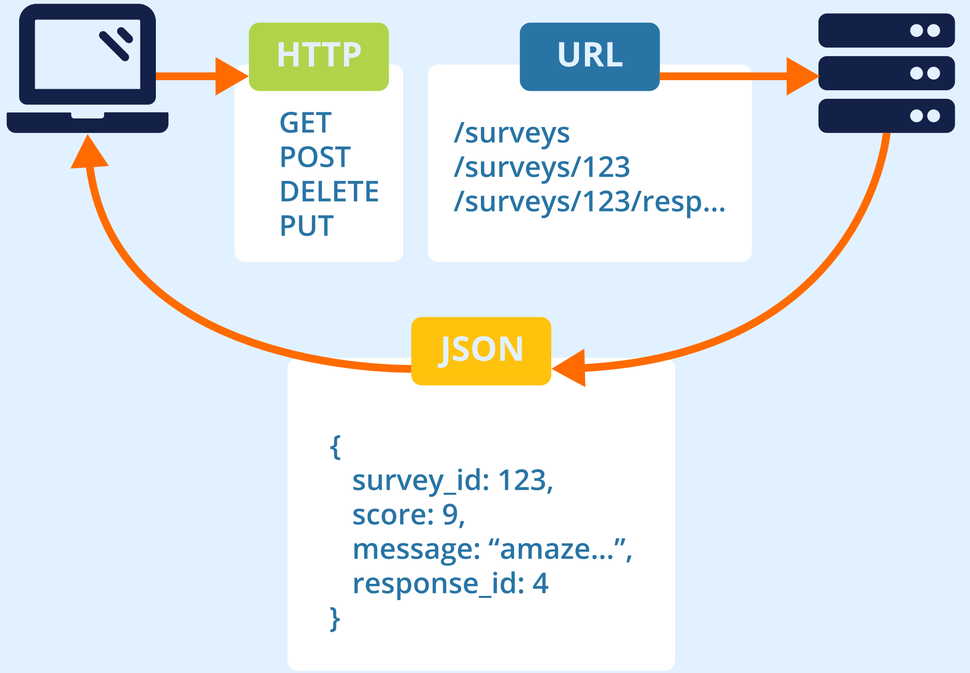
The REST API

For Automation

The RIPE Atlas API

- Powerful tool for programmatic access to RIPE Atlas
- Key benefits:
  - Automate measurement creation and analysis
  - Integrate with your existing systems
  - Perform bulk operations efficiently

What is a REST API?

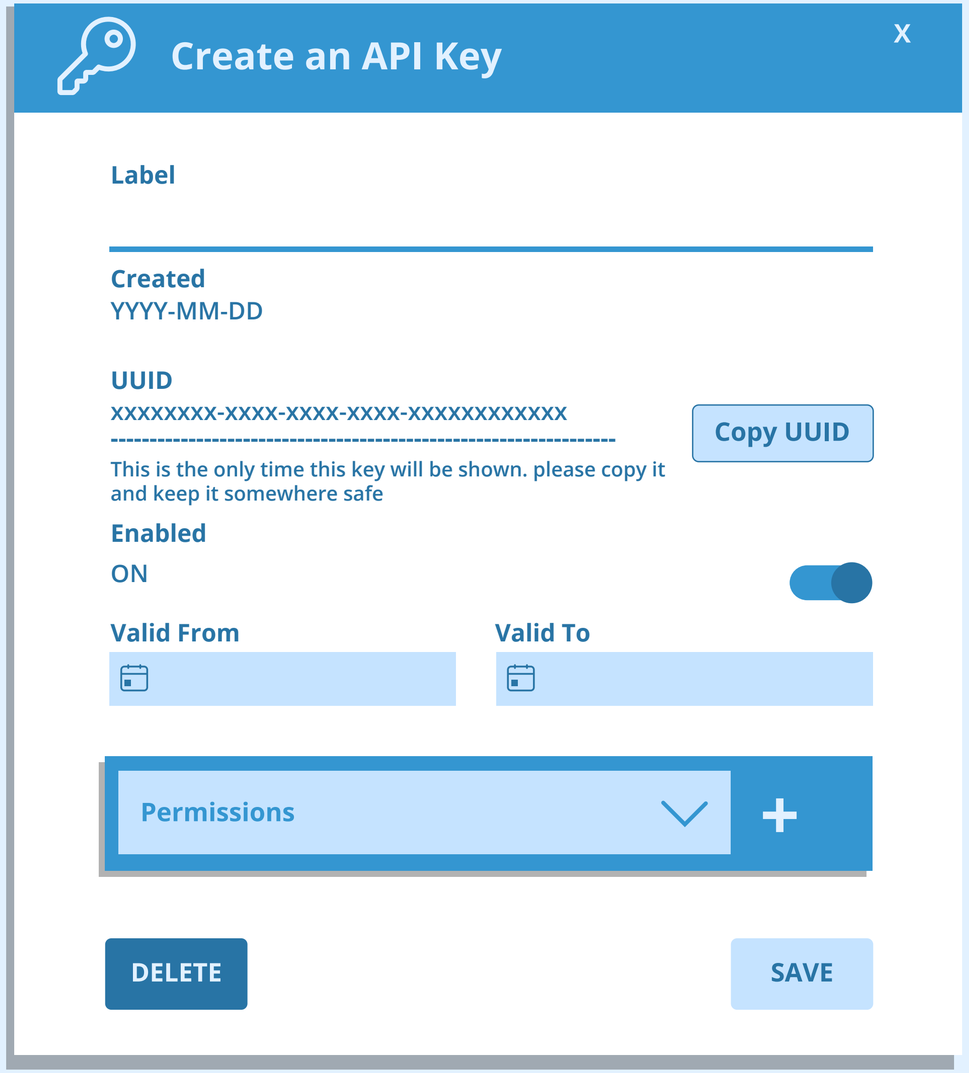


https://atlas.ripe.net/docs/apis/rest-api-manual/

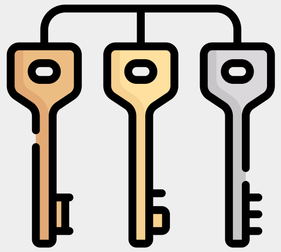
Creating API Keys

- **API keys**: Your secure access to RIPE Atlas
- Creating an API key:
  - Log in to RIPE Atlas
  - Go to the API Keys section: https://atlas.ripe.net/keys/
  - Generate a new key
  - Set key permissions

    i.e. "*Schedule a new measurement*"

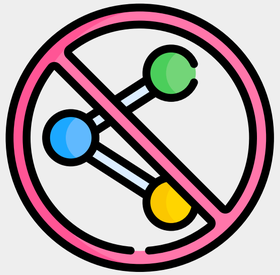


Best Practices for Managing API Keys



Use separate keys for different applications or projects

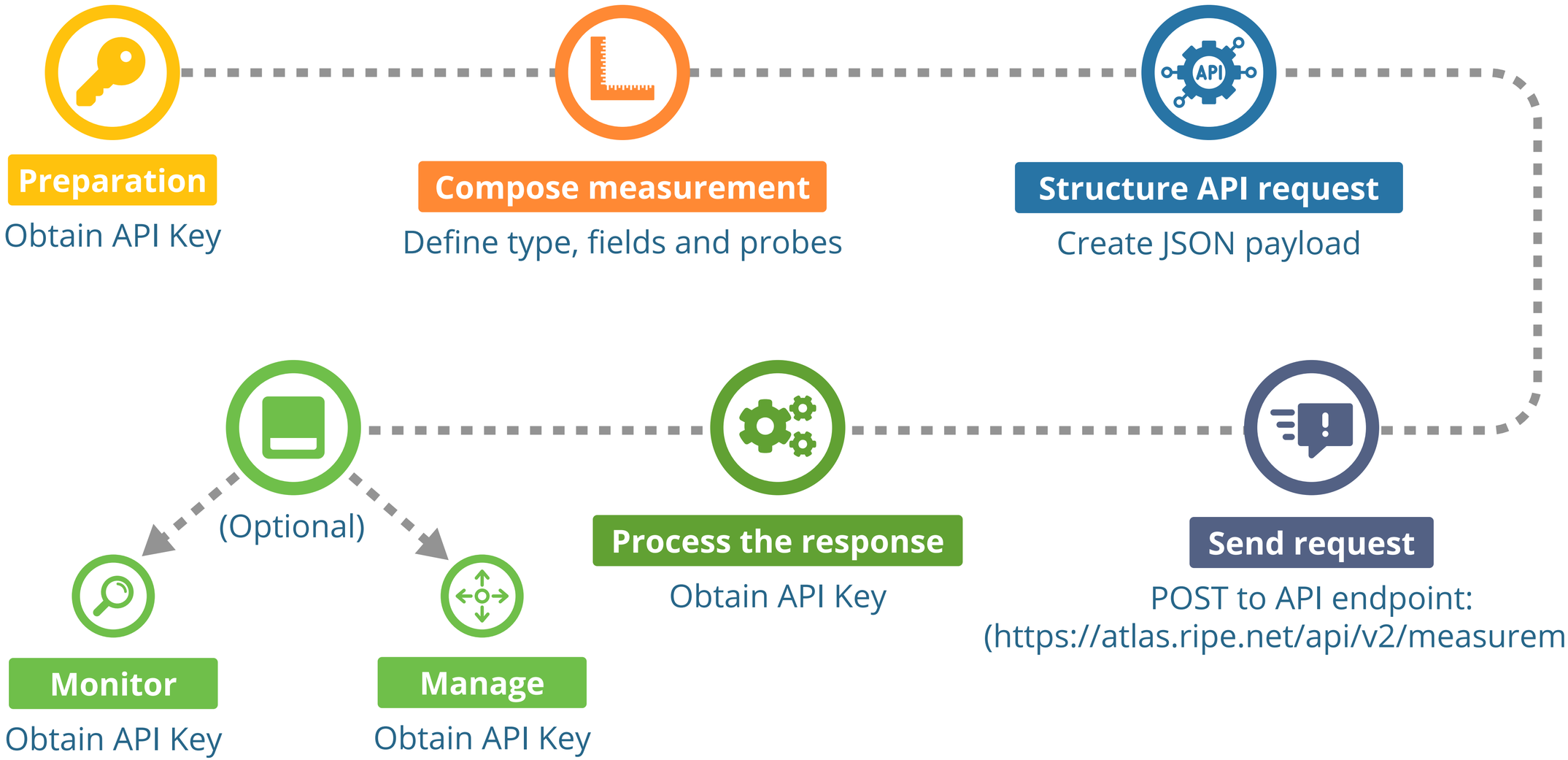
Regularly rotate keys for added security



Never share your API keys publicly

Revoke keys that are compromised or no longer used

Using the RIPE Atlas API



A Simple Example

```
curl --location 'https://atlas.ripe.net/api/v2/measurements/' \
  --header 'Authorization: Key ----' \
  --data @filename_of_JSON_payload
```

```
{
  "definitions": [
{
  "target": "ripe.net",
  "description": "My First Measurement",
  "type": "ping",
  "af": 4
}
  ],
  "probes": [
{
  "requested": 50,
  "type": "area",
  "value": "WW"
}
  ]
}
```

JSON Payload with measurement definition

Using the CLI Tool

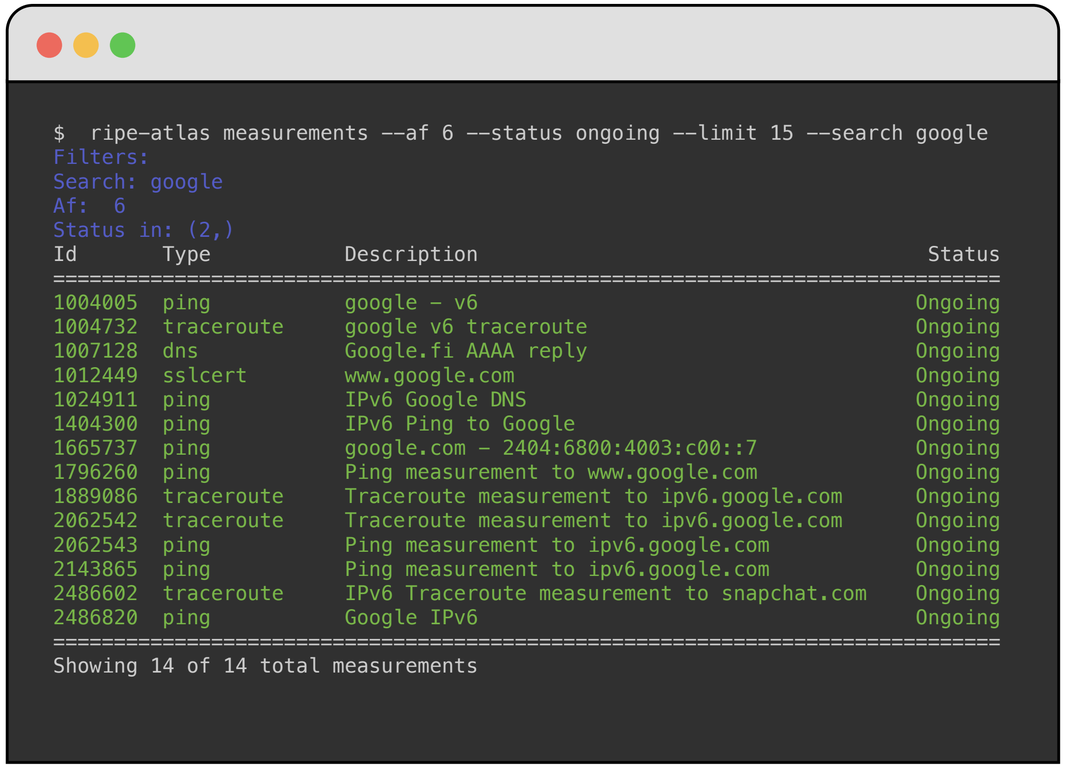
For Power Users

Command-Line Interface (CLI)

- Command-line tool for interacting with RIPE Atlas
- Powerful alternative to the web interface

- **Key Benefits:**
  - Automate measurement tasks
  - Create and run scripts
  - Efficient for advanced users

- **Ideal for:**
  - Bulk operations
  - Integration with other tools
  - Customised workflows

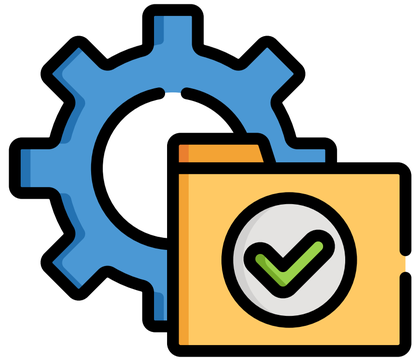


https://ripe-atlas-tools.readthedocs.io/

Installation and Configuration

- **Install and configure virtualenv**
  - virtualenv is a tool for creating isolated virtual Python environments
  - https://virtualenv.pypa.io/en/latest/installation.html

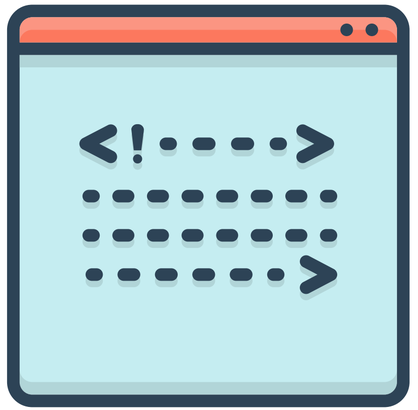
- **Install RIPE Atlas Tools from within virtualenv**
  - `pip install ripe.atlas.tools`
  - Alternative methods are available
  - https://ripe-atlas-tools.readthedocs.io/en/latest/installation.html



- **Initial Setup**
  - Configure an API key
  - Set the default options

Using the CLI Tools

- **Basic syntax**: `ripe-atlas <command> [options] <arguments>`
  - **Commands**: measure, probe-search, report, etc.
  - **Options**: modify command behaviour (e.g., --format)
  - **Arguments**: specific to each command



- **Common structure**:
  - Specify the action (e.g., create measurement, search probes)
  - Define parameters (e.g., measurement type, target, probes)
  - Set additional options (e.g., output format, filters)

- **Get help**:
  - General help: `ripe-atlas --help`
  - Command-specific help: `ripe-atlas <command> --help`

RIPE Atlas CLI Examples

Reporting and Searching

Report the results of measurement 2340408

```
$  ripe-atlas report 2340408
```

Get a list of ongoing measurements that conform to IPv6

```
$  ripe-atlas measurement-search --status ongoing --af 6
```

Probe Information

Search all probes in AS3333

```
$  ripe-atlas probe-search --asn 3333
```

Show specific probe fields

```
$  ripe-atlas probe-search --asn 3333 --field an_v6 --field country --field descriptions --field status
```

Creating Measurements

Create a ping measurement using 20 probes that support IPv6

```
$  ripe-atlas measure ping --target example.com --probes 20 --include-tag system-ipv6-works
```

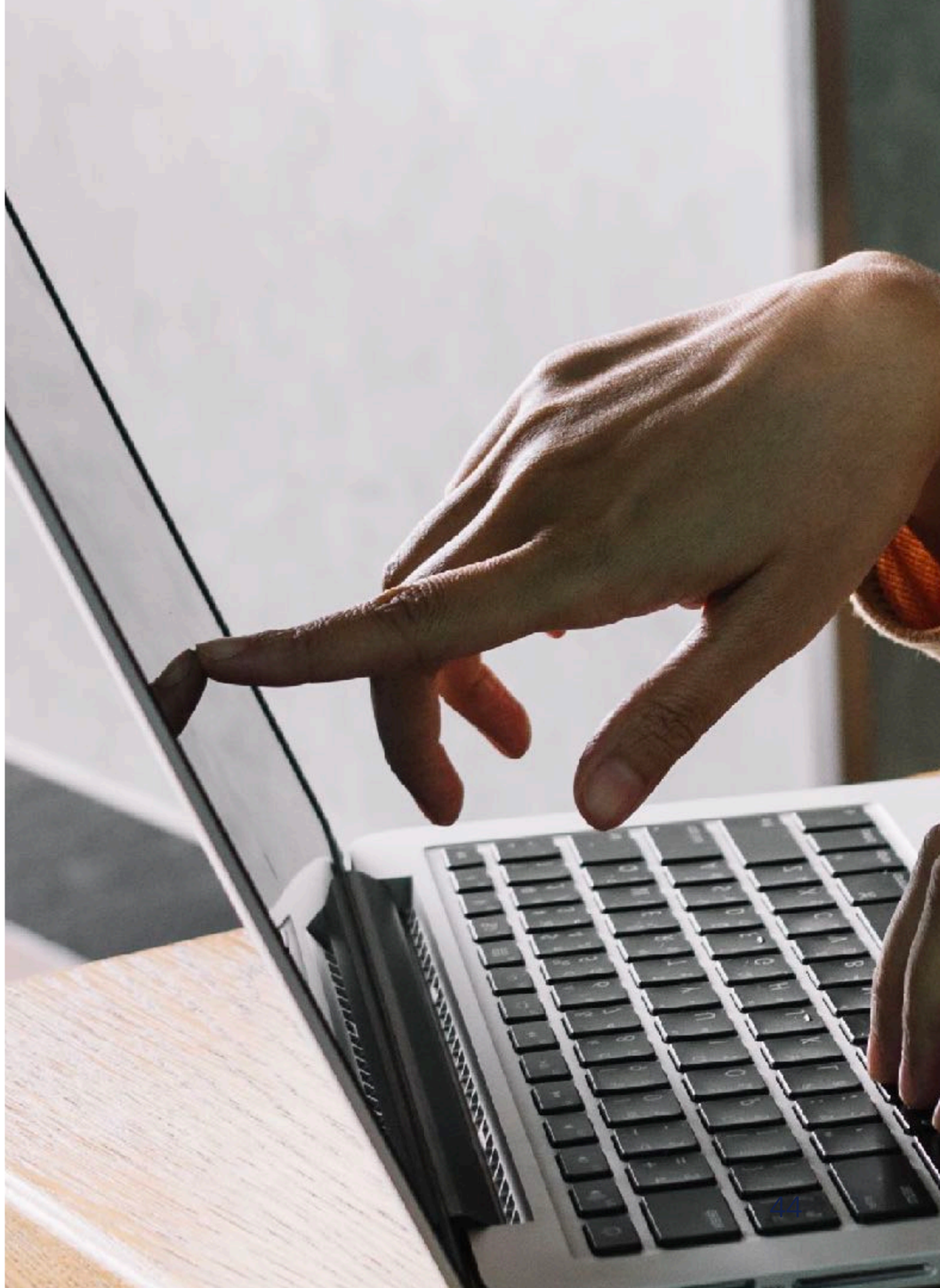
Create a recurring ping measurement

```
$  ripe-atlas measure ping --target example.com --interval 3600
```

Demo time!

We will demo the activity on the screen.

Watch what we do.



Advanced Data Access and Analysis

The Streaming Service

I. Introduction

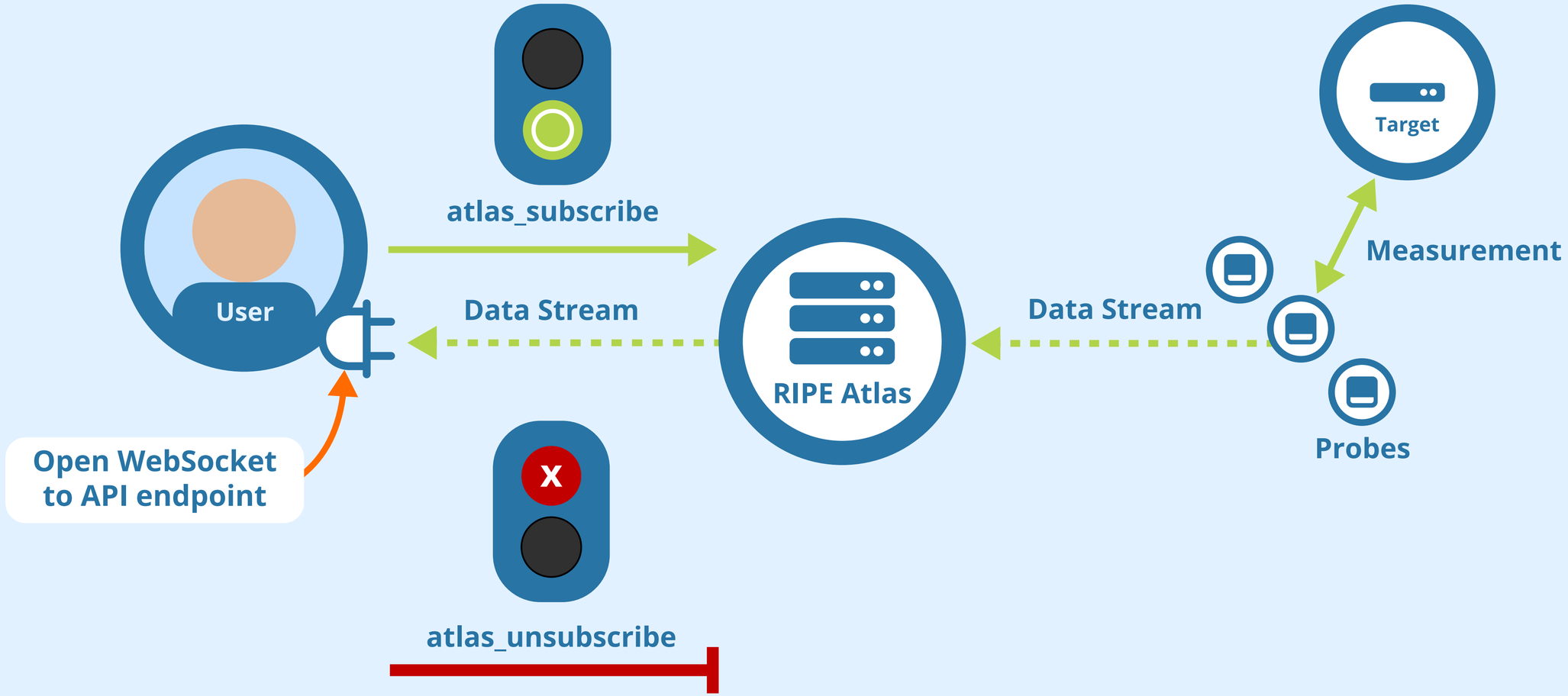
- Real-time access to RIPE Atlas data flow
- Allows tapping into public measurement results, probe status updates, and metadata
- Accessible via WebSocket, HTTP GET, or legacy Socket.IO

II. Types of Data Available

- Measurement results (ping, traceroute, DNS, SSL, HTTP, NTP)
- Probe connection and disconnection events
- Measurement metadata (creation and updates)

https://atlas.ripe.net/docs/apis/streaming-api/

How the Streaming Service Works



Quick Example Using Javascript

```
const socket = new WebSocket("wss://atlas-stream.ripe.net/stream/");
```

```
const params = { streamType: "result", msm: 1001 }
```

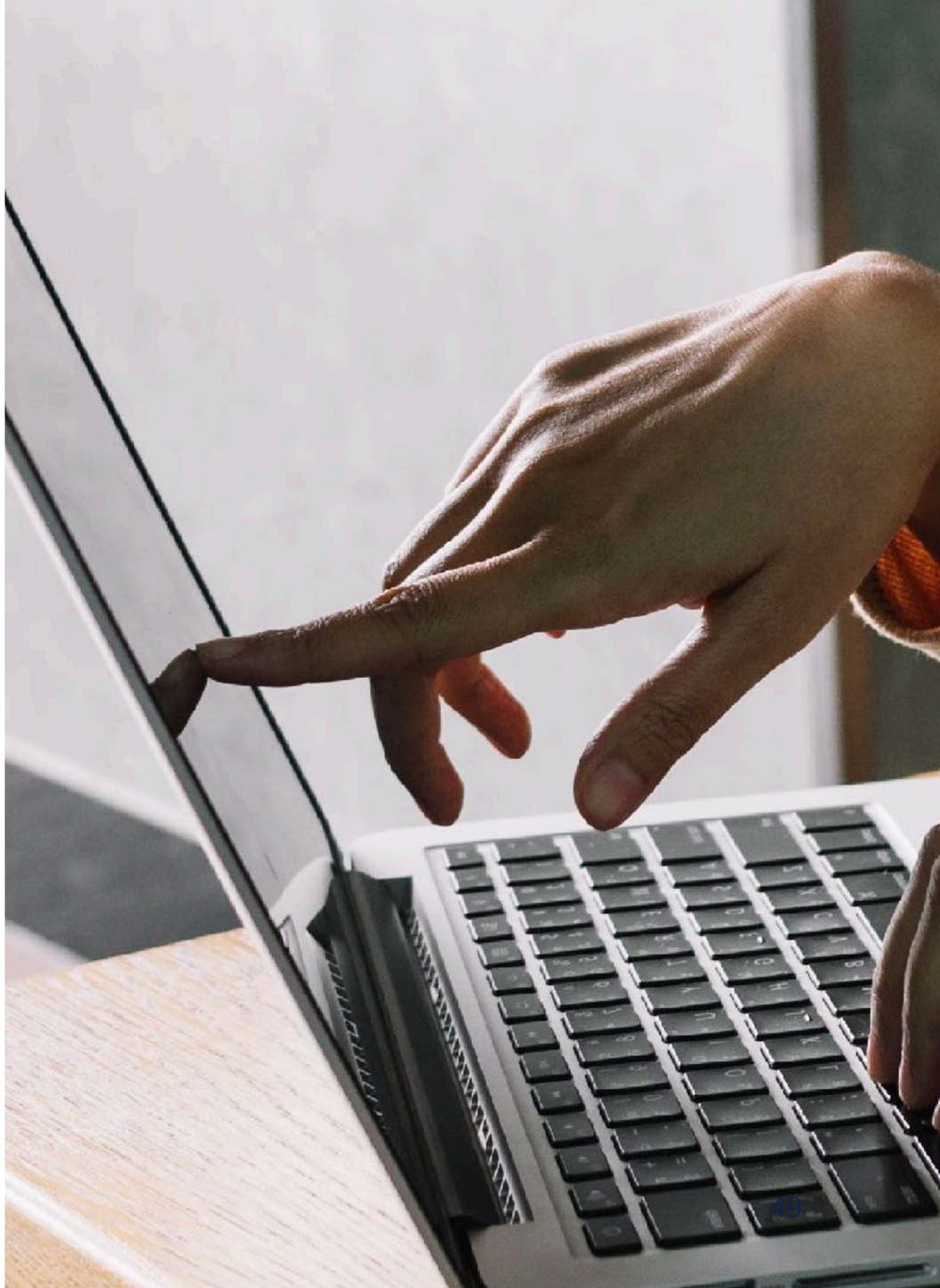
```
socket.onmessage = function (event) {
  console.log(event.data);
};
```

```
socket.onopen = function (event) {
  this.send(JSON.stringify(["atlas_subscribe", params]));
};
```

Demo time!

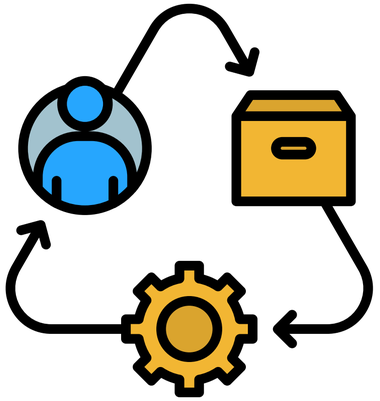
We will demo the activity on the screen.
Watch what we do.

Let’s look at a sample page that uses the streaming service to show results in real time…



Use Cases

- Potential use cases for the **RIPE Atlas Streaming API** are:
  - **Real-time network performance monitoring**
    Track latency, packet loss, and other metrics across multiple geographical locations instantly
  - **Internet outage detection**
    Quickly identify when specific regions or ISPs experience connectivity issues
  - **Network path visualisation**
    Create real-time visualisations of network paths between different points on the Internet, helping to identify bottlenecks or changes in routing
  - **DNS infrastructure health monitoring**
    Track DNS query responses across multiple root servers and top-level domains to detect issues



The BigQuery Service

- Fast query-based access to RIPE Atlas data
- Enhanced computation and analysis capabilities
- Includes sample and full measurement datasets
- Covers various measurement types (DNS, HTTP, ping, etc.)
- Data available: latest 90 days

https://github.com/RIPE-NCC/ripe-atlas-bigquery/

RIPE Atlas Daily Archives

- Aggregates daily RIPE Atlas measurement data for easy retrieval
- **Data Organisation**
  - Bundles all measurements of a particular type into one archive
  - Generates archives per hour for manageable file sizes
- **Data Retention and Usage**
  - Archives hold data for about one month from collection date
  - Usage falls under regular RIPE NCC Terms of Service

https://data-store.ripe.net/datasets/atlas-daily-dumps

RIPE Atlas Use Cases

Practical Applications

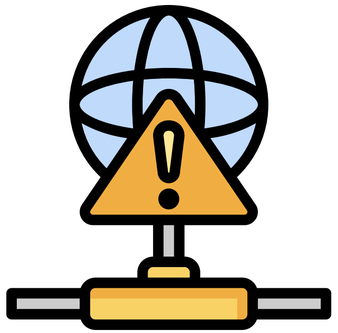
Take the poll!

How do you **currently** use or **plan** to use RIPE Atlas?

1 min.

Identifying Network Outages

- **Use RIPE Atlas to detect and localise network outages**
  - **Create targeted measurements**
    Set up specific tests (e.g., ping, traceroute) to suspected problem areas
  - **Analyse results from multiple probes**
    Compare data from various global locations to pinpoint the issue
  - **Correlate data with BGP announcements**
    Check if routing changes coincide with observed outages

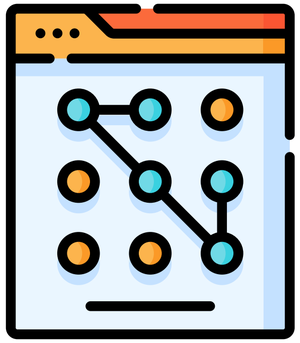


DNS Resolution Issues

- **Use RIPE Atlas to identify and resolve DNS issues**
  - **Configure DNS measurements**
    Set up tests querying multiple DNS servers to identify widespread or localised issues
  - **Analyse performance metrics**
    Compare response times and failure rates to detect slow or unreliable DNS resolvers
  - **Detect response inconsistencies**
    Look for discrepancies in returned IP addresses or other DNS record data across different resolvers

Routing Anomalies

- **Detect and Analyse Routing Anomalies with RIPE Atlas**
  - **Map network paths**
    Use traceroute measurements to identify unexpected path changes
  - **Compare routing perspectives**
    Analyse AS paths from different global vantage points
  - **Integrate BGP data**
    Correlate traceroute results with BGP announcements for comprehensive analysis
  - **Apply to real-world incidents**
    Use these techniques to investigate potential route hijacking scenarios



Latency Tracking

- **Implement Latency Monitoring with RIPE Atlas**
  - **Configure regular measurements**
    Set up recurring ping tests to key network destinations
  - **Visualise latency data**
    Create custom dashboards to display and analyse latency trends
  - **Implement proactive alerts**
    Establish thresholds for automated notifications on latency spikes
  - **Optimise long-term tracking**
    Apply best practices for sustained performance monitoring

IPv6 Deployment Monitoring

- **Monitor IPv6 Deployment with RIPE Atlas**
  - **Assess IPv6 reachability**
    Set up measurements to test connectivity to key services over IPv6
  - **Conduct performance comparison**
    Analyse and compare latency and packet loss between IPv4 and IPv6
  - **Evaluate transition mechanisms**
    Identify and troubleshoot issues with IPv6 transition technologies like tunnels and translations

Questions

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