# Expand your awareness RADIUS

## Using RADIUS to improve network situational awareness

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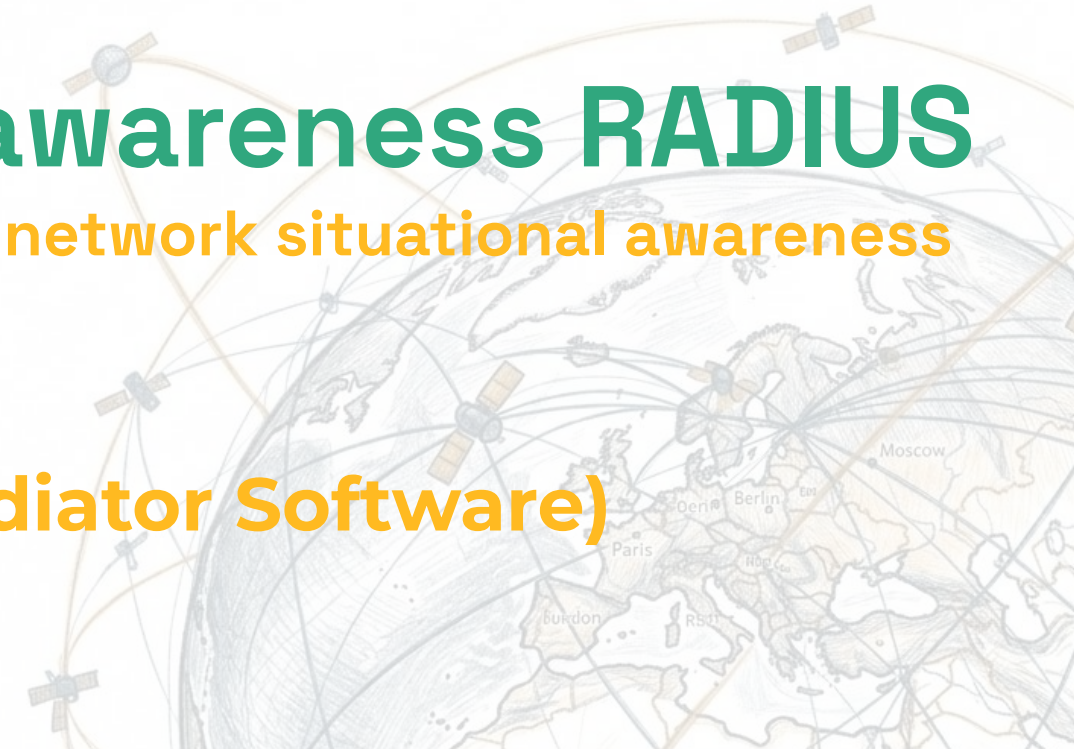


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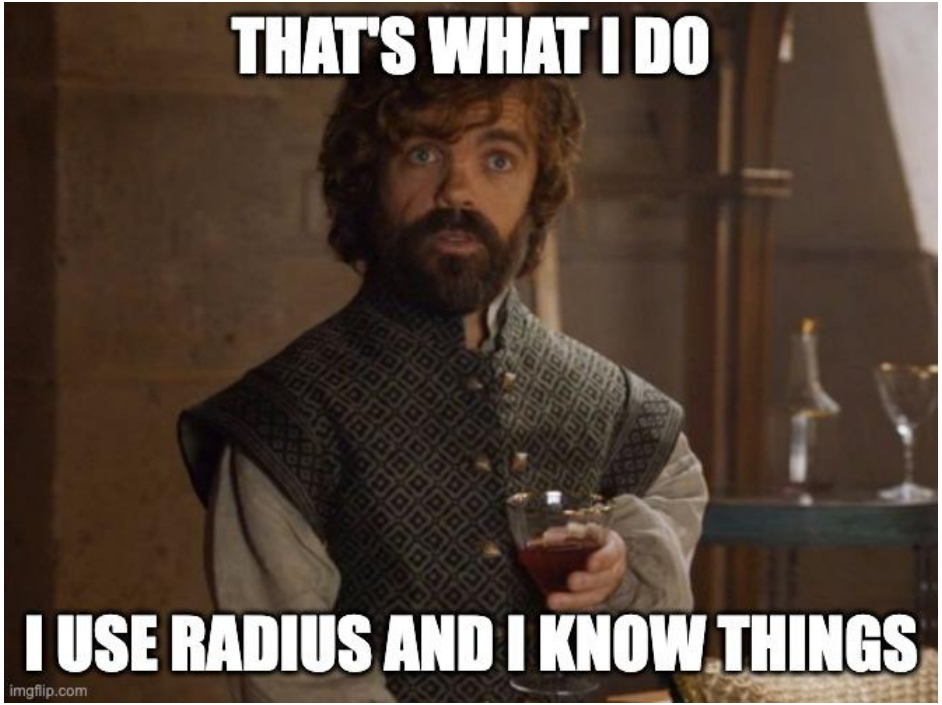
# The access edge knows things

- Identity, device, location and policy meet at the access edge
- VPNs, Wired 802.1X and Wi-Fi already produce useful events even before IP connectivity
- Security tools often see access results, but they do not see the full context
- RADIUS can help fill that gap



# RADIUS is usually treated as a gatekeeper

- Access-Request: may I enter?
- Access-Accept: yes, with this policy
- Access-Reject: no (and sometimes why)
- VLANs, filters, roles and session controls

Useful, but incomplete as a mental model.

# RADIUS is also an access event stream

**Each authentication and accounting exchange can describe:**

- **Who** authenticated, or from which organisation
- **What** device appeared
- **Where** it attached: switch, port, AP, SSID, VPN, NAS identifier / IP address …
- **When** sessions started, changed and ended
- **How** access was authorised
- **How much traffic** was observed
- **Why access** failed or stopped

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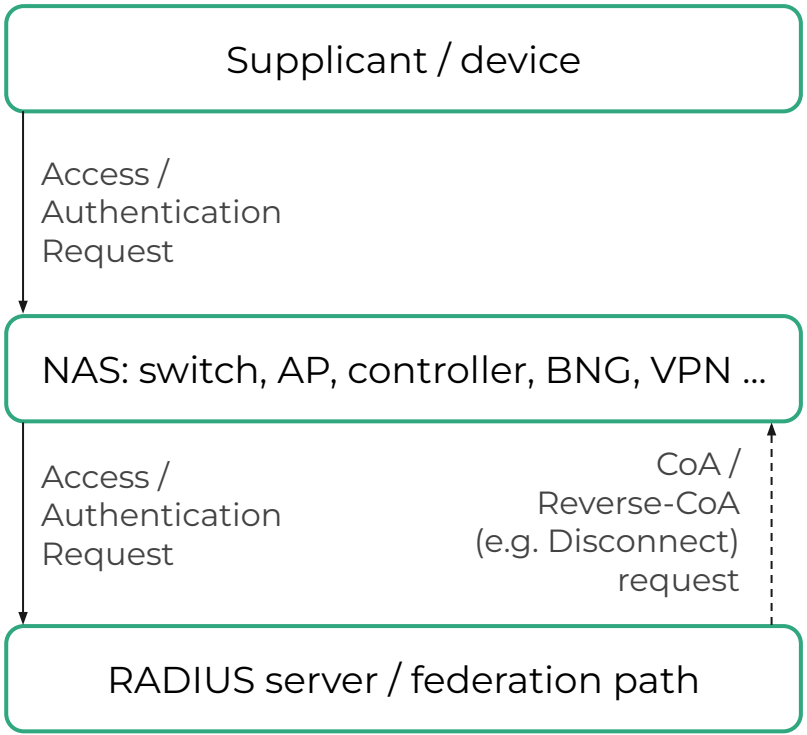
# Questions RADIUS can help answer

- Which user or device was connected where at this time?
- What was their path if they were roaming around?
- Did it use wired, Wi-Fi, VPN or some other access type?
- Which AP, SSID, port, VPN endpoint or IP addresses where involved?
- What policy result and response did it receive?
- Did the session volume and duration look normal?
- Did failure or some other patterns change?

# RADIUS AAA flow




**Authentication**
Access-Request -> Accept / Reject

**Accounting**
Start -> Interim-Update -> Stop

**Dynamic authorisation**
CoA/Reverse CoA, where supported

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# From dial-up records to access telemetry

RADIUS accounting started with practical questions:

- When did the session start and stop?
- How long did it last?
- How much input and output traffic was recorded?
- Why did it terminate?

The same pattern still matters in 802.1X networks and in any access.


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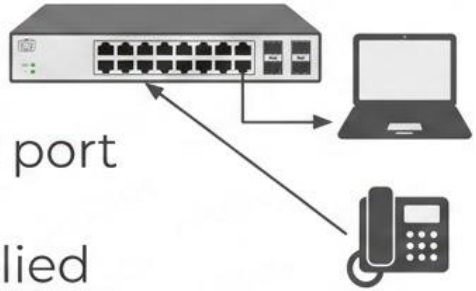
# Wired 802.1X: fixed ports should not be blind spots



Secured Ethernet ports can tell you

- Which user/device authenticated on which switch port
- Whether a fixed port suddenly became active
- Whether the expected VLAN, filter or role was applied
- Whether reauthentication or termination behaviour changed
- Traffic amounts, IP addresses sometimes even without authentication

| Timestamp | User | Device | Port | VLAN | Traffic |
|---|---|---|---|---|---|
| 16.05.2021 | User 1 | Laptop | 4 | 30 | 1300p |
| 16.05.2023 | User 2 | Device | 8 | 30 | 291p |
| 16:05.2022 | User 3 | VoIP | 10 | 30 | 1300p |
| 16:05.2022 | User 4 | computer | 12 | 30 | 120p |
| ... | ... | ... | ... | ... | ... |

Example RADIUS attributes:

NAS-Identifier, NAS-IP-Address, NAS-Port-Type , NAS-Port-Id , Called-Station-Id, Calling-Station-Id , ...

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# Wi-Fi 802.1X context


Wi-Fi RADIUS attributes can add:

- User, realm and device context
- AP, BSSID, SSID information
- RF band and WLAN security attributes, where reported
- Roaming and accountable but private identity context
- Failure and disconnect reason information

Example RADIUS attributes: cisco-avpair, Called-Station-Id, Called-Station-Id, Chargeable-User-Identity, WLAN-RF-Band, WBA-Identity-Provider, Operator-Name ...

# Passpoint and roaming add federation context


Wi-Fi roaming information may provide:

- Home identity provider, visited network details on AP level
- Identifiers: both privacy-preserving and identity disclosing
- Operator, venue and attachment-point context
- Roaming policy, service tier and clearing context
- Connection quality (IETF draft about Connect-Info)

RADIUS helps connect the access event to the roaming story.

# Policy and access information

RADIUS can provide, assign and enforce settings such as:

- VLAN assignment
- Filter or ACL name
- Role or service class
- Quarantine or restricted access
- Priority or QoS-related policy

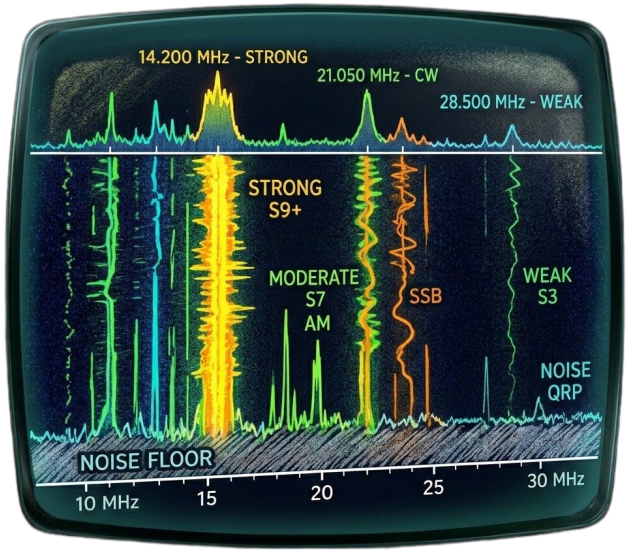
One can then match the access decision result to the intent.

# Accounting as behaviour telemetry

Accounting records can show:

- IP address information
- Start, interim update and stop lifecycle
- Session duration
- Traffic amounts: Input/output octets
- Termination causes
- Location changes, movement paths (Called-Station-Id), connection points
- Signal / connection quality information / statistics

# Detection examples: small signals, useful context




- Same identity appears in unlikely locations
- Connections happening outside working hours
- Endpoint appears on an unexpected fixed port
- Wi-Fi session uses an unexpected settings or VLAN
- Roaming rejects spike for one provider or venue
- Low-use device suddenly transfers high volume
- Reauthentication failures at a switch, AP or site

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# Vendor-specific attributes: useful, but messy

VSAs can add valuable context:

- Endpoint category, posture, role or site metadata
- Controller or NAC-specific policy results
- Roaming service, provider and charging context
- More precise failure classification

But the goal is consistent access context, not vendor analytics.


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# WBA / OpenRoaming VSA examples

Public WBA VSAs illustrate the enrichment pattern:

- WBA-Offered-Service: service tier context
- WBA-Identity-Provider: identity provider attribution
- WBA-Financial-Clearing-Provider / WBA-Data-Clearing-Provider
- WBA-Linear-Volume-Rate: charging model context
- Enhanced Reply-Message: richer reject reasons

These are vendor-specific attributes, not IETF-standard RADIUS attributes.

# Normalisation of the RADIUS attributes


**To refine RADIUS information:**

- Decode standard and selected vendor dictionaries
- Parse inconsistent MAC, SSID, port and Connect-Info formats
- (combine authentication and accounting records into sessions)
- Preserve raw and unknown attributes for troubleshooting
- (re-)map to stable fields for analytics

**Packets** -> **Decoded attributes** -> **Normalised format** -> **Enriched log context**

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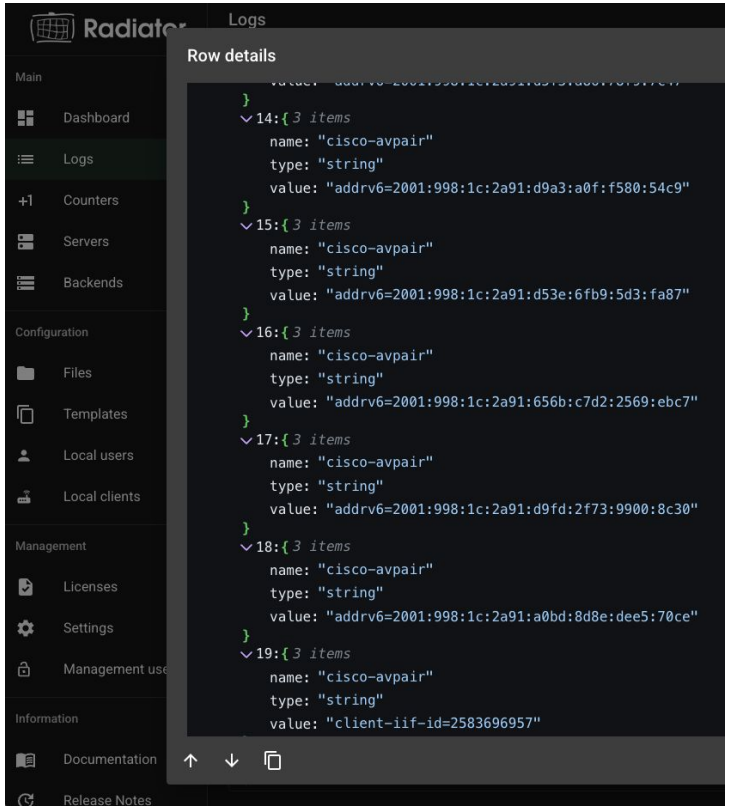
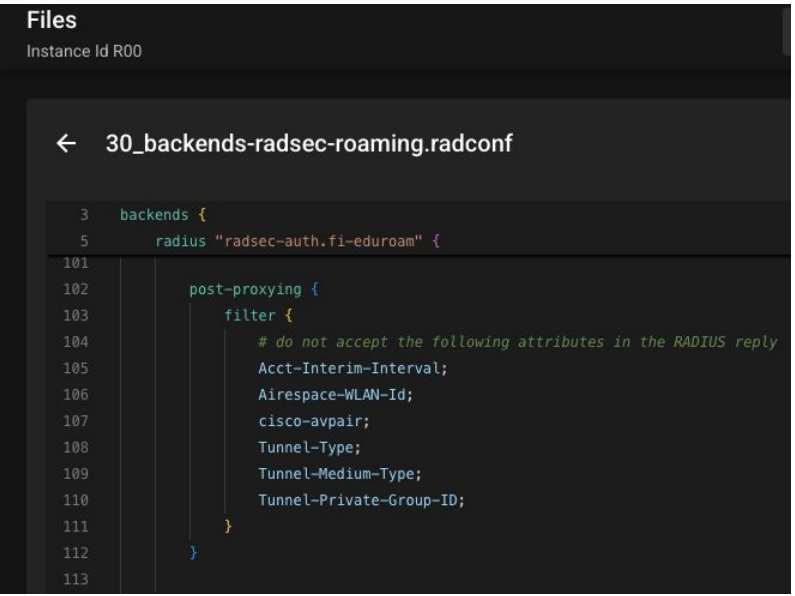
# Example: Converting RADIUS to JSON




# Securing RADIUS information




RADIUS-requests and replies may contain identity, device, location and policy data.

RADIUS replies and CoA requests may also contain instructions to alter user/device network access parameters.

Integration considerations:

- Use RadSec / RADIUS over TLS where paths cross untrusted or administrative boundaries
- Filter all inbound and outbound information and instructions you do not want get
- Move RADIUS information and logs quickly to a log processing / analytics / storage solution, which has role-based access control, retention times and audit logs to secure the information

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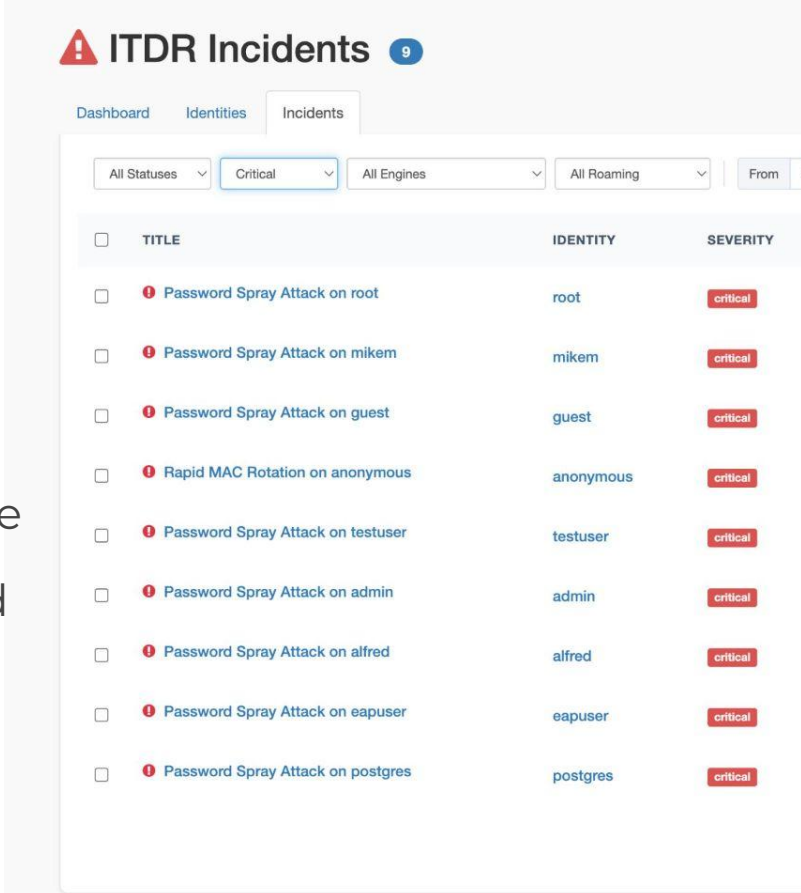
# Using RADIUS to expand your awareness

RADIUS context can enrich:

- SOC timelines and incident information
- SIEM and log analysis and searches
- xDR, DHCP, DNS, VPN and identity correlation
- Asset-inventory validation
- Anomaly models for movement, access type, access times, policy and traffic volume

AI solutions can help identifying anomalies and processing all this information. Some (e.g. IronWiFi ITDR) can be configured to do active response as well.

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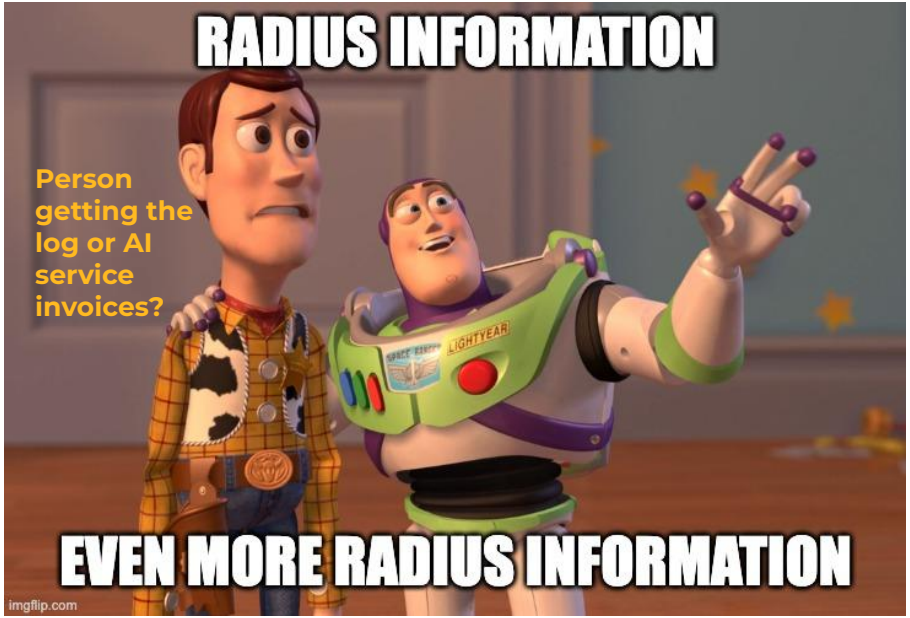
# Automated, active response with RADIUS

With dynamic authorisation (CoA, Reverse-CoA, Passpoint attributes) with RADIUS you can:

- Terminate or authorise connections
- Assign quarantine VLAN or filters
- Policy updates during a session
- Disconnect misbehaving, suspicious devices / users

But use guardrails: authorisation, audit, testing and check the trust borders.

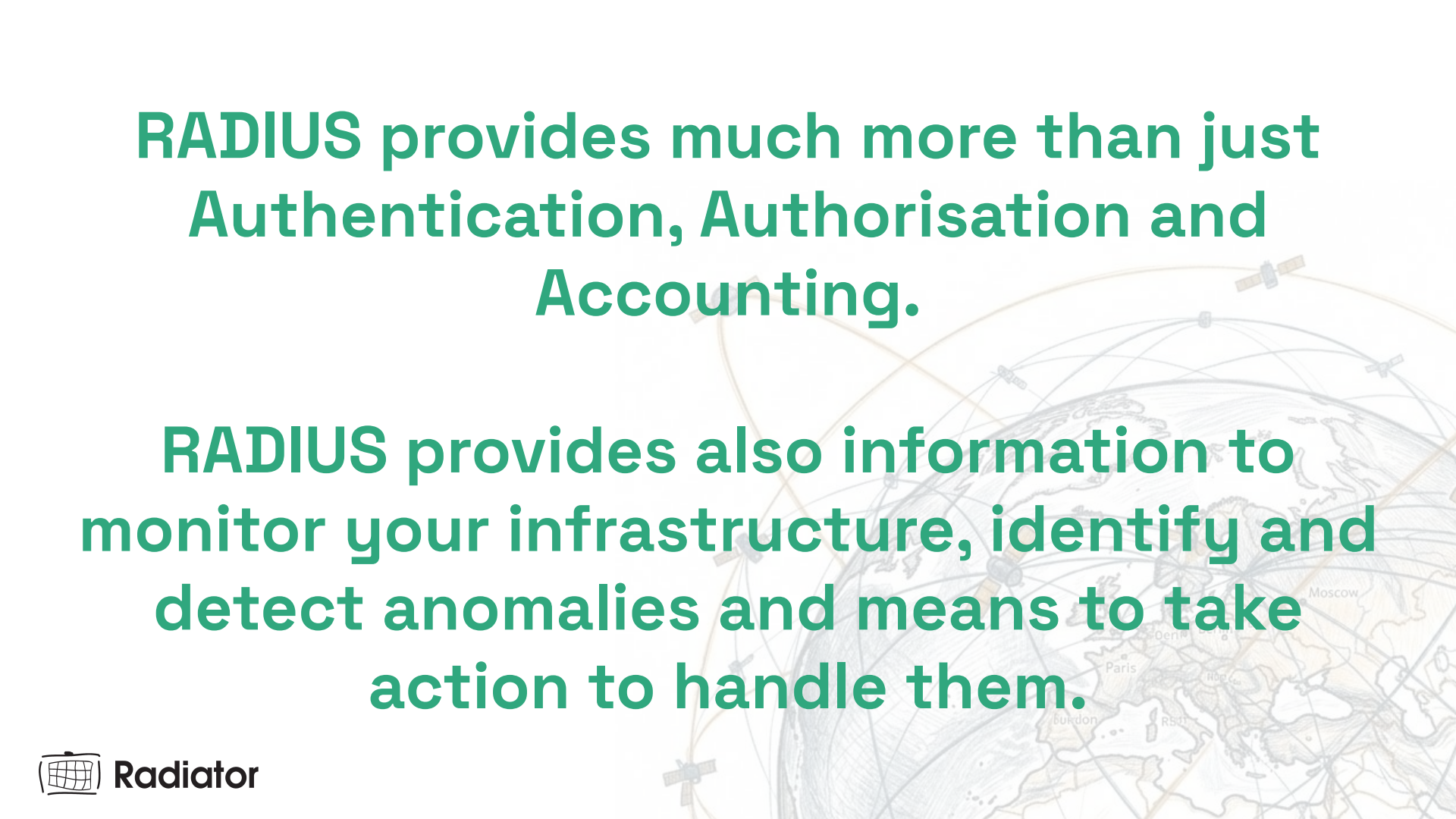
# Future directions




- Common RADIUS as JSON format
- Wi-Fi Quality Metrics (Connect-Info)
- Wi-Fi Sensing?
- Emergency services and location support
- Privacy improvement, but at the same time even more options for location (tracking)
- Privacy first EAPs (EAP-PPT?)
- RADIUS information from the home access points (Per Device Credentials from external RADIUS)

RADIUS provides much more than just Authentication, Authorisation and Accounting.

RADIUS provides also information to monitor your infrastructure, identify and detect anomalies and means to take action to handle them.

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