Characterizing Unsolicited Internet Telemetry: A Single-Address, Single-Provider, Seven-Day Observational Case Study

Research artifact — generated from a frozen seven-day telemetry export

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Observation window: 2026-08-25T21:48:08Z (inclusive) to 2026-09-01T21:48:08Z (exclusive) **Coverage:** incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25,543.595852 seconds.

Coverage qualification: Coverage is incomplete and right-censored at 2026-09-01T14:42:24.404148Z; the unobserved tail is 25,544 seconds. Missing future events are not zero observations.

Contents

Abstract

This single-address, single-provider, seven-day observational case study describes unsolicited telemetry from an operator-unadvertised public deployment. The frozen corpus contains 4,724,688 indexed documents, of which 3,796,496 qualify as externally sourced under the documented source rule. The analytic record preserves sensor-specific units: 465,659 p0f contact tuples, 546,712 Suricata flow records, 34,489 Cowrie sessions, and 22,991 selected application request records. These units are not interchangeable and are not each attacks.

The study treats `t0` only as the earliest indexed operational event in the frozen Elasticsearch corpus. Because network exposure time is not known, elapsed event times are not exposure-to-discovery latency. The scanner-excluded sensitivity analysis removes only sources with explicit scanner self-identification; it does not make the remaining traffic malicious. The available telemetry does not establish malware or real-host compromise. The contribution is a reproducible, privacy-conscious description of observed telemetry and its limits, rather than an estimate of Internet-wide behavior or a claim about source identity.

Introduction

Internet-facing services commonly receive a mixture of measurement, reconnaissance, credential attempts, exploit-shaped requests, and unrelated background traffic [1]. A source address is a network identifier, not a person, organization, or actor. This paper therefore keeps observations, inferred behavior, and confirmed effects separate.

The research question is: what qualifying telemetry units and evidence-bounded behavioral patterns were observed over the fixed seven-day event-time window at one public address? The study is not a prevalence estimate, controlled experiment, or attribution exercise.

Related Work

Internet background radiation and address-history effects motivate cautious interpretation of any one-address deployment [1] [2]. Internet-wide measurement research also establishes that rapid observation of public IPv4 space is not, by itself, a novel finding [3]. Honeypot telemetry is useful for observing interaction with emulated services, but it requires care because sensors emit heterogeneous record types [4] [5].

Methodology

This is a single-address, single-provider, seven-day observational case study; it cannot estimate provider-wide or Internet-wide behavior.

Study boundary and time origin

The authoritative window is half-open: `@timestamp >= 2026-08-25T21:48:08Z` and `@timestamp < 2026-09-01T21:48:08Z`. It spans 604,800 seconds. `t0` is the earliest indexed operational event in the frozen Elasticsearch corpus. Because network exposure time is not known, elapsed event times are not exposure-to-discovery latency. Coverage status is `incomplete_right_censored`, with records observed through `2026-09-01T14:42:24.404148Z`. Coverage is incomplete and right-censored at 2026-09-01T14:42:24.404148Z; the unobserved tail is 25,544 seconds. Missing future events are not zero observations.

Analytic populations and units

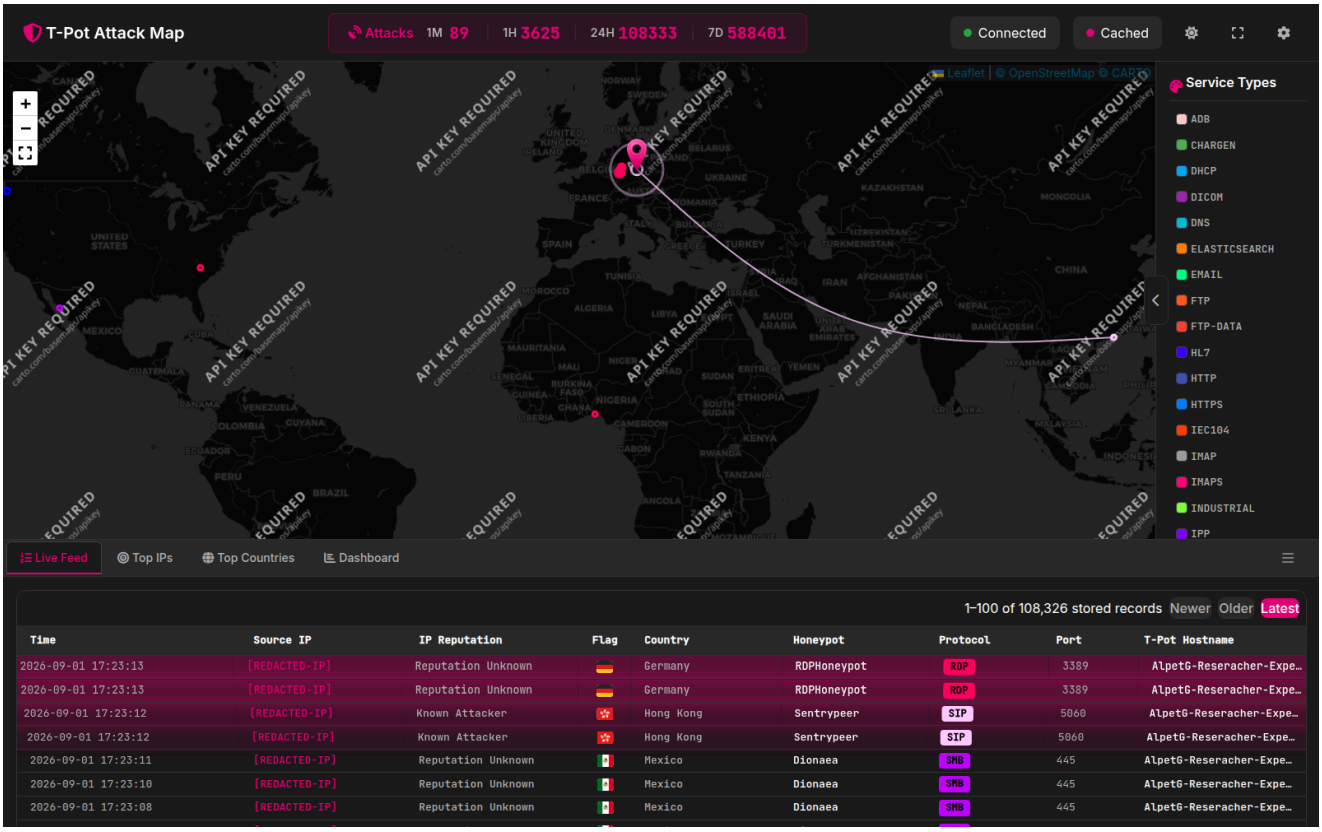
The public analysis excludes verified sensor-originated, private, and unusable source values before external-source aggregation. An indexed document is not necessarily a network connection; a p0f contact tuple is not necessarily a completed connection; a Suricata flow is not a session; a Cowrie session is not a real-host login; and an application request record is not proof of exploitation.

Scanner-excluded sensitivity analysis

The deterministic rule is: exclude every observation from a source with an explicit Cortex Xpanse or Censys scanner self-identification. It identified 1,464 source addresses across 110,331 qualifying observations. Sensitivity analysis only; remaining traffic is not thereby established as malicious.

Contextual screenshots

Contextual screenshot metadata is retained separately from the analytical record. Contextual evidence only; frozen telemetry and derived metrics remain authoritative. Contextual host-state evidence only; frozen telemetry and derived metrics remain the authoritative analytical record.



Contextual capture — Attack Map. Full-page dashboard evidence for the canonical seven-day filter; source addresses are redacted and the screenshot is contextual only.

Contextual capture — Kibana dashboard. Full-page dashboard evidence for the canonical seven-day filter; source addresses are redacted and the screenshot is contextual only.

Dataset

Population	Count	Unit and qualification
Raw Elasticsearch documents	4,724,688	Indexed records; not attacks or connections
External-source documents	3,796,496	Documents passing the external-source rule
Unique external source IPs	22,485	Network identifiers, not people
p0f contact tuples	465,659	Deduplicated contact observations
Suricata flow records	546,712	Flow telemetry, not sessions
Cowrie sessions	34,489	Decoy interaction sessions
Application request records	22,991	Selected sensor records; not proof of effect

The source rule excluded 928,192 records from the external-source population. The public artifacts retain aggregate results and do not publish raw source addresses, credentials, commands, or payload material.

Among p0f contact observations, the most represented apparent source country after excluding Kosovo/Kosova labels was **United States** (132,693 contact observations). This is an enrichment-based descriptive result, not a nationality, identity, or attacker attribution.

Results

The seven-day derived figures answer distinct descriptive questions and retain their own population, units, and caveats. They are generated from the published metrics and tables, not from a live dashboard.

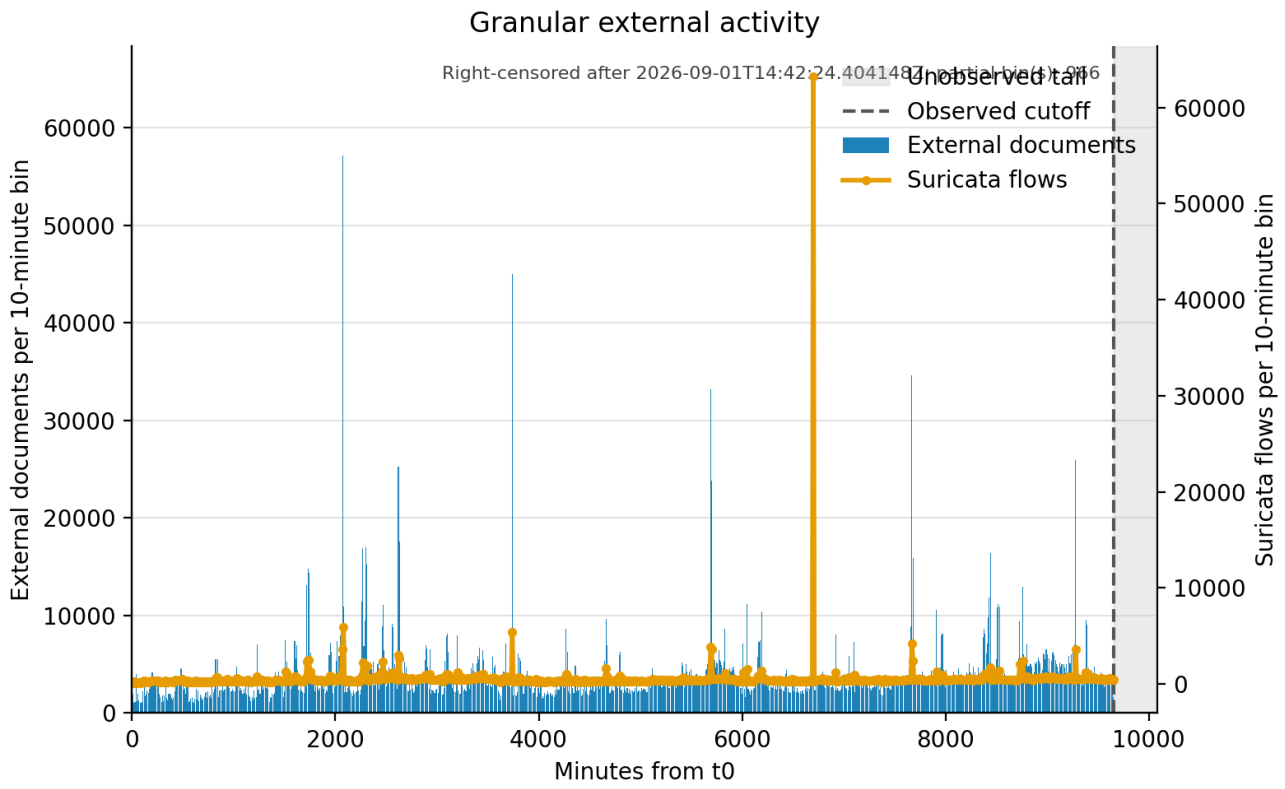


Figure 1. How did qualifying external activity vary across the study window? Population: Qualifying external-source documents and Suricata flow records. Units: documents and flows per 10-minute bin. Coverage status is incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25543.595852 seconds. Missing future events are not zero observations.

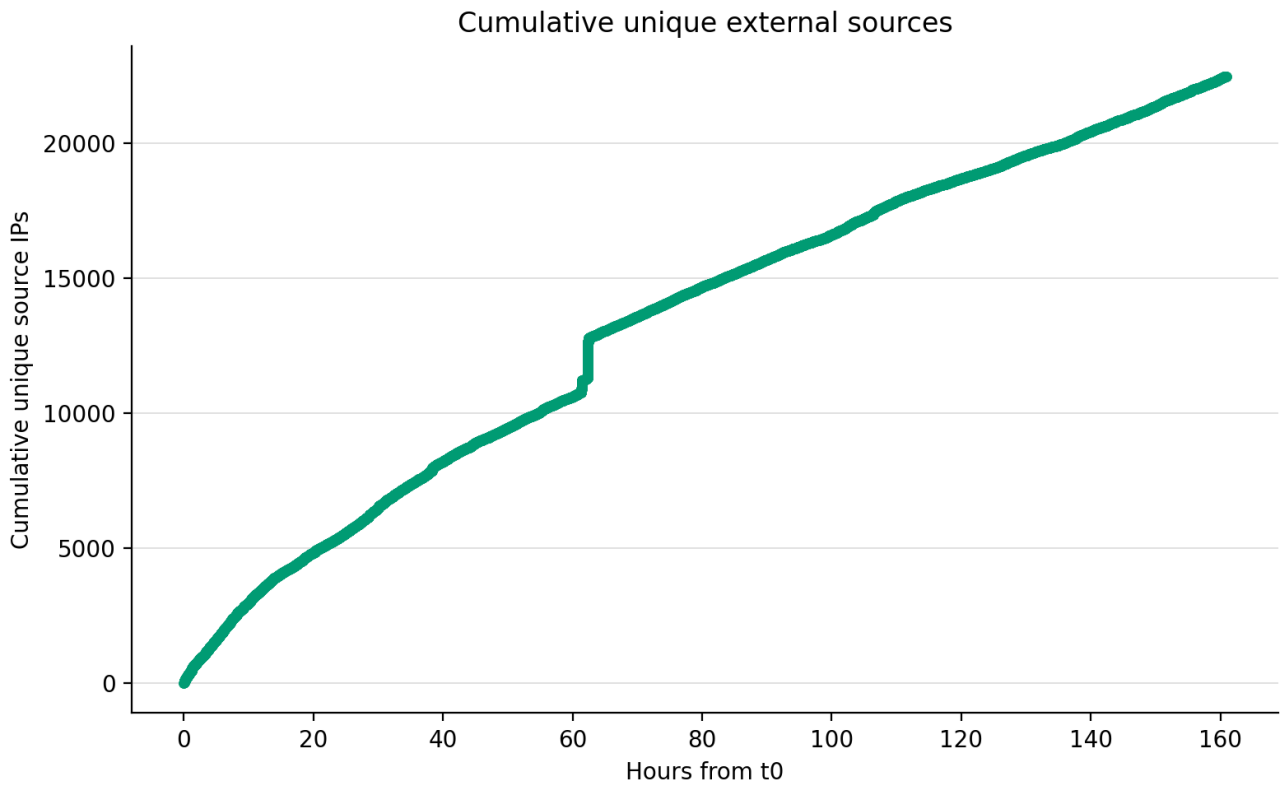


Figure 2. How quickly did unique external sources accumulate? Population: Qualifying external source IPs, ordered by first observation. Units: hours from t0; cumulative unique source IPs. Coverage status is incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25543.595852 seconds. Missing future events are not zero observations.

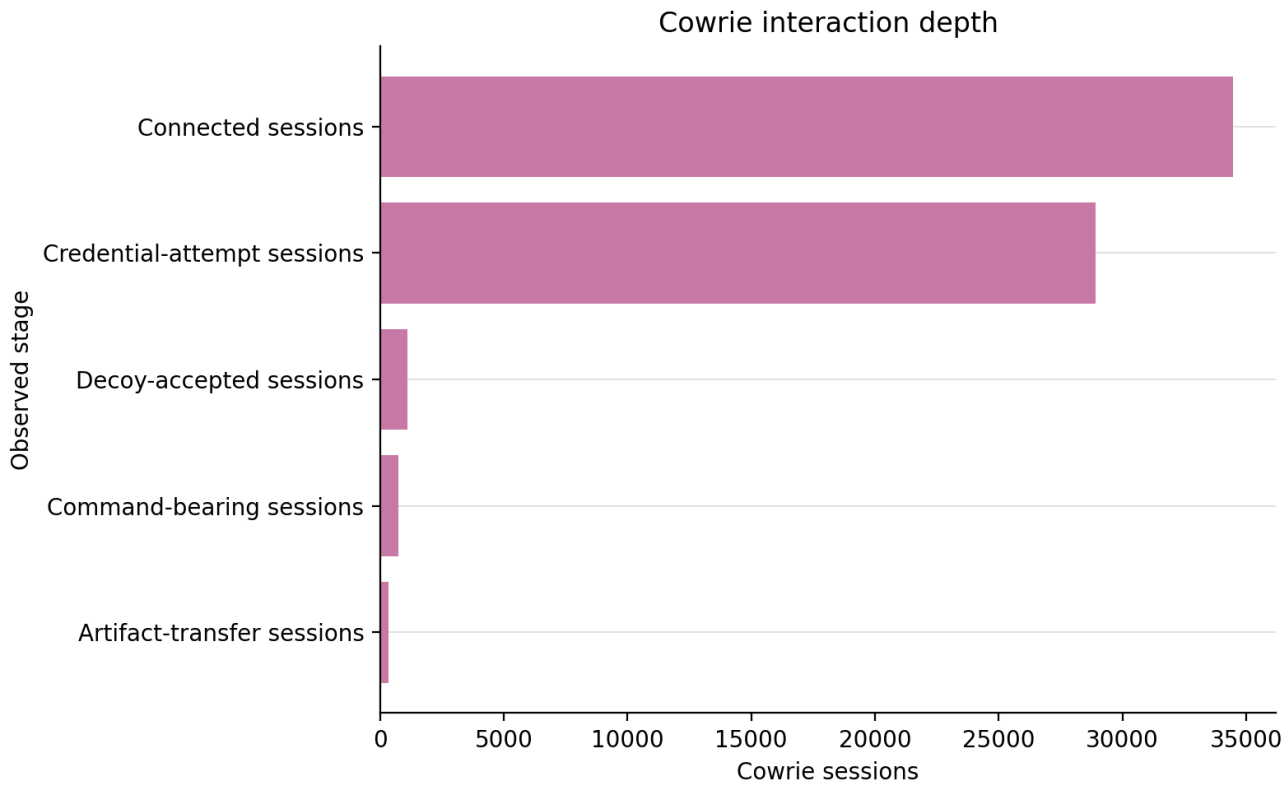


Figure 3. How many Cowrie sessions reached each observable interaction stage? Population: External Cowrie sessions with the corresponding observed event. Units: sessions. Stages are nested observational milestones; accepted decoy logins do not prove real-host access. Coverage status is incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25543.595852 seconds. Missing future events are not zero observations.

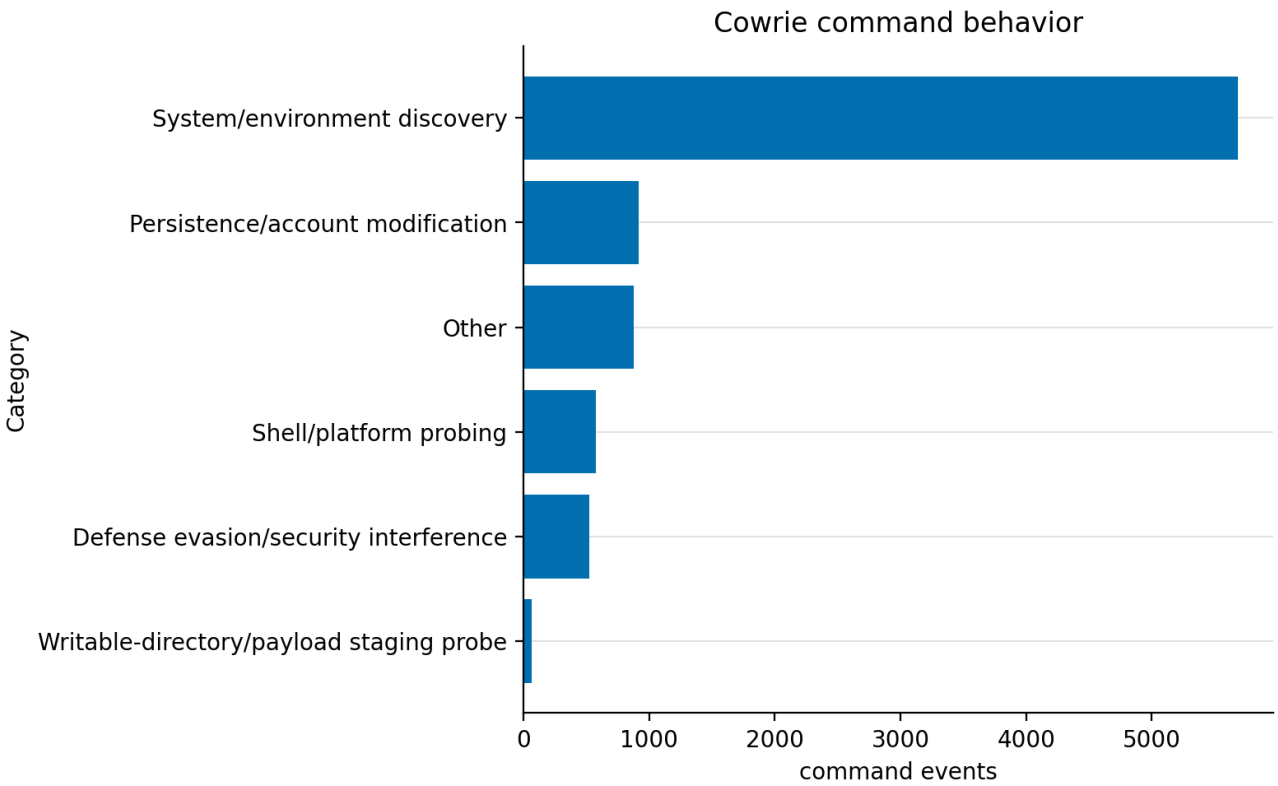


Figure 4. What command behavior categories were observed in Cowrie sessions? Population: Observed Cowrie command-input events. Units: command events. Categories summarize observed command text; they do not establish malware or real-host compromise. Coverage status is incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25543.595852 seconds. Missing future events are not zero observations.

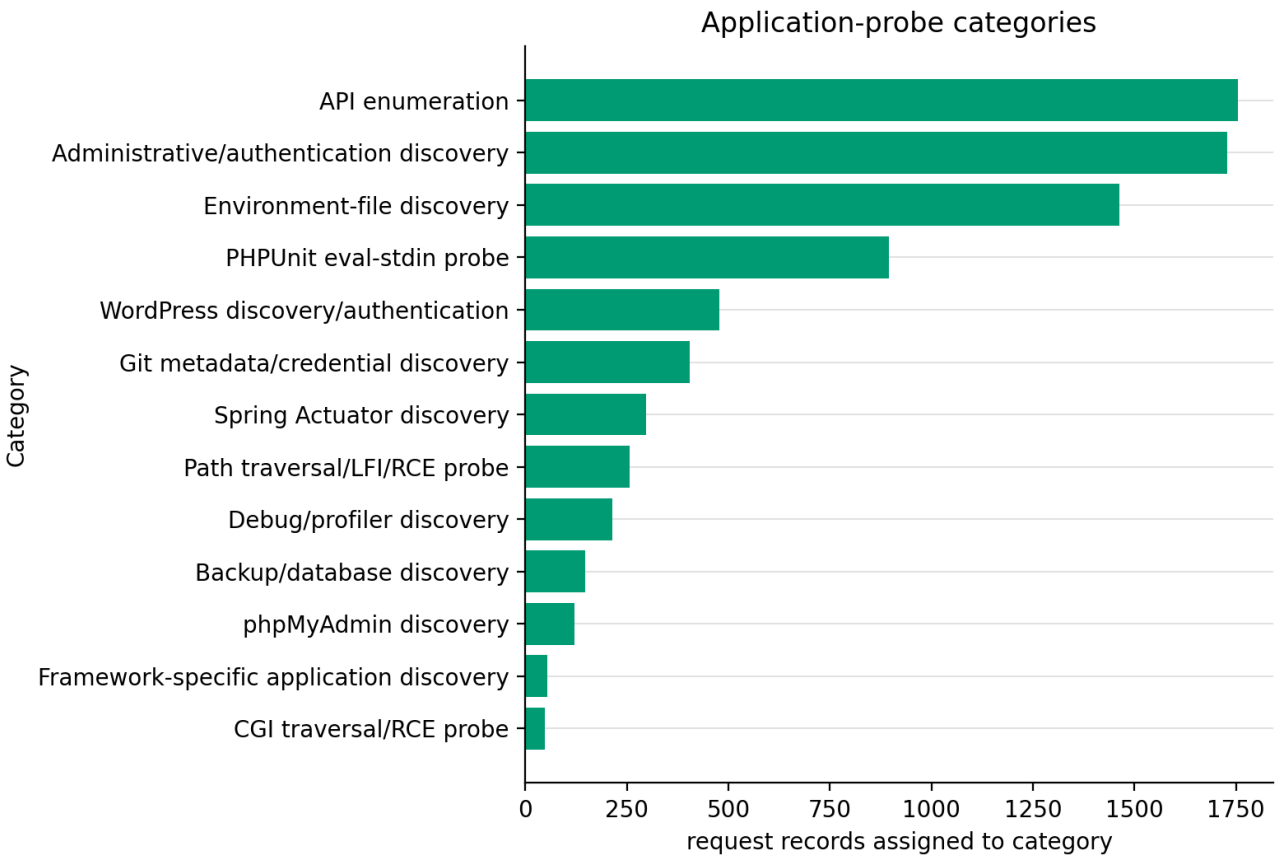


Figure 5. What categories of application probes were observed? Population: Categorized application-request records. Units: request records assigned to category. A request can match more than one category; category membership does not establish exploit success. Coverage status is incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25543.595852 seconds. Missing future events are not zero observations.

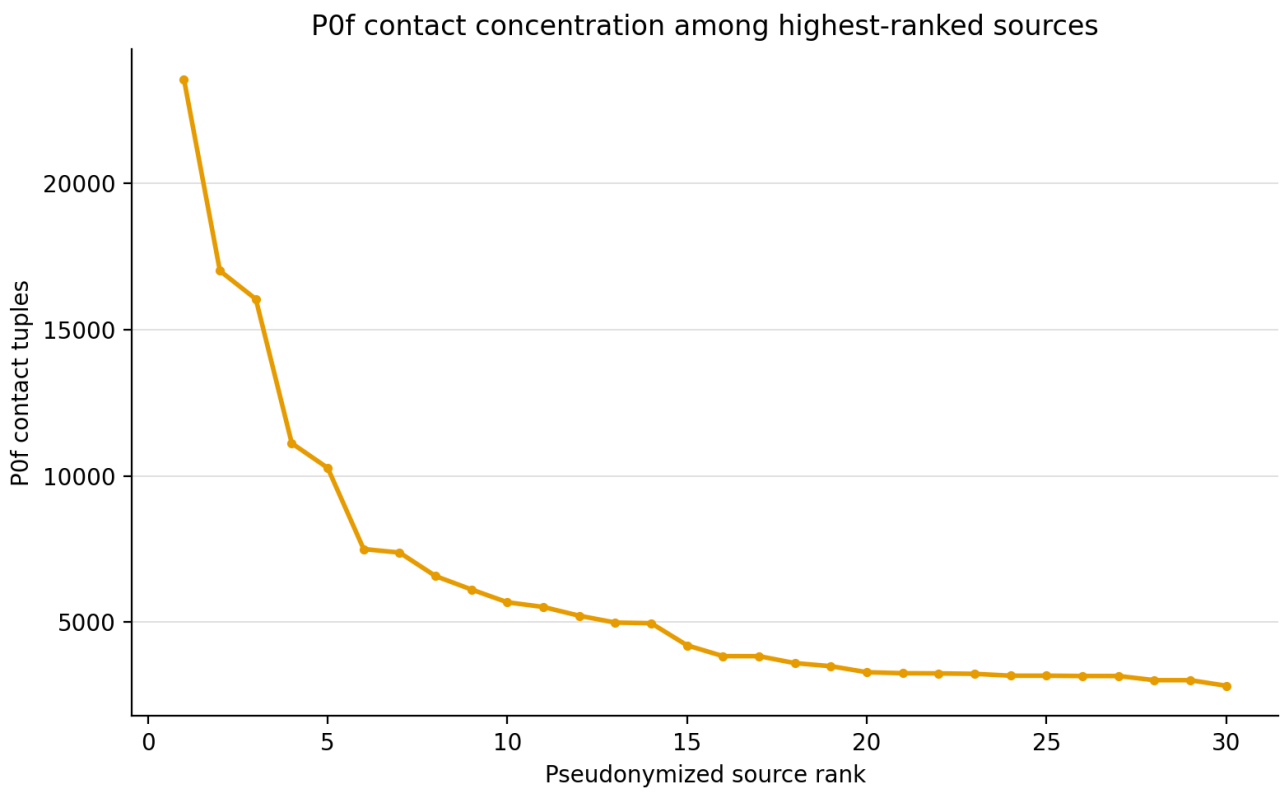


Figure 6. How concentrated were P0f contact tuples among the highest-ranked sources? Population: Pseudonymized sources with P0f contact tuples (highest-ranked rows only). Units: P0f contact tuples per pseudonymized source rank. This is a descriptive top-ranked view; pseudonyms do not identify actors and the source table is capped. Coverage status is incomplete_right_censored; observed through 2026-09-01T14:42:24.404148Z; unobserved tail: 25543.595852 seconds. Missing future events are not zero observations.

Scanner sensitivity table

Population	Measure	Value	Qualification
A: all qualifying external traffic	external_documents	3796496	descriptive sensitivity population
A: all qualifying external traffic	unique_source_ips	22485	descriptive sensitivity population
A: all qualifying external traffic	p0f_contact_tuples	465659	descriptive sensitivity population
A: all qualifying external traffic	suricata_flows	546712	descriptive sensitivity population
A: all qualifying external traffic	application_request_records	22991	descriptive sensitivity population
A: all qualifying external traffic	first_external_event_seconds_from_t0	4.0	relative to earliest indexed event, not exposure
A: all qualifying external traffic	first_credential_attempt_seconds_from_t0	265.106	relative to earliest indexed event, not exposure

Population	Measure	Value	Qualification
A: all qualifying external traffic	first_explicit_exploit_pattern_request_seconds_from_t0	2181.0	relative to earliest indexed event, not exposure
B: explicit-scanner sources excluded	external_documents	3686165	descriptive sensitivity population
B: explicit-scanner sources excluded	unique_source_ips	21021	descriptive sensitivity population
B: explicit-scanner sources excluded	p0f_contact_tuples	449579	descriptive sensitivity population
B: explicit-scanner sources excluded	suricata_flows	532134	descriptive sensitivity population
B: explicit-scanner sources excluded	application_request_records	22649	descriptive sensitivity population
B: explicit-scanner sources excluded	first_external_event_seconds_from_t0	5.0	relative to earliest indexed event, not exposure
B: explicit-scanner sources excluded	first_credential_attempt_seconds_from_t0	265.106	relative to earliest indexed event, not exposure
B: explicit-scanner sources excluded	first_explicit_exploit_pattern_request_seconds_from_t0	2181.0	relative to earliest indexed event, not exposure

Attack Characterization

The observed record types support a conservative characterization of scanning, credential activity, and decoy interaction only at the level their telemetry records. Cowrie recorded 30,005 credential attempts and 718 command-bearing sessions. Decoy-accepted authentication and commands submitted to an emulator do not demonstrate access to a real host, execution on a real host, malware, or an identified actor. The available telemetry does not establish malware or real-host compromise.

Web Application Probing

The selected web population contains 22,991 application request records. The available sensor schemas do not prove one-to-one packet-level transaction reconstruction. Request categories are descriptive and may overlap. An exploit-shaped request, a discovery path, or a response record does not by itself establish disclosure, execution, persistence, or compromise.

Discussion

This remains a single-address, single-provider, seven-day observational case study and cannot support provider-wide or Internet-wide estimates.

The exploratory behavioral-modeling decision was **omitted**. Features are aggregate counts, rates, and spans; they are not semantic source labels. The result is exploratory and does not establish cause, identity, or intent. scikit-learn is unavailable; model evaluation is omitted

The study's direct value is the transparent distinction between documents, contact tuples, flow records, sessions, and request records, as well as confirmed effects. It does not establish the motives, legal operators, or geographical identity of observed source addresses.

The optional model evaluation is omitted from interpretive analysis.

Threats to Validity

The case has one observed public address, one deployment configuration, and one bounded event-time interval. `t0` is an indexed-event origin, not a verified network-exposure time. Sensor schemas have different semantics and cannot be converted into a shared attack count. Explicit scanner exclusion is a sensitivity analysis, not a ground-truth benign/malicious classifier. Apparent network enrichment, if present in the generated tables, does not establish physical location or identity.

General Defensive Implications

Organizations should maintain an asset inventory, reduce unintended exposure, apply timely security updates, use strong access controls, monitor authentication and application telemetry, and rehearse incident response. These are technology-neutral defensive practices; this single case study does not rank products or prescribe a particular platform.

Conclusion

This frozen single-address, single-provider, seven-day observational case study provides a reproducible description of qualifying unsolicited telemetry. Its counts are tied to named metrics and source tables, its figures preserve stated caveats, and its negative findings remain explicit. The results should be read as bounded observational evidence, not a discovery-latency measurement, actor attribution, provider-wide or Internet-wide estimate, or claim about source identity. `t0` remains only the earliest indexed operational event, not a verified network-exposure time.

Data Dictionary

Term	Meaning
Indexed document	One Elasticsearch record in the frozen export; not necessarily a network transaction.
External-source document	An indexed document whose source passed the documented external-source rule.
p0f contact tuple	A deduplicated TCP contact/probe observation; not a guaranteed completed connection.
Suricata flow record	A network-flow telemetry record; not an application session.
Cowrie session	Interaction with a decoy SSH/Telnet service; not evidence of real-host access.
Application request record	A selected honeypot application record; not proof of exploit success.
`t0`	The earliest indexed operational event in the frozen Elasticsearch corpus.

Declarations

Author contributions: Not stated in the source artifact
Funding: Not stated in the source artifact
Competing interests: Not stated in the source artifact
Ethics review: Not stated in the source artifact
Data availability: Restricted raw telemetry is not publicly distributed because it may contain sensitive identifiers and interaction content. Public derived artifacts are generated from the frozen export by the accompanying scripts.
Code availability: See the KSAL Research publication page for approved artifacts.

References

[1] Pang, R., Allman, M., Bennett, M., Lee, J., and Wetherall, D. A first look at modern enterprise traffic. *Proceedings of the ACM SIGCOMM Internet Measurement Conference*, 2005.

[2] Wustrow, E., Karir, M., Bailey, M., Jahanian, F., and Huston, G. Internet background radiation revisited. *Proceedings of the ACM SIGCOMM Internet Measurement Conference*, 2010.

[3] Durumeric, Z., Wustrow, E., and Halderman, J. A. ZMap: Fast Internet-wide scanning and its security applications. *USENIX Security Symposium*, 2013.

[4] Vetterl, A., Clayton, R., and Walden, I. Security and privacy implications of honeypot deployments. *Workshop on Cyber Security Experimentation and Test*, 2018.

[5] T-Pot Community. T-Pot: The All In One Multi Honeypot Platform. Authoritative project documentation, accessed for methodology context.