



# Simgenet SVP — Validation Platform Datasheet

**Simgenet SVP is a network test and validation platform that combines traffic, time synchronization, OAM and IEC 61850 testing in a single instrument, documenting every result with evidence-based, sealed reports against international standards.**

**Simgenet SVP (Validation Platform)** is an **independent network validation and test platform** developed entirely in-house by Simgenet. It is designed for evidence-based verification of routers, switches, time servers (GM/BC) and line quality against **RFC / ITU-T / MEF / IEEE / IEC references** in critical infrastructure, service provider and power utility (IEC 61850) networks. It is vendor-independent: any manufacturer's device is tested with two test ports and standard methodology. Every test is stored in the database with its parameters, raw data and PASS/FAIL verdict, and produces a customer-deliverable, lockable report.

Model: **SVP-100G** · Document version 1.0 (July 2026)

## Use Cases

- **Laboratory validation:** router/switch R&D and regression testing — automated test matrix before every release
- **Field SLA activation:** Y.1564 / RFC 2544 acceptance test at turn-up + sealed customer-deliverable report
- **Power / substation commissioning:** IEC 61850 GOOSE/SV, Power-Profile PTP and HSR/PRP verification
- **Timing infrastructure validation:** GM/BC/time-server conformance (G.8273.2/G.8272 masks), holdover and resilience
- **Continuous monitoring (sentinel mode):** permanently attached to the installation; periodic conformance rounds + GM announce-change tracking + SNMP/NMS alarms — faults detected the moment they occur
- **Interoperability:** vendor-independent reference measurement arbiter in multi-vendor environments

## Positioning

- **Single platform:** Ethernet traffic testing (1G→100G) + PTP/NTP/gPTP timing analysis + Y.1731 OAM + TWAMP/STAMP + TSN + IEC 61850/HSR-PRP — capabilities that require separate instruments or separate licenses on commercial testers, in one box.
- **Hardware-timestamped, ns-class measurement:** functional validation, conformance testing and SLA activation in the field and in the lab.
- **Transparent evidence philosophy:** the report states not only the result but also **what the test does and does not prove** (duration-validity tiers, raw-data appendix, compliance stamp).

## Test Capabilities

### Ethernet Performance (RFC 2544 / RFC 9004 / ITU-T Y.1564 / MEF)

- **RFC 2544:** throughput (NDR, binary search + sweep), latency (LIFO/FIFO/LILO — store-forward/cut-through distinction), frame loss, **back-to-back burst (RFC 9004):** 64...9600B jumbo and IMIX/EMIX frame profiles
- **Y.1564 Service Activation Test (SAT) — full scope:** service configuration test (CIR ramp 25-50-75-100%, EIR, CBS/EBS burst, color-aware PCP/DSCP) + service performance test (multi-service concurrent, 15min/2h/24h)
- Policing/overshoot step per the standard formula: test rate  $CIR + 1.25 \times EIR$ ; SAC band  $CIR \times (1 - FLR) \leq IR \leq CIR + EIR + M$  (M parametric)
- **Y.1563 availability:** SES / Unavailable-second state machine, availability KPI
- **RFC 6349 TCP throughput:** BDP/RWND, Transfer-Time-Ratio, Efficiency %, Buffer-Delay %
- **RFC 2889 L2 switch tests:** MFR, HOL/congestion, address learning/caching, broadcast
- **RFC 3918 multicast:** throughput, join/leave latency, group capacity
- **In-house EMIX L2 traffic engine:** own sequence numbering and monotonic timestamping — **FLR / FTD / FDV / dup / reorder** in a single tool; 802.1Q PCP/DEI, L1-calculated pacing
- **MEF 66 latency histogram** (PD bins) · MEF 48.1/35.1 report compliance
- **Impairment generation:** controlled delay/loss/jitter/reorder/dup injection for DUT resilience testing
- **Micro-burst and latency-under-load analysis:** per-flow latency histogram, PDV/IPDV (RFC 5481)
- **PCAP export:** packet-level capture of test traffic, downloadable for analysis

- **Stress testing:** long-duration load with resource monitoring
- **Protection switching / ring failover measurement:** service disruption time (ms) and loss window on link break (SR TI-LFA, ERPS, HSR/PRP scenarios)
- Bidirectional FD, single-port reflector (field PoC), software-vs-hardware comparison runs
- 100G load generation: DPDK/TREx engine

#### Y.1731 / SOAM Ethernet OAM (ITU-T G.8013)

- **ETH-CC** continuity + LOC detection · **ETH-DM/DMM** delay (FD/FDV) · **ETH-LM/LMM** frame loss · **ETH-SLM/SLR** synthetic loss (MEF 35.1)
- Self-test (internal loop) and real-DUT (peer MEP) modes; in-service measurement

#### TWAMP / OWAMP / STAMP

- **TWAMP (RFC 5357):** always-on reflector + stateful session tracking — forward/reverse loss separation, dup/reorder; TWAMP-Light
- **STAMP (RFC 8762):** sender + reflector; TWAMP↔STAMP reflection auto-detection
- **OWD — true one-way delay:** via PTP synchronization (not a round-trip estimate)

#### Time Synchronization — PTP (IEEE 1588-2008/2019)

- Hardware-timestamped measurement; **cTE / dTE / maxTE, MTIE / TDEV**, PDV suite (Sync-PDV, FollowUp-PDV, DelayReq-PDV, FPP/FPC/FPR — G.8261.1)
- **PASS/FAIL against standard masks:** G.8273.2 ( $A \leq 100\text{ns} \cdot B \leq 70\text{ns} \cdot C \leq 30\text{ns}$ ) · G.8272 PRTC ( $A \leq 100\text{ns} \cdot B \leq 40\text{ns}$ ) · G.8271/G.8271.1 · IEC 61850-9-3 / IEEE C37.238 ( $\leq 1\mu\text{s}$ ) · Y.1541 PDV
- **AUTOMATIC path asymmetry detection** — exposes the hidden constant time error
- **Duration-validity discipline:** short test = lock verification;  $cTE \geq 1000\text{s}$ , field conformance  $\geq 10000\text{s}$ , wander 24-72h — the report prints an explicit warning on insufficient duration
- GM announce analysis: clockClass, accuracy, priority1/2, timeSource, leap flags, traceability; **change-event stream** (clockClass/UTC-offset/traceability transitions into the event log)
- **PTP under load** (traffic + mask in a single run) · **noise tolerance** (servo behavior under controlled impairment) · delay\_req load test · servo state tracking (ACQUIRING→LOCKED→HOLDOVER)
- **24h+ holdover testing** with defined TE limit · PTP v2/v2.1 interoperability check
- **PTP auto-discovery:** "just plug the cable" — automatic domain/profile/GM detection, vendor-independent

#### Synchronous Ethernet — SyncE (ITU-T G.8262/G.8264)

- ESMC/QL message analysis, QL transition tracking, SyncE↔PTP hybrid scenario validation

#### Time Synchronization — NTP

- offset / RTT / stratum / root delay-dispersion / precision / leap; RMS offset, cTE/maxTE (PRTC metrics when hardware-timestamped), frequency drift
- NTP under load · NTP server pool management + preflight; client list

#### TSN (Time-Sensitive Networking)

- **gPTP (IEEE 802.1AS)** profile testing
- **802.1Qbv (time-aware shaper):** gate-latency / bounded-latency / determinism measurement (gPTP-synchronized)
- **802.1Qbu frame preemption** and **802.1CB FRER** validation

#### IEC 61850 / Power Utility Automation

- **GOOSE/SV generation + analysis + capture (sniff); SCL import** for automatic scenarios from the project files
- **QoS-61850 scenario:** GOOSE-class traffic latency/loss criteria under background saturation
- Power-Profile PTP masks (IEC 61850-9-3 / IEEE C37.238)
- **HSR/PRP RedBox seamless failover measurement (IEC 62439-3)** — break the ring, prove zero loss
- **R-GOOSE / R-SV (IEC 61850-90-5):** routable GOOSE/SV over WAN/5G (UDP SPDU envelope, HMAC) — generation and analysis for wide-area protection and virtual-substation scenarios

#### OT / Cyber Security (IEC 62351)

- **IEC 61850/62351 security-compliance and resilience test module** — SVP generates the attack and measures the device's / IDS's response (it is an active resilience tester, not a passive IDS or a general penetration-testing platform)

- **GOOSE security:** poisoning (stNum/sqNum manipulation), replay, flooding/DoS scenarios
- **R-GOOSE security:** replay, spoofing, unsigned-frame injection over routable transport
- **PTP / GNSS time-spoofing:** offset-injection and slow-pull spoofing against timing DUTs — leveraging Simgenet's own GNSS security code base
- **IEC 62351-6 conformance:** forged-HMAC rejection — verify the DUT rejects unsigned/invalid-signature GOOSE/SV

## 5G / Mobile Transport

- **GTP-U (N3/N6) traffic testing:** encapsulated user-plane generation and analysis for mobile backhaul / private-5G validation
- **Base-station timing validation:** G.8271.1 time-error budget and PRTC metrics for RAN synchronization

## On-Device Correlation (the SVP difference)

- On FAIL, the DUT's (GNSS GM/BC) event window is fetched automatically and attached to the report as an "**On-Device Correlation**" block — wire measurement + device internal state in a single report

## DUT Management and Automated Testing

- **Multi-vendor DUT adapters:** ready drivers for Cisco, VyOS, SMGOS and generic Linux devices — automatic configuration, verification and factory reset; new vendor adapters plug in modularly
- **Device inventory:** DUT records (SSH/CLI access), port discovery, wiring map, ping/preflight/quick-status
- **CLI integration:** DUT running-config snapshot, suggested test configuration, pre-test automatic configuration + post-test verification/cleanup, device config backup
- **In-DUT capture and bottleneck analysis:** simultaneous counter/resource sampling from the DUT during the test — whether the problem is on the wire or in the device is separated in one report
- **Glitch classifier + hardware sensor monitoring:** anomaly signatures classified automatically; NIC/optics/temperature sensors sampled
- **Auto-Test sessions:** DUT selection → combination preview → unattended multi-test execution; best-config recommendation
- Escalation reports + health pattern library: recurring fault signatures classified automatically

## Reporting and Record Discipline

- Every test is stored in PostgreSQL with **report no (SVP-YYYY-MM-DD-*nnn*) + test no + customer/project/device + operator**, raw data included (DB-first)
- Report outputs: **PDF / CSV / HTML / print**; Appendix-A raw data section (audit/repeatability); live test streaming via SSE
- **Compliance stamp + report lock:** a locked report cannot be modified; engineer notes field; "Lab/quick-scan" ↔ "formal conformance" labeling
- Test comparison, archiving, re-run, diagnostic bundle download
- Event log (level/code dictionary) + audit trail

## Management, Monitoring and Integration

- **Web interface (HTTPS):** test triggering, live run banner, history, device/customer/project management; role-based users (admin/operator/viewer), brute-force lockout, PBKDF2
- **REST API (OpenAPI):** all tests and management via API — automation/CI integration
- **SNMP:** SIMGENET-SVP-MIB with test-FAIL and hardware-signal traps; NMS (Zabbix) integration — verdicts/maxTE flow to central monitoring automatically
- **Branding:** logo + letterhead customizable per customer/integrator
- Network management: NIC inventory (DPDK↔kernel port switching from the UI), management interface settings, live link status
- Backup (downloadable, with manifest) + **factory reset**; server-clock discipline (UI always shows the SVP server clock; chrony/NTP fallback chain)
- Automatic periodic conformance rounds; watchdog; all test services persistent across reboot (hardened systemd)

## Hardware Platform (SVP-100G)

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- **Test ports:** 1G · 10G · 100G (QSFP28) — modular NIC architecture
- **Timestamping:** NIC hardware timestamp (PHY/PTP)
- **Traffic engine:** DPDK/Trex (100G) + in-house EMIX L2 engine (precision FLR/FTD/FDV)
- **Database:** PostgreSQL (raw data + report archive)
- **Management:** HTTPS web + REST API + SNMP trap

## Licensing Model

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Capacity and feature packages are license-enabled:

- **Rate class:** 1G / 10G / 100G test capacity
- **Packages:** Ethernet Performance (RFC 2544/9004, Y.1564, RFC 6349/2889/3918) · OAM (Y.1731, TWAMP/STAMP/OWAMP) · Timing (PTP/NTP/gPTP conformance) · TSN (Qbv/Qbu/FRER) · Power (61850 GOOSE/SV, HSR/PRP, R-GOOSE) · OT Security (61850/62351 resilience) · 5G/Mobile (GTP-U)

## Reference Standards

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RFC 2544 · RFC 9004 · RFC 6349 · RFC 2889 · RFC 3918 · RFC 5357 (TWAMP) · RFC 4656 (OWAMP) · RFC 8762 (STAMP) · RFC 5481 (PDV) · ITU-T Y.1564 · Y.1563 · Y.1541 · G.8013/Y.1731 · G.8261.1 · G.8262/G.8264 · G.8271/G.8271.1 · G.8272 · G.8273.2 · MEF 35.1 · MEF 48.1 · MEF 66 · IEEE 1588-2008/2019 · IEEE 802.1AS/Qbv/Qbu/CB · IEC 61850-9-3 · IEEE C37.238 · IEC 62439-3 (HSR/PRP) · IEC 61850-90-5 (R-GOOSE/R-SV) · IEC 62351-6 · 3GPP GTP-U

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