

SUMMER INTERNSHIP

On

AUTOMATED DASHBOARD PIPELINE FOR

SAOS REGRESSION INFRASTRUCTURE



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AGENDA

1. ABOUT CIENA
2. INTRODUCTION
3. TECHNOLOGY USED
4. PROJECT APPROACH AND IMPLEMENTATION
5. RESULT
6. CONCLUSION

ABOUT CIENA



Fig.1. Ciena Logo

Organization Name: Ciena India Private Limited

Industry: Telecommunications

Headquarters: 7035 Ridge Road, Hanover, Maryland 21076, United States

Ciena Corporation, an American networking systems and software company, established in 1992, is a global leader in networking systems and software, **specializing in optical and routing solutions** for telecommunications and data networks. **Serving over 85% of the world's largest service providers**, Ciena's clients include AT&T, Meta, and Verizon. Ciena India, its largest R&D facility outside North America, has been recognized as **India's top optical networking company**. As of October 2022, Ciena reported revenues of \$3.63 billion and employs over 8,000 people, led by CEO Gary Smith.

INTRODUCTION

- In the fast-paced telecom industry, ensuring the reliability and scalability of network software is critical. **Ciena's Service-Aware Operating System (SAOS)** powers their global routing and switching devices, requiring continuous regression testing with every new build release.
- The Special Design & Regression Team **faced challenges as test results were scattered across multiple logs**, causing delays and limited visibility.
- To address this, my internship focused on developing an **automated live regression dashboard** that parses logs, consolidates results, and visualizes real-time test statuses. Integrated with **Jenkins CI/CD**, this system streamlined monitoring, improved transparency, and enhanced operational efficiency across Ciena's SAOS regression framework.

TECHNOLOGY USED

Linux Virtual Machine

- Linux is an open-source operating system, meaning it's free to use, modify, and distribute.
- A Linux VM was used as the primary development and testing environment for this project. It provided a stable, secure, and isolated setup to run scripts, deploy services, and manage automated pipelines efficiently within Ciena's regression infrastructure.

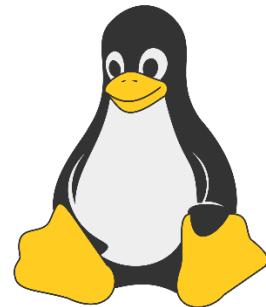


Fig 2. Linux Logo

TECHNOLOGY USED

Python Programming language

- Python is high level, easy to read, has extensive collection of libraries, cross-platform compatibility & easily integrated with CI/CD tools like Jenkins making it a perfect choice for automation pipelines.
- Python's **text-processing efficiency and file-handling capabilities** were crucial for parsing large regression log files and extracting test results.
- Python **served as the backbone** for the Flask-based web application that powered the live dashboard.
- Its **simplicity allowed for fast prototyping and iterative refinement with over 15 script versions.**

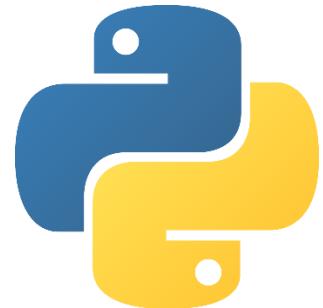


Fig 3. Python Logo

TECHNOLOGY USED

Flask

- Flask, a lightweight Python web framework, was used **to build the backend of the automated dashboard.**
- It enabled **seamless integration between the parsed regression data and the frontend interface**, allowing dynamic visualization of real-time test results.
- **Its flexibility and simplicity made it ideal for rapid development**, API creation, and efficient data handling within the SAOS regression infrastructure..



Fig 4. Flask Logo

TECHNOLOGY USED

Jenkins

- Jenkins, an open-source automation tool, was **used to trigger automated test runs and provide input files for the dashboard script.**
- It streamlined the testing workflow by **scheduling and executing regression tests** without manual intervention.
- By integrating Jenkins with the dashboard pipeline, the process of feeding live test data became efficient and consistent, ensuring timely and accurate updates of test results.



Jenkins

Fig 5. Jenkins Logo

OTHER TECHNOLOGY/ TOOLS USED



PROJECT OVERVIEW AND IMPLEMENTATION

1. Overview of SAOS Regression Infrastructure

- The SAOS Regression Infrastructure ensures the stability and reliability of Ciena's Service-Aware Operating System through continuous automated testing on Linux-based VMs, orchestrated via Jenkins.
- **Previously manual and time-consuming**, the process was transformed by the Automated Dashboard Pipeline, which now **parses, aggregates, and visualizes test results in real time**.
- This automation enhances test coverage, **accelerates feedback, reduces manual effort**, and provides transparent visibility into system performance across builds and platforms.

2. Dashboard Architecture and Design



Fig. 6 Sample SD&R Team Dashboard
Source: Intellectual Property of Ciena India Pvt Ltd.



Results of saos-01-11-02-0121

| # | Test Suite Results for evnt-saos-01-11-02-0121 | 3922 (10.121.182.205) | 5130 (10.121.182.245) |
|---|--|--------------------------|--------------------------|
| 1 | sanity_generic_val_cli_test_soft_install | PASS | |
| 2 | sanity_container_sd_test_soft_install | PASS | |
| 3 | sanity_generic_val_cli_test | | PASS |
| 4 | sanity_container_sd_test | | PASS |
| | Rolled-Up Config Result | PASS | PASS |
| | Rolled-Up Suite Result | | PASS |

Elapsed Time: 0:51:10 (HH:MM:SS)

Fig. 7 Base Dashboard with Dummy Values

3. Core Logic Development

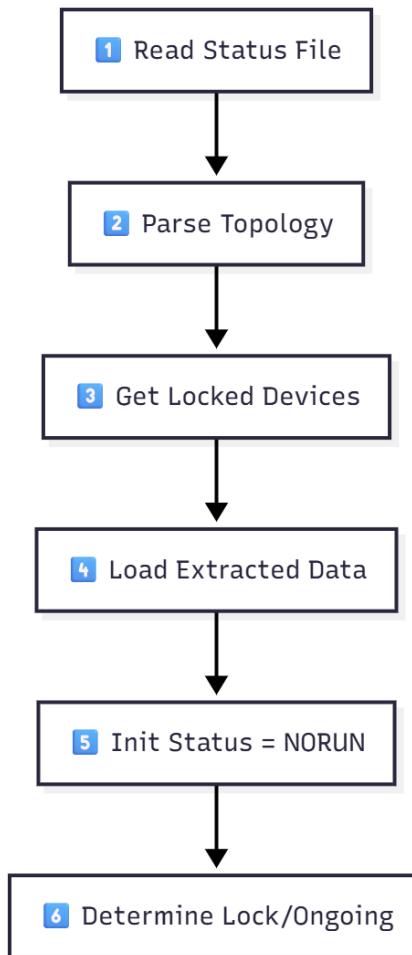


Fig 8. Data & Setup Flow

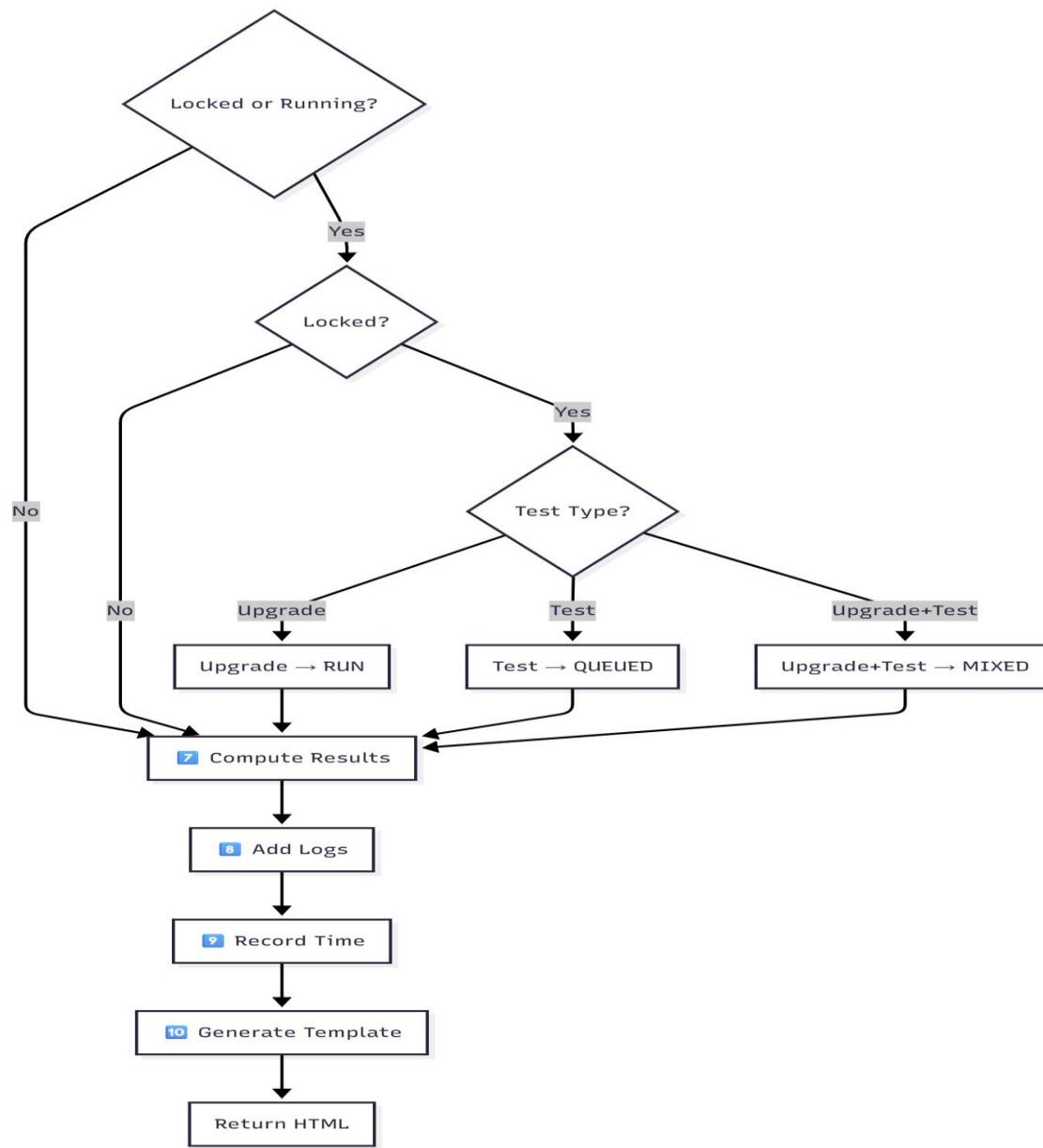


Fig 9. Status Logic & Result Flow

| State | Meaning | Color |
|---------|--|---------------|
| CRASH | System crash during test (Only for Onie Upgrade) | 🔴 Red |
| FAIL | Functional failure that needs investigation | 🔴 Red |
| PASS | Test ran and passed all checks | 🟢 Light Green |
| WARN | Passed with warnings | 🟡 Yellow |
| NORUN | Test not executed | 🔵 Blue |
| QUEUED | Waiting to run | 🟡 Yellow |
| RUNNING | Currently executing | ⼼ Light Cream |

Fig. 10. Test Status Logic Table

| Raw statuses | Result | Why |
|------------------------------|---------|----------------------------|
| ["NORUN", "NORUN"] | NORUN | All NORUN |
| ["PASS", "NORUN"] | PASS | Only PASS and NORUN → PASS |
| ["PASS", "PASS"] | PASS | All PASS |
| ["FAIL", "NORUN", "PASS"] | FAIL | Any FAIL or CRASH trumps |
| ["CRASH", "NORUN", "PASS"] | CRASH | Any CRASH trumps |
| ["QUEUE", "NORUN"] | QUEUE | QUEUE present |
| ["RUNNING", "PASS", "NORUN"] | RUNNING | RUNNING present |
| ["WARN", "NORUN", "PASS"] | WARN | WARN present |

Fig 11. Logic Designing for Rolled-up Config/Suite Result

Key Features Implemented

- Enabled **support for multiple projects** simultaneously through **dynamic routing**, improving scalability and flexibility.
- Implemented **live result visualization**, allowing real-time updates of test outcomes as runs progress.
- Designed and integrated **custom status logic** converting raw numeric codes into meaningful labels like *PASS*, *FAIL*, *CRASH*, *WARN*, etc.
- Applied **color-coded status indicators** for intuitive monitoring and quick status recognition.
- Added **quick access to per-status and per-platform logs**, for both **running** and **completed** test cases.
- Integrated **hyperlinked build numbers** for direct navigation to the complete test suite directory.
- Displayed **per-platform and per-testcase execution time** along with **overall execution time** in HH:MM:SS format.
- Introduced **tooltips and hover details** for enhanced clarity and improved user experience.
- Optimized **log parsing performance** for handling large-scale test runs efficiently.

RESULT

Not secure 10.122.137.22:8081/view/autoUT/CPD

CPD - Results with option as 'upgrade and test'

[Results of saos-01-11-02-0121](#)

Show Execution Times

| # | Test Suite Results for evnt-01-11-02-0121 | 5130 (10.121.182.250) | 3948 (10.121.182.248) | 3928 (10.121.182.213) | 5171 (10.121.182.252) | 8110 (10.121.182.249) | 5164 (10.121.182.253) |
|---|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1 | Onie Upgrade | RUNNING (6 mins) |
| 2 | touchtest_sanity_statedump | QUEUED | | | | | |
| 3 | touchtest_l3vpn_4nodes_test | | QUEUED | QUEUED | QUEUED | QUEUED | |
| 4 | touchtest_trex_lltapi_vpls | | | | | | QUEUED |
| 5 | touchtest_trex_lltapi_vpws | | | | | | QUEUED |
| | Rolled-Up Config Result | RUNNING | RUNNING | RUNNING | RUNNING | RUNNING | RUNNING |
| | Rolled-Up Suite Result | | | | RUNNING | | |

Elapsed Time Since Start: 00:06:28 (HH:MM:SS)

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Fig 12. CPD: “Upgrade and Test” suite newly triggered

Not secure 10.122.137.22:8082/view/DeviceTest_saos-01-11-02-0120 InPrivate

DeviceTest_saos-01-11-02-0120 - Results

[Results of DeviceTest_saos-01-11-02-0120](#)

| # | Test Suite Results for evnt-DeviceTest_saos-01-11-02-0120 | 5134 (10.121.182.188) | 3949 (10.121.182.150) | 5171w (10.121.182.149) | 5131c (10.121.182.147) | 5130 (10.121.182.251) | 5164 (10.121.182.146) | 5130 (10.121.182.135) | 3931 (10.121.182.145) | 3922 (10.121.182.206) | 8192 (10.121.182.148) |
|----|---|--------------------------|--------------------------|---------------------------|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1 | timing_gnss_sanity | FAIL | | | | | | | | | |
| 2 | HEQoS_L3_sanity | | PASS | PASS | PASS | | | | | | |
| 3 | hwslm_functional | PASS | PASS | | | | | | | | |
| 4 | mvpn_MultiSendersReceivers | PASS | | PASS | PASS | PASS | PASS | PASS | | | |
| 5 | mclag_a_a_sanity | FAIL | FAIL | FAIL | FAIL | | | FAIL | | | |
| 6 | radsec_basic_functionality | | | | | | | | PASS | | |
| 7 | l2dp_gr_l2vpnSanity | FAIL | FAIL | FAIL | FAIL | | | | | | |
| 8 | l2dp_frr_6_node_sanity | FAIL | FAIL | FAIL | FAIL | | | | FAIL | FAIL | |
| 9 | l3vpn_6VPE_sanity | | | PASS | PASS | | | | PASS | | |
| 10 | mplsLstp_coroute_tunnel_sanity | | | PASS | PASS | | | | PASS | | |
| 11 | l2vpnppm_pw_lp | PASS | | | PASS | | | | PASS | PASS | |
| 12 | ospf_Sr_Uloop_Functional2 | PASS | | PASS | PASS | PASS | PASS | PASS | | | |
| 13 | hwbfd_singleHop_multiHop_newModel_sanity | | | PASS | PASS | | | | PASS | | |
| 14 | rsvp_TeGrRestartSanity | PASS | PASS | | | | | | | | |
| 15 | evpn_VplsIrbSanityMhToSh | PASS | | PASS | PASS | PASS | PASS | PASS | | | |
| 16 | evpn_FxcVpwsFailoverTest | PASS | PASS | PASS | PASS | | | | | | |
| 17 | srv6_L3vpn6vpeTilfa_Functional | PASS | | PASS | PASS | PASS | PASS | PASS | | | |
| 18 | sr_PolicyAnrFunctional | PASS | PASS | PASS | PASS | | | | | | |
| 19 | l3vpn_EVPN_RT5_RR | | | FAIL | FAIL | | | | FAIL | | |
| 20 | dhcpv6v4Relay_SecIpOverL3vpn6vpe | PASS | PASS | PASS | | | | | PASS | | |
| 21 | ipv4_l3interface_dual_stack_arp_def_vrf_with_traffic | FAIL | | FAIL | | | | | | | |
| 22 | mgmt_Switch | | | | | | | | PASS | | |
| 23 | evpn_FxcVpwsDfElectionSanity | PASS | PASS | PASS | PASS | | | | | | |
| 24 | l2_NbiTestSuite | | | | | | | | | | QUEUED |
| | Rolled-Up Config Result | FAIL | FAIL | FAIL | FAIL | PASS | PASS | FAIL | FAIL | FAIL | QUEUED |
| | Rolled-Up Suite Result | FAIL | | | | | | | | | |

Elapsed Time: 12:01:22 (HH:MM:SS)

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Fig 13. DeviceTest Completed Results

Not secure 10.122.137.22:8082/view/saos-01-11-02-0120

saos-01-11-02-0120 - Results

Results of saos-01-11-02-0120

| # | Test Suite Results for evnt-saos-01-11-02-0120 | 3922 (10.121.182.205) | 5130 (10.121.182.245) | 5130 (10.121.182.138) | 5164 (10.121.182.137) | 5131 (10.121.182.133) | 3926 (10.121.182.244) | 5170 (10.121.182.82) | 5170 (10.121.182.81) | 5171 (10.121.182.198) | 5164 (10.121.182.200) | 5171 (10.121.182.197) |
|----|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| 1 | sanity_generic_val_cli_test_soft_install | FAIL | | | | | | | | | | |
| 2 | sanity_container_sd_test_soft_install | PASS | | | | | | | | | | |
| 3 | sanity_generic_val_cli_test | | PASS | | | | | | | | | |
| 4 | sanity_container_sd_test | | PASS | | | | | | | | | |
| 5 | ettp_loopback_dnx2 | | | PASS | PASS | | | | | | | |
| 6 | lag_functional_stats | | | PASS | | PASS | | | | | | |
| 7 | lacp_agg_basic_tests | | | PASS | | PASS | | | | | | |
| 8 | cfm_lbm_singleTag | | | PASS | PASS | | | | | | | |
| 9 | cfm_untag_up_mep | | | PASS | PASS | | | | | | | |
| 10 | cfm_static_rnep_sanity | | | PASS | PASS | | | | | | | |
| 11 | cfm_no_modify | | | PASS | PASS | | | | | | | |
| 12 | cfm_Cos_Marking_func | | | PASS | PASS | PASS | | | | | | |
| 13 | cfm_fp_dis_ena_func | | | PASS | PASS | PASS | | | | | | |
| 14 | hwcfm_sanity | | | PASS | PASS | | | | | | | |
| 15 | eoam_remoteLoopback | | | PASS | PASS | | | | | | | |
| 16 | eoam_RemoteLoopbackReplace | | | PASS | | PASS | | | | | | |
| 17 | cvid_ranged_test | | | | | | FAIL | FAIL | | | | |
| 18 | system_Management | | | | | | | | PASS | | | |
| 19 | https_Support | | | | | | | | FAIL | | | |
| 20 | Session_local_remoteUserCoexistenceAuthSanity | | | | | | | | PASS | | | |
| 21 | dot1X_Sanity | | | | | | | | PASS | PASS | | |
| 22 | gnmi_InfraTests | | | | | | | | FAIL | | | |
| 23 | sanity_dhcp_lease_test | | | | | | | | | PASS | PASS | |
| 24 | dhcp_ClientOptions | | | | | | | | PASS | | | |
| 25 | dhcp_v6ClientOptions | | | | | | | | PASS | | | |
| 26 | dhepv4Relay_OverL3vpnRobustness | | | | | | | | PASS | PASS | PASS | PASS |
| 27 | dhepv6Relay_OverL3vpn6vpeRobustness | | | | | | | | PASS | PASS | PASS | PASS |
| 28 | dhepv4Relay_OverL3PureIpStats | | | | | | | | FAIL | | | |

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Fig 14. Completed Test Suite Dashboard for
SAOS Build-Run

Hi All,

Please find below the URL structures for accessing results of our two scripts.

CPD (Per-Project Live Dashboard)

Kindly enter: autoUT/{PROJECT_TYPE}

URL Format: <http://10.122.137.22:8081/view/> { autoUT/{PROJECT_TYPE} }

All are running on fixed port 8081.

Examples:

- http://10.122.137.22:8081/view/autoUT/ggn_10X_test_A
- http://10.122.137.22:8081/view/autoUT/ggn_10X_test_B
- http://10.122.137.22:8081/view/autoUT/ggn_10X_test_C
- http://10.122.137.22:8081/view/autoUT/ggn_10X_test_F
- http://10.122.137.22:8081/view/autoUT/ggn_10X_test_G
- http://10.122.137.22:8081/view/autoUT/ggn_10X_quick_sanity
- http://10.122.137.22:8081/view/autoUT/ggn_10X_quick_sanity_softinstall
- http://10.122.137.22:8081/view/autoUT/ggn_10X_on_demand_test
- http://10.122.137.22:8081/view/autoUT/ggn_10X_test_VDR
- <http://10.122.137.22:8081/view/autoUT/CPD>
- <http://10.122.137.22:8081/view/autoUT/DRSanity>
- <http://10.122.137.22:8081/view/autoUT/DeviceTest>

CPD_COMMON (Per-Build Live Dashboard)

Kindly enter: {Complete Build No }

URL Format: <http://10.122.137.22:8082/view/>{Complete Build No}

Expected Build Patterns (as of now, extendable if required):

1. saos-XX-XX-XX-XXXX
2. <prefix>_saos-XX-XX-XX-XXXX
3. saos-XX-XX-XX-XXXX-<suffix>
4. CPD/saos-XX-XX-XX-XXXX/<digits>/

All are running on fixed port 8082.

Examples of actual builds:

- http://10.122.137.22:8082/view/DeviceTest_saos-01-11-02-0121 (CASE 2)
- <http://10.122.137.22:8082/view/saos-01-11-02-0117> (CASE 1)
- http://10.122.137.22:8082/view/SimDR_saos-01-11-02-0111 (CASE 2)
- <http://10.122.137.22:8082/view/saos-01-11-02-0115-nichaudh-lacp> (CASE 3)
- <http://10.122.137.22:8082/view/CPD/saos-01-11-02-0112/140820251755185758/> (CASE 4)

Please use these URLs for accessing the live dashboards.

Thanks & Regards,
Pragya Tripathi

Fig 15. Standardized URLs through dynamic routing

CONCLUSION

- The Automated Dashboard Pipeline for SAOS Regression Infrastructure has significantly improved testing efficiency by converting a manual process into a fully automated, real-time monitoring system.
- Its integration of lightweight technologies like Flask and Python ensures scalable performance across multiple projects, enhancing transparency, speed, and reliability.
- This project serves as a foundation for future advancements in intelligent test analytics and automation.

THANK YOU!