application note

Lab automation solutions for CSPs: Acentury LAMTA and POLATIS® optical circuit switching

Introduction

Communications Service Providers (CSPs) typically have a network environment which includes many different technology vendors, multiple radio access technologies and a wide selection of devices. In a mature market, providers have to compete for new customers by offering superior network performance and developing new and innovative services. In order to assure the quality of their services the providers have to evaluate and certify all new technologies, features and products before they deploy them in the live network.

Key features

- Automate and orchestrate end-to-end functionality and performance testing
- Graphical dashboard
- Resource management
- Multi-vendor support
- Wireless and optical network testing
- Remote testing access
- Resource assignment and reservation

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Challenge

By the very nature of the network environment, the CSPs have to operate complex test laboratories with sophisticated RAN equipment, many radio sources and RF shielded enclosures.

Typically, each piece of equipment is controlled independently. RF interconnections and signal levels between equipment are managed with RF patch panels and separate variable attenuators. Optical links are managed with fiber patch cables.

This presents the CSPs with a number of logistical challenges:

- Long set-up and tear-down times owing to the manual disconnection and reconnection of RF and optical patch cables.
- Wear and tear on connectors from repeated connection affecting the quality of test results.
- High CAPEX costs resulting from the difficulty of sharing expensive test resources efficiently.
- Complex record-keeping to ensure a topology can be recreated at a later date.
- The use of highly skilled lab technicians to run the tests manually.
- How to integrate wireline (optical) and wireless (RF) links together for end-to-end testing in the lab environment.

Solution

Lab operators can now run RF and optical testing in a common lab automation solution. The combination of Acentury's well-established LAMTA automation solution with POLATIS® optical circuit switches means that RF and optical testing can be achieved through a common platform.

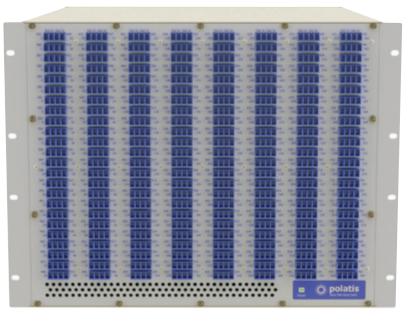
The integration of POLATIS® optical circuit switches within LAMTA provides a fully reconfigurable fiber layer under software control to simplify and speed up the optical testing elements. CSPs can better leverage their lab resources to perform efficient and rapid testing of new services, reducing time to market while achieving a higher quality of test results.

POLATIS® fiber layer optical circuit switching

POLATIS® optical circuit switching, with the patented DirectLight™ beam-steering technology, creates a transparent fiber layer interconnection platform, enabling dynamic and transparent interconnection of any device with an optical interface.

Many of the world's leading CSPs choose POLATIS® as their preferred optical test platform of choice for good reason:

- Industry-leading low insertion loss minimises impact on optical power budgets.
- Superior optical stability and repeatability increase measurement consistency and accuracy for highest quality test results.
- Ultra-low signal latency.
- Protocol and bit-rate agnostic up to 800 Gbs and beyond so future-proof.
- Fully bidirectional optics.
- Dark fiber switching for pre-provisioning of test paths.
- Optional optical power monitoring (OPM) with user configurable alarms.
- Optional variable optical attenuation (VOA to protect sensitive equipment.
- Programmable port shutter option for fiber break simulation.
- Widest range of non-blocking matrix sizes from 16x16 to 384x384 ports.
- Matrix can be partitioned in software to enable sharing by separate test teams.
- Dual redundant power supplies and network interface cards for enhanced reliability and availability.
- Much lower power consumption than packet switches.



POLATIS instrument grade 384x384 optical circuit switch

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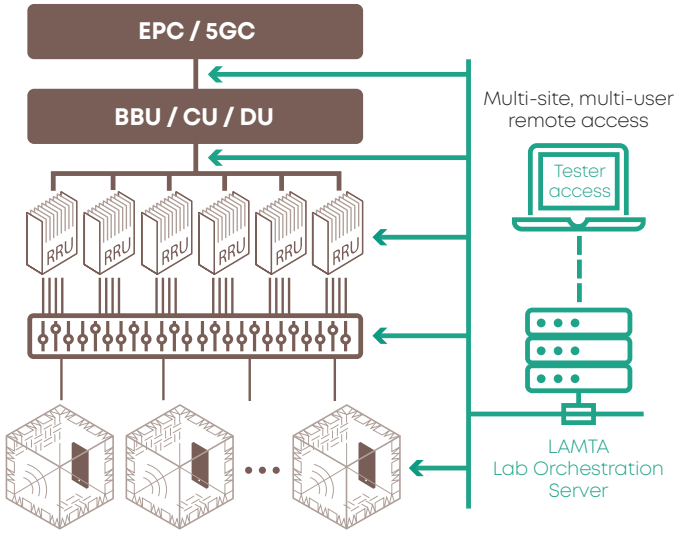
Acentury LAMTA Lab Automation Solution

Acentury builds automation and orchestration solutions for communication service providers (CSPs) and their vendor partners for improving the efficiency and effectiveness of testing and deploying their networks.

The LAMTA solution is an operating system for their labs, orchestrating all resources (both people and equipment) and automating complex tests to enable zero-touch end-to-end (E2E) testing for functionality and performance. This saves them time and effort and lets them get to market faster.

To accomplish this, LAMTA can control several different types of testing equipment from a variety of vendors.

This ranges from the user equipment (ie. smartphones) through RF signal distribution and attenuation control to Radio Access Network (RAN) elements. With this equipment, LAMTA can reproduce more sophisticated real-world scenarios in the lab in less time.



Wireline impairment control
- xHaul performance simulation

Optical switch control
- Lab network reconfiguration

NE parameter control
- Network regression testing

RF signal distribution and attenuation
- Handover / cell edge testing
- MIMO and CA scenarios

UE control
- User experience testing
- Functional and peformance testing

Using LAMTA, lab operators can:
- Configure the lab for tests in a fraction of the time, virtually eliminating setup, teardown, and calibration times.
- Increase test coverage through software control of multiple testing elements simultaneously.
- Organize and optimize expensive and limited lab resources, including both people and equipment.

The addition of support for wireline control into LAMTA introduces the ability to control the POLATIS® optical circuit switch. LAMTA now orchestrates end-to-end tests that include the optical/wireline portion of the network. Examples include validation of different network topologies, fronthaul/midhaul/backhaul performance testing as well as lab reconfiguration and connection management.

Communications Service Providers (CSPs) can leverage this capability to test and verify various network setups.

Consider a scenario where a new Radio Unit (O-RU) from a new vendor needs to be integrated into the network. It is crucial to test and ensure this unit's compatibility and flexibility with other network components. The network includes various combinations of Centralized Units (O-CU) and Distributed Units (O-DU) from different vendors, each with multiple models and software versions.

Performing regression testing with the sample RU can be very time-consuming and complicated, especially when it involves physically changing the connections between different CU/DU combinations and the RU. This process can lead to issues such as broken connections, damaged cables, potential loss, and wasted time for lab engineers.

However, using a POLATIS® optical switch makes it possible to change the System Under Test (SUT) topology by simply re-routing the optical connections between ports. This allows for easy reconfiguration of the RU connections to various CU/DU combinations through a simple drag-and-drop interface.

For instance, in the three scenarios shown below, Vendor A's O-RU is being tested with three different O-CU/O-DU combinations available in the network. Instead of physically changing the RU's connection each time, the lab can be rapidly reconfigured between scenarios through LAMTA software.

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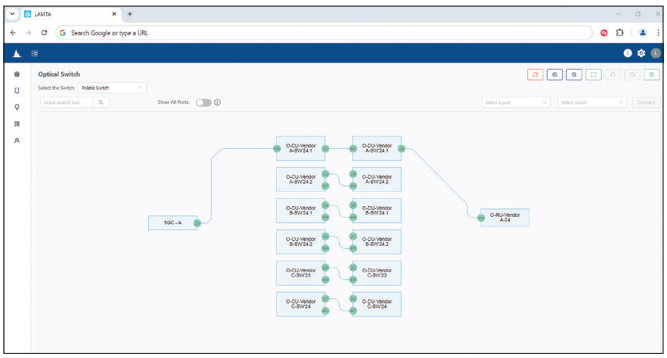
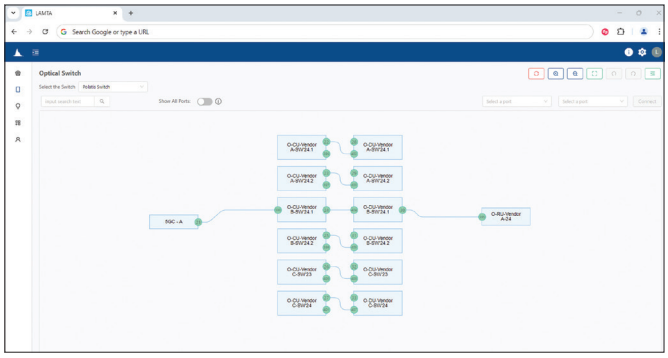
The LAMTA user interface presents the connections as links between network elements, not just as optical ports, so the network topology is easy to understand and modify. Users can change the physical connections using a simple drag-and-drop interface, apply the network configuration changes remotely, and immediately resume testing.

Going forward, these changes can even be automated and incorporated into larger testing scripts to further reduce testing down time.

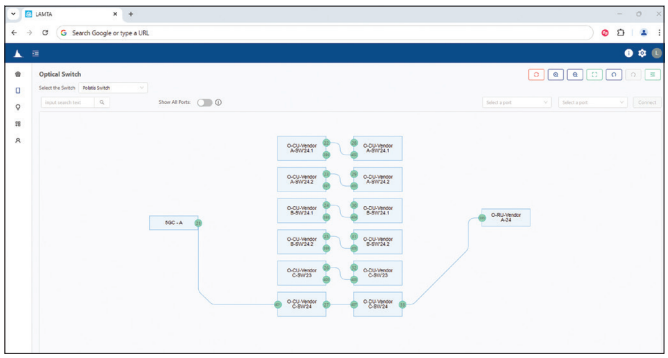
Scenario 1
O-CU/O-DU from same vendor with latest software release



Scenario 2
O-CU/O-DU from Vendor B with latest software release



Scenario 3
O-CU/O-DU from Vendor C with latest software release



Key benefits

- Set up tests in minutes with no manual cable patching or equipment setup.
- Reduce equipment needed at each individual test station, such as attenuators or PCs.
- Efficiently share limited and expensive test resources among testers.
- Enable the 'lights out lab' – testing from anywhere.
- Software-controlled E2E test cases such as regression, with handover and roaming conditions.
- Easily reproduce test environments for rapid fault-finding.

More to explore

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