

Ethernet Service Activation

Rapid carrier-grade Ethernet service turn-up testing and acceptance

Netrounds can be used to validate carrier-grade Ethernet services and mobile backhaul performance through all stages of the network life cycle: for activation testing at delivery time, for continuous day-to-day quality monitoring, and for remote troubleshooting when problems arise.

Executive Summary

Netrounds is a complete solution for service turn-up testing and activation. Netrounds features include:

- Capabilities to validate both Ethernet control and data plane
- Standards-based reporting and service birth certificates to show that Ethernet connections are activated correctly at time of delivery
- Features for remote troubleshooting of business Ethernet services

Benefits include:

- Rapid Ethernet service turn-up and activation
- Comprehensive test coverage using pre-built templates
- Reduction of labor-intensive, manual procedures thanks to process automation
- Minimized truck rolls and field efforts through remote troubleshooting
- Reduced cost by using software on standard x86 hardware

Introduction

Netrounds' software-only and hosted components allow deployment with minimal effort and get you started instantly and easily. Netrounds is also built with a user-friendly and intuitive Web GUI that is simple to operate and accessible from anywhere in the world.

Netrounds is suitable for both lab and field networks and contains versatile features and tools compliant with relevant international standards from ITU and the Metro Ethernet Forum (MEF).

How it works

Netrounds Test Agents come in a variety of formats to suit your network test and service assurance needs. Virtual and Software Test Agents are packaged as downloadable software which is easily installed by the user, whereas Preinstalled Test Agents are configured by Netrounds on certified x86 hardware of various form

factors and capacities. All of these Test Agent types have identical traffic-generating capabilities and differ only in terms of packet performance, which is determined by available CPU resources and interface speeds.

To begin using the Test Agents, connect them to switch or router ports in your network. The Test Agents may be of the same type or of different types.

Each Test Agent can send and receive multi-stream and multi-QoS traffic over both TCP and UDP, which are required for service activation tests. Using these traffic generators, you are able to make sure that packet loss, jitter and maximum one-way delay stay within your Service Acceptance Criteria (SAC) and meets your requirements on service availability.

The Test Agents will also help you test that Layer 2 control protocols, as well as VLAN ID and Class of Service (Priority Code Point) information, are being handled correctly end-to-end.

Netrounds has the following useful features for service activation tests:

- Intuitive and easy-to-use Web Portal
- Full automation using Netrounds Cloud API or Web Portal, along with centralized real-time documentation of all test results
- Support of international standards for testing and verification of Carrier Ethernet services

Netrounds complies with the following standards:

- ITU-T Y.1563 Ethernet frame transfer and availability performance
- ITU-T Y.1564 Ethernet service activation test methodology (color-aware and non-color-aware)
- MEF Carrier Ethernet 2.0 Blueprint Services
- MEF 6.1.1 L2 Control Protocol handling

Y.1564 Ethernet service activation

Netrounds supports ITU-T Y.1564 Ethernet Service Activation Test Methodology to let you verify that your Ethernet connection complies with the service acceptance criteria (frame loss ratio, frame delay, frame delay variation, Ethernet availability) for your Ethernet services, as well as ensure that bandwidth shaping and Quality of Service (QoS) are correctly configured. Netrounds includes ready-to-run and automated Y.1564 test templates.

Metro Ethernet Forum (MEF)

Netrounds supports the MEF Carrier Ethernet (CE) 2.0 services certification (E-Line, E-LAN, E-Tree and E-Access) that was introduced in 2013, replacing MEF9 and MEF14 which is part of the outdated MEF

Netrounds complies with the following ITU and MEF standards:

- ITU-T Y.1563
- ITU-T Y.1564
- MEF Carrier Ethernet 2.0
- MEF 6.1.1 L2 Control Protocol handling

CE 1.0 certification program. Netrounds can automate the tests to verify and configure a MEF Ethernet service, and is of great benefit both for automating lab tests and for professional delivery verification tests of Ethernet services end-to-end in the live network.

Requirements and specifications

The following table gives examples of tests that can be automated with Netrounds for MEF Ethernet Private Line (EPL) service, which is similar to E-LAN and E-Tree.

Carrier Ethernet (CE) 2.0 services

Minimum number of network interfaces per Test Agent	2	Support for tests on Q-in-Q interfaces	No
Support for tests on VLAN interfaces	Yes (each physical interface handles 32 VLAN:s according to IEEE 802.1q)		
Priority marking	Layer 3 QoS: IP precedence or DSCP (defined per flow) Layer 2 QoS: Priority Code Point, PCP (defined per flow)		
Min EVC MTU Size	Send UDP with Ethernet frames MTU size 1522, and verify that the datagrams arrive at the receiver.		
CE-VLAN ID Preservation	Send Ethernet frames with a specified VLAN ID, and make sure the VLAN ID is preserved at the receiving Test Agent.		
CE-VLAN CoS Preservation	Send Ethernet frames with a specified Priority Code Point (PCP), and make sure the PCP is preserved at the receiving Test Agent.		
Unicast Service Frame Delivery	Send Unicast UDP service frames and verify that the frames arrive at the receiver.		
Multicast Service Frame Delivery	Send Multicast UDP service frames and verify that the frames arrive at the receiver.		
L2CP Processing	Send frames with configurable destination MAC address, Ethertype, and specify whether the frames should be passed or dropped. Create fully automated test sequences in accordance with MEF 6.1.1.		
EVC Performance	For the EVC performance tests, Netrounds adheres to ITU Y.1564 Ethernet Service activation test methodology.		
Connectivity Check messages	Part of MEF 6.1.1 L2CP Processing; IEEE 802.1ag Ethernet OAM frames of Ethertype 0x8902 must be tunneled.		
Linktrace, Unicast, and Multicast messages	Part of MEF 6.1.1 L2CP Processing; IEEE 802.1ag Ethernet OAM frames of Ethertype 0x8902, Multicast MAC DA 01-80-C2-00-00-3x (x ranges from 0 to 7) must be tunneled.		

ITU-T Y.1564 Ethernet service activation test features

Minimum number of Test Agents required	2	Minimum number of network interfaces per Test Agent	2
Support for tests on VLAN interfaces	Yes (each physical interface handles 32 VLANs according to 802.1q)	Support for tests on Q-in-Q interfaces	No
Priority marking	Layer 3 QoS: IP precedence or DSCP (defined per flow) Layer 2 QoS: Priority Code Point, PCP (defined per flow)		
Simple CIR validation test	Y.1564, section 8.1.2, test A.1. During this test the sender Test Agent generates frames at a rate equal to CIR. The receiver Test Agent measures received rate, loss, delay, and jitter on the stream. The test fails if any of the thresholds for maximum frame loss ratio, delay, or jitter is exceeded.		
Step load CIR test	Y.1564, section 8.1.2, test A.2. In each test step "Load step size" is added to the current rate, until CIR (Committed Information Rate) is reached. The test fails if any of the thresholds for maximum frame loss ratio, delay, or jitter is exceeded at any step.		
EIR configuration test (color-aware)	Y.1564, section 8.1.2, test B.1. During this test the sender Test Agent generates green frames at a rate equal to CIR, and yellow frames at a rate equal to EIR. The combined rate should not exceed the link rate. The receiver Test Agent measures received rate, loss, delay, and jitter on both streams (green and yellow). The test fails if any of the thresholds for maximum loss ratio, delay, or jitter is exceeded for the green stream.		
EIR configuration test (non-color-aware)	Y.1564, section 8.1.2, test B.2. During this test the sender Test Agent generates frames at a rate of CIR + EIR. The receiver Test Agent measures received rate, loss, delay, and jitter on the stream. The test fails if the measured rate is less than $CIR \times (1 - max_loss)$.		
Traffic policing test (color-aware)	Y.1564, section 8.1.2, test C.1. During this test the sender Test Agent generates green frames with rate CIR, and yellow frames with rate $1.25 \times EIR$. (However, if EIR is less than 20% of CIR, the yellow frames are instead generated at a rate of $EIR + 0.25 \times CIR$.) The combined rate should not be bigger than the link rate. The receiver Test Agent measures received rate, loss, delay, and jitter on both streams (green and yellow). The test fails if any of the thresholds for maximum frame loss ratio, delay, or jitter is exceeded for the green stream, or the total received rate is higher than $1.05 \times (CIR + EIR)$.		
Traffic policing test (non-color-aware)	Y.1564, section 8.1.2, test C.2. During this test the sender Test Agent generates frames with rate $CIR + 1.25 \times EIR$. The receiver Test Agent measures received rate, loss, delay, and jitter on the stream. The test fails if the measured rate is higher than $CIR + 1.05 \times EIR$ or less than $CIR \times (1 - max_loss)$.		