Huawei Technologies
Service Activation Using RFC 2544 Tests

Introduction

Huawei advocates adopting the use of Layer 3 IP Technology to cell site gateway. Huawei explains that it is cost effective for service providers to have the service checked and verified before it is taken into operations. To this end, Huawei implements a test methodology based on RFC 2544 in its access and aggregation devices. This report investigates the use of RFC 2544 as service activation tool for service providers. It explains the use, the tests, and the results we collected in a test session with the vendor at EANTC's lab in Berlin, Germany.

Background

RFC 2544 standard, specified by the Internet Engineering Task Force (IETF), is the de facto benchmarking test methodology to evaluate the performance of network devices using throughput, frame loss, delay and delay variation tests. Each test in the RFC is validating specific aspects of the router's data plane performance. The test methodology also defines frame sizes, test duration and the number of test iterations.

Huawei borrowed the methodologies specified in RFC 2544 to deliver to service providers a mean to proactively measure service performance through a set of tests and reports. These reports can later be used by service providers to demonstrate to customers that the service was verified before handover.

Test Results Highlights

- **Built-in RFC 2544 traffic generator and analyzer**
- **Accurate measurement of throughput, packet loss, delay and delay variation using built-in measurement tool**

Test Setup

In their demonstration, Huawei engineer constructed the test network comprised of four devices: Huawei ATN905-outdoor with the built-in RFC 2544 traffic generator and analyzer function; Huawei CX600-X1-M4 acting as remote device with traffic reflector function incorporated to loop packets back to the generator. Both devices were connected through simulated networks consisting of both Huawei ATN910B and ATN950B. All devices were connected using Gigabit Ethernet links. To ensure end-to-end connectivity between both traffic generator/analyzer and the reflector, Huawei engineers configured all links in OSPF area 0.

During the test Huawei ATN905-outdoor transmitted test packets addressed to CX600-X1-M4, which reflects them back. The built-in analyzer incorporated into the Huawei ATN910B processed the received packets, compared them with the transmitted packets and calculated the performance metric. The figure below depicts the test setup.

The test traffic generated by the Huawei ATN905 contained a single IPv4 stream. It consisted of a packet spread from 64- to 1518-bytes as specified in RFC 2544. The throughput measurement was configured for a duration of two minutes per packet size with a maximum duration of one hour. The time limitation is important when packet loss is recorded by the measuring devices, the bandwidth target is

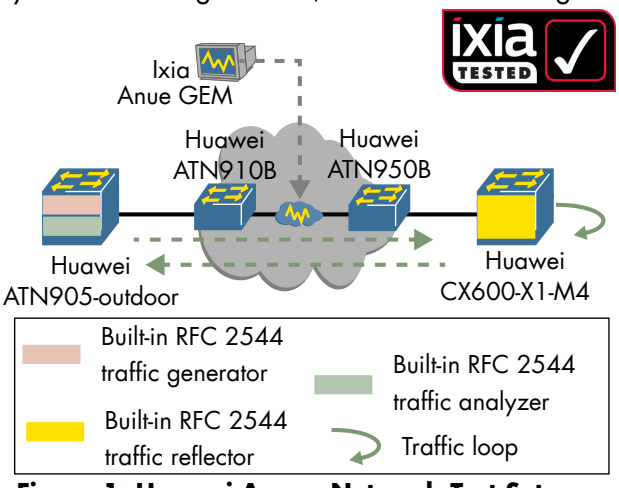

Figure 1: Huawei Access Network Test Setup

reduced (as per RFC 2544) and the test begins again. The acceptable frame loss ratio was set to 1% of the total capacity.

After verifying that the built-in RFC 2544 solution of Huawei was able to successfully measure full line rate throughput of 1 Gbit/s, we created an artificial limitation in the network. One of the Huawei routers central to the functions we tested was configured to limit the bandwidth to 900 Mbit/s. We then verified that the measurements were still correct and showing 900,000 Kbit/s for all frame size.

Size (bytes)	Throughput (Kbps)	Precision (Kbps)	Loss Ratio	Completion
64	909603	1000	0.98%	success
128	909830	1000	0.98%	success
256	909830	1000	0.93%	success
512	911250	1000	0.99%	success
1024	913684	1000	0.99%	success
1280	914858	1000	0.99%	success
1518	915355	1000	0.95%	success

Table 1: Service Activation Results as Delivered by the Huawei CLI

Packet Loss Performance Test

We performed this test by sending 300 Mbit/s IPv4 traffic from the access router's built-in traffic generator. Huawei engineer configured port shaping in the center of the network to limit bandwidth to 100 Mbit/s. Our expectation was to measure a packet loss of 66.67%. The packet loss measurement across all frame size as displayed by the RFC 2544 built-in traffic analyzer met our expectation.

Packet Delay Performance Test

Once throughput measurements completed, we looked into the next important metrics that are often defined in Service Level Agreement - packet delay and packet loss.

We first ran the test without any impairment to record the performance baseline for the this test. We then configured Ixia Anue GEM impairment generator to add a constant unidirectional delay of 1 millisecond to the traffic and measured the two-way packet delay and delay variation across all packet sizes. The outcome of the test met our expectations as well - the results provided on the CLI showed increase in the two-ways packet delay of 1 millisecond compared to the baseline measurement. It is worth mentioning that the Packet delay variation remained constant across all frame size.

Summary

For service providers rolling out edge devices to many locations, the ability to measure the performance of the link before it is handed over to the customer is a bullet-proof way to increase customer satisfaction. Such measurements also have an aspect of insurance - if the customer complains about service quality at a later time, at least the service provider can proof that the service was working. The same tool can also be used once the customer complains to test the service.

In our test we successfully used Huawei's RFC 2544 built-in tester on complete interfaces - just as the RFC intended the methodology to be used. The measurements functioned as expected and provided useful and well displayed output on the command line interface (CLI). Huawei explained that they are committed to supporting ITU-T Y.1564 solution in an upcoming release of their software, which will enable per Class of Service monitoring in multi-service environments.

About EANTC

The European Advanced Networking Test Center (EANTC) offers vendor-neutral network test services for manufacturers, service providers and enterprise customers. Primary business areas include interoperability, conformance and performance testing for IP, MPLS, Mobile Backhaul, VoIP, Carrier Ethernet, Triple Play, and IP applications.

EANTC AG
Salzufer 14, 10587 Berlin, Germany
info@eantc.com, http://www.eantc.com/
version 5.0 20131007, JG