EtherSAM

The new standard in Ethernet service testing

Methodology Reference Poster

Based on ITU-T Y.1564 standard

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Phase 1: Service Configuration Test (Ramp Test)

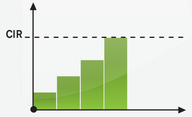
Objective: Validate the network configuration of each defined services (rate limiting, traffic shaping, quality of service).

Methodology: For each service, a ramp test is used to gradually reach and exceed the CIR; all key performance indicators (KPIs) are measured against a threshold.

Step	CIR (%)	Frame Loss (%)	Max Jitter (ms)	Max Latency (ms)	Verdict	Average Throughput (Mbit/s)
1	50.0	0.0	0.100	5.051	✓	1.988
2	75.0	0.0	0.098	5.051	✓	2.981
3	90.0	0.0	0.098	5.051	✓	3.577
CIR	100.0	0.0	0.098	5.051	✓	3.974
Overshoot		0.0	0.100	5.051		4.002

The above values are for example purposes only.

Phase 1: CIR Test



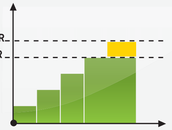
- Service is ramped up from minimum value to CIR rate
- At each step, KPIs are measured and validated against pass/fail criteria

CIR Pass/Fail Criteria:

☑ • Rx rate = Tx rate • KPIs within SLA

☒ • Rx rate < Tx rate • Any KPI fails

Phase 2: Service is tested at EIR



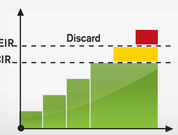
- Service is tested at EIR
- KPIs are not guaranteed
- Pass/fail based on Rx throughput

EIR Pass/Fail Criteria:

☑ • CIR ≤ Rx rate ≤ CIR+EIR

☒ • Rx rate < CIR

Phase 3: Service is tested at the Traffic Policing rate



- Service is tested at the Traffic Policing rate
- KPIs are not guaranteed
- Pass/fail based on Rx throughput

Traffic Policing Pass/Fail Criteria:

☑ • CIR ≤ Rx rate ≤ CIR+EIR

☒ • Rx rate > CIR+EIR

Phase 2: Service Performance Test

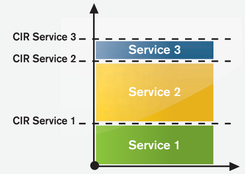
Objective: Validate the quality of service of each defined service and prove service-level agreement (SLA) conformance.

Methodology: All services are generated at once to their CIR and all KPIs are measured for all services.

Service No.	Average Throughput (Mbit/s)	Frame Loss (%)	Max Jitter (ms)	Max Latency (ms)	Verdict
1	5.0	0.0	0.262	5.179	✓
2	0.126	0.0	0.296	5.175	
3	3.972	0.0	0.259	5.051	✓

The above values are for example purposes only.

Service Test



Service Test Pass/Fail Criteria:

☑ • KPIs within SLA per service

☒ • Any KPI fails

- Simultaneous generation of all services at CIR and simultaneous measurement of all parameters
- Pass/fail threshold for each parameter (in each direction)
- Suggested test time: 2 hours; depending on customer procedures, test time can be as low as 2 minutes
- Can be scaled to longer term test (e.g., 24 hours or more)

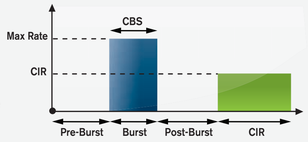
Burst (CBS, EBS) Test

Objective: Verify that the expected burst (CBS or EBS) size can be transmitted with minimal loss.

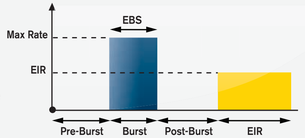
Methodology:

- Test sequence
  - Initialization period: Off time before executing the burst sequences to ensure the network can absorb the first burst
  - Burst sequences
  - Termination period
- Each direction is tested individually to ensure the policing/shaping mechanism is properly configured
- Burst sequence can be repeated for user-configurable value

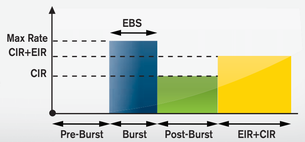
CBS Test Burst Sequence



EBS Test Burst Sequence (CIR = 0)



EBS Test Burst Sequence (CIR > 0)



EtherSAM Characteristics

- Completely adapted to today's Ethernet services—addressing all key SLA parameters: throughput, frame loss, latency, packet jitter, out-of-sequence for multiple services simultaneously
- Much faster than RFC 2544
- Bidirectional results for all services (based on Dual Test Set)
- Testing can be transitioned to long term (e.g., 24h)
- Standards-based (ITU-T Y.1564)

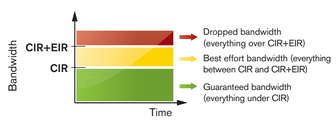
Benefits

- Complete SLA validation with a single test
- Optimized quality of service
- Turn-up is eight times faster than RFC 2544 (based on connection with four classes of service)
- Significant OPEX reduction
- 100% first time right
- Standards-based Ethernet test methodology providing accurate and reliable test results

Useful Definitions

- Committed burst size (CBS): Number of allocated bytes available for bursts of ingress service frames transmitted at temporary rates above the CIR while meeting the SLA guarantees provided at the CIR.
- Committed information rate (CIR): Average rate in bits/s of service frames up to which the network delivers service frames and meets the performance objectives defined by the class of service attribute.
- Excess burst size (EBS): Number of allocated bytes available for bursts of ingress service frames sent at temporary rates above the CIR + EIR while remaining EIR conformant.
- Excess information rate (EIR): Average rate in bits/s of service frames up to which the network may deliver service frames but without any performance objectives.
- Ethernet Mix (EMIX): The EMIX frame sequence format can be configured from two to eight frames, with configurable frame sizes ranging from 64 to 16 000 bytes. The main purpose of EMIX is to emulate real-life network traffic and uncover potential issues that may not arise when testing with a constant frame size.

Traffic Color Awareness



KPIs

Throughput
Frame transfer delay (latency)
Frame delay variation (jitter)
Frame loss
Frame loss ratio

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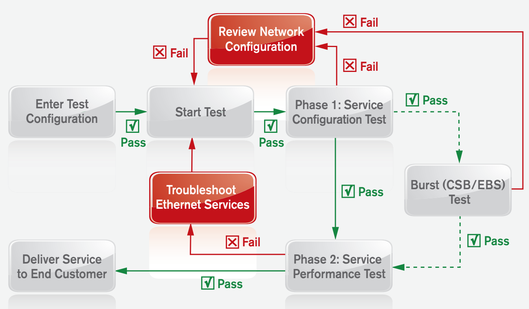
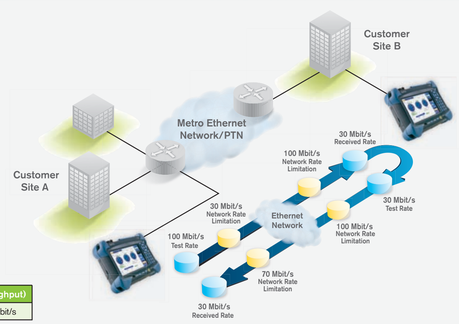
EtherSAM Methodology



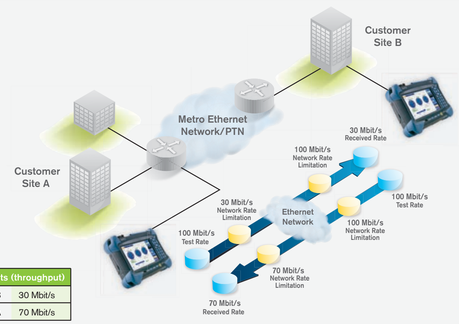
Round-Trip Topology



Results (throughput)	
A to A	30 Mbit/s

Round-trip results only

Bidirectional Topology



Results (throughput)	
A to B	30 Mbit/s
B to A	70 Mbit/s

Independent results for each test direction for each individual service

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EXFO Headquarters > Toll-free: +1 800 663-3936 (USA and Canada)
Tel.: +1 418 683-0211 | Fax: +1 418 683-2170 | info@EXFO.com

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