# draft-leipnitz-spring-pms-implementation-report

Use case: MPLS path monitoring
Monitoring MPLS paths

- ▶ network topology (the implementation detects and stacks LDP signaled Labels)
- ▶ the MPLS path monitoring packets remain in data plane
- ▶ a single PMS is able to address all LSPs of a domain, a PMS allows allows arbitrary path combinations
- ▶ Example task shown here: PMS based data plane failure detection between LER i and LER j.

In general, all MPLS LSPs of a domain can be monitored this way.

PMS: MPLS Path Monitoring System

PMS based LSP measurement, here with 3 LSP segments
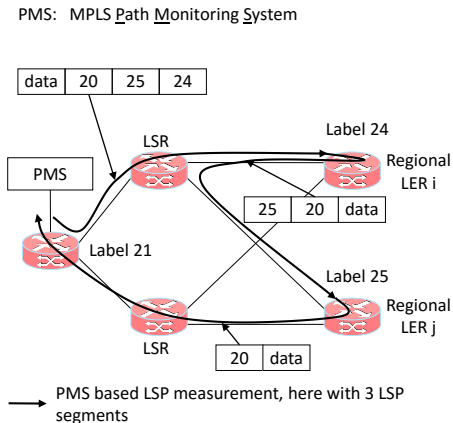
Measurement Topology (extract)

case one: IPPM and PMS
comparison of RT Delay
measurement:

- PerfMA 1 ↔ PerfMA 3
  (reference)
- PMS ↔ LER 3

case two: LER 2 ↔ LER 3
measurements:

- LER 2 ↔ LER 3 = PMS →
  LER 1 → LER 2 → LER 3 →
  LER 2 → LER 1 → PMS
  − PMS ↔ LER 2
- LER 3 ↔ LER 2 in analogy by
  subtracting PMS ↔ LER 3
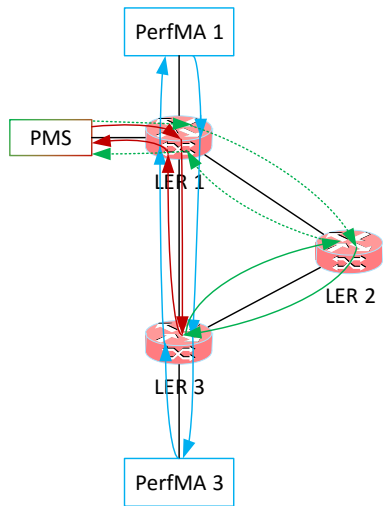
Measurement Results and Evaluation

- measurement: 288 mean RT Dealy values each calculated of 10 singleton samples (8 hours measurement)

- Anderson-Darling-K-Sample (ADK) is successful (≤ 1.993, RFC 6576) after adjustment of the mean / median

- high precision of the values

- no network emulator inserted

- LER 2 $\leftrightarrow$ LER 3 two calculation methods result in mean / median values differing by $10\,\mu$s

Test metric	PERFAS+	PMS
minimum [μs]	691.5	695.5
maximum [μs]	701	704.5
mean [μs]	695.4	699.6
median [μs]	695.5	699.5
standard deviation [μs]	1.4	1.7
ADK-value	278.445	
ADK-value (adj. of mean)	1.701	
ADK-value (adj. of median)	1.982	

Table: PERFAS+ and PMS OWD measurement results for path LER 1 to LER 2 and ADK test results

IP-address variation

- identical routing paths for all measurements, no Equal-cost multi-path routing

- 11 mean round-trip delay values of 10 singletons per measurement, collected at different times of a day

- only IP-addresses varied, MPLS-stack kept the same

- PMS connected to two different LER "one" and "two"

- difference in mean values of 19.5 μs and 14.4 μs, RTD a.b.c.0 is always smaller than that of a.b.c.32

Interface IP-address	mean [μs]	median [μs]
one / a.b.c.0	1413.2	1412
one / a.b.c.32	1432.7	1433
two / a.b.c.0	1446.4	1446
two / a.b.c.32	1460.8	1460.5

Table: Destination-IP-address variation

MPLS topology detection

- ▶ the LDP signaled MPLS topology is discovered by management plane access
- ▶ For more information, see:

  🌐 Blili, R. and Maghbouleh, A.
  Best Practices for Determining Traffic Matrices in IP Networks
  V 4.0.
  NANOG 43 Brooklyn, NY.
  http://www.nanog.org/meetings/nanog43/presentations/
  Blili_trafficmatrix_N43.pdf.

  📕 Horneffer, M. and Schnitter, S.
  Traffic Matrices for MPLS Networks with LDP Traffic Statistics.
  VDE-Verlag, 2004.