PWE3 Congestion Considerations

draft-ietf-pwe3-congcons

(temporarily expired)

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Reminder: What this draft says …

We present two distinct cases:

1) *elastic* PWs carrying congestion responsive traffic
   e.g., Ethernet PWs carrying mostly TCP traffic
2) *inelastic* PWs that can not respond to congestion
   e.g., TDM PWs (structure-agnostic or structure-aware)

Analysis shows that:

1) elastic PWs are automatically TCP-friendly
   and do not require any additional mechanisms
2) inelastic PWs are *often* TCP-friendly
   and frequently do not require any additional mechanisms

The old draft (pdf version) presented 20 full-color graphs
depicting TCP-friendly areas in delay-PLR "phase space"

New work

We decided to depict the TCP compatibility in a new way
more understandable to the transport community

The new graphs depict rate vs. packet loss rate PLR
given delay (or RTT) and packet size S

It is well known that the TCP rate is given by S / (RTT f(PLR))
while the TDM PW maintains a constant bit rate
independent of delay and PLR

Thus we can depict the TDM constant rate
on the same axes as the TCP rate

And observe if the TDM rate is significantly above that of TCP

The graphs are worst-case “apples to apples”, that is
they assume that the TCP traffic uses the TDM packet size
rather than using the largest segment size it could

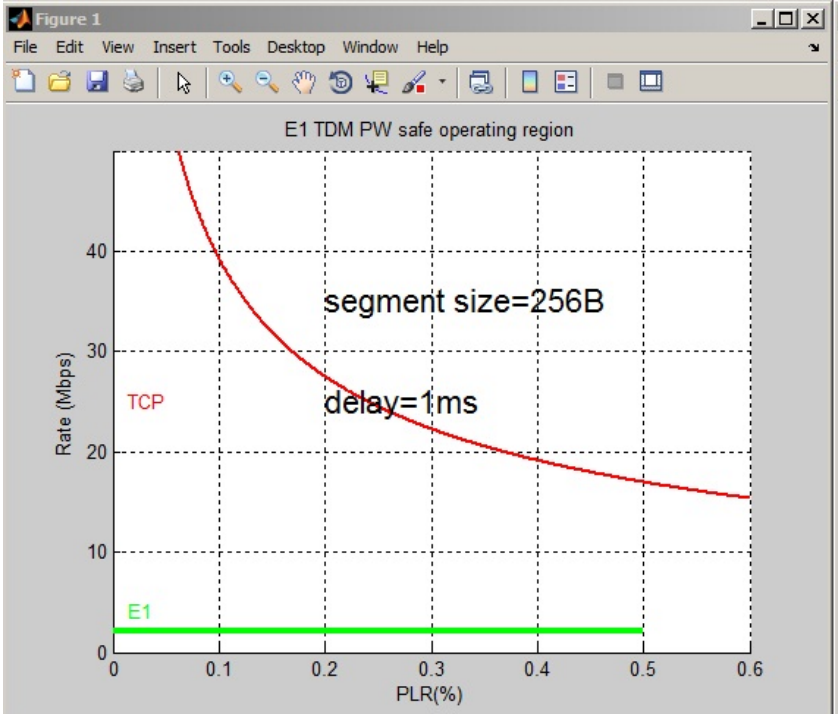
Figure 1
File Edit View Insert Tools Desktop Window Help
E1 TDM PW safe operating region
segment size=256B
delay=1ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

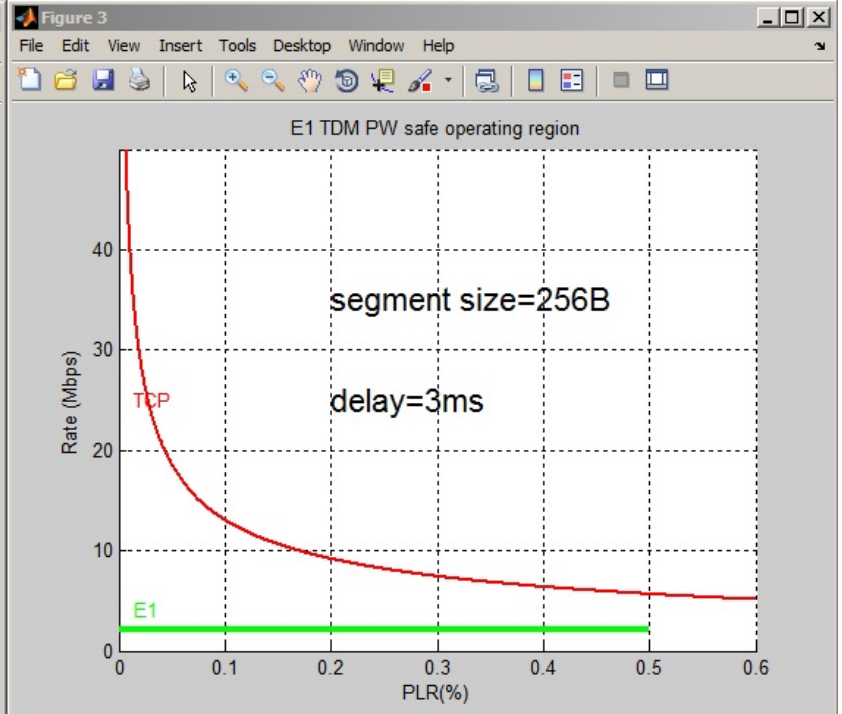
Figure 3
File Edit View Insert Tools Desktop Window Help
E1 TDM PW safe operating region
segment size=256B
delay=3ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

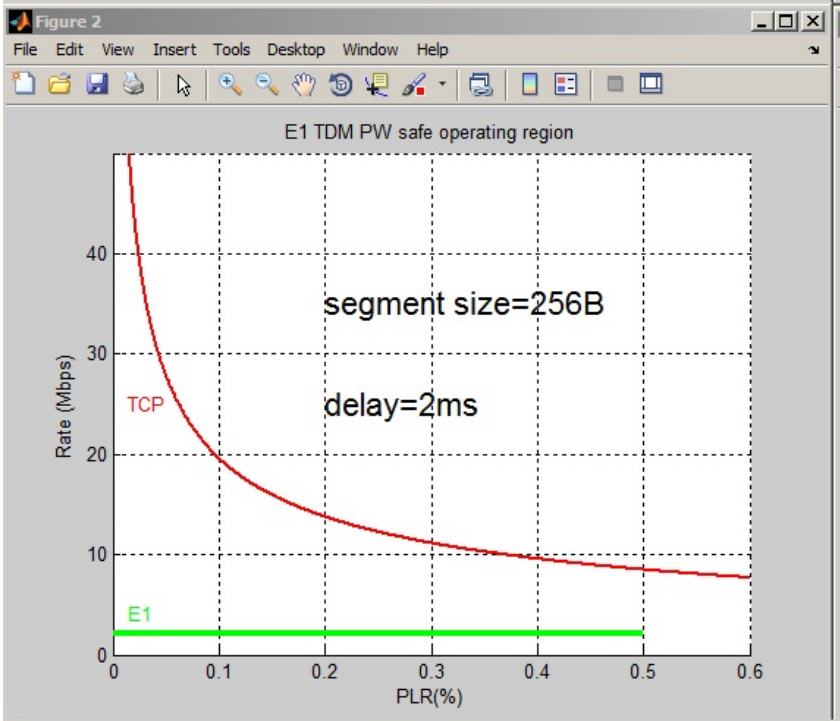
Figure 2
File Edit View Insert Tools Desktop Window Help
E1 TDM PW safe operating region
segment size=256B
delay=2ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

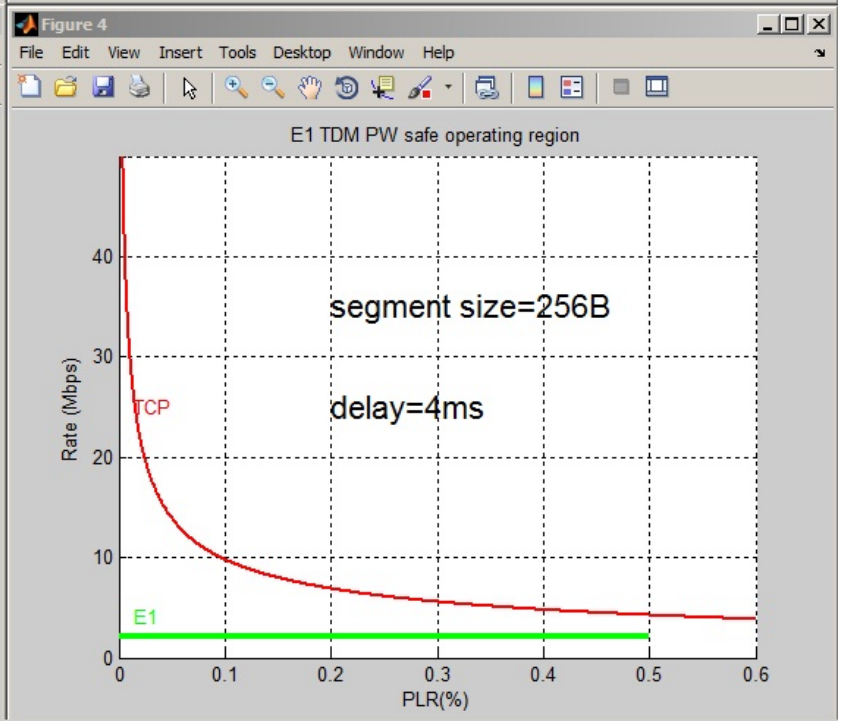
Figure 4
File Edit View Insert Tools Desktop Window Help
E1 TDM PW safe operating region
segment size=256B
delay=4ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

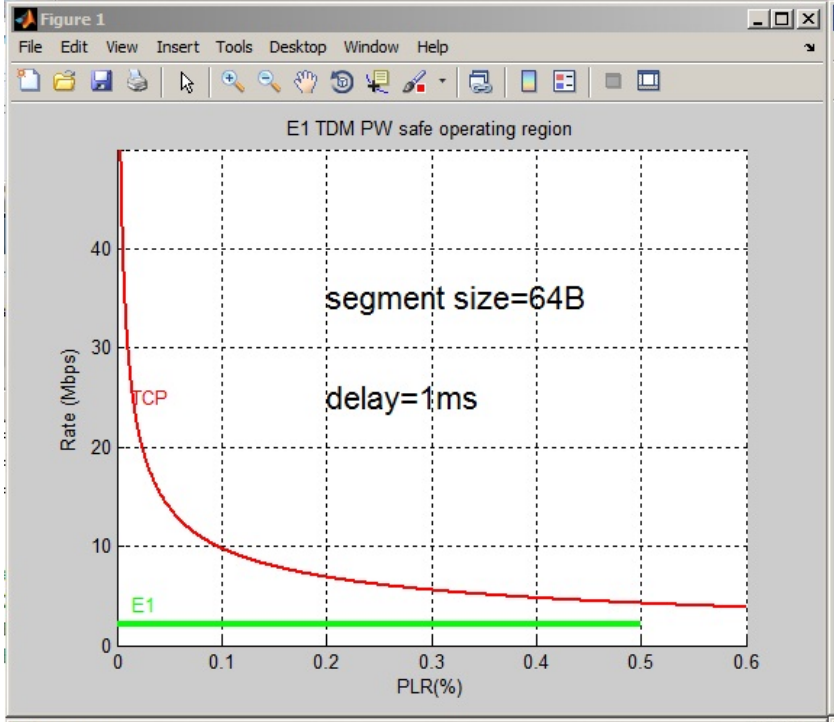
Figure 1
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E1 TDM PW safe operating region
segment size=64B
delay=1ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

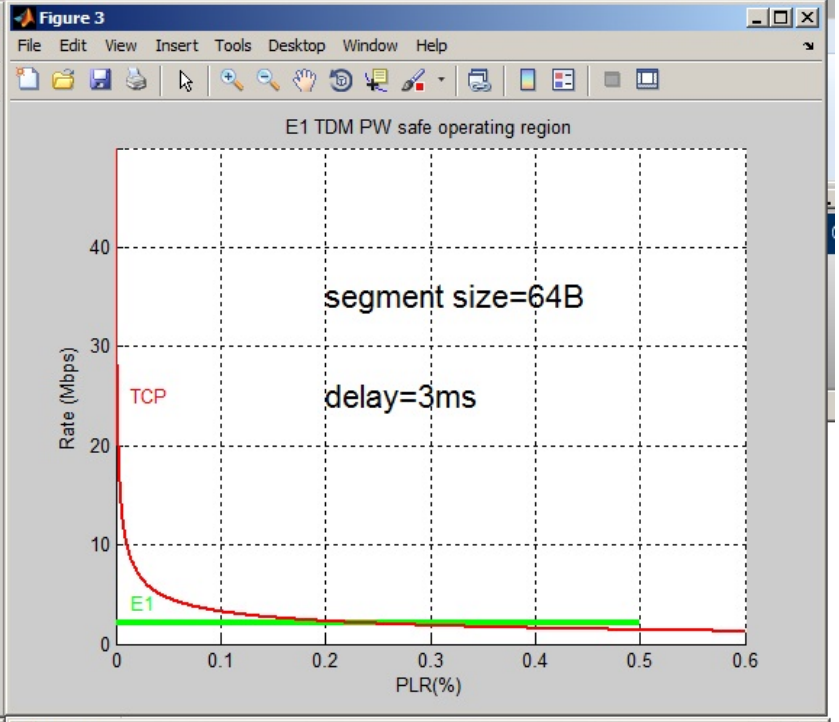
Figure 3
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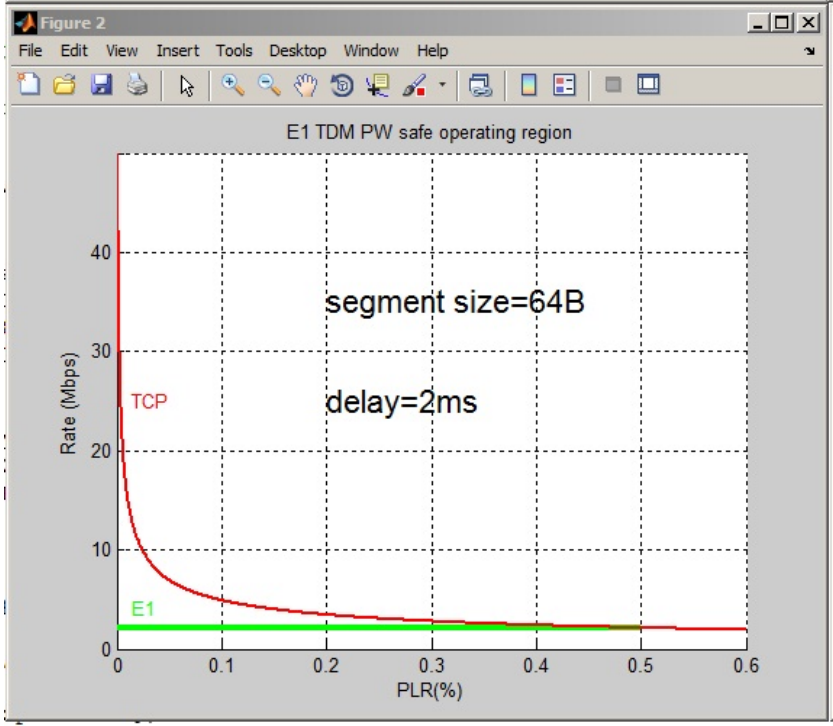
E1 TDM PW safe operating region
segment size=64B
delay=3ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6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delay=2ms
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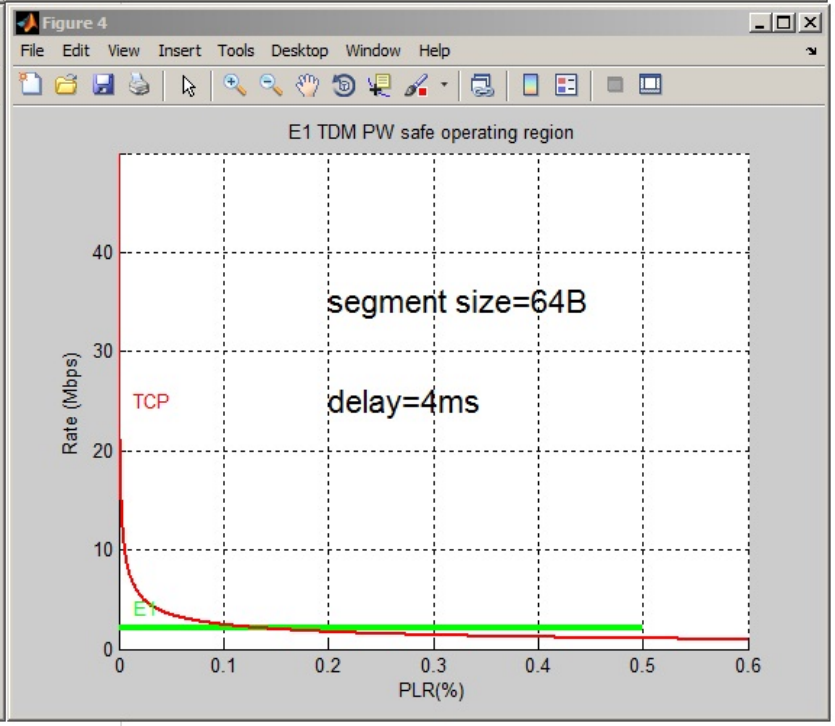
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6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PLR(%)
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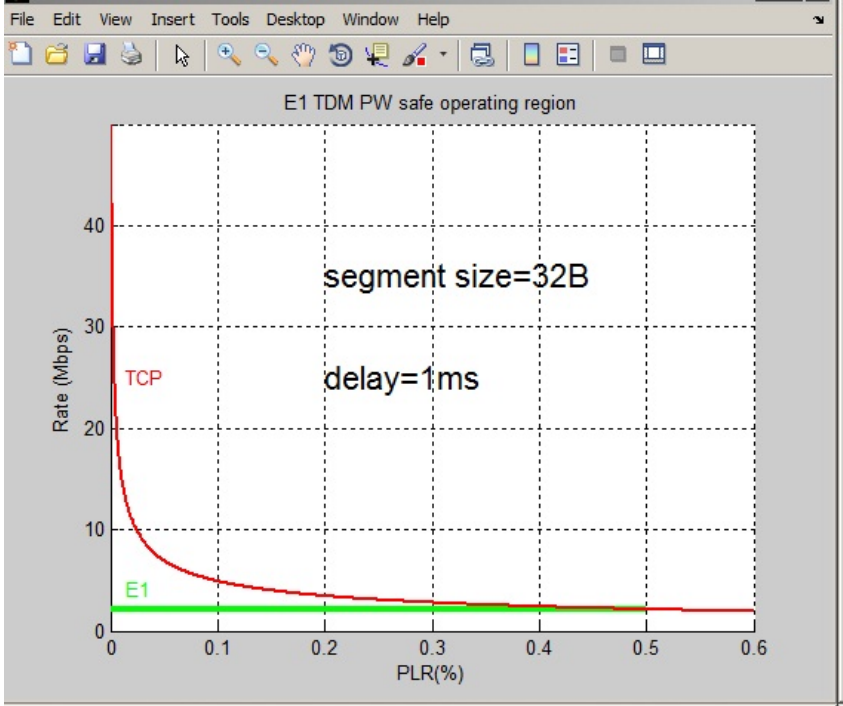
0.4
0.5
0.6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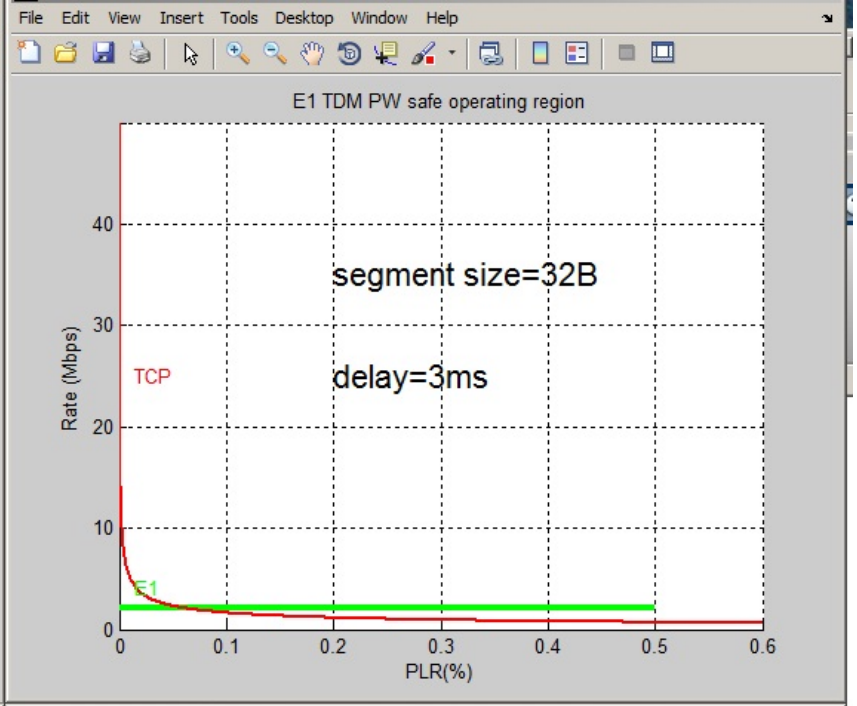
E1 TDM PW safe operating region
segment size=32B
delay=1ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6


File Edit View Insert Tools Desktop Window Help
E1 TDM PW safe operating region
segment size=32B
delay=3ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

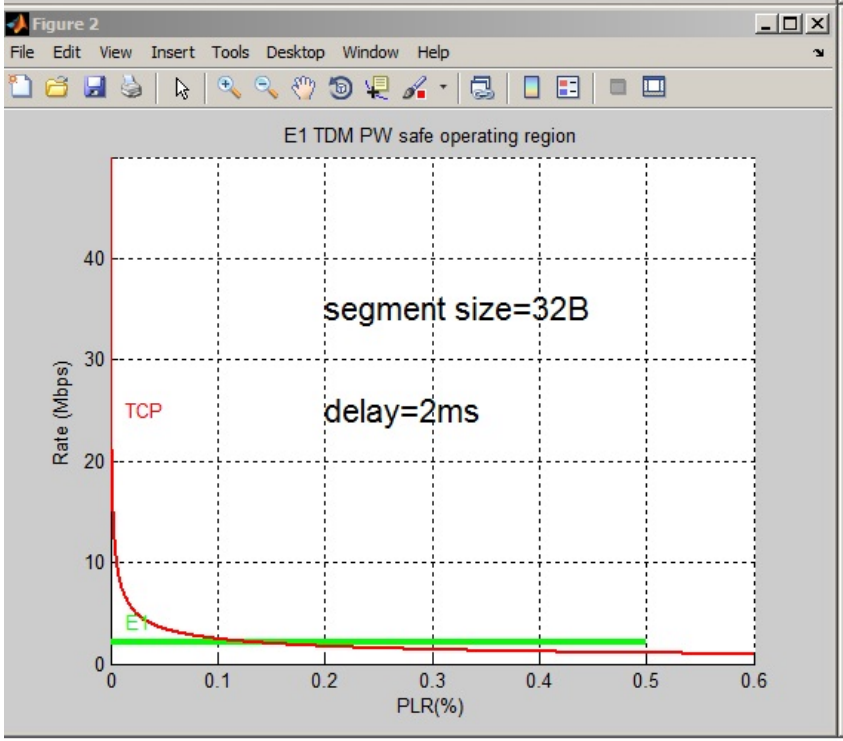


Figure 2
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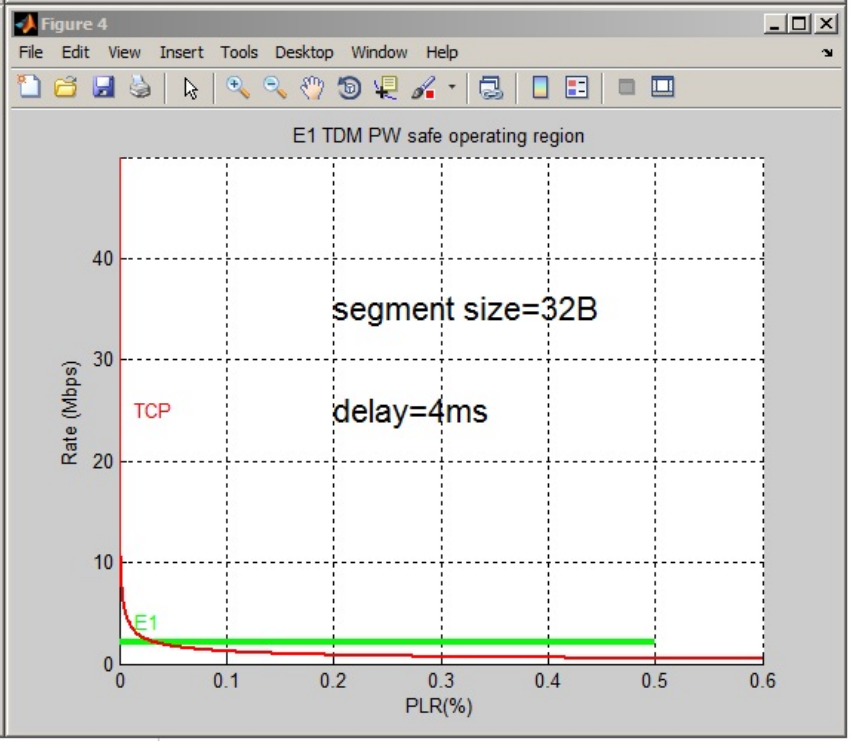
E1 TDM PW safe operating region
segment size=32B
delay=2ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6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E1 TDM PW safe operating region
segment size=32B
delay=4ms
TCP
E1
Rate (Mbps)
PLR(%)
0
10
20
30
40
0.1
0.2
0.3
0.4
0.5
0.6

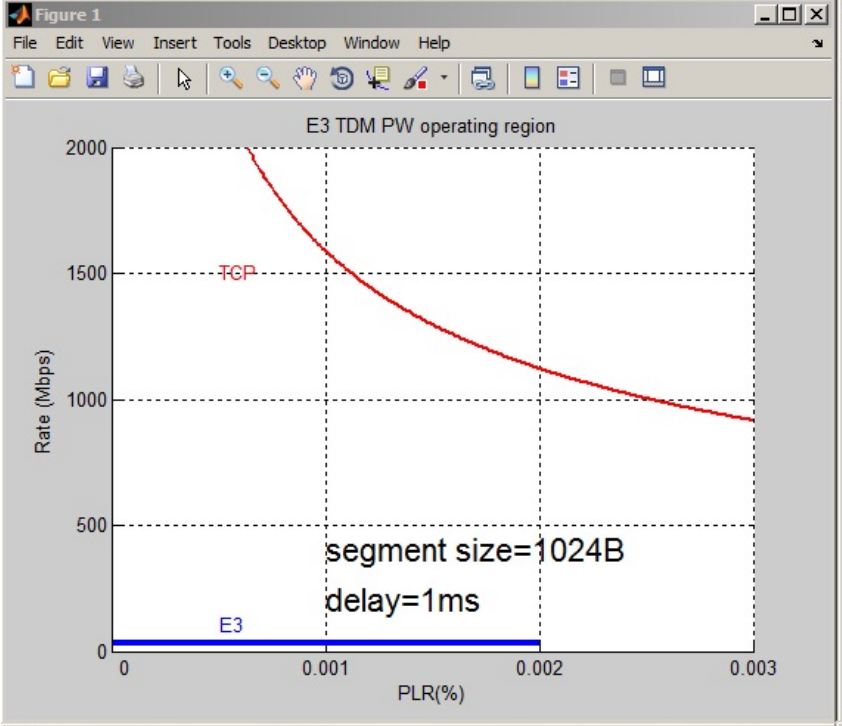
Figure 1
File Edit View Insert Tools Desktop Window Help
E3 TDM PW operating region
2000
1500
1000
500
0
Rate (Mbps)
TCP
segment size=1024B
delay=1ms
E3
0
0.001
0.002
0.003
PLR(%)

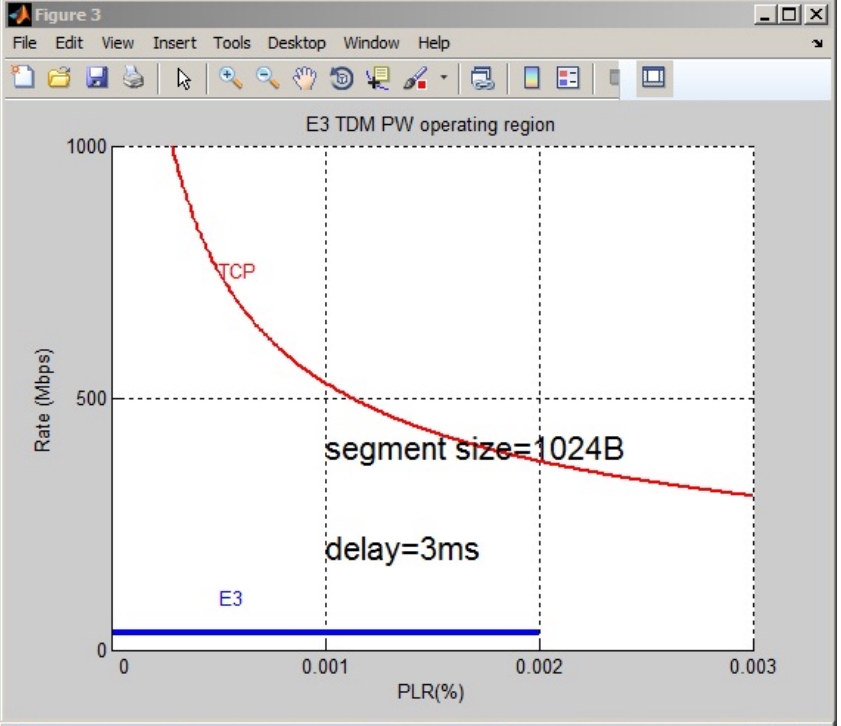
Figure 3
File Edit View Insert Tools Desktop Window Help
E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=1024B
delay=3ms
E3
0
0.001
0.002
0.003
PLR(%)

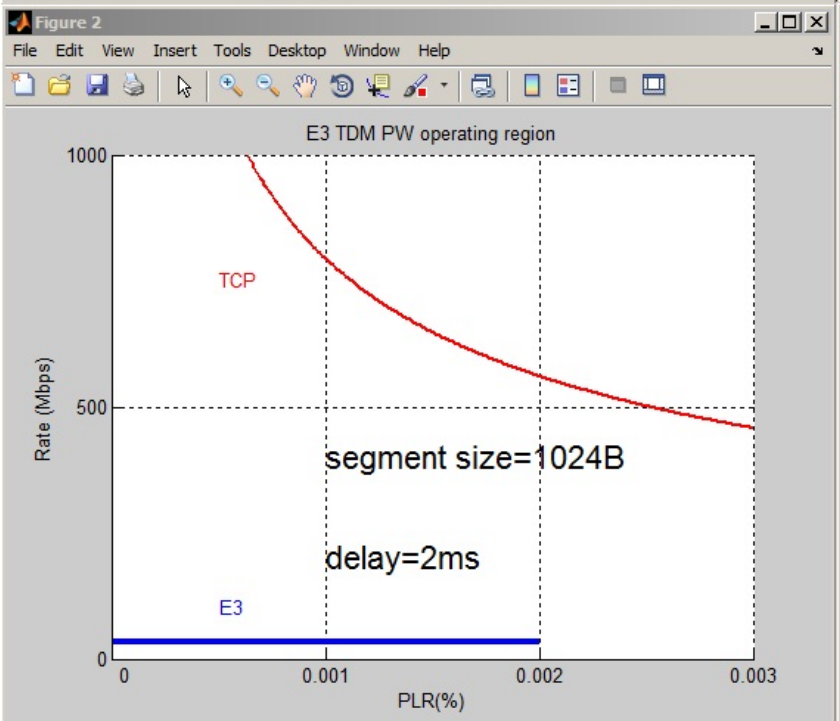
Figure 2
File Edit View Insert Tools Desktop Window Help
E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=1024B
delay=2ms
E3
0
0.001
0.002
0.003
PLR(%)

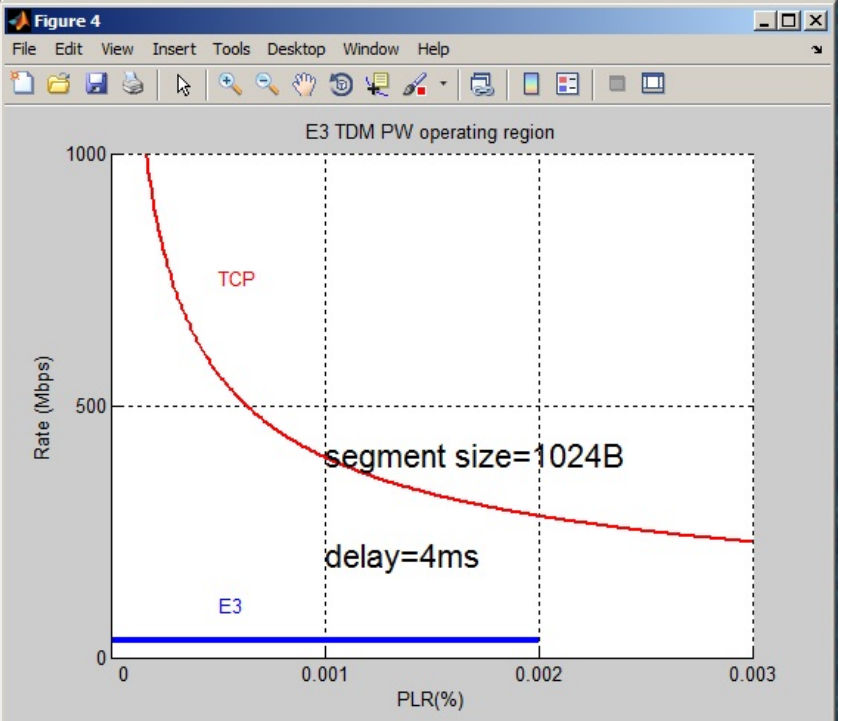
Figure 4
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E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=1024B
delay=4ms
E3
0
0.001
0.002
0.003
PLR(%)

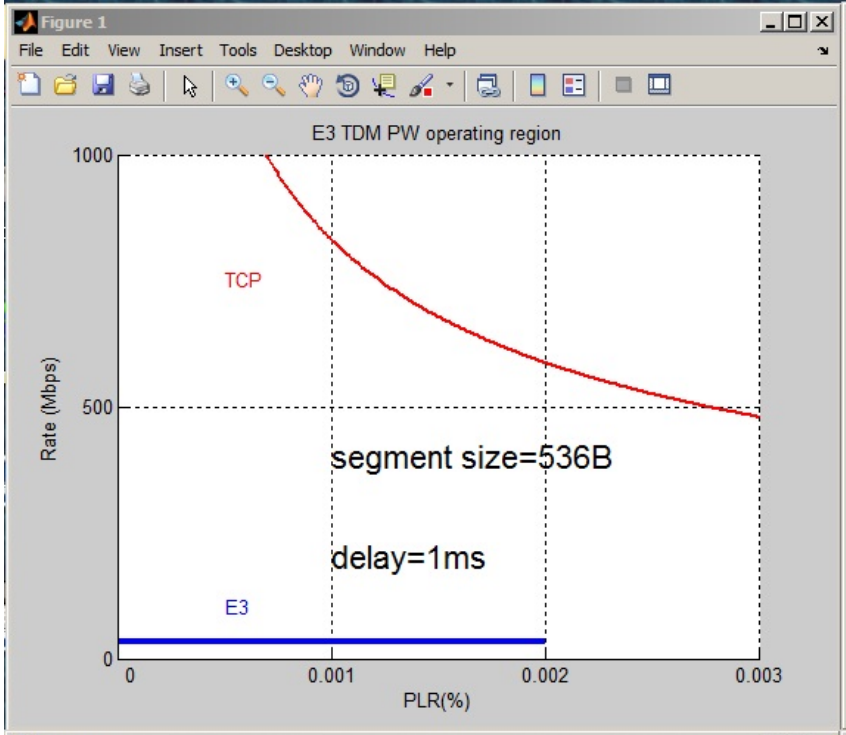
Figure 1
File Edit View Insert Tools Desktop Window Help
E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=536B
delay=1ms
E3
0
0.001
0.002
0.003
PLR(%)

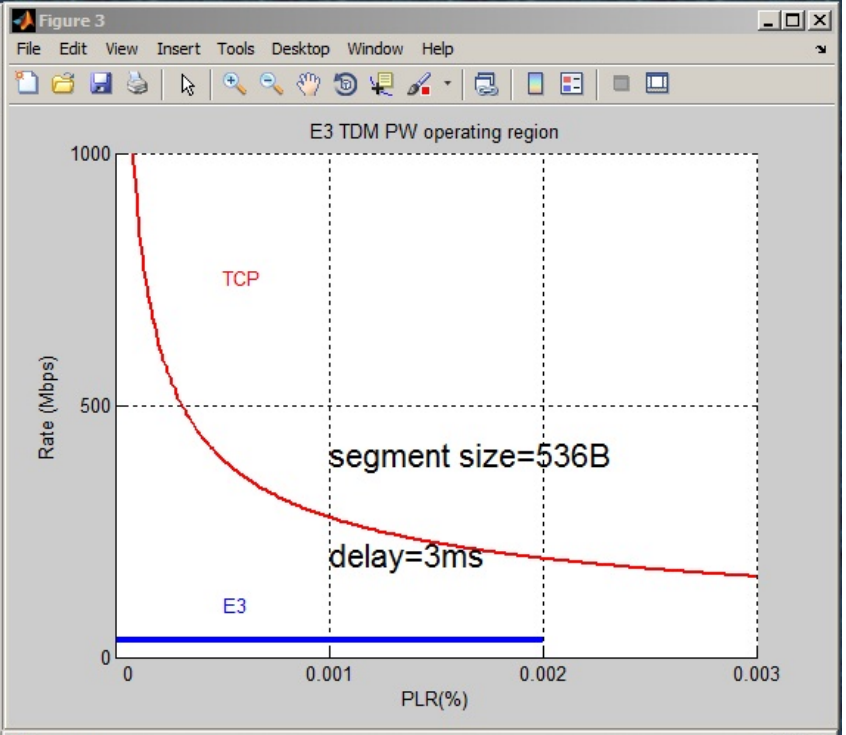
Figure 3
File Edit View Insert Tools Desktop Window Help
E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=536B
delay=3ms
E3
0
0.001
0.002
0.003
PLR(%)

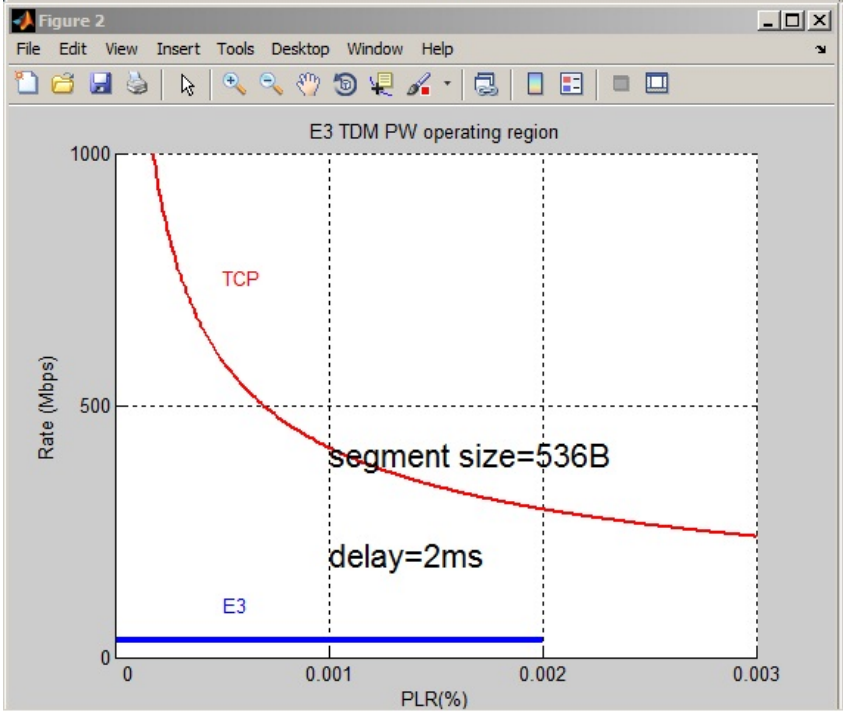
Figure 2
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E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=536B
delay=2ms
E3
0
0.001
0.002
0.003
PLR(%)

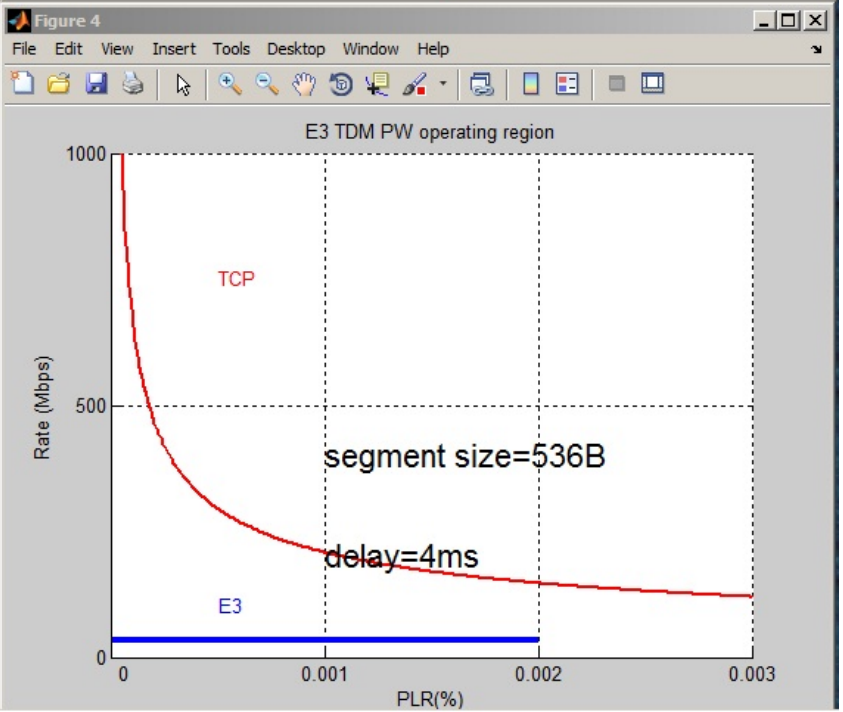
Figure 4
File Edit View Insert Tools Desktop Window Help
E3 TDM PW operating region
1000
500
0
Rate (Mbps)
TCP
segment size=536B
delay=4ms
E3
0
0.001
0.002
0.003
PLR(%)

Technical Comments

The E1 payload sizes were chosen to be 32B, 64B, and 256B corresponding to 1, 2, and 4 frames per packet

The E3 payload sizes were 1024B (the SAToP must support value) and 536B (the TCP must-support value)

The E1 graphs extend to PLR=½% and the E3 graphs to 0.002% compatible with achieving valid TDM service according to G. 826

The delay values of 1, 2, 3, and 4 ms correspond to 1-way on-the-wire propagation latency

Results

We see that in almost all cases
- a TDM PW consumes less data-rate than TCP would
- under the same conditions

The exceptions being E1 with
- small frames sizes and
- long on-the-wire delay

and even then the difference is negligible

Covering all the cases of the previous draft with this new method
- will consume even more space !

Once we decide which graphs to include
- and finish some rewording
- we will respin the draft and request a WG LC