

Measuring ECN++ Good News for ++, Bad News for ECN over Mobile

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TCPM WG - IETF 100

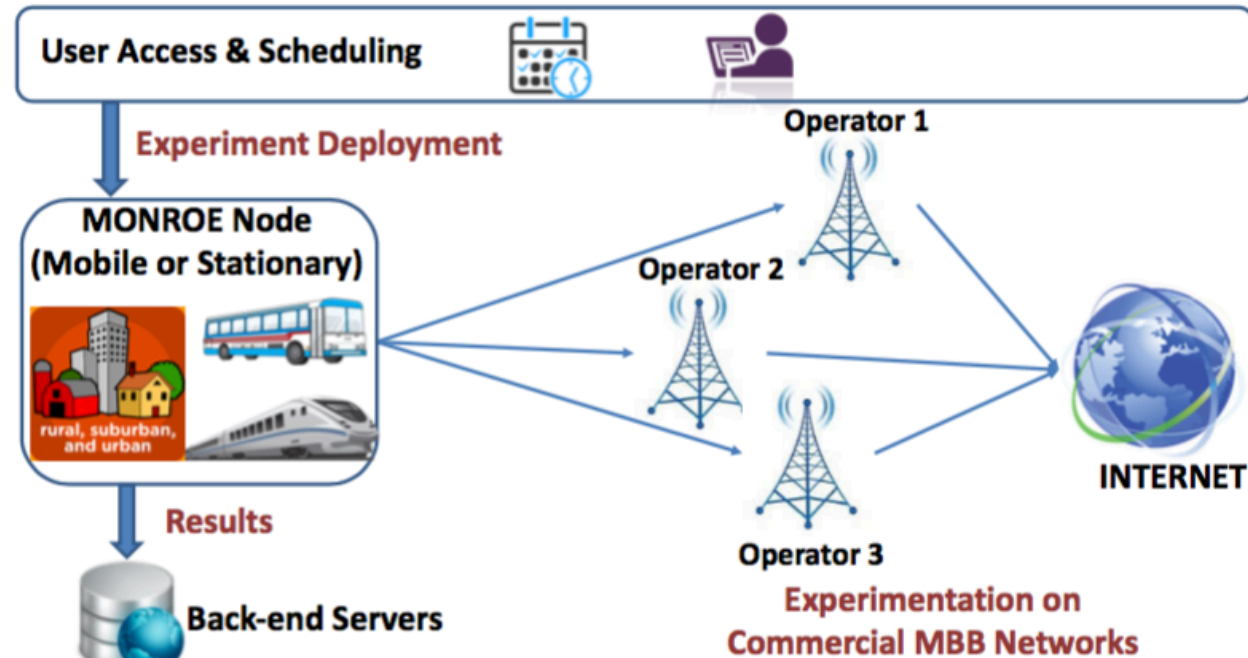
Motivation

- Provide initial data for the ECN++ experiment defined in draft-ietf-tcpm-generalized-ecn
- In particular, learn if ECN-marked TCP control packets, Pure ACKs are treated differently to ECN-marked TCP data packets
- Measure how ECN-marked data packets are treated as a baseline and measure ECN-marked control packets and pure ACKs to compare.

Measurement platforms

11 MBB ISPs:

Vodafone (IT)
TIM (IT)
WIND (IT)
Orange (ES)
Yoigo (ES)
Movistar (ES)
Telia (SE)
Telenor (SE)
Three (SE)
Telia (NO)
Telenor (NO)



54 Plantelab nodes in 25 ASes in 22 countries.



PLANETLAB

An open platform for developing, deploying, and accessing planetary-scale services

Experiments

- TCP SYN, Data packets, Pure ACKs and FINs
- All possible ECN (IP and TCP) flag combinations in ECN, ECN+, ECN++ and AccECN
- Tracebox from clients to Alexa 100k
 - Tracebox is similar to traceroute but verifies changes between the sent packet and the returned one
- Between clients and our servers
 - In this case, we can also test SYN/ACKS

Measurement campaign

- Between January and May 2017
- Port 80 and port 443
- 26 million end-to-end communications
- 6.5 million different paths

Findings

- ECN clearing
 - 7 out of the 11 mobile providers clear the ECN field in the IP header for packets from client in both ports by the first hop
 - A few tests in other 7 mobile providers and found 3 of them clearing ECN (making 10 out of 18)
 - 1 mobile provider clears ECN in port 80 and not in port 443 (proxy)
 - No evidence of clearing ECN in the traffic from the servers to the client
 - For the other 3 mobile providers 0,53% of clearing ECN deeper in the network (5 hops away)
 - For fixed providers, 0,23 % clearing ECN deeper into the network

ECN and ECN++

- ECN and ECN++ possible packet/flag combination (both IP and TCP header flags) do NOT cause packet drop
- **ECN++ support is the same as ECN support**
 - ECN++ are not discarded, cleared, bleached more often than ECN packets
- 61% of Alexa top 500k supports ECN
 - 3,51% support ECN+ but NONE of them respond as defined in RFC5562

Other stuff

- All the 158K servers of the Alexa top 500k servers that we were able to test for ECN respond to a ECE flag in the same way the respond to 3 dup ACK
- Initial window of the top 500k Alexa
 - 51% IW=10
 - 9,2% IW=2
 - 9,3% IW=4
 - 14% N/A
 - 0,4% IW>10!!!!
 - 1121 servers deliver the whole file in the first RTT (maximum seen of 585 packets in the first RTT)

Final remarks

- ECN++ seems as safe as ECN so far.
- More work needs to be done in ECN still.
- Evidence of ECN clearing found, does it matter?
 - if other links precede the cellular hop (e.g. a home router or bus/train connected over cellular), any CE-marking introduced in the home or vehicle network would be wiped, which would fool ECN sources into overrunning their local network.
- Paper can be found at:
http://www.it.uc3m.es/amandala/ecn++/ecn_commag_2018.html