

Bottleneck sharing among wireless and Ethernet hosts

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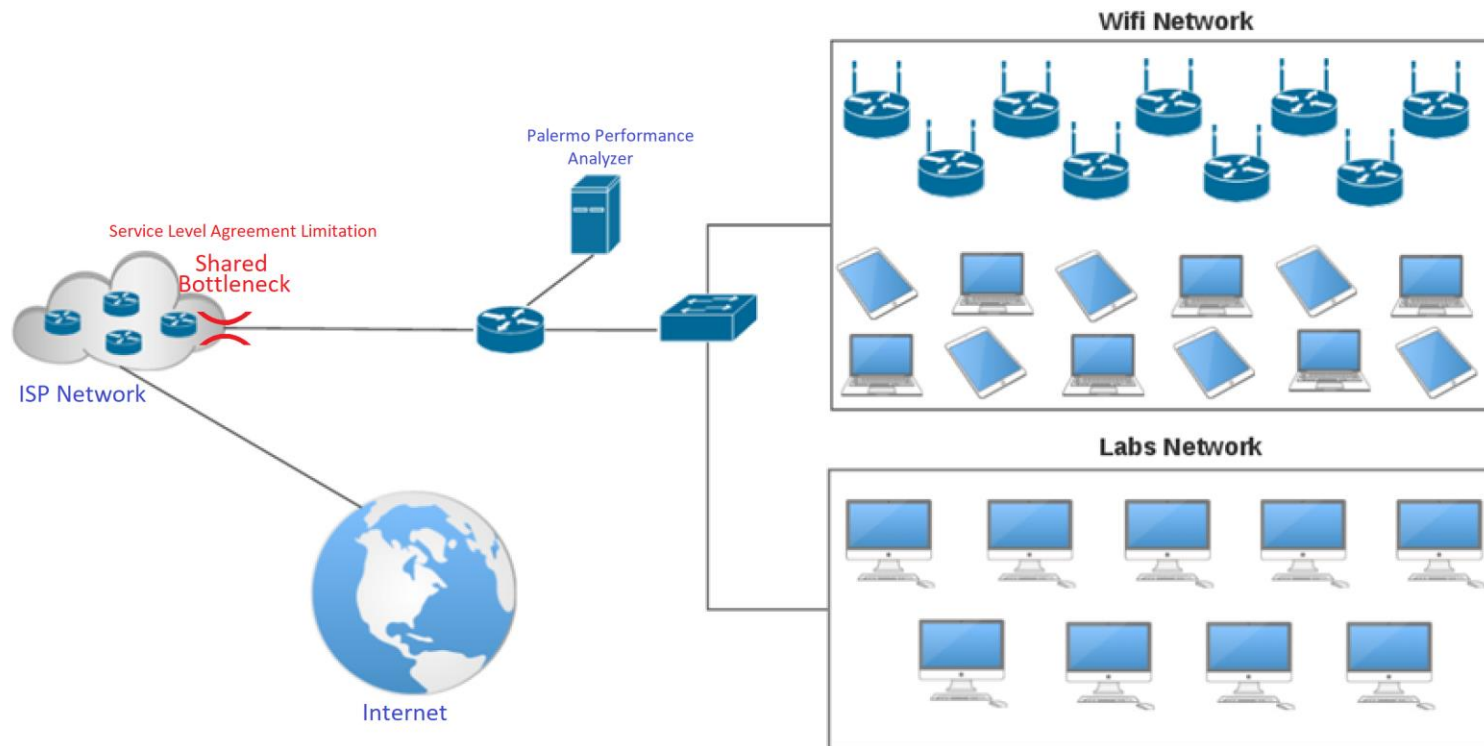
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Goals

- * Performance comparison among clients sharing the same bottleneck and the same network path.
- * But using different access technologies: Wifi vs Ethernet.

Measurement architecture



Tool:

Palermo Performance Analyzer

Unique features:

- * **Throughput limitation analysis:** network limited, source generation rate limited, flow control limited.
- * Server response times.
- * Asymmetric routing.
- * Very high volume capability

Other features

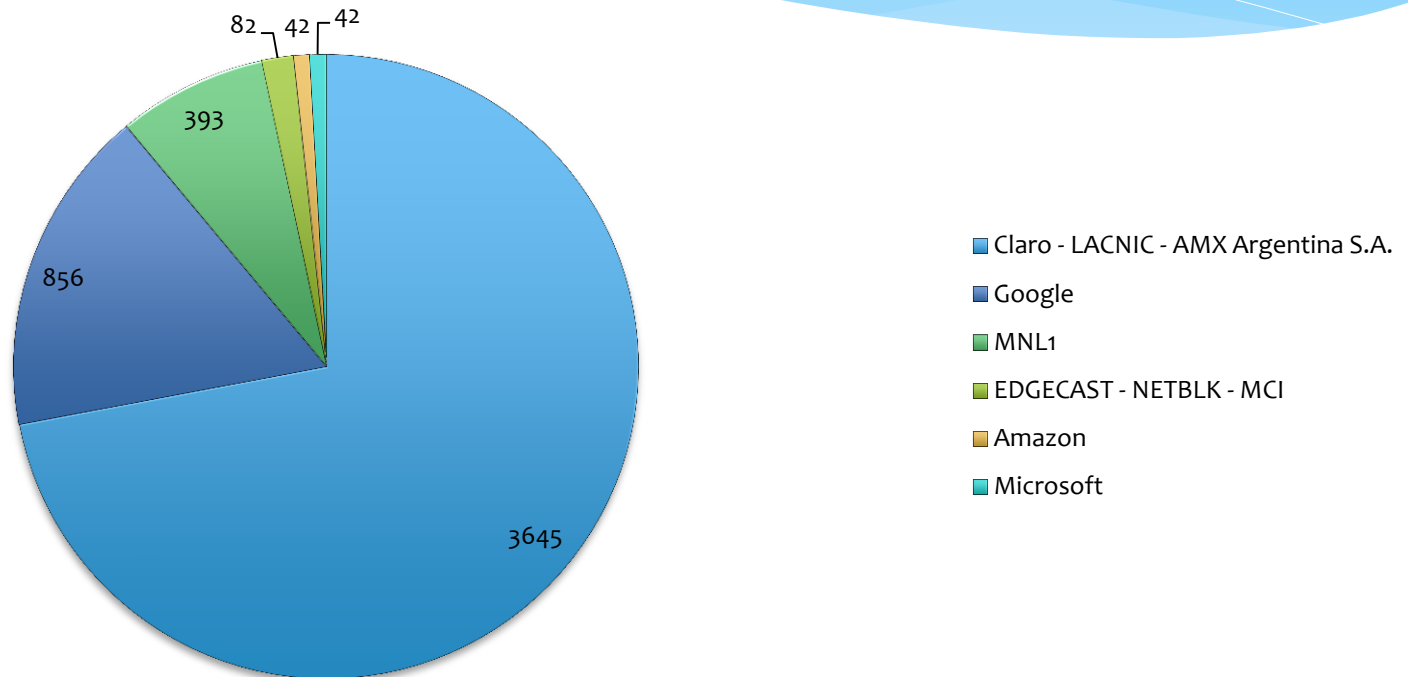
- * Round Trip Times.
- * Retransmissions.

- * Passive measurements and analysis

Análisis

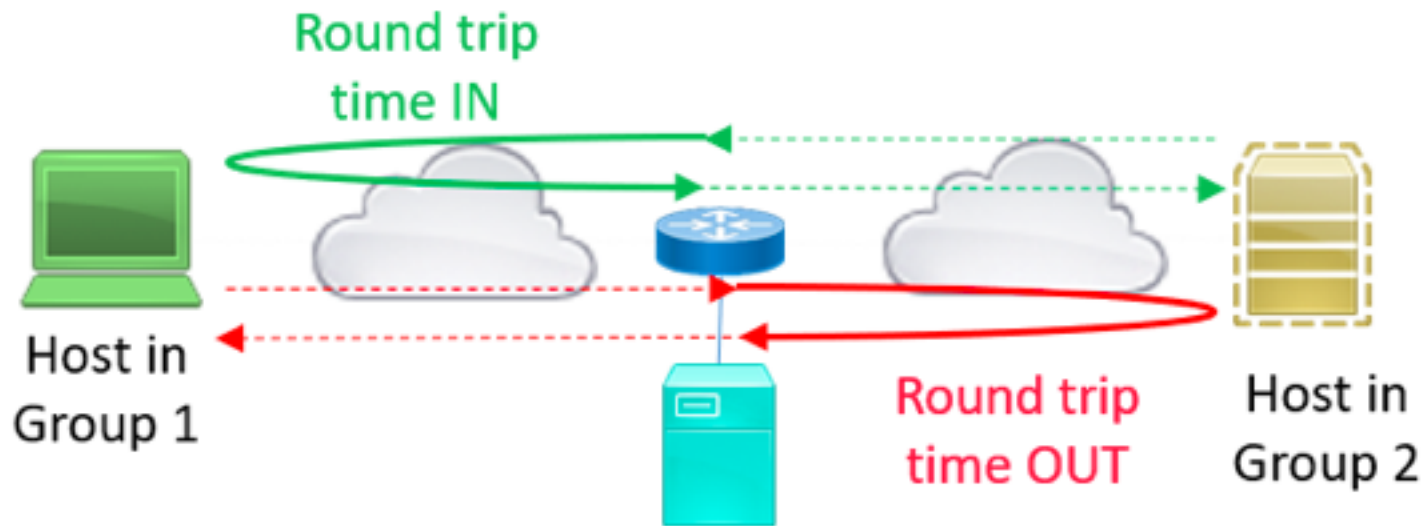
- * Performance was compared individually for each of the Internet class C networks accessed from Wifi and Ethernet Clients.
- * Networks considered: only those exchanging traffic volumes larger than configured threshold
- * For each considered network, obtained Round Trip Times (HRTT), Throughput, and Retransmissions both for Wifi and Ethernet

Traffic origins (downloaded MBytes)



Most traffic coming from **cache**s hosted in provider ISP (**AMX**)

Half Round Trip Times



Two Half Round Trip Times are measured.

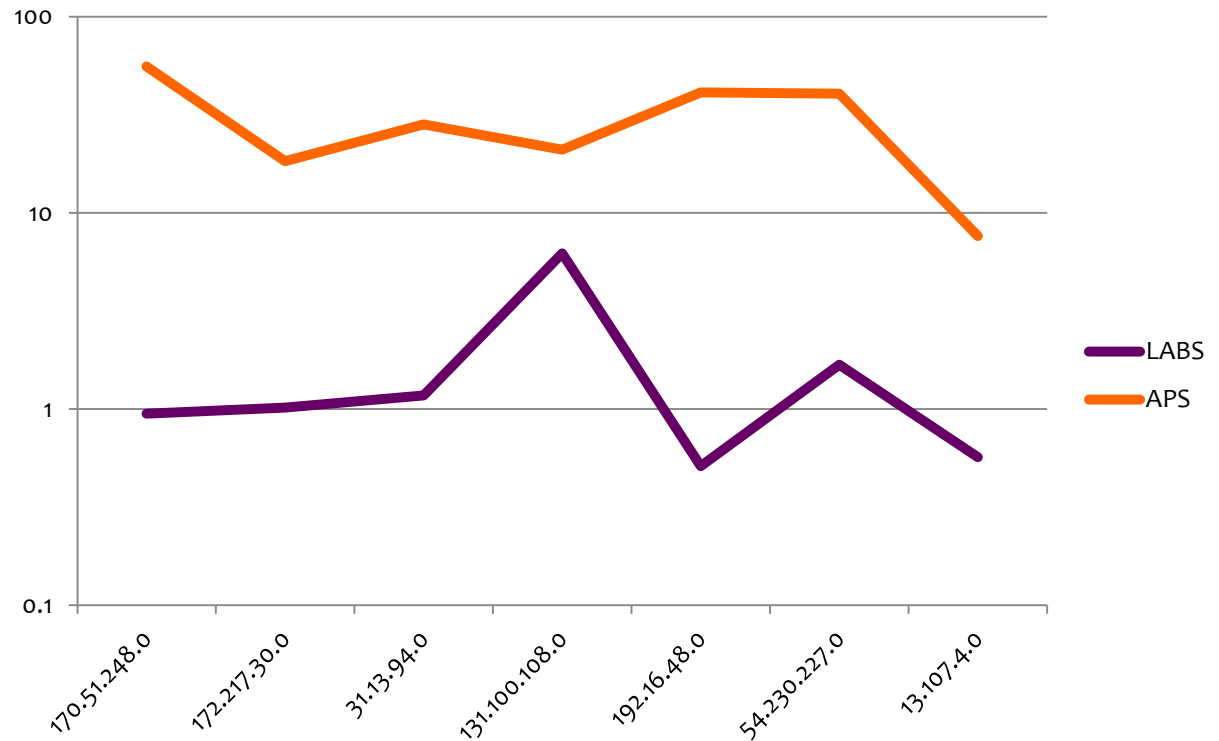
INSIDE Half Round Trip Times

Latency due to
local Ethernet (LABS) or
local Wifi (APS) network.

IP	LABS (ms)	APS (ms)
170.51.248.0	0,949	55,665
172.217.30.0	1,019	18,341
31.13.94.0	1,174	28,189
131.100.108.0	6,226	21,003
192.16.48.0	0,511	41,12
54.230.227.0	1,682	40,539
13.107.4.0	0,568	7,618

local Ethernet (LABS): low
local Wifi (APS): high!

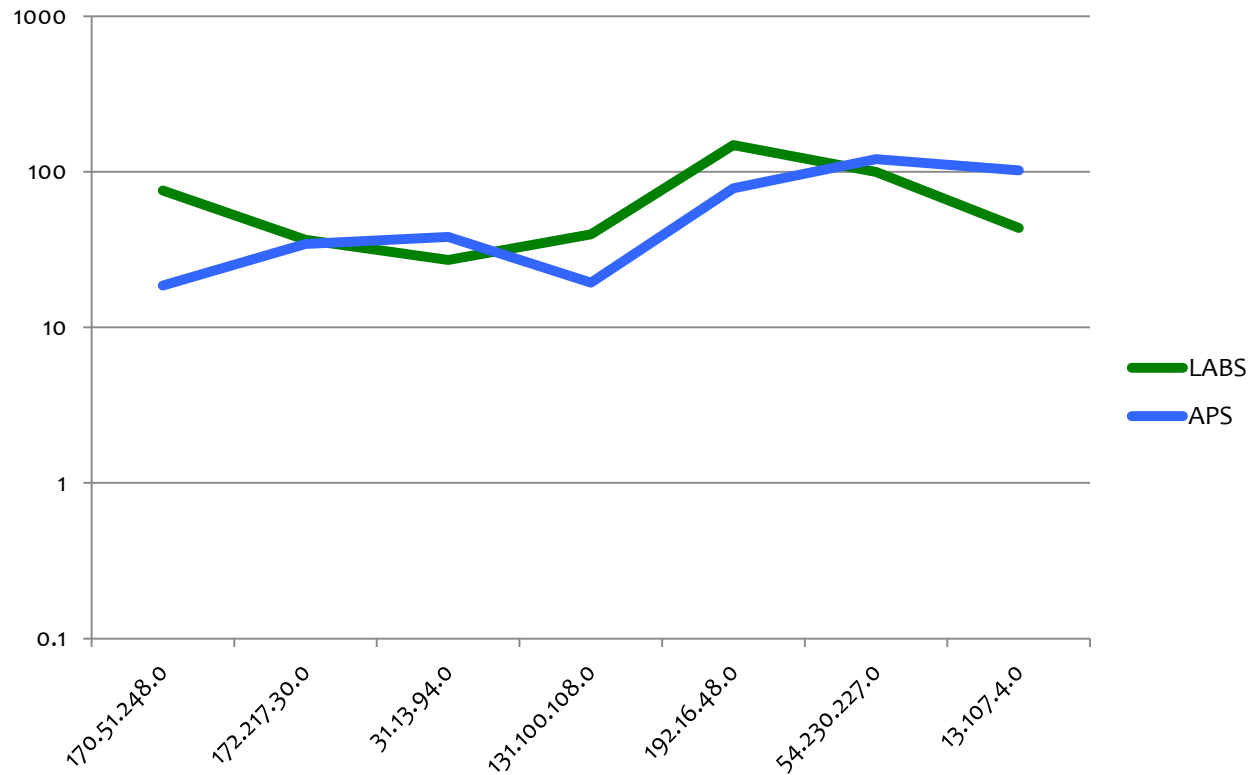
Mainly affecting short transaction
oriented connections (web)



Resultados HRTT OUTSIDE

Latency due to outside path
shared among all hosts
(very similar)

IP	LABS (ms)	APS (ms)
170.51.248.0	75,833	18,533
172.217.30.0	36,53	34,287
31.13.94.0	27,061	38,172
131.100.108.0	39,552	19,384
192.16.48.0	148,581	78,44
54.230.227.0	99,654	120,543
13.107.4.0	43,466	101,962



Latency

Outside (same for Wifi and Ethernet)

- * Bottleneck queuing (main outside latency)
- * Propagación delay.

Inside (much higher for Wifi clients):

- * Level 2 wifi retransmissions (wifi) caused by packet loss.
- * Transmit wait times due to shared access medium contention CSMA/CA.

Effects:

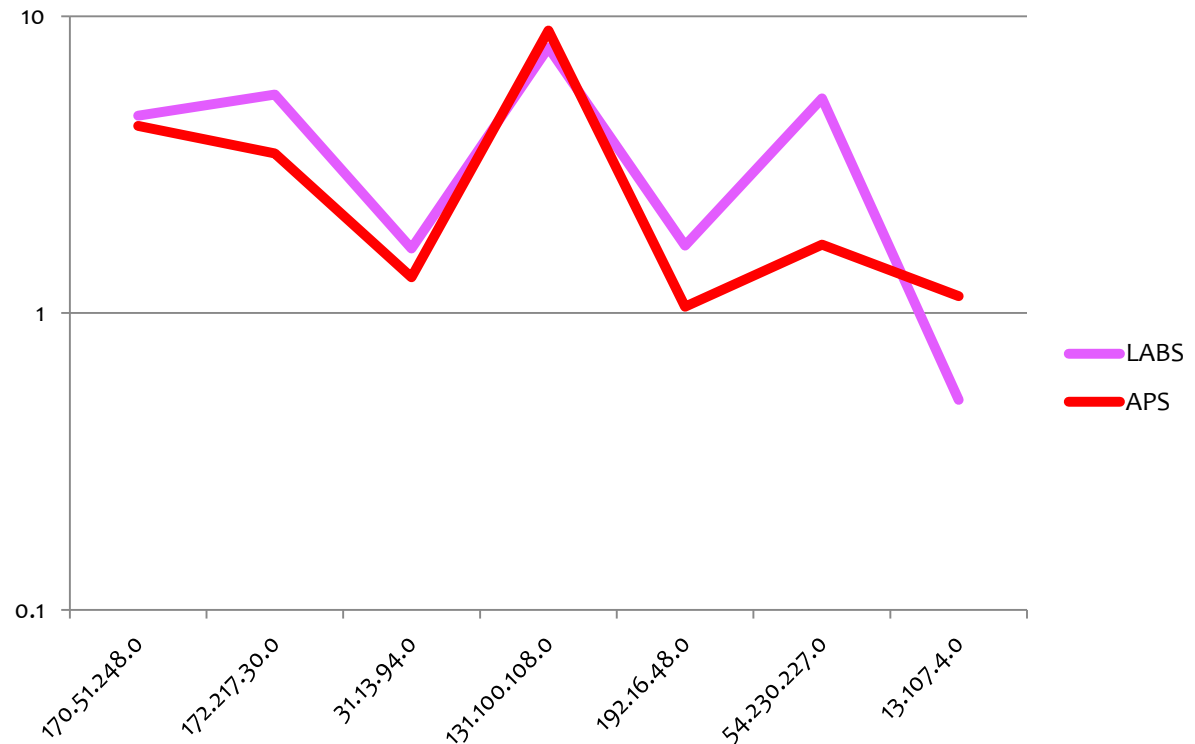
- * Transaction oriented connections obtain lower performance in Wifi clients.
- * Web pages generally holding many objects, needing many transactions, take significantly longer.

Download Throughput NL

Measured for Network-limited connections.

Similar throughputs from each Internet class-C network for both Wifi and Ethernet.

IP	LABS (Mbps)	APS (Mbps)
170.51.248.0	4,62	4,27
172.217.30.0	5,44	3,45
31.13.94.0	1,65	1,32
131.100.108.0	7,84	8,95
192.16.48.0	1,69	1,05
54.230.227.0	5,28	1,7
13.107.4.0	0,51	1,14



Throughput

- * Similar results for both Wifi and Ethernet Clients when compared for same origin Internet networks.
- * TCP adapts similarly for both client types, being mainly affected by common shared bottleneck.

Conclusions

- * Different access technologies (WIFI/LAN) obtain different performances when communicating with the same Internet servers, even when reaching them through the same path.
- * Transaction oriented connections (i.e. WEB), obtained total times 25%-30% larger in WIFI.
- * Long connections (i.e. downloads) obtain similar performances (throughput).
- * Level 4 Retransmissions are similar for both Wifi and Ethernet (extra wifi losses are solved at level 2 and not seen in level 4).

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¡Thanks!