Networks in a Box

Objective

The objective of this test is to evaluate the performance and operational capabilities of access points in various real-world environments, including home, office, hospital, and stadium settings, using Candela's Networks in a Box solution. The test will involve emulating virtual devices and using real devices at different distances (near, medium, and far) and applying predefined traffic profiles to simulate activities such as video streaming, online gaming, browsing, file downloads, and application video streams (YouTube, Netflix, Zoom, etc.). Additionally, the performance of IoT devices connected to Alexa will be assessed. The aim is to identify key performance metrics and potential issues related to AP capacity, coverage, QoS, and device handling under typical usage scenarios.

DUT Configuration

Test Network	Qualcommertiab
Name of the Test Scenario	Duplex_home_scenario
Test Duration (minutes)	15
No. of Devices in test	50
2GHz SSID	TPLINK_2G
2GHz BSSID	DEFAULT
2GHz Security	WPA2
5GHz SSID	TPLINK_5G
5GHz BSSID	DEFAULT
5GHz Security	WPA2
6GHz SSID	TPLINK_6G
6GHz BSSID	DEFAULT
6GHz Security	WPA3

Client Distributions and Pass/Fail Analysis

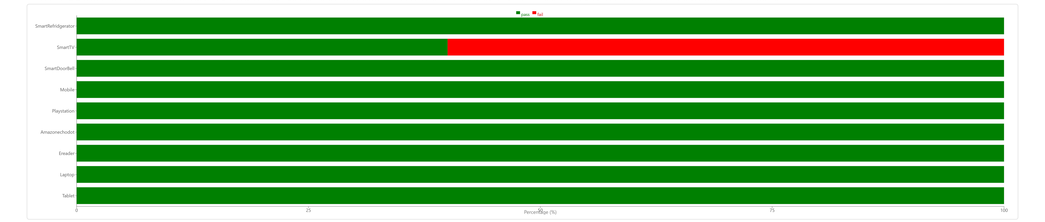
The distribution of clients across various distances—near, medium, and far can be seen in the below image. Each client's pass/fail status was determined based on SLA criteria, with green indicating pass and red indicating fail. This representation provides a clear summary of the test outcomes across various client distances.

Device Information

Device Name	Traffic Profile	Distance	Device Type	Client Type	Bandwidth	Mac	Channel	Mode	RSSI
Samsung	SmartRefrigerator_Cloud_Controls	far	SmartRefrigerator	Virtual	2.4GHz	36:f6:f6:c6:98:94	6	802.11bgn 4S 2x2	-36 dBm
LG	Netflix_SmartTV_Streamingvideo TCP	far	SmartTV	Virtual	2.4GHz	36:f6:f6:60:93:94	6	802.11bgn 4S 2x2	-36 dBm
Amazon Ring	SmartDoorBell_Streamingvideo-UDP	far	SmartDoorBell	Virtual	2.4GHz	36:f6:f6:23:24:94	6	802.11bgn 4S 2x2	-40 dBm
Xiaomi 5Pro	Amazonshopping_Mobile_WebBrowsing	far	Mobile	Virtual	2.4GHz	36:f6:f6:2e:ae:94	6	802.11bgn 4S 2x2	-40 dBm
Kindle	Kindle_WebBrowsing	far	Ereader	Virtual	2.4GHz	36:f6:f6:ab:07:94	6	802.11bgn 4S 2x2	-40 dBm
Oneplus10	Spotify_Mobile_Streamingaudio TCP	far	Mobile	Virtual	5GHz	36:f6:f6:83:9f:9a	36	802.11an-AC 8S 2x2	-60 dBm
HP	FileZilla_Laptop_DownloadFile-FTP	far	Laptop	Virtual	5GHz	36:f6:f6:31:d6:9a	36	802.11an-AC 8S 2x2	-61 dBm
PS5	Gaming_Playstation_Streamingvideo-UDP	far	Playstation	Virtual	5GHz	36:f6:f6:4f:1a:9a	36	802.11an-AX 8S 2x2	-60 dBm
Amazonecho	Alexa_AmazonEchoDot_Streamingaudio-TCP	far	Amazonechodot	Virtual	5GHz	36:f6:f6:32:4f:9a	36	802.11an-AC 8S 2x2	-60 dBm
iPad	Chrome_Tablet_WebBrowsing	far	Tablet	Virtual	5GHz	36:f6:f6:e2:7a:9a	36	802.11an-AC 8S 2x2	-62 dBm
Oneplus11	Amazonshopping_Mobile_WebBrowsing	far	Mobile	Virtual	6GHz	36:f6:f6:df:1d:96	259	802.11ax-BE 16S 2x2	-72 dBm
Pixelxla	Spotify_Mobile_Streamingaudio TCP	far	Mobile	Virtual	6GHz	36:f6:f6:7a:44:96	259	802.11ax-BE 16S 2x2	-64 dBm
Iphone 16 pro max	Chrome_Mobile_WebBrowsing	far	Mobile	Virtual	6GHz	36:f6:f6:c6:ee:96	259	802.11ax-BE 16S 2x2	-71 dBm
Iphone 16 pro max	Chrome_Mobile_WebBrowsing	far	Mobile	Virtual	6GHz	36:f6:f6:24:4c:96	259	802.11ax-BE 16S 2x2	-72 dBm
Pixelxla	Amazonshopping_Mobile_WebBrowsing	far	Mobile	Virtual	6GHz	36:f6:f6:ab:ad:96	259	802.11ax-BE 16S 2x2	-72 dBm
Samsung	SmartRefrigerator_Cloud_Controls	medium	SmartRefrigerator	Virtual	2.4GHz	36:f6:f6:a7:71:e4	6	802.11bgn 4S 2x2	-36 dBm
LG	Netflix_SmartTV_Streamingvideo TCP	medium	SmartTV	Virtual	2.4GHz	36:f6:f6:4e:3b:e4	6	802.11bgn 4S 2x2	-36 dBm
Amazon Ring	SmartDoorBell_Streamingvideo-UDP	medium	SmartDoorBell	Virtual	2.4GHz	36:f6:f6:c2:c5:e4	6	802.11bgn 4S 2x2	-36 dBm
Xiaomi 5Pro	Spotify_Mobile_Streamingaudio TCP	medium	Mobile	Virtual	2.4GHz	36:f6:f6:38:81:e4	6	802.11bgn 4S 2x2	-36 dBm
Kindle	Kindle_WebBrowsing	medium	Ereader	Virtual	2.4GHz	36:f6:f6:ff:a4:e4	6	802.11bgn 4S 2x2	-40 dBm
Oneplus10	PrimeVideo_Mobile_Streamingvideo TCP	medium	Mobile	Virtual	5GHz	36:f6:f6:48:13:ea	36	802.11an-AC 8S 2x2	-55 dBm
Lenovo	FileZilla_Laptop_DownloadFile-FTP	medium	Laptop	Virtual	5GHz	36:f6:f6:d6:cf:ea	36	802.11an-AC 8S 2x2	-56 dBm
PS5	Gaming_Playstation_Streamingvideo-UDP	medium	Playstation	Virtual	5GHz	36:f6:f6:96:9d:ea	36	802.11an-AX 8S 2x2	-55 dBm
HP Pivilion	FileZilla_Laptop_DownloadFile-FTP	medium	Laptop	Virtual	5GHz	36:f6:f6:c6:07:ea	36	802.11an-AC 8S 2x2	-55 dBm
PS5	Gaming_Playstation_Streamingvideo-UDP	medium	Playstation	Virtual	5GHz	36:f6:f6:55:dd:ea	36	802.11an-AX 8S 2x2	-55 dBm
Pixelxla	Spotify_Mobile_Streamingaudio TCP	medium	Mobile	Virtual	6GHz	36:f6:f6:e5:2c:e6	259	802.11ax-BE 16S 2x2	-61 dBm
Oneplus11	Amazonshopping_Mobile_WebBrowsing	medium	Mobile	Virtual	6GHz	36:f6:f6:2d:5b:e6	259	802.11ax-BE 16S 2x2	-70 dBm
Pixelxla	Spotify_Mobile_Streamingaudio TCP	medium	Mobile	Virtual	6GHz	36:f6:f6:d0:e3:e6	259	802.11ax-BE 16S 2x2	-62 dBm
Iphone 16 pro max	Chrome_Mobile_WebBrowsing	medium	Mobile	Virtual	6GHz	36:f6:f6:70:60:e6	259	802.11ax-BE 16S 2x2	-67 dBm
Oneplus11	Youtube_Mobile_Downloadvideo-UDP	medium	Mobile	Virtual	6GHz	36:f6:f6:9a:1a:e6	259	802.11ax-BE 16S 2x2	-60 dBm
Samsung	SmartRefrigerator_Cloud_Controls	near	SmartRefrigerator	Virtual	2.4GHz	14:13:33:a5:19:33	6	802.11bgn 4S 1x1	-31 dBm
LG	Netflix_SmartTV_Streamingvideo TCP	near	SmartTV	Virtual	2.4GHz	14:13:33:64:45:33	6	802.11bgn 4S 1x1	-30 dBm
Amazon Ring	SmartDoorBell_Streamingvideo-UDP	near	SmartDoorBell	Virtual	2.4GHz	14:13:33:96:11:33	6	802.11bgn 4S 1x1	-28 dBm
Kindle	Kindle_WebBrowsing	near	Ereader	Virtual	2.4GHz	14:13:33:65:5d:33	6	802.11bgn 2S 1x1	-26 dBm
LG	Netflix_SmartTV_Streamingvideo TCP	near	SmartTV	Virtual	2.4GHz	14:13:33:e5:6e:71	6	802.11bgn 4S 1x1	-31 dBm
Amazon Ring	SmartDoorBell_Streamingvideo-UDP	near	SmartDoorBell	Virtual	2.4GHz	14:13:33:e0:ac:71	6	802.11bgn 4S 1x1	-28 dBm
Xiaomi 5Pro	Spotify_Mobile_Streamingaudio TCP	near	Mobile	Virtual	2.4GHz	14:13:33:73:78:71	6	802.11bgn 4S 1x1	-31 dBm
LG	Netflix_SmartTV_Streamingvideo TCP	near	SmartTV	Virtual	2.4GHz	14:13:33:ba:39:71	6	802.11bgn 4S 1x1	-31 dBm
Oneplus10	Amazonshopping_Mobile_WebBrowsing	near	Mobile	Virtual	5GHz	14:13:33:4c:20:ed	36	802.11an-AC 8S 2x2	-42 dBm
PS5	Gaming_Playstation_Streamingvideo-UDP	near	Playstation	Virtual	5GHz	14:13:33:3e:93:ed	36	802.11an-AX 8S 2x2	-42 dBm
Amazonecho	Alexa_AmazonEchoDot_Streamingaudio TCP	near	Amazonechodot	Virtual	5GHz	14:13:33:67:7e:ed	36	802.11an-AC 8S 2x2	-42 dBm
Oneplus10	PrimeVideo_Mobile_Streamingvideo TCP	near	Mobile	Virtual	5GHz	14:13:33:7b:31:ed	36	802.11an-AC 8S 2x2	-42 dBm
Macbook pro	FileZilla_Laptop_DownloadFile-FTP	near	Laptop	Virtual	5GHz	50:c2:e8:4a:2f:47	36	802.11an-AX 8S 2x2	-41 dBm
PS5	Gaming_Playstation_Streamingvideo-UDP	near	Playstation	Virtual	5GHz	50:c2:e8:49:ce:47	36	802.11an-AX 8S 2x2	-41 dBm
Samsung23ultra	Spotify_Mobile_Streamingaudio TCP	near	Mobile	Virtual	5GHz	50:c2:e8:d5:22:47	36	802.11an-AX 8S 2x2	-41 dBm
Macbook pro	FileZilla_Laptop_DownloadFile-FTP	near	Laptop	Virtual	5GHz	50:c2:e8:00:e5:47	36	802.11an-AX 8S 2x2	-41 dBm
Oneplus11	Amazonshopping_Mobile_WebBrowsing	near	Mobile	Virtual	6GHz	70:15:fb:2c:0b:c8	259	802.11ax-BE 16S 2x2	-52 dBm
Oneplus11	Spotify_Mobile_Streamingaudio TCP	near	Mobile	Virtual	6GHz	70:15:fb:a5:af:e3	259	802.11ax-BE 16S 2x2	-46 dBm
Pixelxla	PrimeVideo_Mobile_Streamingvideo TCP	near	Mobile	Virtual	6GHz	70:15:fb:f6:c5:1a	259	802.11ax-BE 16S 2x2	-46 dBm
Iphone 16 pro max	Amazonshopping_Mobile_WebBrowsing	near	Mobile	Virtual	6GHz	70:15:fb:1c:db:ac	259	802.11ax-BE 16S 2x2	-51 dBm

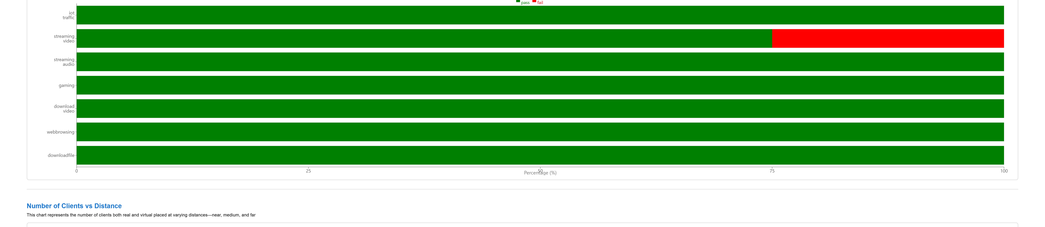
Performance with respect to device types

This representation highlights the pass/fail performance rates across various device types, including mobiles, laptops, tablets, gaming consoles, IoT devices, and smart wearables. The data allows us to assess which device categories perform optimally with the Access Point, providing insights that similar devices are likely to exhibit comparable performance in real-world scenarios.



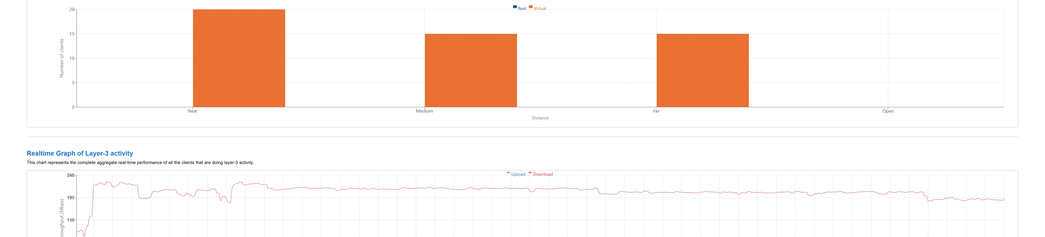
Performance with respect to traffic types

This representation presents the pass/fail performance rates across different traffic types, including video conferencing, audio/video streaming, gaming, and IoT applications. By examining these results, we can determine which traffic types perform better with the Access Point and infer that similar traffic can be effectively deployed in real-world scenarios.



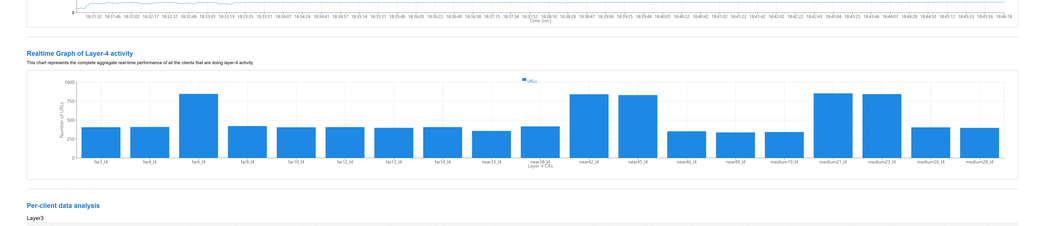
Number of Clients vs Distance

This chart represents the number of clients both real and virtual placed at varying distances—near, medium, and far



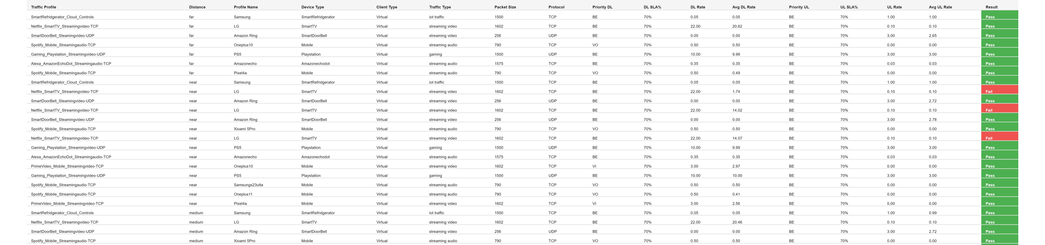
Realtime Graph of Layer-3 activity

This chart represents the complete aggregate real-time performance of all the clients that are doing layer-3 activity.



Realtime Graph of Layer-4 activity

This chart represents the complete aggregate real-time performance of all the clients that are doing layer-4 activity.



Per-client data analysis

Layer3

Traffic Profile	Distance	Profile Name	Device Type	Client Type	Traffic Type	Packet Size	Protocol	Priority DL	DL SLA%	DL Rate	Avg DL Rate	Priority UL	UL SLA%	UL Rate	Avg UL Rate	Result
SmartRefrigerator_Cloud_Controls	far	Samsung	SmartRefrigerator	Virtual	iot traffic	1500	TCP	BE	70%	0.05	0.05	BE	70%	1.00	1.00	Pass
Netflix_SmartTV_Streamingvideo TCP	far	LG	SmartTV	Virtual	streaming video	1602	TCP	BE	70%	22.00	20.62	BE	70%	0.10	0.10	Pass
SmartDoorBell_Streamingvideo-UDP	far	Amazon Ring	SmartDoorBell	Virtual	streaming video	256	UDP	BE	70%	0.00	0.00	BE	70%	3.00	2.65	Pass
Spotify_Mobile_Streamingaudio TCP	far	Oneplus10	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.50	BE	70%	0.00	0.00	Pass
Gaming_Playstation_Streamingvideo-UDP	far	PS5	Playstation	Virtual	gaming	1500	UDP	BE	70%	10.00	9.99	BE	70%	3.00	3.00	Pass
Alexa_AmazonEchoDot_Streamingaudio TCP	far	Amazonecho	Amazonechodot	Virtual	streaming audio	1575	TCP	BE	70%	0.35	0.35	BE	70%	0.03	0.03	Pass
Spotify_Mobile_Streamingaudio TCP	far	Pixelxla	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.49	BE	70%	0.00	0.00	Pass
SmartRefrigerator_Cloud_Controls	near	Samsung	SmartRefrigerator	Virtual	iot traffic	1500	TCP	BE	70%	0.05	0.05	BE	70%	1.00	1.00	Pass
Netflix_SmartTV_Streamingvideo TCP	near	LG	SmartTV	Virtual	streaming video	1602	TCP	BE	70%	22.00	1.74	BE	70%	0.10	0.10	Fail
SmartDoorBell_Streamingvideo-UDP	near	Amazon Ring	SmartDoorBell	Virtual	streaming video	256	UDP	BE	70%	0.00	0.00	BE	70%	3.00	2.72	Pass
Netflix_SmartTV_Streamingvideo TCP	near	LG	SmartTV	Virtual	streaming video	1602	TCP	BE	70%	22.00	14.02	BE	70%	0.10	0.10	Fail
SmartDoorBell_Streamingvideo-UDP	near	Amazon Ring	SmartDoorBell	Virtual	streaming video	256	UDP	BE	70%	0.00	0.00	BE	70%	3.00	2.79	Pass
Spotify_Mobile_Streamingaudio TCP	near	Xiaomi 5Pro	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.50	BE	70%	0.00	0.00	Pass
Netflix_SmartTV_Streamingvideo TCP	near	LG	SmartTV	Virtual	streaming video	1602	TCP	BE	70%	22.00	14.37	BE	70%	0.10	0.10	Fail
Gaming_Playstation_Streamingvideo-UDP	near	PS5	Playstation	Virtual	gaming	1500	UDP	BE	70%	10.00	9.99	BE	70%	3.00	3.00	Pass
Alexa_AmazonEchoDot_Streamingaudio TCP	near	Amazonecho	Amazonechodot	Virtual	streaming audio	1575	TCP	BE	70%	0.35	0.35	BE	70%	0.03	0.03	Pass
PrimeVideo_Mobile_Streamingvideo TCP	near	Oneplus10	Mobile	Virtual	streaming video	1602	TCP	VI	70%	3.00	2.97	BE	70%	0.00	0.00	Pass
Gaming_Playstation_Streamingvideo-UDP	near	PS5	Playstation	Virtual	gaming	1500	UDP	BE	70%	10.00	10.00	BE	70%	3.00	3.00	Pass
Spotify_Mobile_Streamingaudio TCP	near	Samsung23ultra	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.50	BE	70%	0.00	0.00	Pass
Spotify_Mobile_Streamingaudio TCP	near	Oneplus11	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.41	BE	70%	0.00	0.00	Pass
PrimeVideo_Mobile_Streamingvideo TCP	near	Pixelxla	Mobile	Virtual	streaming video	1602	TCP	VI	70%	3.00	2.56	BE	70%	0.00	0.00	Pass
SmartRefrigerator_Cloud_Controls	medium	Samsung	SmartRefrigerator	Virtual	iot traffic	1500	TCP	BE	70%	0.05	0.05	BE	70%	1.00	0.99	Pass
Netflix_SmartTV_Streamingvideo TCP	medium	LG	SmartTV	Virtual	streaming video	1602	TCP	BE	70%	22.00	20.46	BE	70%	0.10	0.10	Pass
SmartDoorBell_Streamingvideo-UDP	medium	Amazon Ring	SmartDoorBell	Virtual	streaming video	256	UDP	BE	70%	0.00	0.00	BE	70%	3.00	2.72	Pass
Spotify_Mobile_Streamingaudio TCP	medium	Xiaomi 5Pro	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.50	BE	70%	0.00	0.00	Pass
PrimeVideo_Mobile_Streamingvideo TCP	medium	Oneplus10	Mobile	Virtual	streaming video	1602	TCP	VI	70%	3.00	2.52	BE	70%	0.00	0.00	Pass
Gaming_Playstation_Streamingvideo-UDP	medium	PS5	Playstation	Virtual	gaming	1500	UDP	BE	70%	10.00	10.00	BE	70%	3.00	3.00	Pass
Gaming_Playstation_Streamingvideo-UDP	medium	PS5	Playstation	Virtual	gaming	1500	UDP	BE	70%	10.00	9.95	BE	70%	3.00	2.99	Pass
Spotify_Mobile_Streamingaudio TCP	medium	Pixelxla	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.50	BE	70%	0.00	0.00	Pass
Spotify_Mobile_Streamingaudio TCP	medium	Pixelxla	Mobile	Virtual	streaming audio	795	TCP	VO	70%	0.50	0.49	BE	70%	0.00	0.00	Pass
Youtube_Mobile_Downloadvideo-UDP	medium	Oneplus11	Mobile	Virtual	download video	1402	UDP	BE	70%	80.00	78.42	BE	70%	0.01	0.01	Pass

Layer4-7

Traffic Profile	Distance	Profile Name	Device Type	Client Type	Traffic Type	Protocol	Max Speed	File Size/URL	SLA URLs	Total URLs	Result
Amazonshopping_Mobile_WebBrowsing	far	Xiaomi 5Pro	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	406	Pass
Kindle_WebBrowsing	far	Kindle	Ereader	Virtual	webbrowsing	HTTPS	0.12	https://openlibrary.org/works/OL7924109W/The_Eye_of_the_World_%28The_Wheel_of_Time_Book_1%29	5	409	Pass
FileZilla_Laptop_DownloadFile-FTP	far	HP	Laptop	Virtual	downloadfile	FTP	20.00	2	5	846	Pass
Chrome_Tablet_WebBrowsing	far	iPad	Tablet	Virtual	webbrowsing	HTTPS	0.10	www.google.com	5	421	Pass
Amazonshopping_Mobile_WebBrowsing	far	Oneplus11	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	405	Pass
Chrome_Mobile_WebBrowsing	far	Iphone 16 pro max	Mobile	Virtual	webbrowsing	HTTPS	17.00	www.mi.com	5	407	Pass
Chrome_Mobile_WebBrowsing	far	Iphone 16 pro max	Mobile	Virtual	webbrowsing	HTTPS	17.00	www.mi.com	5	398	Pass
Amazonshopping_Mobile_WebBrowsing	far	Pixelxla	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	407	Pass
Kindle_WebBrowsing	near	Kindle	Ereader	Virtual	webbrowsing	HTTPS	0.12	https://openlibrary.org/works/OL7924109W/The_Eye_of_the_World_%28The_Wheel_of_Time_Book_1%29	5	357	Pass
Amazonshopping_Mobile_WebBrowsing	near	Oneplus10	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	416	Pass
FileZilla_Laptop_DownloadFile-FTP	near	Macbook pro	Laptop	Virtual	downloadfile	FTP	20.00	2	5	841	Pass
FileZilla_Laptop_DownloadFile-FTP	near	Macbook pro	Laptop	Virtual	downloadfile	FTP	20.00	2	5	836	Pass
Amazonshopping_Mobile_WebBrowsing	near	Oneplus11	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	352	Pass
Amazonshopping_Mobile_WebBrowsing	near	Iphone 16 pro max	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	337	Pass
Kindle_WebBrowsing	medium	Kindle	Ereader	Virtual	webbrowsing	HTTPS	0.12	https://openlibrary.org/works/OL7924109W/The_Eye_of_the_World_%28The_Wheel_of_Time_Book_1%29	5	343	Pass
FileZilla_Laptop_DownloadFile-FTP	medium	Lenovo	Laptop	Virtual	downloadfile	FTP	20.00	2	5	853	Pass
FileZilla_Laptop_DownloadFile-FTP	medium	HP Pivilion	Laptop	Virtual	downloadfile	FTP	20.00	2	5	843	Pass
Amazonshopping_Mobile_WebBrowsing	medium	Oneplus11	Mobile	Virtual	webbrowsing	HTTPS	0.50	https://www.amazon.in/Samsung-Fully-Automatic-Ecobubble-WA80BG4545BR/?c.technologistpdp-80087J25981	5	404	Pass

Chrome_Mobile_WebBrowsing	medium	iphone 16 pro max	Mobile	Virtual	webbrowsing	HTTPS	17.00	www.mi.com	5	397	Pass