

Networks in a Box

Candela
TECHNOLOGIES

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.

Test Configuration:

Name of the Test Scenario	Modern Simple Home
Test Duration (in Min)	120
Number of Devices in Test	17
2.4GHz SSID	TPLINK_2G
2.4GHz BSSID	90:3c:b3:6c:41:b0
2.4GHz Security	Wpa2
5GHz SSID	TPLINK_5G
5GHz BSSID	90:3c:b3:6c:41:b1
5GHz Security	Wpa2
6GHz SSID	TPLINK_6G
6GHz BSSID	90:3c:b3:6c:41:b2
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.

■ Passed ■ Fail

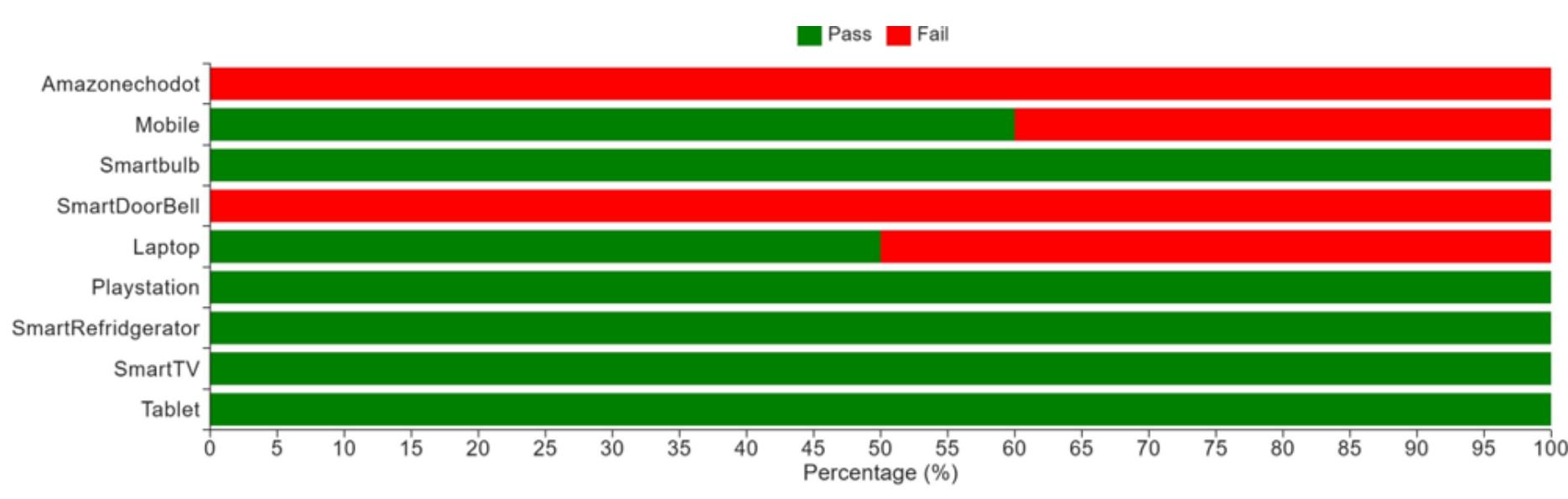
Device Information



Profile name	Distance	Device Type	Client Type	Traffic Profile	MAC Address	Channel	RSSI	SSID	Mode	NSS	Bandwidth
Macbook Pro	Near	Laptop	Virtual	FTP File Transfer	84:3e:1d:cc:ac:0a	227	-30	TPLINK_6G	802.11a-AX	2x2	80MHz
PS5	Near	PlayStation	Virtual	Gaming	84:3e:1d:10:ae:0a	227	-32	TPLINK_6G	802.11a-Ax	2x2	80MHz
iPhoneX	Near	Mobile	Virtual	Spotify Music	84:3e:1d:2f:9d:06	36	-35	TPLINK_5G	802.11an-AC	1x1	80MHz
Samsung Refrigerator	Near	Smart Refrigerator	Virtual	Smart Controls	84:3e:1d:87:d7:a0	6	-37	TPLINK_2G	802.11bn	1x1	20MHz
LG TV	Near	Smart TV	Virtual	Streaming Netflix	84:3e:1d:9d:a3:9a	6	-35	TPLINK_2G	802.11bgn	1x1	40MHz
Wipro Bulb	Near	Smart Bulb	Virtual	Smart IoT Controls	84:3e:1d:84:66:9a	6	-32	TPLINK_2G	802.11bgn	1x1	20MHz
Macbook Air	Near	Laptop	Virtual	MS Teams Meeting	8E:A9:9E:96:5F:61	227	-29	TPLINK_6G	802.11a-Ax	2x2	80MHz
Pixel 4	Medium	Mobile	Virtual	Zoom Conference call	84:3e:1d:26:08:a0	36	-55	TPLINK_5G	802.11an-AC	2x2	80MHz
HP Laptop	Medium	Laptop	Virtual	YouTube Streaming	38:f8:f6:ae:ce:b6	36	-58	TPLINK_5G	802.11an-AC	2x2	80MHz
Lenovo Thinkpad	Medium	Laptop	Virtual	Zoom Conference Call	38:f8:f6:b2:90:b6	6	-50	TPLINK_2G	802.11bgn	1x1	40MHz
OnePlus 10R	Medium	Mobile	Virtual	YouTube Streaming	38:f8:f6:00:01:b6	6	-53	TPLINK_2G	802.11bgn	1x1	40MHz
Samsung s23 Ultra	Medium	Mobile	Virtual	Streaming online Video	38:f8:f6:4d:42:ba	36	-58	TPLINK_5G	802.11an-AX	2x2	80MHz
Amazon Ring	Far	Smart Doorbell	Virtual	Motion Detections and Uploading Live Video	38:f8:f6:a7:da:b4	6	-78	TPLINK_2G	802.11bgn	1x1	20MHz
Wipro Bulb	Far	Smart Bulb	Virtual	Smart IoT Controls	38:f8:f6:2e:57:b4	6	-77	TPLINK_2G	802.11bgn	1x1	20MHz
Vivo Y24	Far	Mobile	Virtual	Streaming Prime Video	38:f8:f6:aa:e0:b4	36	-75	TPLINK_5G	802.11an-AC	2x2	80MHz
Samsung S23 Ultra	Far	Mobile	Virtual	WhatsApp Video Call	84:3e:1d:a4:01:06	36	-77	TPLINK_5G	802.11an-AX	2x2	80MHz
Amazon echo dot	Far	Smart Home Control	Virtual	Smart Controls and Streaming audio	84:3e:1d:5c:b7:06	36	-77	TPLINK_5G	802.11an-AC	1x1	40MHz

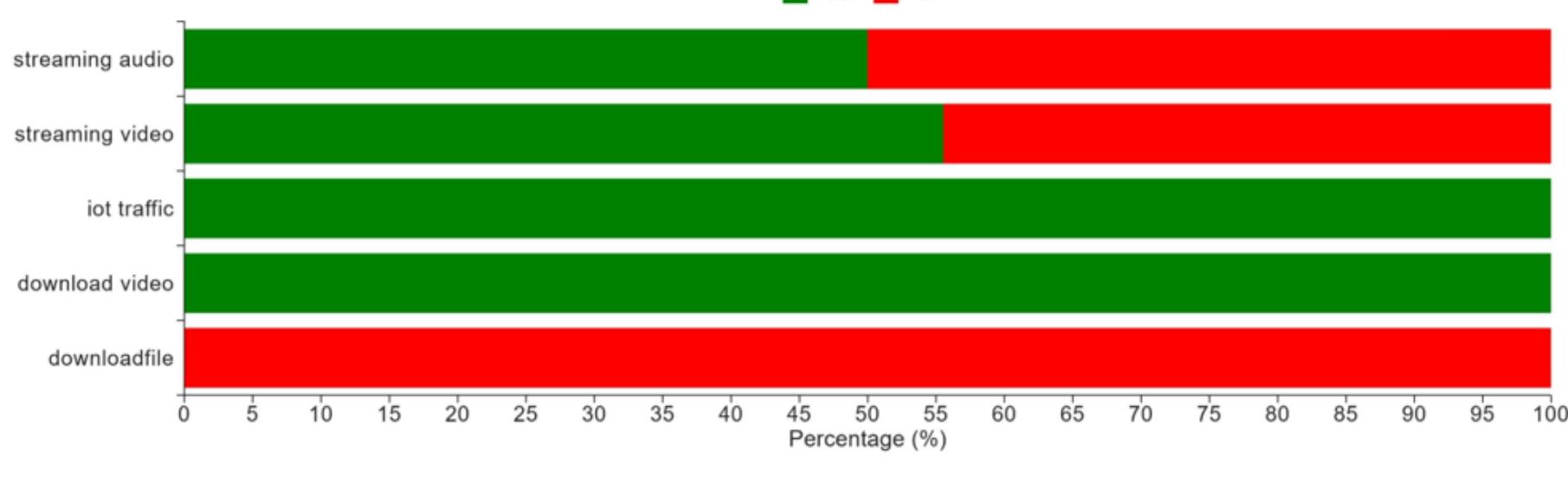
Performance with respect to device types:

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.



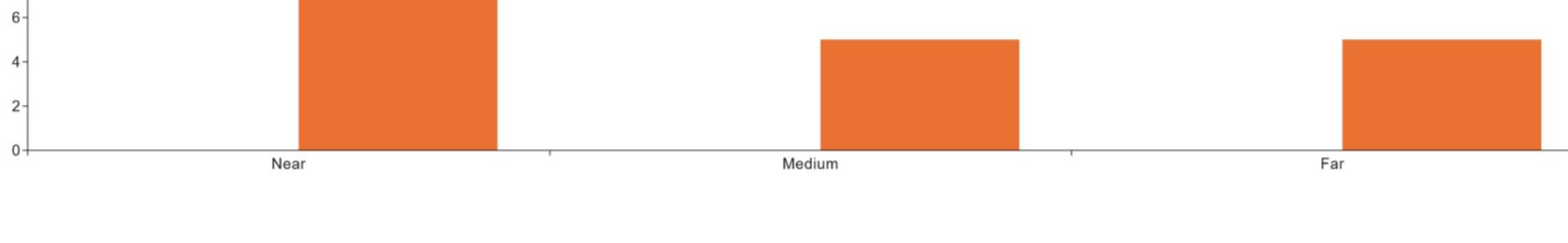
Performance with respect to traffic types:

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.



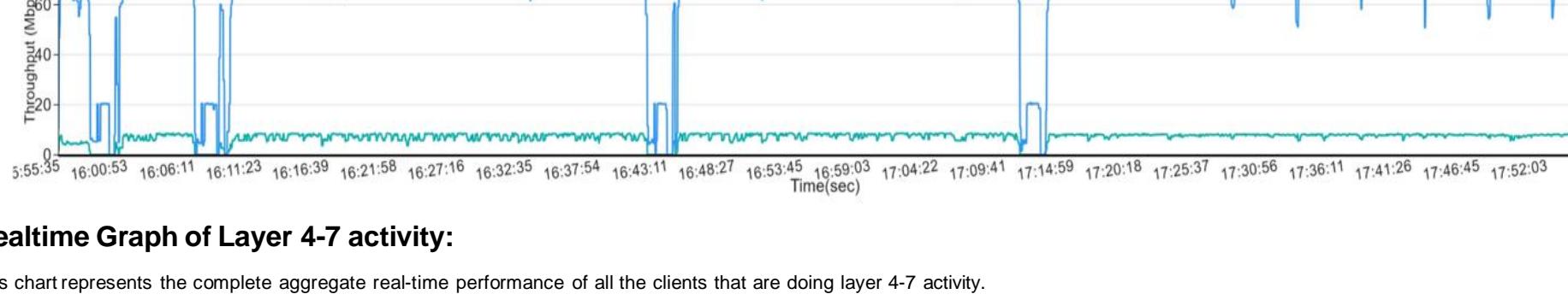
Number of Clients vs Distance

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 4-7 activity:

This chart represents the complete aggregate real-time performance of all the clients that are doing layer 4-7 activity.



Per-client data analysis:

Layer-3

Traffic Profile	Distance	Profile Name	Device Type	Client Type	Traffic Type	Packet Size (Bytes)	Traffic Protocol	Priority DL	DL SLA%	Download Rate (in Mbps)	Obtained Average Download Rate (in Mbps)	Priority UL	UL SLA%	Upload Rate (in Mbps)	Obtained Average Upload Rate (in Mbps)	Result
Alexa_Amazon_EchoDot_Streamingvideo-TCP	far	Amazonecho	Amazonechidot	Virtual	streaming audio	1575	TCP	BE	70%	0.35	0.00	BE	70%	0.03	0.00	Fail
Whatsapp_Mobile_Streamingvideo-UDP	far	Samsungs23ult	Mobile	Virtual	streaming video	110	UDP	VO	70%	1.50	0.00	BE	70%	0.00	0.00	Fail
PrimeVideo_Mobile_Streamingvideo-TCP	far	Vivo vY24	Mobile	Virtual	streaming video	1602	TCP	VI	70%	3.00	0.00	BE	70%	0.00	0.00	Fail
SmartBulb_IOT	far	Wipro Bulb	Smartbulb	Virtual	iot traffic	280	TCP	BE	70%	0.00	0.00	BE	70%	0.00	0.00	Pass
SmartDoorBell_Streamingvideo-UDP	far	DoorBell	SmartDoorBell	Virtual	streaming video	256	UDP	BE	70%	0.00	0.00	BE	70%	3.00	1.72	Fail
MSTeams_Laptop_Streamingvideo-TCP	near	macbookPro_6G	Laptop	Virtual	streaming video	1600	UDP	BE	70%	5.00	0.00	BE	70%	5.00	0.00	Fail
Gaming_Playstation_Streamingvideo	near	Playstation_6G	Playstation	Virtual	streaming video	1500	UDP	BE	70%	10.00	8.93	BE	70%	3.00	2.68	Pass
Streaming_Mobile_Audio-TCP	near	iPhoneX	Mobile	Virtual	streaming audio	790	TCP	VO	70%	0.50	0.46	BE	70%	0.00	0.00	Pass
refridgerator	near	Smartrefridgerator	Smartrefridgerator	Virtual	iot traffic	1500	TCP	BE	75%	0.10	0.09	BE	75%	2.00	1.77	Pass
Netflix_SmartTV_Streamingvideo-TCP	near	LG TV	SmartTV	Virtual	streaming video	1602	TCP	BE	70%	22.00	19.77	BE	70%	0.10	0.09	Pass
SmartBulb_IOT_Control	near	Wipro Bulb	Smartbulb	Virtual	iot traffic	280	TCP	BE	70%	0.00	0.00	BE	70%	0.00	0.00	Pass
Youtube_Mobile_Downloadvideo-UDP	medium	Samsungs23ult	Mobile	Virtual	download video	1402	UDP	BE	60%	8.00	7.34	BE	60%	0.01	0.01	Pass
zoom_Tablet_Streamvideo	medium	Pixel 4	Tablet	Virtual	streaming video	1170	UDP	BE	70%	1.00	0.92	BE	70%	0.50	0.46	Pass
Youtube_Laptop_Streamingvideo-UDP	medium	HP	Laptop	Virtual	streaming video	1400	UDP	BE	70%	20.00	19.23	BE	70%	0.02	0.02	Pass
Zoom_Laptop_Streamingvideo-UDP	medium	Lenovo_Thinkpad	Laptop	Virtual	streaming video	1170	UDP	BE	70%	0.11	0.10	BE	70%	0.02	0.02	Pass
Youtube_Mobile_Downloadvideo-UDP	medium	Oneplus10R	Mobile	Virtual	download video	1402	UDP	BE	60%	8.00	7.32	BE	60%	0.01	0.01	Pass

Layer4-7

Traffic Profile	Distance	Profile Name	Device Type	Client Type	Traffic Type	Traffic Protocol	Max Speed (in Mbps)	File Size/URL	SLA URLs	Total URLs	Result
FTP_TransferfileProfile	near	macbookPro_6G	Laptop	Virtual	downloadfile	FTP	1000.00	1000	5	181	Fail

