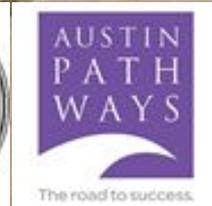




HACA & Austin Pathways
Sneakernet Project
June 7, 2021 - July 30, 2021





Presenter

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With Thanks to

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HACA & Austin Pathways Resident Smart City Ambassadors*



Background & Introduction

- HACA has 18 public subsidized housing properties spanning Austin from north to south across the eastern crescent.
- Is a single provider's 4G hotspot the best product for all HACA properties and all parts of town?
- What are acceptable levels of service, using third-party definitions, for broadband speed in a HACA household, i.e. per multiple users using intensive applications simultaneously in a household?
- What is the cost of service both per household and per property for wireline vs. wireless broadband service?
- Does a resident at a given property get "\$1 of wireless broadband" for a dollar spent?



Our Scope

- One year 7-Week Project Staffed by co-lead by 2 and assisted by 4 part-time ACC IT Work Study Interns
- Three Phases.
 - Phase 1, July 30, Procurement Recommendation, Stakeholder Feedback
 - Phase 2 & 3, Vendor analysis
- Core activities, Phase 1: design of experiment, key map design and validation, data collection and validation, evaluation, stakeholder requirements feedback and synthesis
- Ten HACA Properties
 - 8 Central and North Properties with No In-Home Internet
 - 2 Central-Downtown Properties with Free Google Fiber



Phase 1 Questions

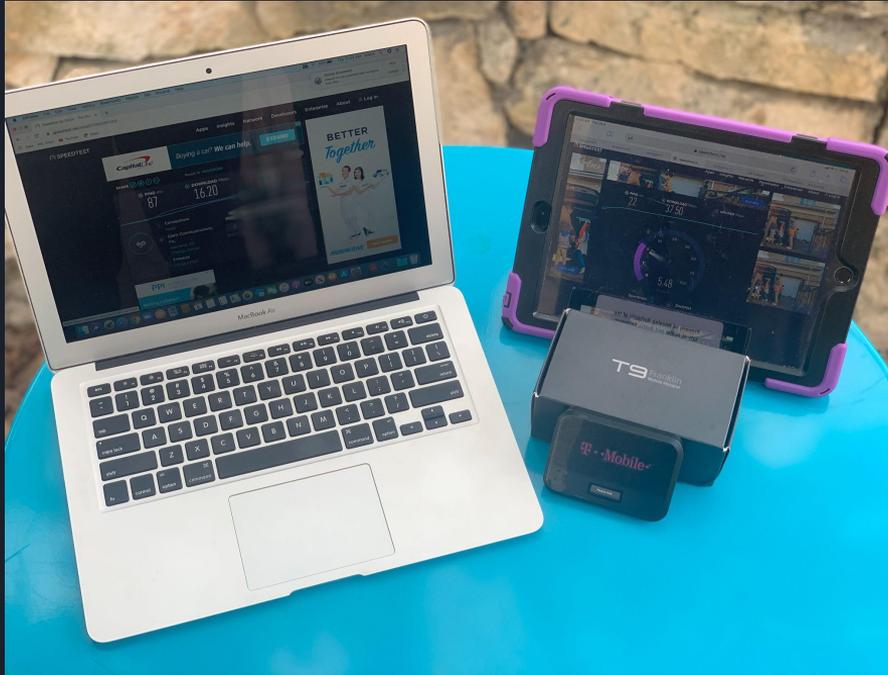
- What is the right internet service to provide to each household at each property, given a conservative outdoor reading and better-than-average devices?
- Is a single provider's 4G hotspot, is that product the best for all HACA properties and all parts of town?
- What are acceptable levels of service, using third-party definitions, for broadband speed in a HACA household, i.e. per multiple users using intensive applications simultaneously in a household?
- What is the cost of service both per household and per property for wireline vs. wireless broadband service?
- Does a resident at a given property get "\$1 of broadband" for a dollar spent?

On Location at North Loop

- Boots on the ground
- Outdoors only
- Hardware in hand



Speedtesting Hardware



MacBook Air: 1.6ghz, dual-core
8th-gen, intel core i5 2015,
macOS Catalina 10.15.7

Mac Serial #: CO2SC907H3QF

iPad: 32GB, 7th Gen, IOS 13.7

iPad Serial #: CO2SC907H3QF

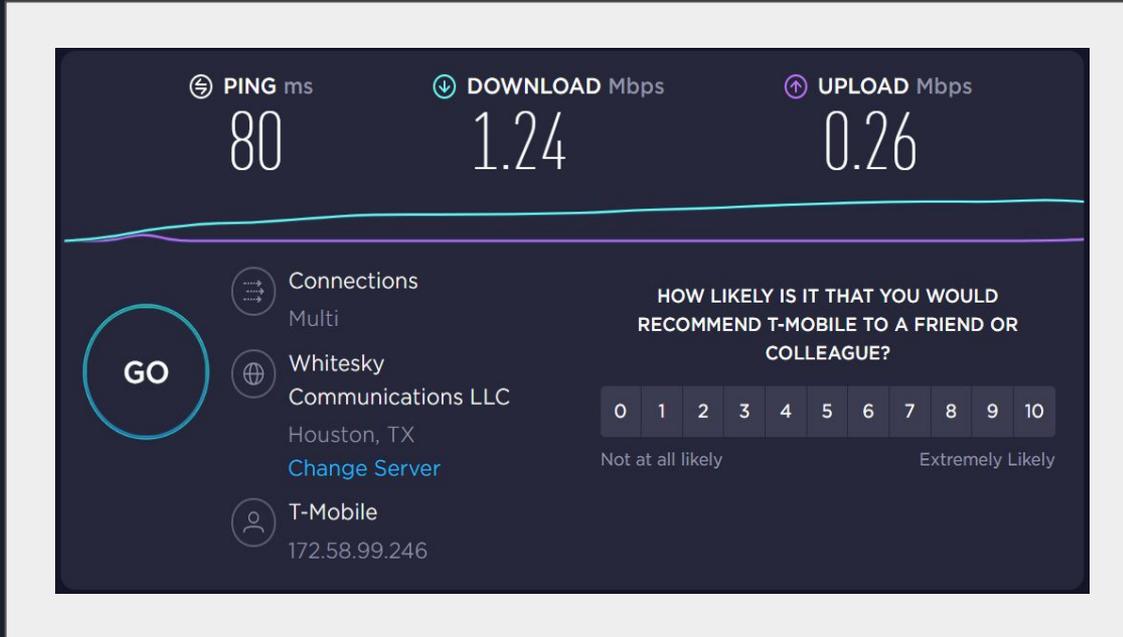
T-Mobile 4G Hotspot Sims:

8901260011786575707F

8901260011786569304F

8901260011786459530F

Ookla's Speedtest.net in the browser

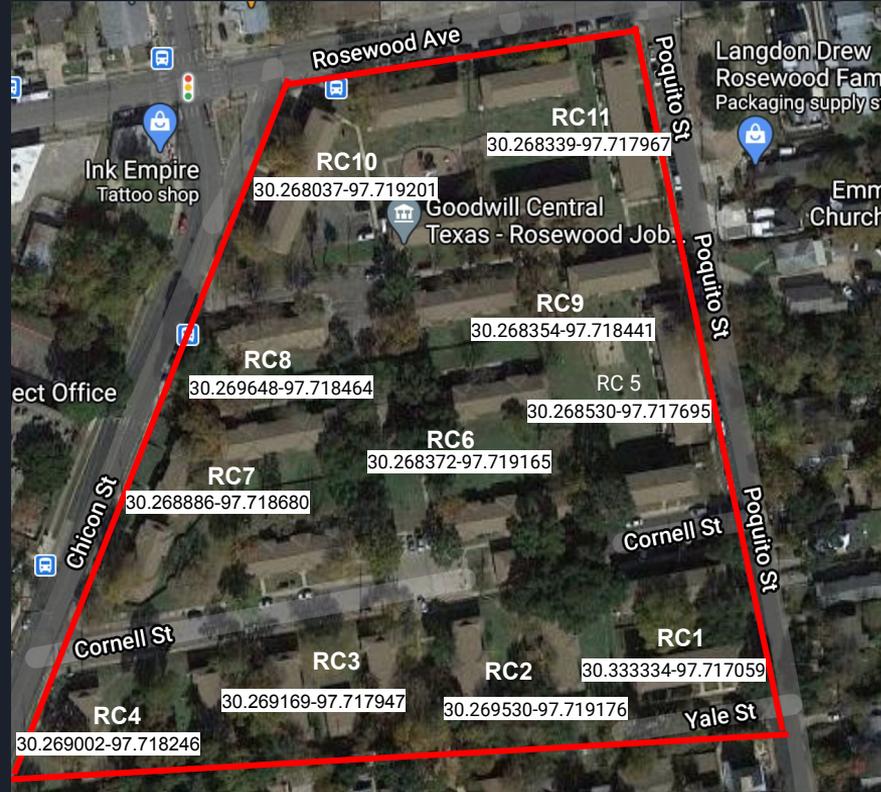


Speed tests measure:

- ping (ms)
- download (Mbps)
- upload (Mbps)

Property Key Maps - Example, Rosewood Courts

- Built in 1939
- 124 units
- 248 residents
- 58 K-12 Households
- Borders: Rosewood to Cornell/Yale N-S and Chicon to Poquito W-E.
- The property is approximately 358,000 ft².



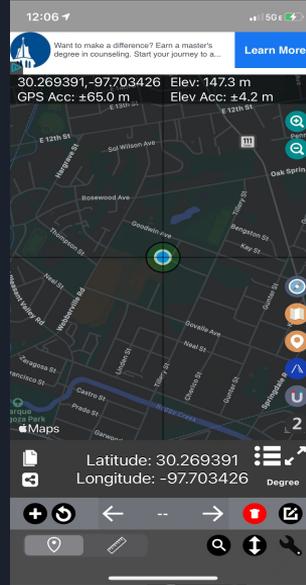
Confirm your Key Map GIS Location

1



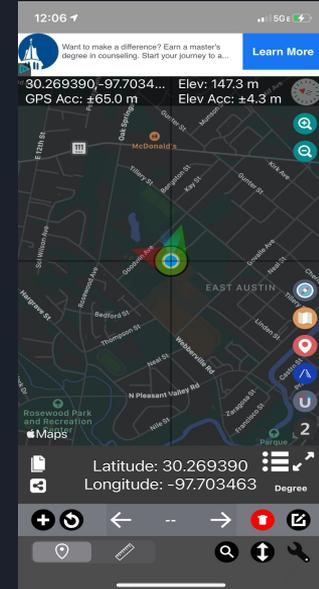
Download the
Coordinates App

2



Click on the  symbol and it will refresh your location,

3



Zoom in with your fingers on the touch screen. Check that Long & Lat are correct at the bottom

FCC Broadband Speed Guides

	Light Use (Basic functions: email, browsing, basic video, VoIP, Internet radio)	Moderate Use (Basic functions plus <i>one</i> high-demand application: streaming HD video, multiparty video conferencing, online gaming, telecommuting)	High Use (Basic functions plus <i>more than one</i> high-demand application running at the same time)
1 user on 1 device	Basic	Basic	Medium
2 users or devices at a time	Basic	Medium	Medium/Advanced
3 users or devices at a time	Medium	Medium	Advanced
4 users or devices at a time	Medium	Advanced	Advanced

Basic Service = 3 to 8 Mbps*

Medium Service = 12 to 25 Mbps

Advanced Service = More than 25 Mbps

Sources:

<https://www.fcc.gov/consumers/guides/broadband-speed-guide>

<https://www.fcc.gov/consumers/guides/household-broadband-guide>

*Mbps (Megabits per second) is the standard measure of broadband speed. It refers to the speed with which information packets are downloaded from, or uploaded to, the internet.

Minimum Download Speeds for:

- Students – 5-25 Mbps
- Telecommuting – 5-25 Mbps
- Streaming HD Video – 5-8 Mbps
- File Downloading – 10 Mbps
- Online Gaming – 4 Mbps

Hotspots performance extremes

Santa Rita Courts
2341 Corta Street Ave. 78702



Rosewood Courts
2001 Rosewood Ave. 78702



Grid Location Group	Property	Grid Location	Test Number	Device Tested	SIM Number	Date	Time 24h	Lat/Long Position	Ping (ms)	Download (Mbps)	Upload (Mbps)
SR01	Santa Rita	SR01	1	iPad	89112601178649530F	7/12/2021	12:08	30.259712-97.716037	53.00	17.64	13.93
	Santa Rita	SR01	1	MacBook Air	89112601178649530F	7/12/2021	12:08	30.259712-97.716037	68.00	18.70	12.68
	Santa Rita	SR01	2	iPad	89112601178649530F	7/12/2021	12:41	30.260712-97.716037	54.00	4.81	7.68
	Santa Rita	SR01	2	MacBook Air	89112601178649530F	7/12/2021	12:38	30.260712-97.716037	48.00	37.06	18.09
	Santa Rita	SR01	3	iPad	89112601178649530F	7/12/2021	12:08	30.259712-97.716037	50.00	12.99	13.91
SR02	Santa Rita	SR02	1	MacBook Air	89112601178649530F	7/12/2021	12:08	30.259712-97.716037	52.00	26.78	11.03
	Santa Rita	SR02	1	iPad	89112601178649530F	7/12/2021	12:02	30.258872-97.717835	49.00	16.63	13.58
	Santa Rita	SR02	2	MacBook Air	89112601178649530F	7/12/2021	12:02	30.258872-97.717835	50.00	22.88	12.90
	Santa Rita	SR02	2	iPad	89112601178649530F	7/12/2021	12:02	30.258872-97.717835	191.00	16.16	11.61
	Santa Rita	SR02	3	MacBook Air	89112601178649530F	7/12/2021	12:02	30.258872-97.717835	58.00	14.68	11.91
SR03	Santa Rita	SR03	1	MacBook Air	891126011786565304F	7/12/2021	11:50	30.26126-97.718342	64.00	14.77	14.10
	Santa Rita	SR03	1	iPad	891126011786565304F	7/12/2021	11:50	30.26126-97.718342	51.00	28.16	20.04
	Santa Rita	SR03	2	MacBook Air	891126011786565304F	7/12/2021	11:50	30.26126-97.718342	40.00	12.16	11.99
	Santa Rita	SR03	2	iPad	891126011786565304F	7/12/2021	11:50	30.26126-97.718342	53.00	30.61	11.80
	Santa Rita	SR03	3	iPad	891126011786565304F	7/12/2021	11:50	30.26126-97.718342	169.00	16.49	17.39
SR04	Santa Rita	SR04	1	MacBook Air	89112601178649530F	7/12/2021	11:54	30.260233-97.718032	52.00	8.81	24.00
	Santa Rita	SR04	1	iPad	89112601178649530F	7/12/2021	11:54	30.260233-97.718032	53.00	16.66	9.77
	Santa Rita	SR04	2	MacBook Air	89112601178649530F	7/12/2021	11:54	30.260233-97.718032	54.00	8.86	18.00
	Santa Rita	SR04	2	iPad	89112601178649530F	7/12/2021	11:54	30.260233-97.718032	199.00	14.86	12.02
	Santa Rita	SR04	3	MacBook Air	89112601178649530F	7/12/2021	11:54	30.260233-97.718032	45.00	15.32	11.14
SR05	Santa Rita	SR05	1	MacBook Air	891126011786565304F	7/12/2021	11:37	30.260819-97.718031	82.00	11.40	7.00
	Santa Rita	SR05	1	iPad	891126011786565304F	7/12/2021	11:37	30.260819-97.718031	104.00	27.07	10.10
	Santa Rita	SR05	2	MacBook Air	891126011786565304F	7/12/2021	11:37	30.260819-97.718031	90.00	10.40	11.00
	Santa Rita	SR05	2	iPad	891126011786565304F	7/12/2021	11:37	30.260819-97.718031	49.00	8.81	20.00
	Santa Rita	SR05	3	MacBook Air	891126011786565304F	7/12/2021	11:37	30.260819-97.718031	49.00	8.81	20.00

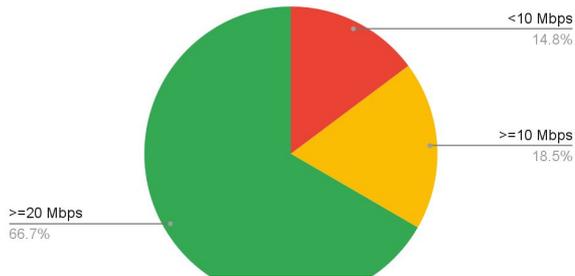
Grid Location Group	Property	Grid Location	Test Number	Device Tested	SIM Number	Date	Time 24h	Lat/Long Position	Ping (ms)	Download (Mbps)	Upload (Mbps)
RC01	Rosewood Courts	RC01	1	MacBook Air	89112601178649530F	7/12/2021	11:07	30.260312-97.719184	102.00	7.82	7.98
	Rosewood Courts	RC01	1	iPad	89112601178649530F	7/12/2021	11:07	30.260312-97.719184	74.00	3.76	1.81
	Rosewood Courts	RC01	2	MacBook Air	89112601178649530F	7/12/2021	11:07	30.260312-97.719184	54.00	5.89	6.30
	Rosewood Courts	RC01	2	iPad	89112601178649530F	7/12/2021	11:07	30.260312-97.719184	56.00	4.89	12.10
	Rosewood Courts	RC01	3	MacBook Air	89112601178649530F	7/12/2021	11:07	30.260312-97.719184	118.00	4.20	1.40
RC02	Rosewood Courts	RC02	1	iPad	89112601178649530F	7/12/2021	10:20	30.26232-97.718084	72.00	17.41	17.41
	Rosewood Courts	RC02	1	MacBook Air	89112601178649530F	7/12/2021	10:20	30.26232-97.718084	70.00	5.26	4.88
	Rosewood Courts	RC02	2	iPad	89112601178649530F	7/12/2021	10:20	30.26232-97.718084	77.00	10.89	6.02
	Rosewood Courts	RC02	2	MacBook Air	89112601178649530F	7/12/2021	10:20	30.26232-97.718084	64.00	10.74	4.00
	Rosewood Courts	RC02	3	iPad	89112601178649530F	7/12/2021	10:10	30.260312-97.718084	72.00	8.65	8.80
RC03	Rosewood Courts	RC03	1	MacBook Air	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	109.00	8.61	2.10
	Rosewood Courts	RC03	1	iPad	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	88.00	8.39	11.30
	Rosewood Courts	RC03	1	MacBook Air	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	70.00	1.87	1.40
	Rosewood Courts	RC03	2	iPad	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	144.00	6.50	1.80
	Rosewood Courts	RC03	2	MacBook Air	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	93.00	6.84	4.80
RC04	Rosewood Courts	RC03	3	iPad	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	88.00	10.66	5.82
	Rosewood Courts	RC03	3	MacBook Air	89112601178649530F	7/12/2021	10:14	30.260105-97.718616	80.00	10.72	4.80
	Rosewood Courts	RC04	1	MacBook Air	89112601178649530F	7/12/2021	10:02	30.260105-97.718480	97.00	7.96	3.80
	Rosewood Courts	RC04	1	MacBook Air	89112601178649530F	7/12/2021	10:02	30.260105-97.718480	117.00	10.17	8.61
	Rosewood Courts	RC04	2	iPad	89112601178649530F	7/12/2021	10:02	30.260105-97.718480	88.00	11.13	9.10
RC05	Rosewood Courts	RC04	3	MacBook Air	89112601178649530F	7/12/2021	10:02	30.260105-97.718480	89.00	15.30	12.90
	Rosewood Courts	RC04	3	iPad	89112601178649530F	7/12/2021	10:02	30.260105-97.718480	55.00	12.91	10.80
	Rosewood Courts	RC05	1	MacBook Air	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	110.00	3.67	4.00
	Rosewood Courts	RC05	1	iPad	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	143.00	1.44	1.80
	Rosewood Courts	RC05	2	MacBook Air	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	132.00	1.40	1.10
RC05	Rosewood Courts	RC05	2	MacBook Air	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	49.00	4.42	1.40
	Rosewood Courts	RC05	2	iPad	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	81.00	4.42	1.10
	Rosewood Courts	RC05	3	MacBook Air	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	144.00	8.49	3.00
	Rosewood Courts	RC05	3	iPad	89112601178649530F	7/12/2021	10:10	30.260663-97.717647	144.00	8.49	3.00

The Device Matters

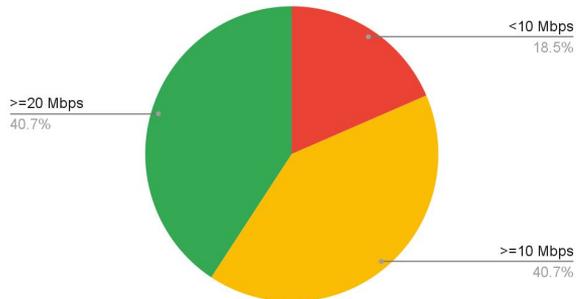
In general, MacBook Pro devices performed better than iPads. Both devices used were relatively new, or “better than average.”

Santa Rita Courts

Percentage of Macbook Tests with Capable Speed

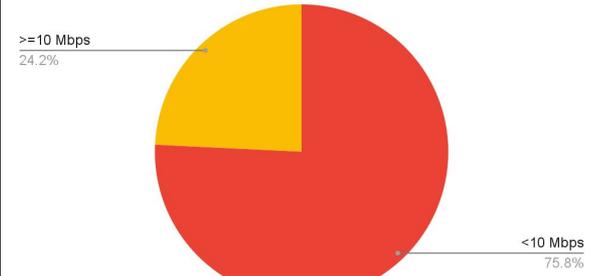


Percentage of iPad Tests with Capable Speed

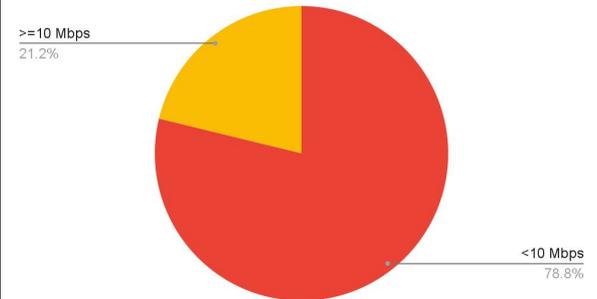


Rosewood Courts

Percentage of Macbook Tests with Capable Speed



Percentage of iPad Tests with Capable Speed



PRELIMINARY FINDINGS

Hotspot Purchase Recommendation

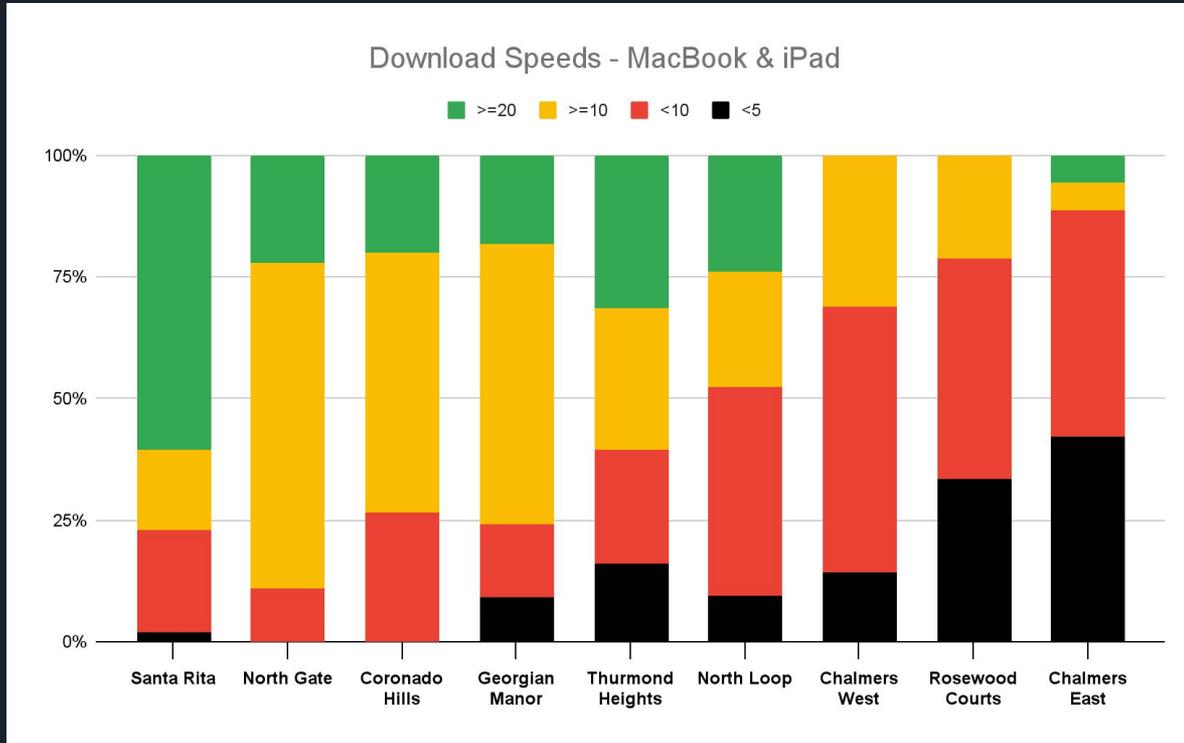
Based on Anecdotal Data, June 7 - July 30, 2021

Property Name	Units (#)	Recommendation (Buy Hold or Stop)	Served Units (#)	Served Units (%)	Under-served (#)	Under-Served Units (%)	Un-served (#)	Un-served (%)
Santa Rita	97	Buy	89	92%	0	0%	8	8%
Georgian Manor	94	Buy	46	49%	31	33%	17	18%
Northgate	50	Buy	18	36%	26	52%	6	12%
Thurmond Heights	144	Hold	46	32%	54	38%	44	31%
Coronado Hills	48	Hold	13	27%	19	40%	16	33%
Booker T. Washington	216	Stop	30	14%	0	0%	186	86%
Northloop	130	Hold	0	0%	130	100%	0	0%
Chalmers Courts	79	Stop	0	0%	0	0%	79	100%
Chalmers East	158	Stop	0	0%	0	0%	158	100%
Rosewood	124	Stop	0	0%	0	0%	124	100%
Totals	1140		242		260		638	

Table 1, 10 properties tested using outdoor keymap locations; "Units served" based on percentage of keymap points % of keymap points serving >20Mbps download speed, denoted by green color denotes keymap points.

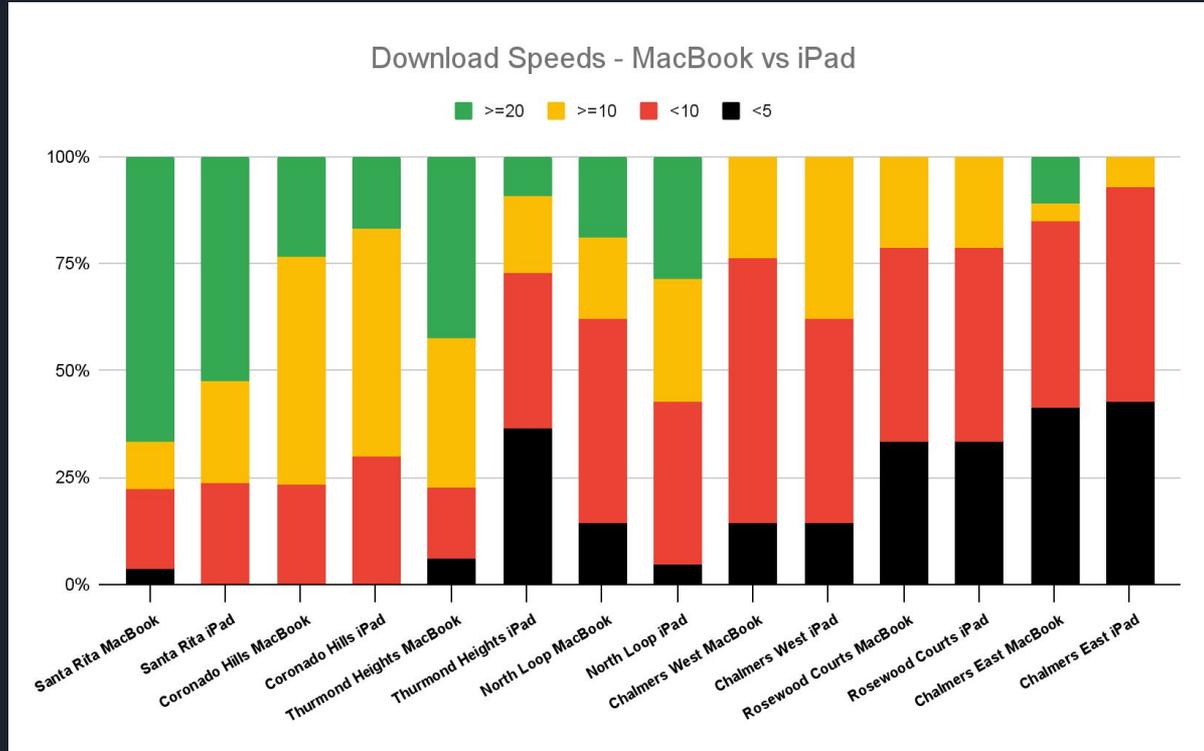
Download Speeds

MacBook and iPad, by Property



Upload Speeds

MacBook and iPad, by Property





Phase 2 questions to be answered by May, 2022

- What is the right internet service to provide to each household at each property, given an actual indoor reading and better-than-average devices?
- Do mobile wireless providers tend to perform well in some neighborhoods where other providers do not perform well?
- Do 5G hotspots for a given vendor perform better than 4G at HACA properties? How much better? What is the incremental value provided?
- Does a resident at a given property get “\$1 of 5G broadband” for a dollar spent?
- Does the socioeconomic status of the area affect the results? Could we try across the street?
- Which wireless service providers are the best options for properties in distinct and diverse parts of town?



Questions?

Catherine Crago

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